Parametric Cost Estimating Training Track For The Parametric Estimating Handbook

Chapter 8

Other Parametric Applications

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- Considerations When Applying Tools
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Objective

- Provide an synopsis of
  - What to consider when developing and implementing a parametric estimating model
  - Give descriptions of general and specialized applications where parametric estimating techniques can be used
  - Show examples of where and how these techniques have been implemented

Overview

- Parametric techniques can be used for a variety of applications!

- Parametric Techniques are:
  - Accurate
  - Fast
  - Flexible
  - Repeatable (Replicable and Consistent)
  - Cost Effective
  - Efficient in allowing minimal effort in subsequent modeling exercises

Tailoring Applications to Customer Needs

- The most important element for a successful parametric application is to involve all affected parties early in the development, testing, and implementation of the parametric model

- The needs of both internal and external customers must be considered and coordinated during the entire process to ensure that the needs and concerns of all parties have been addressed

Tailoring Applications – Effective Tools

- Use integrated product teams (IPTs)
  - The Parametric Estimating Reinvention Laboratory demonstrated that the use of IPTs is a best practice for implementing, evaluating, and negotiating new parametric techniques in an estimating system
  - An IPT usually includes
    - Representatives from the contractor's organization
    - Representatives from the contractor's major buying activities, DCMA, and DCAA

Tailoring Applications – Effective Tools (Continued)

- Using an IPT process team members provide their feedback on a real-time basis on issues such as:
  - Calibration and validation processes
  - Estimating system disclosure requirements
  - Government evaluation criteria
- With an IPT contractors can address the concerns of Government representatives before incurring significant costs implementing an acceptable parametric estimating system or developing proposals based on appropriate techniques
- Collaboration facilitates ability to negotiate fair and reasonable prices for proposals based on parametric techniques
- Achieves buy-in and a sense of mutual ownership

Tailoring Applications – Effective Tools (Continued)

- Consider customer's requirements
  - Coordinate the specific requirements for known and expected customers to ensure that the model has the flexibility to provide the data and estimates needed
  - A model that isn't flexible or doesn't meet the customer's requirements won't be used by the customer

Tailoring Applications – Effective Tools (Continued)

- Provide training to all customers
- Training ensures the customer is aware of:
  - How the parametric tool was developed
  - What type of costs it is estimating
  - Helps to ensure their "buy-in" on and use of the model

Tailoring Applications – Effective Tools (Continued)

- Obtain a memorandum of understanding (MOU)
  - A MOU developed between the contractor and the customer ensures that there is an agreement on what type of data will be provided to meet the customer's needs

Considerations When Applying Tools

- When applying the tools used in parametric estimating models, both the contractor and customer should consider the following items:
  - Has there been a significant change in the underlining assumptions and data that was used to calibrate the model?
  - Are the assumptions reasonable?
  - Has the parametric model been appropriately calibrated and validated?
    - Has the model been tested recently to ensure it is still accurate?
    - The risk associated with the estimate will increase if the model provides an inaccurate result.

Considerations When Applying Tools (Continued)

- Are the inputs to the parametric model appropriate?
- Have any significant adjustments been made to the model?
- Are the outputs from the parametric model realistic?
- Are there any indications that the database requires an out-of-period update?

When and How to Use the Various Tools and Techniques

- It's important to understand that the development and use of parametric tools requires:
  - Time
  - Money
  - Other resources
- (Many) complex parametric models require:
  - Sizeable investments in development or licensing fees
  - Complex model calibration and validation can be costly

When and How to Use the Various Tools and Techniques (Continued)

- It's important for an organization to:
  - Assess the benefits to be gained
  - Perform a cost versus benefits analysis (CBA) prior to making an investment in parametric tools
    - If an organization is planning to develop a set of simple CERs to apply to estimates the benefit to cost ratio may be excellent

General Applications

- Parametric techniques are used for a variety of general applications:
  - Forward Pricing Rate Models
  - Subcontractor Price or Cost Analysis
  - Cost as an Independent Variable (CAIV)
  - Risk Analysis
  - Bid/No Bid Analysis
  - Conceptual Estimating
  - Independent Cost Estimates (ICEs)
  - Design-to-Cost (DTC)
  - Life Cycle Cost Estimates
  - Budget Planning & Analysis
  - Proposal Evaluation

