
Space Station Contract Negotiations: Principles and Process

by Ray Lugo

The Space Station Program has undergone more redesigns, rebaselining and reconfigurations than any other major aerospace program. The path we are currently on for Space Station began in late 1993 with the Crystal City activities that resulted in the International Space Station Alpha and the selection of Boeing as the Prime contractor. The restructured program is constrained to a flat \$2.1 billion per year funding profile and existing contracts that were novated to the Prime contractor. The original plan was to have a contract in place in early calendar year 1994. However, the activities associated with the redesign delayed any real progress in the contract negotiations until June 1994 and the selection of a dedicated negotiation team.

When the negotiation team was formed, the Estimate At Completion (EAC) for the Prime contract portion of the program was about \$7.7 billion. This figure resulted from several cost reduction exercises initiated between the time the letter contract was signed and the middle of 1994. The Space Station Program, while still executable, would have been extremely difficult to manage within the cost estimates and the small reserves that would be available. The team's key objective was to negotiate a fair and reasonable cost estimate that would provide adequate reserves to resolve unknown problems in the future. No predetermined cost figures were used, but the team was challenged to negotiate a fair contract that would provide adequate reserves.

The hallmark of a successful negotiation would be a signed contract to accomplish the program within the budget and schedule constraints. This was the number one principle that the team followed. There was a basic understanding from the outset that we did not want to reduce the capability of the Space Station beyond the baseline we had established going into the negotiation. The team established a ground rule at the outset that "nothing would be thrown overboard" in order to achieve agreement . . . we would not reduce the technical content of the contract.

The key document for the contract was the Statement of Work (SOW), which was assumed to describe the content of the program accurately. Unfortunately, we found this was not so. When team leader Lee Evey discovered the SOW was under contractor control, we knew we had a problem. We expected Boeing to understand the content of the SOW, but we did not think they should be maintaining the most important technical document of the entire contract, determining configuration management.

The transfer of the SOW from the contractor to the negotiation team was a major undertaking. The conversion of the document from a proprietary format to one that the team could use and manipulate required an extensive effort. However, this task was small when compared to the task of rewriting the SOW and reaching agreement with the contractor on its content and interpretation.

