

Boeing North America Creates Accurate Estimates for Proposals

A Question and Answer Session with Chuck Salbato, Steve Terry and Darryl Webb of Boeing North American's Space Systems Division's Pricing Group reveals how Boeing North American is incorporating the PRICE tools into their long-term goal to achieve automated pricing to proposal capability and to establish Parametrics as Basis of Estimate.

The History of Boeing North American's, formerly Rockwell Aerospace and Defense, push to "go parametric" through the proposal process starts around World War II, when North American Aircraft (NAA) mass produced fighter aircraft and bombers to send directly to the battle fields of Europe and Asia. The evolution was gradual until recently, when Boeing North American made the commitment to actively create a full-fledged business group devoted to establishing parametrics as basis of the proposal generating process.

The vision of the current Boeing North American group is to collect and document program information to include in extensive databases; develop robust algorithms based on this information; and to turn around accurate program estimates based on parametric methodology within a matter of days.

This case study explores and outlines Boeing North American's estimating history as a background for what the company is achieving today. A question and answer session with Boeing North American's Chuck Salbato, Director of Pricing; Steven Terry, Manager, Cost Modeling and Simulation, and Darryl Webb, Project Manager -- Parametrics, exposes Boeing North American's current practices and future vision.

Case Background: The push to incorporate parametric estimating capabilities into standard operations at Boeing North American was initially dictated by events. In the 1940s, parametrics was included in the overall estimating process to allow NAA analysts to come up with quick estimates on the aircraft being mass produced for war. Methodologies used in those days relied on dollars per pound and simple CERs (Cost Estimating Relationships) to establish design-to-production costs. Due to the nature of industry at that time (mass production of one product type) this method was an effective means of establishing accurate estimating relationships.

After World War II came the effort to develop higher end technologies for nuclear weaponry, manned and unmanned space flight and other technical challenges brought forth by the Cold War. The techniques used during World War II no longer could apply and a new estimating paradigm was born.



CASE STUDY

Pushed by accelerating technological growth and challenges, North American established a new parametric estimating group to handle the challenges of the Apollo missions and beyond. The focus of the group was to collect and analyze data and return recommendations to program and executive management for the strategic decision making process. The data and estimates for the group were used entirely for strategic management planning and executive decision making. Estimates for use in proposals still rested on grass-roots based methodologies. However, it was this group that planted the seeds for the parametric capabilities that are being developed at Boeing North American today in the pursuit of a complete and automated proposal pricing system.

Interviewer Question: "Explain to me a little bit about how your group was established and why."

Steve Terry, Manager, Cost Modeling and Simulation: "In the 1970s and 1980s Boeing North American applied parametric techniques that were developed in periods past.... [Cost Estimating Relationships -CERs]...and began to explore and apply an algorithmic approach to pricing. The frustration with CERs was that the real world is far too complex to allow even a multi-dimensional CER to begin to approximate or measure the cost drivers that effect any system, subsystem, assembly or component. A need for function driven algorithms was spearheaded in a few organizations and slowly caught on.... [however] we were still striving to improve our methods of blanketing our estimating methodology with the business, customer and climate variables that we identified as critical to estimate fidelity, such as... ways of doing business, customer operating philosophy, criticality of a failure, political impacts, tools and processes, workforce to name a few of the items we were concerned about. With a great amount of R&D accomplished, we settled on developing a pricing system based on the PRICE models which, we have concluded, lend themselves to this type of function driven estimating technique. The PRICE models are what we consider and classify as activity-based, technology driven estimating tools which produce more than spreadsheets, lines, curves and slopes. They are programmatic, deterministic models that react to a design solution in a very program and product specific manner, while based in a generic costing approach...."

Chuck Salbato: In 1990, I was tasked with forming a world class estimating group which would utilize a scientific method of pricing to derive accurate and credible estimates with speed. The first thing I had to do, other than defining the methodology, was to find the right people. That's when we (Boeing North American) asked Darryl Webb, who was self-employed at the time, to come and lead our new effort. We hired Darryl April 1, 1991 to lead the new parametric estimating group and it was Darryl who spearheaded the definition process and who was responsible for hiring the team of estimators to see the process through.



Darryl Webb: "Technically, I knew what to do. I had been working with the PRICE models and parametric estimating methodology since the 1970s so this was not new to me. Finding the right people was the challenge. I brought on Steve Terry and Tom Burns in 1992 to help establish the estimating team which, of course, has grown and evolved since then. One thing that we do stress and will continue to stress, is training. We spend four hours a day in training in all aspects of estimating - from systems development to concepts, product training, calibration and so on. The point is to understand what something - be it a shuttle or anything - is about and to understand it completely - both in a technical and in a business sense. I am at the point now where I work with universities to educate graduating engineers on parametrics and how it applies to their work. The whole thing is based on an education process..."

IQ: Can you explain why you chose parametrics in a little more detail.