But wait, there's more…

General Applications (Continued)

- Should Cost Studies
- Estimates at Completion (EACs)
- Costing by Phase of Contract
- Trade Studies
- Sensitivity Analysis
- Basis of Estimates (BOE's)
- Affordability & Cost Realism
- Cost Spreading
- Sizing parameters
- MTBF, MTTRs
- Make-buy analysis
- Etcetera, Etcetera, Etcetera

General Applications (Continued)

- There are other possible applications limited only by the imagination of the user
- Many are widely used by Industry and the Government
- They are accurate, fast, flexible, easily repeatable, and cost effective

General Applications: Forward Pricing Rate Models

- There are many estimating approaches for forecasting indirect expense rates
- The most traditional approach is known as "bottoms-up"
  - Generally based on detailed, departmental budget data
  - Can be time and cost intensive
- Contractors have been implementing proprietary models using forecasted sales and historical cost estimating relationships (CERs) to develop indirect forward pricing rates

General Applications: Forward Pricing Rate Models (Continued)

- Developing forward pricing rates using a parametric model involves:
  - Obtaining a **Sales Forecast** as the major cost driver
  - **Total cost input** (TCI) calculated as a percentage of sales based on historical trends
  - **Direct labor** and materials base developed as a percentage of TCI also based on historical trends and adjusted for any known changes

General Applications: Forward Pricing Rate Models (Continued)

- Labor/materials/G&A **Expense pool costs** as a percentage of their respective bases
- **Fixed pool costs** from prior years adjusted for any known changes
- **Variable pool costs** calculated by applying the variable pool cost portion of the rate (based on historical trends) to the current forecasted base
- **Semi-variable costs** calculated as a ratio up to a certain threshold and fixed after a threshold is reached

General Applications: Forward Pricing Rate Models (Continued)

- Forecasts need to be adjusted to reflect
  - Previous nonrecurring expenses
  - Implementation of new processes
  - Any other known factors that would cause deviations from the historical relationships

- These elements should be considered when developing forward pricing rates using historical CERs:
  - Reasonableness of the sales forecast
  - Accuracy of the historical CERs
  - Accuracy of the underlying data used to develop the historical relationships

General Applications: Forward Pricing Rate Models (Continued)

- Facilitates the negotiation of a forward pricing rate agreement (FPRA)
  - Implementation of a forward pricing rate model can save both the contractor and Government significant resources
    - Reduced costs
    - Reduced proposal preparation and review cycle time
- When properly implemented, forward pricing rate models will be as accurate as other approaches

General Applications: Subcontractor Price or Cost Analysis Using Vendor Data

- A variety of parametric techniques can be used to develop independent estimates for use in performing price or cost analysis on applicable subcontract estimates to establish the reasonableness of proposed prices

- Developing parametric subcontractor analysis tools is similar to building tools to estimate an internal effort
  - Model development life cycle is identical, consisting of:
    - Data collection Calibration
    - Validation
    - Establishing estimating procedures that describe the methodologies for performing subcontract price or cost analysis using parametric techniques
  - The only substantial process difference relates to the collection of subcontractor technical, programmatic, and cost data (Identifying, evaluating, and normalizing the data)

General Applications: Subcontractor Price or Cost Analysis Using Vendor Data (Continued)