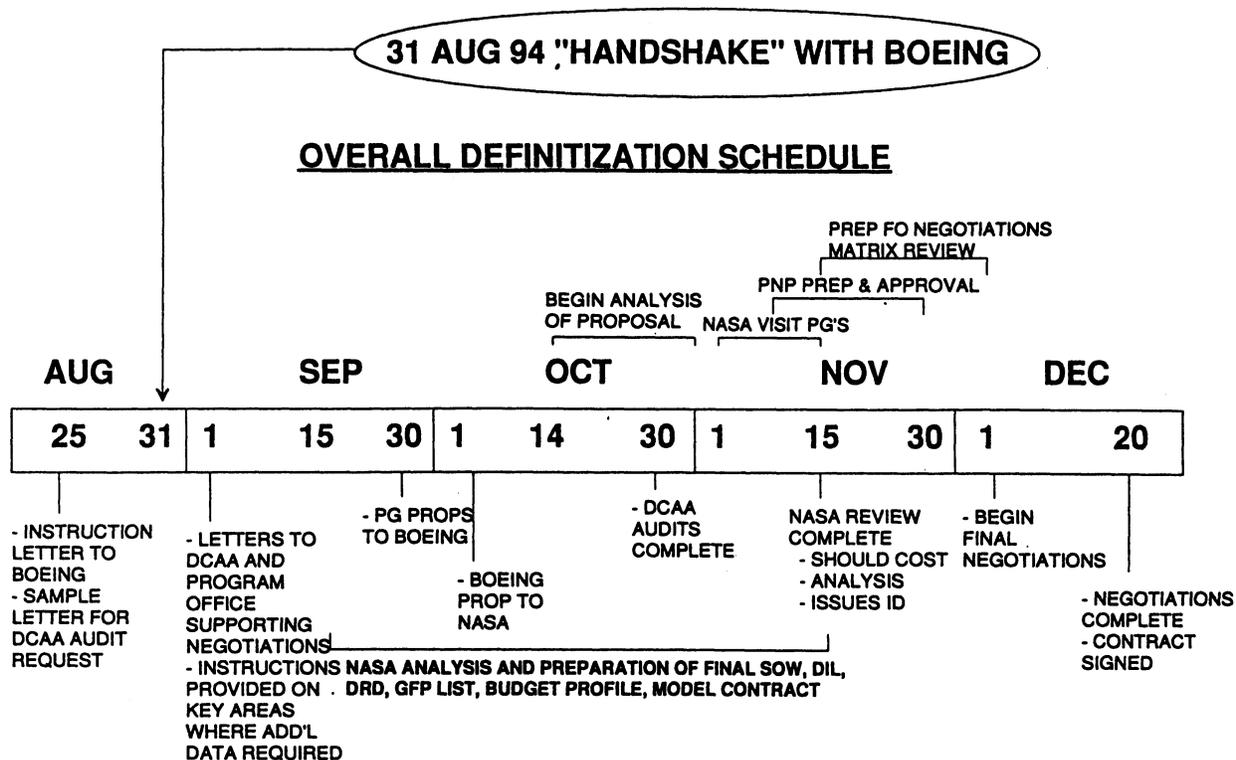


Figure 1. Space Station "Handshake" Negotiations

Resolution of the SOW was a key element in the interim agreement (called the "handshake") with the Prime contractor. The "handshake" was a necessary interim step to show that the program was doable within the available resources. This helped assure the parties external to the negotiations that success was possible. The agreement on the SOW and its interpretation served as a risk mitigator to the contractor and enabled productive discussions regarding the cost of the program. However, these efforts were exceedingly strenuous and difficult.

The "handshake" was to be an enabling agreement to facilitate final definitization of the contract. In addition, the "handshake" served more importantly as an interim milestone toward the definitization that would demonstrate the "new" Space Station

Program was making substantive progress toward the goal of building, launching and operating a Space Station. While the "handshake" met its external requirements, this interim agreement caused confusion about its role in the final definitization, despite efforts by both sides to clearly define the nature of this agreement. The Prime understood the agreement on price as a not-lower-than figure, while the NASA team used the "handshake" as a not-to-exceed figure. These divergent perceptions led to non-productive discussions at the start of the final definitization negotiations.

The nucleus of the NASA team, roughly 25 people, followed the negotiation from beginning to end, representing all the major subassemblies of the Space Station, the launch package managers, the supporting field

Centers and Headquarters. The diversity of this group provided the technical, business management and procurement expertise required to negotiate a contract of this size. The team was augmented during the fact-finding of the Tier II subcontracts and the Product Groups, but there were never more than about 70 people on the team at any given time.

While the team's diversity proved beneficial in resolving the technical issues, this was the first major procurement most of the cast had ever been involved in, and we required extensive training. Despite our inexperience, we were enthusiastic and confident that we could negotiate a fair and reasonable price to accomplish the task of designing, building and operating the Space Station.

Building 265 at Johnson Space Center was to house the team for the duration of the negotiations. Known as "The Bunker," Building 265 is best described as a hole in the ground with an air-conditioning system. It was believed that the negotiations would be enhanced by having both parties close to each other. During the first phase of the negotiations, NASA had approximately 70 percent of the space and Boeing had the remaining 30 percent. The arrangements were changed during the second phase of the negotiations with Boeing securing space elsewhere; both NASA and Boeing were aware that critical negotiation data needed more security.

The process employed to formalize the Space Station contract was a logical extension of the Product Team management approach

used for the program. The NASA team represented all the elements of the Space Station Program, including the field Centers and Headquarters. Additionally, the team had a schedule, requirements and a budget to execute its task.

The formation of the team began with a briefing by the lead negotiator, Lee Evey, who declared that he did not have all the answers, and that we would have to do our homework to develop a fully documented pre-negotiation position. Lee also shared his experiences in negotiating other contracts and reviewed those lessons learned with the team. Lee's experience at negotiating contracts was extensive; for example, the negotiation of the \$400 million Russian contract in support of Space Station. Lee emphasized that no two negotiations are alike and there is no "cookbook approach" for negotiating a contract. However, both contracts used tools in common to collect, organize and document the contract data for the purpose of developing a negotiation position. After careful selection of the negotiation team, the key common item was the diligent preparation of the team, the way NASA should.

