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Case Study #11

US Army Corps of Engineers

Alternative Dispute Resolution Series

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THE J6 PARTNERING CASE STUDY
J6 LARGE ROCKET TEST FACILITY

February 1994

IWR Case Study 94-ADR-CS-11

The Corps Commitment to
Alternative Dispute Resolution (ADR)

This case study is one in a series of publications describing techniques for Alternative Dispute Resolution (ADR). This series is part of a Corps program to encourage its managers to develop and utilize new ways of resolving disputes. ADR techniques may be used to prevent disputes, resolve them at earlier stages, or settle them prior to formal litigation. These case studies are a means of providing Corps managers with up-to-date information on the latest ADR processes, and the information here is designed to encourage innovation by Corps managers in the use of ADR techniques.

The ADR Program is carried out under the auspices of the U.S. Army Corps of Engineers, Office of Chief Counsel, Lester Edelman, Chief Counsel, and Frank Carr, Chief Trial Attorney. The program is under the guidance of the U.S. Army Corps of Engineers' Institute for Water Resources (IWR), Alexandria VA. C. Mark Dunning, Ph.D., Chief, Program and Analysis Division of IWR supervised the ADR program during the development of this study, assisted by Trudie Wetherall, ADR Program Manager. Jerome Delli Priscoli, Ph.D., Senior Policy Analyst of IWR is currently supervising the program. James L. Creighton, Ph.D., Creighton & Creighton, Inc., serves as Principal Investigator of the contract under which this study has been produced.

Other ADR case studies, pamphlets, and working papers available are listed at the end of this report.

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THE J6 PARTNERING CASE STUDY
J6 LARGE ROCKET TEST FACILITY

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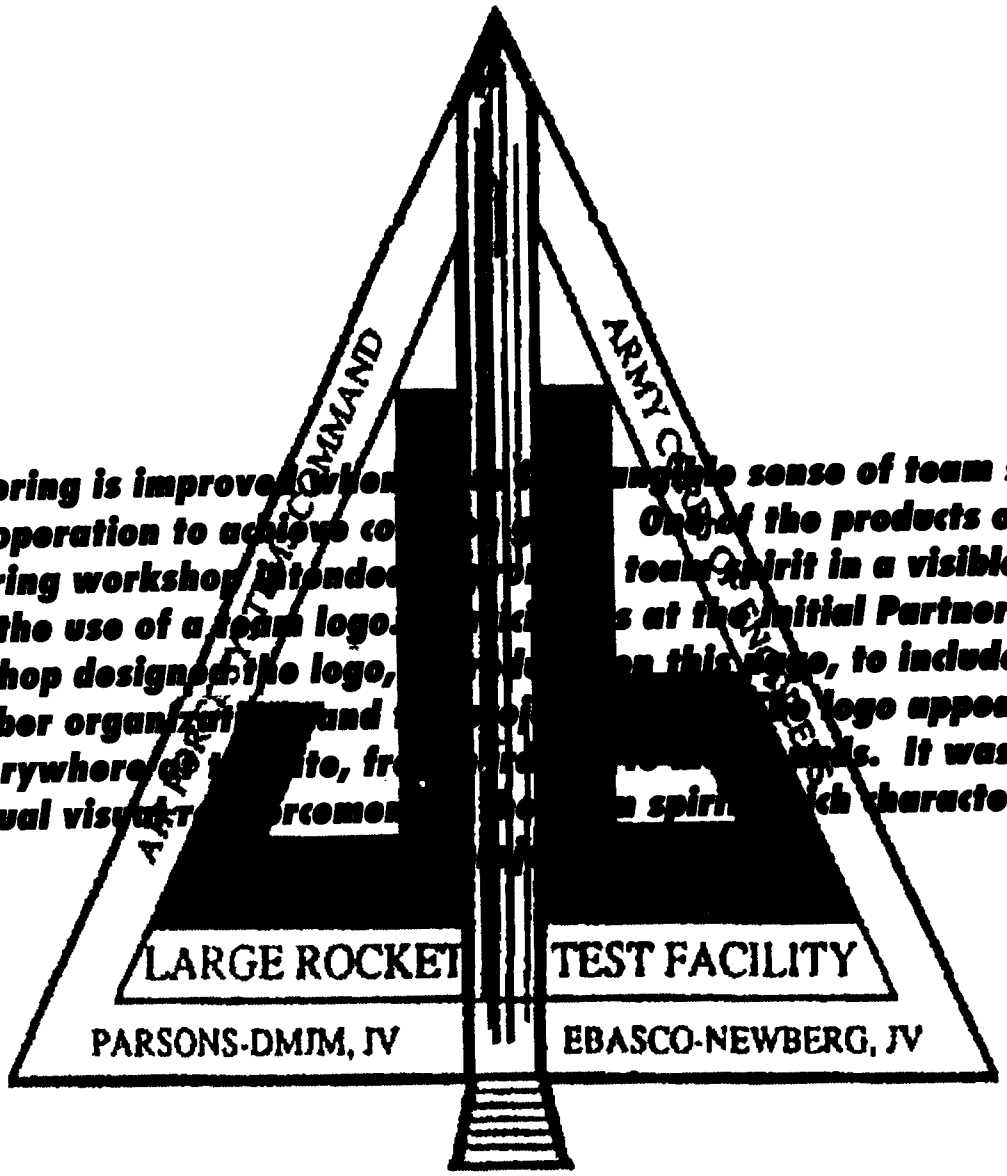