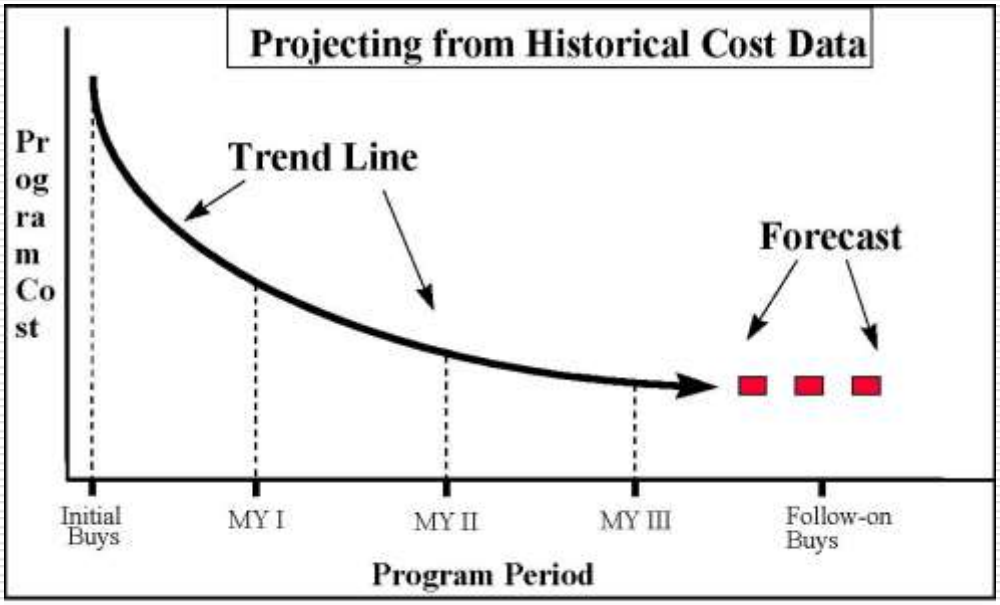

Figure 8.3 Projecting from Historical Data

- The graph in Figure 8.3 shows how an estimator may project cost from the normalized data
- The data set used in this example exhibited extremely stable properties and produced an excellent modeling result - Do not expect all results to achieve this close a fit

General Applications: Subcontractor Price or Cost Analysis Using Vendor Data (Continued)

- The most significant benefit for using parametric tools to perform subcontract price and cost analysis is flexibility and repeatability
  - Once the foundation model has been created
    - Subsequent modeling exercises for updates and so forth can be performed
    - Subsequent modeling exercises involve almost minimal effort
  - The implications for cost savings are obvious

General Applications: Subcontractor Price or Cost Analysis Using Vendor Data (Continued)

- Real Life Example
  - In the 1970s through the 1980s 'widebody' fuselage assemblies were subcontracted by a major aircraft manufacturer
    - Airline carriers would request fuselage modifications to address unique layouts dependent on route, number of passengers, and the like (Subcontract ECPS = SECPs)
    - Most of the SECPs involved low cost components being relocated in the fuselage
    - The subcontractor had four full time people generating bottoms-up estimates for the SECPs
    - The prime manufacturer had two full time people analyzing the subcontractor's estimates
  - This was an inefficient use of resources

General Applications: Subcontractor Price or Cost Analysis Using Vendor Data (Continued)

- Real Life Example (Continued)
  - A Bill of Material (BOM) and a weight statement was available for each SECP that summarized:
    - Common and peculiar (unique) item changes by pounds in and out
    - Component or commodity type (Hardware, extrusions, forgings, sheet metal, etc.)
  - Labor and Material cost could be associated with such changes
    - A baseline configuration for a complete fuselage BOM was costed by component type
    - The cost of the BOM was negotiated between the Subcontractor and the Prime
    - Dollars per Pound ($/lb) from the costed BOM were derived for each component type

General Applications: Subcontractor Price or Cost Analysis Using Vendor Data (Continued)

- Real Life Example (Continued)
  - A Parametric Model utilizing the $/Lb was constructed:
    - Baseline $/Lb were adjusted by the SECP weight statement
    - Adjustments were made for quantity, escalation, improvement curve placement, uniqueness and the like
    - Labor, Material, and ODC summary and component level costs and prices resulted
    - The model was verified and calibrated against previous bottom-up estimates and actuals
  - Both the subcontractor and the prime benefitted from the model
    - One person could generate and analyze a week of changes in half a day (Fast, Efficient and Cost Effective!)
    - The model could essentially address any change (Flexible!)
    - Results were accurate, consistent, verifiable, and replicable!
  - This model was created in less than two weeks by one person and was used for twenty years!