The success of the negotiation would result primarily from our early preparation. The investment in training the team in the process, the time spent cleaning up the Statement of Work, the review of the proposal, the documentation of the government's position—all this prep work resulted in a final contract that is executable within the schedule, budget and technical constraints levied by the program.

In terms of preparation, this activity should set the standard for future NASA contract actions. Through diligent analysis and exacting preparation, the NASA team became experts on the content of the Prime's proposal. The NASA team's visits to major Tier II subcontractors and the Product Groups to review their activities resulted in our understanding of the status of the hardware/software development activities in the program before negotiations began. The Tier II subcontractors are the major component and subsystem providers to the Product Groups. The Product Groups are the Freedom Work Package contracts that were novated to the Prime during the Space Station program restructure.

The contract negotiation schedule was initially set to begin in July, with a "handshake" or interim contract by the end of August. Although these dates were later modified, the schedule was still quite aggressive considering that little progress had been made toward a negotiated agreement since the signing of the letter contract nearly two years earlier. Our first activity, to review and rewrite the Statement of Work, was a key element in the handshake agreement and one that established the framework for the contract. The clarification and revision of the SOW formed the basis for the proposals by the Prime and Product Groups. We found out later that the Prime did not have the Product Groups and Tier II subcontractors proposing against the revised SOW. This decision by the Prime was apparent during the Tier II reviews, when we discovered that the Tier IIs were building hardware to a different assembly sequence, to support a

different vehicle configuration with a different set of performance requirements.

Besides the activity associated with the development of the Statement of Work, the team also took on the task of resolving problems with the Government Furnished Equipment (GFE), Government Furnished Property (GFP), Government Furnished Data (GFD) and the Deliverable Items List (DIL). The DIL documents the items of hardware, software and data required of the participants in the program to deliver the end-items. It also records the deliveries between the Tier IIs and the Product Groups, between the Product Groups and the Prime, between NASA and the Product Groups, and between the Product Groups and all the combinations of the above.

The agreement of the items, quantities and schedules for all the items on the DIL required the formation of a special team. The team reduced the discrepancies to less than 1 percent of the total items on the DIL before the negotiations concluded. The original documents had complicated the ability to resolve technical issues in the negotiations, and the contractor needed agreement on the items in the lists before committing to the delivery schedules. The review and agreement to the GFP/GFD/GFE lists were complete, except a few items, by the time the contract was signed.

The Tier II subcontractor review was a daunting but necessary task. To simplify the effort, it was decided that the criteria for review would be subcontracts with a value remaining of \$50 million, which reduced the

number of contractors to be reviewed by two NASA review teams. The review was organized by the three Product Groups (PGs), the Major Tier I subcontractors within the Prime contract: McDonnell Douglas (PG-1)/Rocketdyne (PG-2) and Boeing (PG-3). The teams were staffed with the system experts in each Product Group and a small "Core Team" that would perform horizontal integration. The process used to review the Tier II subcontractors was developed by the team to cover the critical elements associated with program and budget execution. The Core Team developed a standard list of questions mailed to each contractor approximately a week before the visit. Questions were standardized to determine if there was consistency in direction from the Prime and Product Groups or if there was a problem in interpreting program direction.

Before the reviews began, the team requested support from the Defense Contract Auditing Agency (DCAA) and the Defense Contracting Management Command (DCMC) in fact-finding and, subsequently, in contract negotiations. DCAA involvement in the process was invaluable in finalizing the contract. The Houston DCAA office assigned a liaison who resided on-site at JSC for the entire negotiation period and participated in almost every facet of the fact-finding and negotiation. Both DCAA and DCMC participated in the process with the negotiating team.

During the Tier II reviews it became apparent that the program was not heading in the direction the Product Groups had expected. Specifically, direction had not reached the contractors relating to the current configura-

tion of the Station, the assembly sequence and the manifest. We determined that some of these communication problems were the responsibility of the program, others rested with the Prime. This and other information gained during the fact-finding, while not necessarily a key element of the negotiation, would be critical to the successful execution of the program. Following the Tier II reviews a report was written by the team and presented to NASA management and eventually, to the Prime's management. The Prime seemed surprised at the state of affairs and used the report subsequently to negotiate with the Product Groups.