"Partnering is improve[illegible] sense of team spirit and cooperation to achieve co[illegible] One of the products of the Partnering workshop intended [illegible] team spirit in a visible way was the use of a team logo. [illegible] at the initial Partnering workshop designed the logo, [illegible] this logo, to include the member organizations and [illegible] logo appeared everywhere [illegible] to, fr[illegible]. It was a continual visual reinforcement [illegible] spirit [illegible] characterized

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INTRODUCTION AND OVERVIEW

This case study describes the use of "Partnering" on the J6 Large Rocket Test Facility, a large construction project with a total cost greater than one hundred fifty million dollars. This case study is one of a series published by the U.S. Army Corps of Engineers documenting applications of Alternative Dispute Resolution (ADR) techniques. ADR techniques may be used to prevent disputes, resolve them at early stages, or settle them before they reach formal litigation.

Partnering is a preventative approach to dispute resolution, initiated at the beginning of a construction contract or other major project in an effort to change the traditional adversarial relationship between owner and contractor into a more cooperative team-based approach.[1] The contract is awarded on the usual competitive basis, but after the contract is awarded the contractor is invited to participate in Partnering. Once an agreement is reached, representatives of all the key parties to the contract go thorough joint team-building activities to help define common goals, improve communication, and foster a problem solving attitude between the people who must work together on the contract. Participants come to understand and appreciate the roles and responsibilities each will have in carrying out the project. Often the teams identify cost or quality goals and work together to achieve them, sharing in the benefits when they are accomplished. Partnering usually involves a series of meetings, beginning with a team-building session that lasts several days to a week, with regular "tune-up" meetings between the parties. These team-building sessions normally involve the use of a facilitator or facilitator team.

Partnering has become a major emphasis of the Corps of Engineers. The Chief of Engineers recently issued a policy memorandum which stated: "Therefore, it is the clear policy of the Corps of Engineers to develop, promote and practice Partnering on all construction contracts, and to universally apply the concept to all other relationships."[2]

The J6 Large Rocket Test Facility project was chosen for this case study to show how the concept applies on a large scale construction project. Another case study will consider Partnering used on a smaller project. One of the reasons for looking at projects of different sizes is to determine whether Partnering applies only to projects of a certain scale.