General Applications: CAIV

- CAIV is an acquisition strategy that helps maintain cost objectives (including life cycle costs), while achieving the necessary performance objectives of a contract

- Some purposes of CAIV are to:
  - Provide for innovative design in manufacturing, support, and contracting approaches
  - Reduce program development and production time
  - Consider and potentially reduce life cycle costs
  - Be flexible and able to overcome program cost growth

General Applications: CAIV (Continued)

- The basic concept of CAIV is that each acquisition program has three significant variables:
  - Performance that satisfies operational requirements (good)
  - Affordable life cycle costs (cheap)
  - Delivery according to an established schedule (fast)

- Under the CAIV philosophy, performance and schedule are considered dependent on the funds available for a specific program

- Parametric models are key tools in performing CAIV analyses

General Applications: CAIV (Continued)

- To effectively perform trade studies and efficiently consider cost in each case, programs that require CAIV must build a cost model that
  - Baselines the program
  - Estimates total ownership cost (TOC) for every trade study alternative or option

- After an appropriate parametric model has been obtained and calibrated, a program cost and performance baseline is created
  - The baseline establishes a set of program cost and performance concepts that reflect the initial program configuration(s)
  - This program baseline should allow trade studies to be performed using a consistent set of
    - Estimating parameters
    - Guidelines
    - Assumptions

General Applications: CAIV (Continued)

- After the program baseline has been established and reviewed by the customer, effective trade studies can be performed against it
  - The important aspect of trade studies is to determine the evaluated "delta" cost and performance of the various trade-off options
  - Program management can then assess the option that meets program performance objectives at an affordable cost
  - In some cases, performance may be traded for cost

General Applications: CAIV (Continued)

- Benefits for Using a Parametric Application

- The parametric model serves to help routinely evaluate prevalent (and evolving) cost estimates against cost goals and targets
  - Using the cost model as derived within the context of the program WBS, cost targets are "flowed down" to IPTs and subcontractors
  - Corrective management action (i.e., additional trade studies) is taken when cost estimates deviate from IPT and subcontractor targets
  - Corrective action should also be taken when the current system estimate deviates from the system-level goal
  - Using this approach, the program should remain affordable, and TOC carefully managed

General Applications: CAIV (Continued)

- As with subcontractor cost analysis and other applications, once the foundation model has been created, subsequent modeling is
  - Performed rapidly
  - Performed with almost minimal effort
  - Cost Effective

General Applications: Risk Analysis

- Risk analysis is another important aspect of the acquisition strategy of most major programs
  - Risk analysis provides an orderly and disciplined procedure for evaluating these uncertainties, so a more realistic cost estimate can be made
  - Risk analysis is a process that uses qualitative and quantitative techniques for analyzing, quantifying, and reducing uncertainty associated with cost or performance goals Risk analysis provides additional information and insights to a program's decision makers
  - Risk analyses are conducted iteratively as part of the many cost analyses performed on a typical program, including:
    - Cost goal allocation
    - Baseline estimate updating
    - Cost trade studies

General Applications: Risk Analysis (Continued)

- Risk analysis can be performed using a number of techniques, including parametrics
  - Capturing program uncertainty in the variance measures of parametric estimates allows the analyst to mathematically model and quantify the risk
  - Most parametric models are adept at performing uncertainty analysis

- A major benefit of the use of parametric tools in the risk analysis process is the fact that the tools are repeatable in this highly iterative procedure
  - Many "what-if" exercises must be performed during a program's life cycle
  - The use of parametric tools is the only practical way to perform these exercises
  - Ensures consistency in the approach to quantifying risk

General Applications: Bid/No Bid Analysis

- The question of whether to bid a project (or not) is a strategic one
  - The decision involves much more than making a profit
    - A company may be willing to take a loss on a project if there is significant profitable follow-on potential
    - They may want to strategically place a product in the marketplace
    - They may wish to get into a new business arena
  - Careful consideration given at the bid/no-bid stage can have an enormous impact on an organization's bottom line

General Applications: Bid/No Bid Analysis (Continued)

- Parametric tools can be useful at this business process stage, and can help the decision maker - Let's assume that a company is considering proposing to an RFP
  - The product is new, state of the art, and conceptual
    - No bill of materials exists
  - How should a cost estimate be performed?
    - Clearly, performing a bottoms-up estimate at this stage of the program doesn't seem reasonable
    - Parametric tools come to mind
  - Benefits of Using a Parametric Approach in this situation are
    - Bottoms-up estimating approaches are not practical without a BOM
    - Parametric models are easily "tweaked" for changes to specs, design, schedule and so forth