The review of the Tier II subcontractors was followed by the delivery of the proposal from the Prime. The proposal was divided into four sections: one section for the Prime and the remaining three sections for the Product Groups. The Prime had made no attempt to standardize or integrate the proposals. The content and format of each section were different, requiring a review to be done by volume (proposer) and the creation of a Core Team to review elements of the contract that crossed the Prime/Product Group line.

The team reviewed the areas of Operations, Utilization, Configuration Management, Information Systems, Procurement, Verification and Software, concentrating on consistency and the horizontal integration of the proposals. The Prime and Product Group teams performed the detailed technical assessment of the individual proposals. As part of the proposal review, fact-finding was done in each proposal. We determined

that a thorough review of each proposal would require five or six days of meetings, and that the meetings should be held at the contractor's site. The proposer would support each review, but the Core Team could not attend simultaneous meetings at four locations across the U.S. Therefore, schedules were staggered so that the Core Team could attend the first three days of reviews at each site.

The teams were also given one travel day between reviews (with the exception of Product Group 1 & 2 reviews, whose sites were not geographically distant from one another). The meetings were structured to cover all of the items the Core Team reviewed in the first three days, followed by more detailed technical briefings and follow-ups on the remaining days. After completing the reviews, the team returned to JSC, prepared a report for program management and developed a pre-negotiation position that was briefed to Headquarters and Space Station Program managers during the Thanksgiving break. The team also developed detailed cost models for each Product Group and the Prime. A set of standardized documents was employed for the Product Group and Prime assessments so data could be shared across the team.

The key element of the pre-negotiation position was the development of the negotiation range; that is, the range of prices in which the negotiation team would be free to strike a deal. This process was facilitated by the development of what we called the "matrix." The Matrix documented every element of the negotiation, to include the

technical, cost, or schedule issues, the most aggressive cost position associated with that position (the best we could hope for) and the objective position (what we were sure we could get).

The Matrix document is broken into three parts: part one is issue identification, part two is issue discussion and part three is issue status. The Matrix is created on a word processor, maintained by the individual responsible for the topic area and continuously updated during the negotiations. The value of this document as a tool is hard to quantify, but one team member used to call it a \$6 billion document. The Matrix allowed the team to focus on the issues, to detect where small concessions could be traded for large concessions and to provide a scorecard of the proceedings.

Formal negotiations were scheduled to begin in early December and conclude on the 15th; the contract signing would occur before the Christmas holidays. This schedule basically constrained the negotiations to about two weeks, an incredibly short period of time for a contract as complicated as this one. Typically, NASA negotiates a price that is higher than the proposed cost. This approach simply would not work in this case for a number of reasons. The most glaring reason was that the proposal delivered subsequent to the cost convergence activities of \$7.7 billion did not fit with the program's funding constraints. The more important, but related, reason was that the contractor proposed early year funding requirements that made the program virtually impossible to execute.

These reasons motivated the team to explore creative ways to negotiate all of the Prime program content into the contract and to be hard-nosed negotiators. The NASA team thought the negotiations could be handled best by dividing the proposal into its components; that is, to negotiate the Product Group proposals and the Prime proposals separately. It was envisioned that these negotiations would be conducted concurrently and that the contract would be signed at a figure which represented the sum of the parts. While the negotiations were difficult, the

team maintained professionalism throughout the process. We were confident that through preparation and honest negotiation, a fair and equitable deal could be struck. In the initial discussions, the Prime decided to fact-find NASA. In their view, NASA had already done all the fact-finding, depriving the Prime of the opportunity to fact-find the Product Groups and the Tier IIs. This role reversal was followed by the Prime's pronouncement that no agreements would be reached in the team sessions, which made the negotiation schedule impossible.