[1]See Partnering (IWR Pamphlet 91-ADR-P-4, December 1991)

[2]Commander's Policy Memorandum #4, dated 31 March 1993, on Partnering in the Corps of Engineers,

THE J6 ROCKET TEST FACILITY

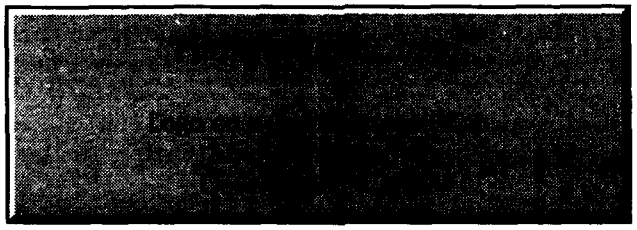
The J6 Large Rocket Test Facility is part of the Arnold Engineering Development Center (AEDC) at Arnold Air Force Base, Tennessee. Arnold Air Force Base is located in middle Tennessee, roughly halfway between Nashville and Chattanooga. The J6 facility is the latest addition to the rocket motor testing capacity at Arnold AFB. It was designed to improve the margin of safety and lessen the risk of damage if there is an accident in testing powerful rocket motors.

The mission of the J6 Facility is to test the nation's high energy solid rocket motors. These are the motors that power the Peacekeeper, Minuteman, Trident and other ICBM missiles. Rocket motors will be test fired at the facility, which will be able to simulate altitudes of 100,000 feet and will contain the force of a rocket motor generating 500,000 pounds of thrust during test burns that may last as long as two minutes. The facility is sited to minimize damage from a possible explosion equivalent to the force generated by 100,000 pounds of TNT.

In essence, the facility is a giant vacuum chamber that allows rockets to be test fired under low atmospheric pressure conditions similar to outer space. As shown in the cutaway perspective on the next page, the rocket motors themselves are fired in the test cell enclosure building, which has a giant blast wall. Before a rocket motor is fired, the facility is pumped down to a very low atmospheric pressure. Gaseous nitrogen is introduced to displace oxygen and lessen the chance of explosion. As the motor is fired, steam is used to provide initial cooling and to pump down the test cell to an atmospheric pressure of 0.16 PSIA which is equivalent to an altitude of 100,000 feet.

At the rear of the site, the huge dehumidification cooler receives the exhaust gases. Here, the hot gases are cooled with a spray of water. This is no ordinary shower of water, however. Behind the DHC is a 3 million gallon water storage tank. The tank is emptied during the normal two minute test burn of a rocket motor. To achieve a flow rate of more than a million gallons per minute, the water flows through a series of valves, the largest having a diameter of 144 inches.

The J6 Facility was part of Air Force improvements designed to increase safety at the AEDC. Before completion of the J6 test facility, rocket motors were tested in facilities sited close to other base facilities. These other facilities would have been at risk if a rocket motor had exploded.