Steve Terry: Well, first of all, you must understand our overall charter which is to build accurate and verifiable estimates in a short amount of time. We decided to use parametrics because it is the one methodology that offers a completely scientific alternative which produces credible estimates. The estimate is directly tied to the physics of the design solution. This cost link can be displayed and is displayed in the estimate itself.

Darryl Webb: Parametrics provides a "basis of estimate" that is auditable and verifiable, like Steve said. It's important to understand that in parametric pricing the actual estimate basis is worthy of audit..."

Steve Terry: Our challenge here at Boeing North American is to produce a quality estimate on anything in four days. This is not a proposal quality estimate but really a management tool that will be ready for review by management on day five. The point is to give us a strategic decision making tool during the concept development stage of any project. Of course, we are working to expand our mandate to include rapid production of estimates as basis of proposal and bid which of course is at the heart of our mandate.

Chuck Salbato: In 1991, our controller, Bill Collopy, talked about where we should be in 5 years, in 7 years and so forth. He set forth a vision to build a parametric capability which would provide quality estimates for new business ventures. The long term goal, which we are working toward and implementing now, is to use this parametric capability in conjunction with a solid cost data bank to support the preparation of cost proposals and the negotiation process..."

IQ: I've heard a lot about your data bank. Give me an overview of the information you include and why...

Steve Terry: Well, there is no credible data that will not be accepted into the database. I have system data on virtually every type of aircraft, spacecraft, truck, car, mobile armored vehicle, and GSE as well as extensive data on electronics, buildings and ships. There's more.... I have data from almost all of modern history, 167 B.C. through the present. I have hydraulic fluid with and without the can. Some of my favorite calibrations are ammunition, orbiter toggle switches, ICBM guidance and the HMS Victory. Now obviously my data supports estimating but it is also the basis of my credibility, analysis, methods and processes. It is because of the wealth of my data that I can be confident in my estimate. Because Boeing North American produces a wide variety of products it is essential that I have a lot of data. A facility that produces one product and will only produce one product with variations will really only need data about this product.

IQ: Can you give me a good example of a recent estimate you might have produced using this information?

Steve Terry: GPS II F; Interim Service Module for ISS; EELV for several different configurations... The bottom line is that this data gives us a solid foundation to produce estimates on things as simple as a latch to something as complex as a complete integrated vehicle.

IQ: I understand that you are creating an automated system to develop pricing (estimates) to proposal. Is this in keeping with your decision? Can you explain what you are doing in more detail?

Steve Terry: Our ultimate goal is to replace pricing systems that exist today with an automated parametric pricing system. No one is able to produce accurate proposals fast. The goal is to create a system based on auditable data - based on verifiable analysis of program variables with a direct link to product (proposals). With the tools and methodologies that exist today we cannot do this. We can, but it is all based on brute strength, sheer will power and a tremendous amount of effort - effort to create an estimate; effort to create a proposal and so forth. The automated system precludes the release of an estimate that is not traceable to the technical, programmatic and economic factors that describe a proposed design solution. We can only create a parametric cost position by integrating the actual cost drivers in a verifiable linkage. Now... once this system is developed, it can be linked to a variety of tools such as CAD, CAM, CAE or CASE tools and provide a complete cost to proposal nucleus. What this means is that we have developed a new paradigm based on Computer Aided Pricing, or CAP, which allows us to interface on an enterprise-wide level and produce accurate and supportable bids within a matter of days.

IQ: Your future vision is to be able to establish parametrics as the basis of estimate for your operations. What do you see as the major obstacles to accomplishing this goal?



Chuck Salbato: "Overcoming the current government regulations and public law is a primary obstacle. The secondary obstacle is related to the acceptance of the new concept by middle management and the rank and file for both government and industry..."

Steve Terry: "As Chuck said, we have a number of obstacles. I'd like to also add that computing power is another obstacle, but the natural advancement in computing state of the art will eventually solve this problem.

IQ: When do you think you'll present your first proposal using parametrics as basis of estimate?

Steve Terry: Six months to one year for a parametric proposal as basis of the bid. Probably more like 2 and 1/2 years until we have accomplished our ultimate goal of creating a new pricing paradigm.

IQ: Thank you for your time. Is there anything else you would like to add?

Steve Terry: One of the major paradigm shifts that we have accomplished at Boeing North American is to identify the pricing or costing task as a discipline equal to the other disciplines in the organization. On a fully integrated product development team the cost person sits shoulder to shoulder with the engineering discipline, manufacturing discipline, quality discipline, etc. Success requires a dedicated individual with a quality set of tools and an environment where cost is treated as an equally important product variable. No one in the industry will doubt that Boeing North American can design cutting-edge spacecraft that will meet the customers needs, the question is can it be done in an affordable manner and in a reasonable time period. These questions can only be answered by the dedicated cost professional. At Boeing North American the solution to the parametric pricing problem is highly motivated, professional and trained people, a quality set of tools and an environment where Life Cycle Cost results can affect the final design solution.



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