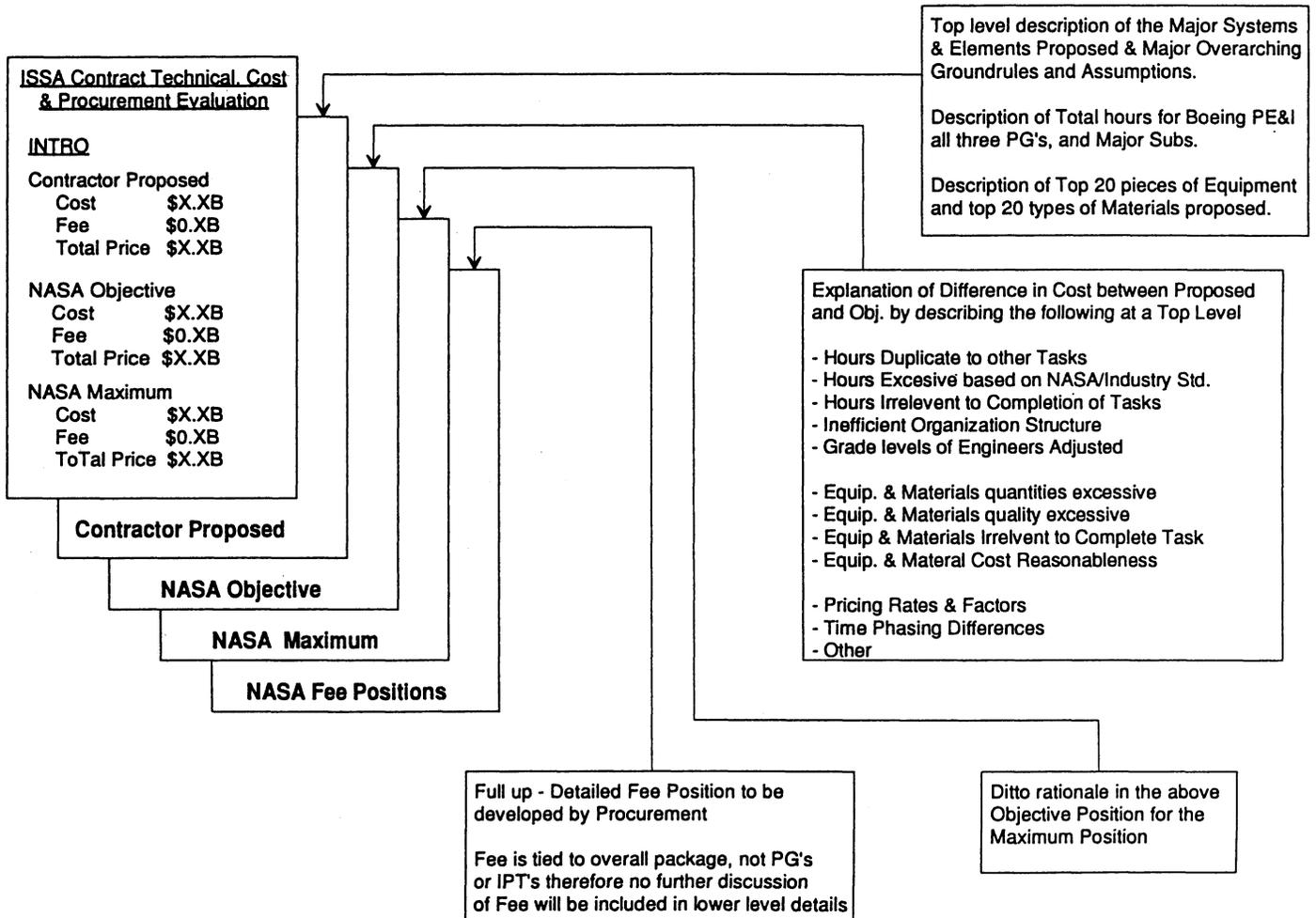


Figure 3. Format for Final Technical Evaluation – Overall Summary Level

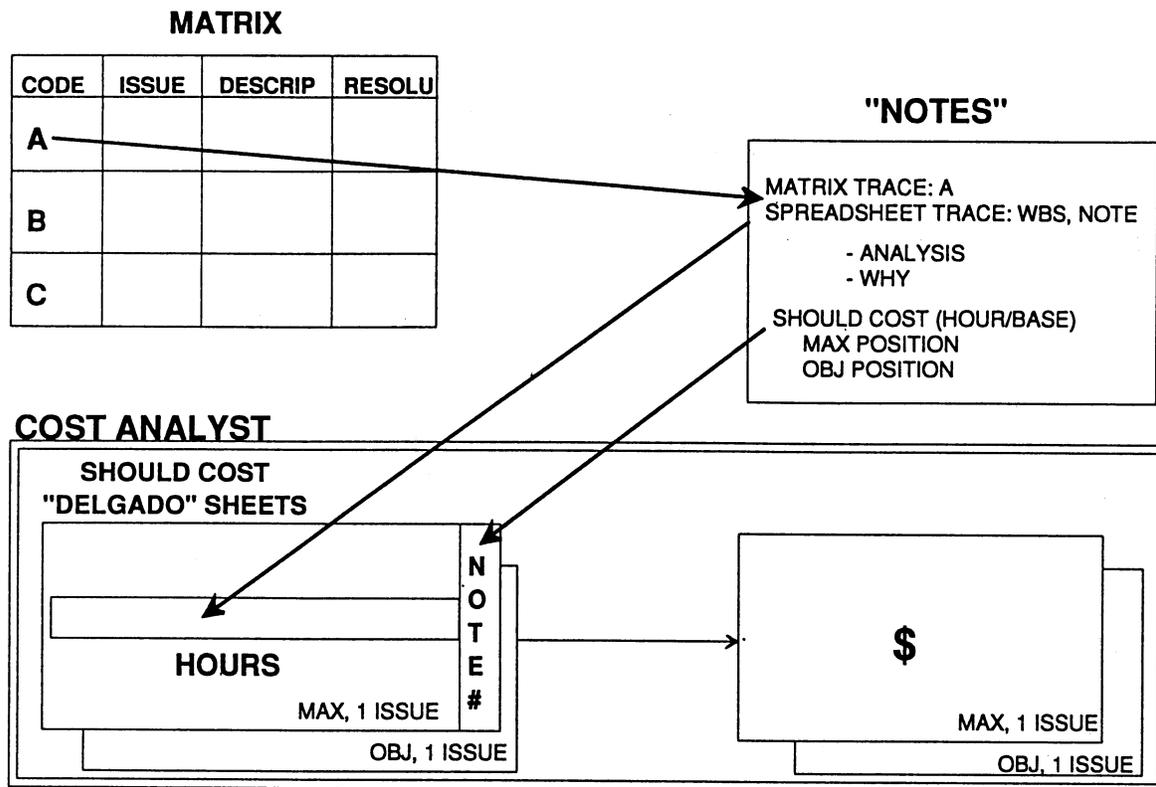


Figure 4. "Should Cost" Process

As the Prime's fact-finding proceeded through the Christmas holidays, a meeting was held between senior NASA management and Boeing corporate management. This high-level meeting was held between key Boeing executives, including the Chief Executive Officer, and NASA management, including the Administrator, the Associate Administrator of Space Flight and the Space Station Program Director. This meeting, central to the negotiations and to the NASA negotiation team, resulted in an affirmation by NASA management that the NASA team was empowered to negotiate the contract and that all negotiations

would occur in The Bunker. Following this meeting, both teams were directed to redouble their efforts to negotiate the terms of the contract before the start of the New Year. When it became apparent that negotiations could not conclude that quickly, a Christmas holiday was declared. Negotiations were rescheduled to begin after the first of the year.

Once the negotiations began in earnest, there were numerous attempts to change the SOW so that the Prime and Product Groups could further reduce their risk and improve their opportunity for profit. In

general, the SOW was left unchanged, but several areas were rewritten or clarified to reduce possible ambiguities. Key issues between the parties were quickly identified, and strategies to resolve the issues were worked. Initially, all of the issues were technical execution issues. Cost issues did not surface until most of the technical issues were quantified and resolved. Probably the most contentious issue in the negotiations, except for the cost discussion, was the management of the assembly flights.