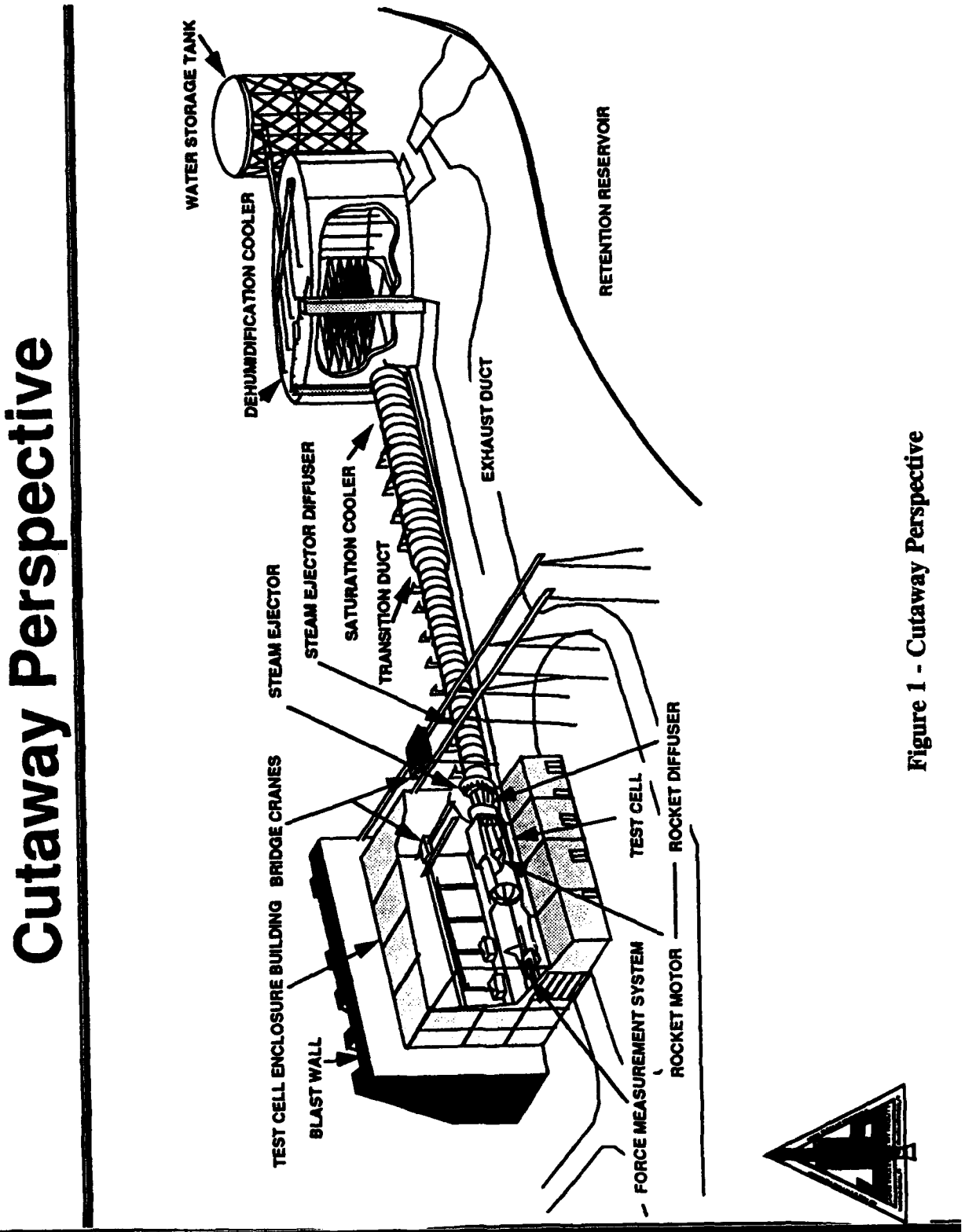


Figure 1 - Cutaway Perspective

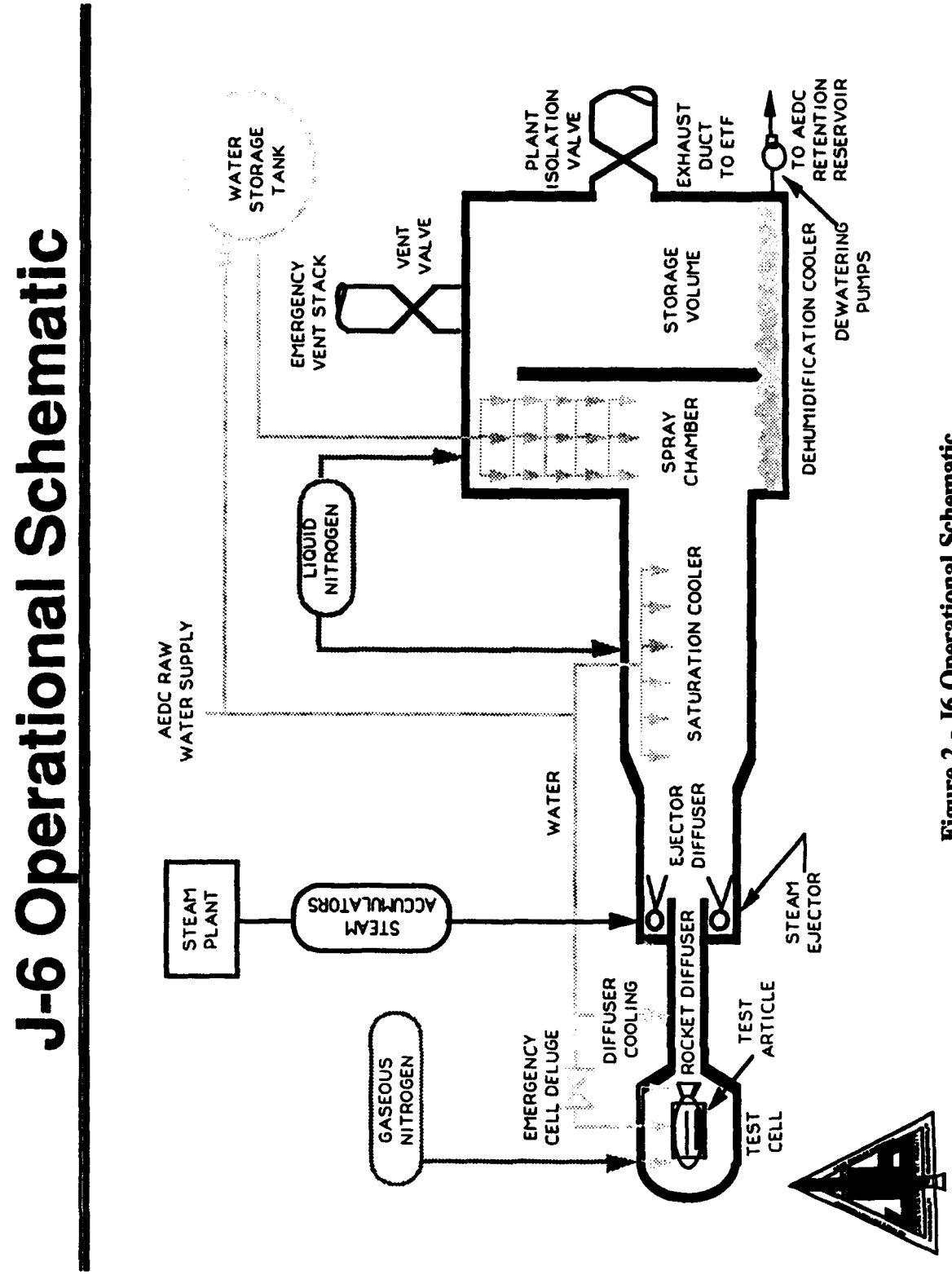


Figure 2 - J6 Operational Schematic

THE ORGANIZATIONS INVOLVED

In 1986, the Air Force and the Corps of Engineers agreed on a joint management plan for the design and construction of the J6 Facility. At the time of the agreement the decision was made to give direct responsibility for the project to the on-site managers for the Air Force and the Corps, since successful cooperation between the two organizations was critical for success.

The J6 Facility was designed by a joint venture of Ralph M. Parsons Corp. and Daniel, Mann, Johnson & Mendenhall (Parsons/DMJM Joint Venture). The design work was completed in 1988, with over 2000 drawings and 4000 pages of specifications. The design called for integration of the J6 facility with the existing AEDC utilities and systems.

The prime contractor was a joint venture of EBASCO Constructors and Gust K. Newberg Construction Company. At the height of construction, the EBASCO/Newberg Joint Venture managed a workforce of over 600 workers. Major subcontractors were CBI Services, suppliers of steel and experts in pressure vessel construction, and Science Applications International Corporation (SAIC), which supplied the control systems hardware and software.

Another firm, Sverdrup Technology, Inc. provided the Air Force with expert technicians and managers to carry out testing programs at AEDC. As the operating contractor, Sverdrup had invaluable knowledge of the technical and operational requirements that the completed J6 facility must meet, so Sverdrup was a key member of the team.

GETTING THE CONTRACT IN PLACE

Partnering occurs once the contract is in place. Up until that time, Federal agencies must follow a set of complex procedures designed to ensure a competitive and fair bidding process. No discussion of Partnering takes place until after the contract is in place.

The J6 project did not have an easy start. First, all the bids received exceeded the Air Force cost estimate substantially. Initial offers came in at roughly $200-263 million -- an exceptionally wide range. The probable explanation for such a wide range of bids was either ambiguity in the bid documents or some fundamental misunderstanding by the bidders. The government sought the comments of bidders to discover where there was uncertainty. Then the government refined the bid documents to remove ambiguities and called for Best and Final Offers. The government team included a "road map" showing changes, impacts, and listing every specification which was affected by a change. Revised bids came in at $168-174 million, a more normal range.