General Applications: Bid/No Bid Analysis (Continued)

- Once the estimate is complete, management can decide if the project is worth pursuing
  - If the cost estimate is within a specified competitive range, a "bid" decision could be made
  - It is important to note that other criteria besides cost are important considerations
- The benefits of parametric models are clear whenever rapid and flexible estimating is required

General Applications: Conceptual Estimating

- If a software or hardware product has been conceptualized, parametric models can provide a fast and easy cost estimate

- Engineering concepts such as weight, manufacturing and engineering complexities, source lines of code and so forth are normally available at the time concepts are being developed

- For example, if a Government program manager has a new technical needs, a cost estimate can be obtained

General Applications: Conceptual Estimating (Continued)

- The conceptualization will take the form of a general description:
  - Application
  - Platform
  - Programming language(s)
  - Security level
  - Programmer experience
  - Schedule
  - SLOC
  - Etc.

- Such information can produce a cost estimate using any number of parametric models
  - Parametric model inputs are largely conceptual

General Applications: Independent Cost Estimates (ICEs)

- Parametric tools are invaluable for performing ICEs
  - ICEs can also be used to validate EACs for ongoing contracts

- Assume that a bottoms-up estimate has been generated for an organization who is proposing on a "must win" program
  - Winning the program could be important for a variety of reasons
  - Should the organization bet winning the program on just one estimating approach?

- If an independent estimate (or two) is performed by a team of people who have no vested interest in, or little knowledge of, the primary estimate, the benefits of such an estimate could be enormous

General Applications: ICEs (Continued)

- If the ICE supports the primary estimate, then added confidence is automatically placed on the original estimate
  - If the two estimates indicate significant differences between each other, an evaluation can still be performed to correct the primary proposal
  - If two estimates show a more than 10% difference (management will determine the level of significance) between themselves, a careful review, analysis and explanation may be in order

- If a bottoms-up estimate was used as the primary estimate, and a "second opinion" is required, the use of parametric tools is certainly an option
  - Other approaches (e.g., the Delphi technique) could also be used
  - A parametric model will link the technical parameters to the bottoms-up cost estimate

General Applications: Design to Cost (DTC)

- Design to cost principles have been already covered within the context of CAIV, however there are subtle differences
  - CAIV is a management approach that emphasizes cost at the program level
  - DTC's focus is on the manufacturing aspect of a program
  - The term "design for manufacturability" could also be used
  - In any event, the approaches are similar in philosophy
  - Trade studies play a significant role in both approaches

General Applications: DTC (Continued)

- A product must be manufactured for customer affordability
  - A customer will not purchase a $10,000 vacuum cleaner, regardless of how good it is
  - Based on analyses, cost targets or "standards" are allocated to manufacturing operations
  - The management expectation is that those standards will be met or exceeded by the floor operators
  - The targets are "rolled up" to the final product
  - If the final target is met, the product is affordable and the manufacturing processes are assumed to be under control
  - If the targets are exceeded, the processes may be out of control, and an analysis should be performed
- Parametric tools fit into this process as analytical techniques in reducing cost
  - For instance, a parametric model can easily support manufacturing process trade-offs
  - Two or more competing processes can be quickly modeled that allow the manufacturing engineer to select the least costly approach
  - No other estimating technique is quite as effective within the context of cost trade-offs

General Applications: Life Cycle Cost Estimates (LCCEs)

- A parametric model can be developed to assist in estimating the life cycle costs of a program
  - Can be used in performing "what if" analysis
  - Can be used in assessing the impact of technical, schedule, and programmatic factors on the total costs

- The LCCE inputs that have the greatest influence on cost drivers are readily available to the analyst because of the automated capability of the model, including
  - The vast array of integrated cost analysis tools embedded within the model
  - The complete online documentation features of the model
  - The information necessary to understand what elements within the system are cost drivers
  - Why these cost drivers exist

General Applications: LCCEs (Continued)

- Online documentation
  - Provides different analysts the ability to easily adapt the model to their specific needs
  - Provides program management with a quick and flexible method of preparing required program cost and budget reports