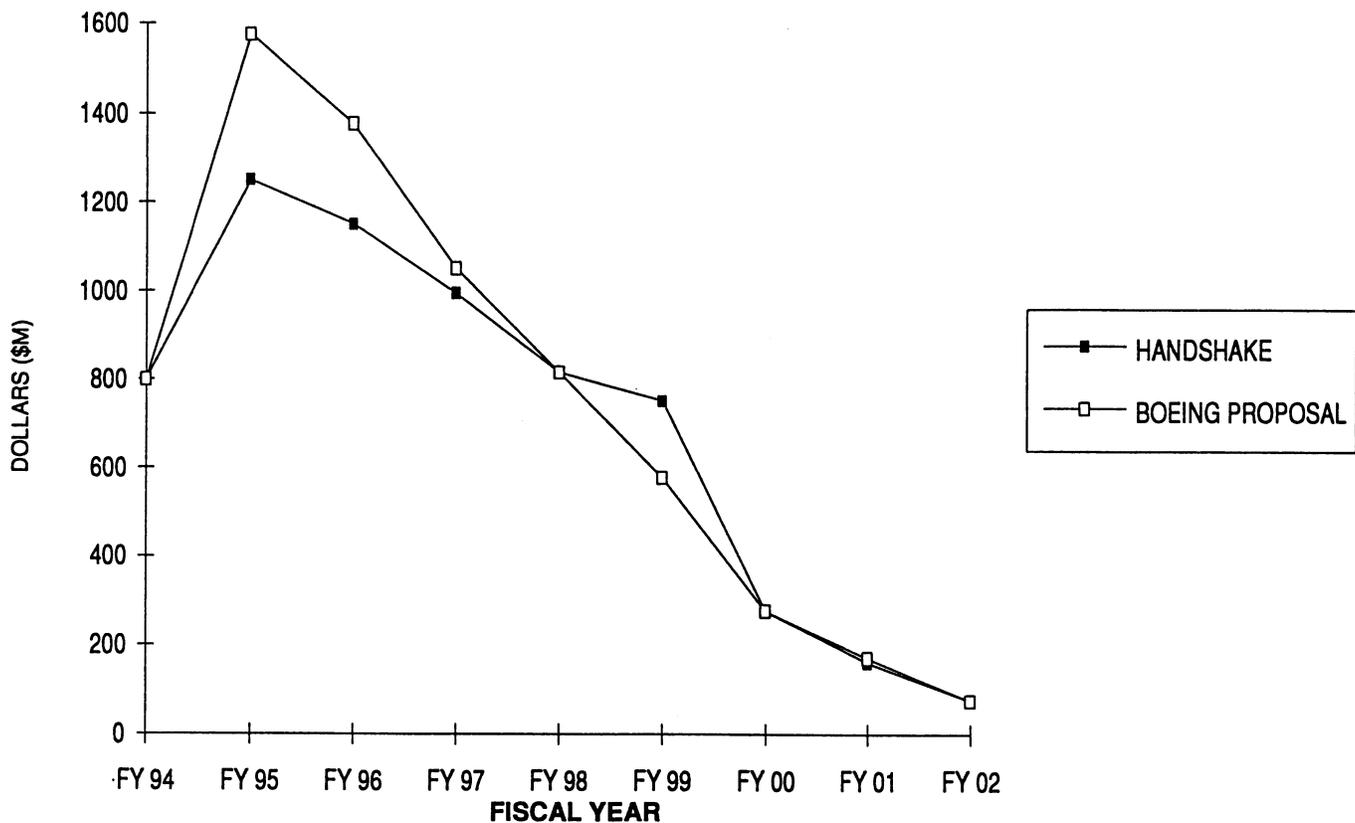
The issue of managing the launch and checkout of each element was critically important to the NASA team. It was essential to guarantee that each element would work on launch and in conjunction with the other elements already on orbit. The NASA position relied upon the management approach adopted for Space Station Alpha. During the transition at Crystal City, the Prime proposed managing the program by using the Integrated Product Team (IPT) approach. The IPT management philosophy divides a job up into its products and assigns a team to manage the development and delivery of each product. The Launch Package/Stage management teams were delegated with the overall responsibility of developing the flight hardware elements, performing the integration and verification, conducting on-orbit checkout and acceptance, and operating the elements until the next stage arrives on-orbit.

This holistic approach to management, consistent with the IPT management approach, was unsettling to the contractor,

since it pushed the budget, schedule and technical responsibility to a fairly low level in the contractor's organization. The Prime's main objection had to do with budget responsibility, as well as subcontract management and direction. The contractor could not accept a management approach that would have delegated the ability to commit to contract changes at this lower level. The Prime felt decisions that would affect the contract schedule, cost and/or technical direction had to be made by senior contractor personnel, and subcontractor direction would have to be provided by subcontract managers.

This issue was finally resolved by mutual agreement. NASA recognized the significance of the risk the contractor was being asked to accept. The NASA management approach would have created a significant number of new subcontract managers, most of whom were experts in building hardware but who had little experience in managing subcontracts. The Prime understood the need to manage the "stages of assembly" and formed a new team, at a level high enough in the contractor's organization to minimize risk, yet responsive enough to manage the development of the hardware.

The contract was structured to implement new requirements that had been levied as a result of the Hubble Space Telescope. It was the first time that the new NASA award fee policy had been implemented in a major contract. Interjecting it into the contract—when negotiations to date had never had to address this issue—represented a major



NOTE: HANDSHAKE PROFILE EXCLUDES AWARD FEE IN FY95, FY96, AND FY 97
THIS FUNDING PROFILE REPRESENTS THE HANDSHAKE NEGOTIATIONS, NOT THE CONTRACT

Figure 5. Final Negotiations, ISSA Letter Contract Definitization

change to traditional award fee operations and presented a significant challenge to both the contractor and government negotiators. The NASA award fee policy was originally written to be applied on more traditional NASA requirements where the mechanics of accomplishing the evaluation would be comparatively simple. For example, it assumes that award fee payments are accomplished on an interim basis or a relatively simple device, like a spacecraft, or as the spacecraft is built. Upon launch a determination is made of the spacecraft's performance and, if the performance exceeds

targeted levels, an additional positive performance incentive is paid and all award fee payments are converted from interim payments into final payments. On the other hand, if performance falls below targeted performance levels, an award fee "take back" may occur where the final award fee payment determination is less than the total interim award fee payments already received by the contractor. The result is a refund by the contractor, back to the government, of the difference between the interim and final award fee payment amounts.

While such a procedure is complex, it was much more difficult in the environment contemplated for the International Space Station Alpha (ISSA). With ISSA there was not a single launch, but a series of 30 launches during which various capabilities and/or successive configurations would come on line, culminating in a fully operational ISSA as it moved toward final completion. It was further complicated by a seemingly infinite number of measures which could be employed to determine the success of ISSA. Through mutual hard work and effective problem solving by both parties, an approach was developed which allowed for periodic "final evaluations" at various key milestones in the in-space construction of ISSA. At these milestones, award fee "take back" analyses would be performed and awards based on the performance of the ISSA at the current stage of its development. These procedures, which serve to maintain high levels of contractor motivation across contract performance, also allow for the achievement of a series of final award fee payments at these mutual defined points of critical development.

The provision for fee take-back further complicated the negotiation, and was an element of risk that the contractor sought to mitigate. In the final contract, Boeing agreed to a plan that would allow for the award of fee through the execution of the contract, but would expose all the fee to the take-back provisions if the Station failed to perform on-orbit. In addition to the fee take-back feature in the contract, fee was used to encourage the contractor to reduce cost. The fee structure of the contract provides an opportunity for the contractor to earn an additional \$.25 of

fee for every dollar of cost they reduce against the target price; on the other side of the equation, for every dollar overrun they would lose \$.25 of fee. This incentive feature could conceivably increase the effective fee while lowering the total costs by three times as much.

The agreement, reached late on a Saturday night, was followed by a victory celebration. Cigars were handed out to everyone as the negotiation teams moved outside "The Bunker." The negotiated price was more than \$2 billion less than the EAC at the start of the negotiation, and the terms of the agreement clearly defined the content of the task, the schedule and the performance required. We had achieved our win-win goal.

The signing of the contract, the ceremonial activity associated with the conclusion of the negotiations, was conducted on Friday, January 13, 1995. The negotiations had taken almost 6½ months to complete. Just before the agreement was consummated, the NASA team determined that the Prime had already made money. A key contract provision was a sharing of cost risk; the contractor could benefit from contract underruns and would be penalized for contract overruns. During the closing days of the negotiations it was noted that one of the Tier II proposals had been updated, providing the Prime with a cost savings, and therefore a windfall profit just as the contract took effect.

The principles and processes developed during this intensive negotiation should constitute a new standard for all future NASA contracts.