- As before, once the one-time effort of creating the basic model is finished, model reuse and repeatability for sensitivity studies is easy

General Applications: Budget Planning & Analysis

- All businesses must budget
  - A decision that must be made has to answer certain questions
    - First, what products will be offered for sale, or proposed for future sale?
    - Next, how will the organization fulfill its obligations?
    - What resources will be used, and how much will the use of these resources cost?
    - What is the best mix of business that will allow the organization to maximize profit potential?
  - All such questions involve trade-offs
- Parametric tools are useful in performing budgeting exercises
- The benefits of using parametric tools for trade-off analyses have already been discussed

General Applications: Proposal Evaluation and Red Team Reviews

- When a proposal is submitted to a customer, how good is it?
- What will the customer think of it?
- Red Team Reviews are performed by independent, senior organization personnel who place themselves "in the shoes of" the customer
  - Red Team Reviews take place just prior to proposal submission
  - The reviews are about much more than just cost – technical compliance is often at least as important – but cost, especially if the program has a CAIV requirement, is always important

General Applications: Proposal Evaluation and Red Team Reviews (Continued)

- Any proposal evaluation that includes a sound parametric approach making a solid link between technical design and cost will be a superior product to the simple cost estimate and better received by the customer

- The Government also uses teams and parametric approaches to evaluate contractor estimates and proposals

General Applications: Should Cost Studies

- Many cost evaluation techniques can be used to perform should cost studies
  - Selection of a technique can depend on various factors such as timing, available resources, cost of using a specific approach and so forth
  - Should cost studies can be performed at any time during a product's life cycle, even after a program is over
  - The only criterion is if management needs or wants to know the answer to the question, "What should the product (have) cost?"
  - Depending upon the specific situation, parametric tools may or may not play a role in a should cost analysis

General Applications: Should Cost Studies (Continued)

- If a parametric model has already been developed and utilized for a program or product, the model can be used in a should cost analysis
  - If a program has overrun, for instance, the model can be used to evaluate differences between the proposed program and the one that was executed to determine why
  - In this type of application, the benefits of the parametric modeling technique should be easy, quick and efficient

General Applications: Estimate at Completion (EACs)

- Estimates at completion are often performed on larger programs, especially if there is an earned value analysis requirement
- They are normally performed as an indication of the financial health of a program
- If a parametric model has been developed for a program, the model is an easy and efficient way to develop EACs on a regular basis

General Applications: Costing by Phase of Contract

- Costing by phase of contract comes within the context of life cycle costing (LCC) or total ownership cost (TOC)
  - Clearly, LCCs or TOCs necessitate the costing of all program phases
  - Sometimes, if a LCC or TOC has not been performed, and a parametric costing model has been already developed, the cost of future phases of the program can be easily evaluated
  - Such a data point is often required for planning purposes

- If a program were in the development phase, and a production phase cost estimate is required, a parametric model can be used for the cost estimate
  - A bottoms-up approach is not practical without a BOM

General Applications: Trade Studies

- Trade studies always come with a CAIV or a DTC program
- Trade studies are almost always used in a commercial business environment, and are more and more frequently being used in DoD
- Trade studies are most frequently used to evaluate cost and performance trade-offs between competing technical designs
- The basic idea behind trade studies is to get the highest performance for the lowest cost
  - What it doesn't mean is "cheapest"
  - It means best performance value, or best "bang for the buck"

General Applications: Trade Studies (Continued)

- Parametric costing models are very effectively used in trade studies
- Trade studies usually require multiple sensitivity studies, with rapid turnaround times
- The power of the parametric models is that the models' inputs are easily "tweaked"
  - No other estimating approach is as effective

General Applications: Sensitivity Analysis

- Parametric tools are extremely powerful when sensitivity analyses are needed
  - Ability to easily adjust inputs for (even small) changes provides management with a strong and superior analytical benefit
  - When a parametric model's input(s) is changed, the resulting costing is instantaneous
  - The sensitivity analysis can be quickly performed many, many times until the ultimate result is obtained
  - No other estimating approach besides parametrics can perform this task effectively

General Applications: Basis of Estimates (BOEs)

- The traditional method for creating a basis of estimate and submitting a proposal is to go out and perform a "bottoms-up" estimate using historical data, judgmental estimates, and obtaining detailed cost and pricing data
  - This is a very time consuming and expensive process that is also not very flexible when assumptions relating to quantity and scope of work change
  - However, through the use of parametric estimating techniques a model can be developed that is less expensive in the long run and provides greater flexibility
  - As demonstrated in the following example, through careful planning and coordination with all groups affected, a parametric model can be used for the basis of estimate in many proposals

General Applications: BOEs (Continued)

- Lockheed Martin Astronautics (LMA) signed up as a Reinvention Laboratory member to test the PRICE H Model as a primary Basis of Estimate (BOE) based on solid, auditable and verifiable data
- In coordination with the local Defense Contract Management Agency (DCMA) and Defense Contract Audit Agency (DCAA), LMA developed an implementation plan to calibrate and validate the use of the Price H Model
- The plan included joint training, writing a procedure for the estimating manual, calibration of relevant historical programs, and development of an approach to validate and use of the model in a test proposal requiring cost or pricing data

General Applications: BOEs (Continued)

- Technical programmatic and cost data were collected on four contemporary spacecraft to support the calibration of the model
- After DCMA and DCAA reviewed the calibrations a validation test was performed by comparing the model results for selected hardware end items with current EAC projections for an almost completed space program
- Once the model was calibrated and validated it was used to develop the BOE for two new interplanetary spacecraft (Mars 2001 Mission Lander and Orbiter)
- Required about 95% collection and analysis and 5% calibration time

General Applications: BOEs (Continued)

- The following lessons were identified during the LMA project and should be considered whenever parametric estimating techniques are used to develop a BOE:
  - Requires management support
  - Need company champions
  - Constant selling is required
  - There is a sizable start up cost
  - Team training is a must
  - Culture change is required

General Applications: BOEs (Continued)

- The implementation is a challenging learning process
- Obtain early IPT consensus on the model and procedures
- The data collection tasks were the most challenging
- Interview product integrity engineers to fully understand the technical aspects of the model
- This processes requires lots of data analysis and reconciliations
- You will never have all the data desired but need to determine what data are critical
- The process required about 95 percent collection and analysis and 5 percent actual calibration time

General Applications: Affordability and Cost Realism

- One of the largest challenges both the Government and industry has is evaluating the affordability of changes in quantities and requirements
  - A current use is to squeeze a major concept into a budget
  - The concept of cost realism requires that all key performance parameters (KPPs) be costed
  - This activity is even increased with the constant changes occurring in funding of Government programs
- Today, most contractor and Government organizations have affordability groups
  - Frequently, the quantity that is anticipated when a solicitation is issued can change significantly during the negotiation and funding process
  - Parametric techniques can be effectively used to
    - Address the costs variances associated with changing quantities without requiring the solicitation of new bids
    - Provide a level of comfort relating to the affordability of the new quantities that reduces the risk for both the Government and the contractor

General Applications: Affordability and Cost Realism (Continued)

- A probability approach is best used when
  - The quantities are uncertain
  - Current and accurate cost data are available
  - Large quantities are procured
  - There is a high unit cost

- The strengths of using this approach is that it
  - Reduces the risk on the procurement
  - Provides visibility of prices that may be unreasonable
  - Is easy to implement
  - Is flexible in the fact it can be used for different line items in a contract

- The disadvantage of this method is that
  - It is sometimes difficult to get external and internal customers to agree to using this method
  - Since the probability given to each expected quantity can significantly effect the outcome its is imperative that these probabilities be realistic

Summary

- There are many uses of parametric tools other than to develop estimates for proposals. Such uses include, but are not limited to:
  - Independent estimates, including conceptual estimates;
  - CAIV applications
  - EACs
  - Should cost studies
  - Design-to-cost
  - Risk analysis
  - Budget planning

- The use of parametric tools is limited only by the end-user's imagination

Summary (Continued)

- Parametric techniques are
  - Accurate
  - Fast
  - Flexible
  - Repeatable (Replicable and Consistent)
  - Cost Effective
  - Efficient in allowing minimal effort in subsequent modeling exercises

Questions and Discussion

- ??????????