However, the winning bid was still $43 million more that had been originally programmed, leading Congress to require a certification letter from the Department of Defense explaining how the project would stay within the new programmed budget. Deputy Assistant Secretary of Defense Robert Stone issued the certification, citing the choice of the most qualified construction contractor through the RFP process, the three tier management approach to be used by the Air Force and Army, and the heightened oversight and guidance on all aspects of the project. Clearly, the pressure was on the J6 team to perform.

The process of revising the bid documents and getting new offers took a great deal of time and effort at the start of the job. It may have paid off, however, for two main reasons: It solidified the working relationships in the government team, since it had to produce in a pressure-packed problem situation. Second, dialogue was opened between the government and the contractors, thus beginning a relationship that could be later expanded upon in the Partnering workshop. The dialogue with all the bidders during the Best and Final Offer phase showed the government could be responsive to contractor's need for information. The government also proved it was open to suggestions, incorporating many suggested changes.

But the problems were not over once the contract was signed. The notice to proceed with work was issued on March 26, 1990. But two days later, a stop work order had to be issued due to funding problems. Construction was suspended for almost 5 months. When the project finally received a go-ahead in August 1990, the project team had to gear up quickly for construction, in spite of the loss of some key people who were reassigned during the suspension period.

THE DECISION TO USE PARTNERING

This was the first experience with Partnering for most of the people who worked on the J6 project. Many of the Corps people had heard of the Oliver Lock and Dam project, the first effort at Partnering in the Mobile District and possibly the first use of Partnering in the Corps.

While the contractor and subcontractors had not had direct experience with Partnering on a government job, they were familiar with the technique from work in the private sector. CBI, for example, had been part of Partnering with companies in the petroleum and chemical industries.

At the beginning of the project, the attitude of some of the Corps people "Why do we need Partnering? We always work cooperatively with the contractor!" In essence, there was suspicion about what Partnering could achieve. How could it improve a situation that wasn't broken?

On the other hand, some Corps managers were aware that their people had the attitude: "There's a right way to build this project - our way!" Corps staff held a number stereotypes about contractors on government projects, such as: contractors will build their case for claims from the start of the project; contractors will bury us in Requests for Information (RFIs) about the design and use that to justify claims at the end; any time we tell contractors anything, it will show up in an expensive change that they'll claim we directed them to make.

The contractor personnel held similar negative stereotypes about government work, especially about bureaucratic delays and the imperious attitude of government managers. But within the contracting teams there was a range of experiences. Some had experienced easy relations with government agencies, while others had difficult experiences. Where the relationship had worked, the difference was the ability of contractor and government personnel to talk together and resolve construction issues quickly, in a positive way.

The Air Force was the most significant Federal player in promoting a new way of managing the J6 project. There had been significant problems with schedule and cost overruns on a previous construction project at AEDC. Air Force leadership wanted to avoid a repeat of that experience at all costs. They sought a more cooperative arrangement with the Corps in managing the J6 project, and urged a joint, team-based management approach. In fact, Air Force and Corps management personnel held a team-building workshop for their groups before the construction contract was awarded. The concept came to be known as "Front Loading for Success" because it emphasized early teamwork and foresight in establishing the management structure. This experience led the leadership of the government team to be receptive to the idea of Partnering with the contractor. Dan Burns, then the Chief of Construction at Mobile, was also a proponent of Partnering and felt that the J6 project would be a good test of the concept in the military construction arena.

Partnering also held advantages for the contractor team. For example, CBI was usually the prime contractor rather than a subcontractor. Some people within the contractor team worried that this relationship would place a barrier in the way of communication. This could negate CBI's technical expertise, since CBI would have to talk first to EBASCO/Newberg, which in turn relay the information to the Corps. If CBI had technical

concerns or questions, cumbersome communication lines could add delay and cost to the project. CBI's Project Manager, Lance Buboltz, acknowledged that one of his options in this situation would have been to "cover ourselves with paper" (i.e. document design problems) and then "get the government to pay us to fix it." However, Partnering offered another way to bridge the communication gap, and Mr. Buboltz made certain that efficient and direct communication was a part of the discussion at the initial Partnering workshop.

These problems and the complexity of the project had everyone worried about the ability to bring in a successful project on time and within budget. In light of the funding issues described above, coupled with the unhappy experience on an immediately prior construction project at AEDC, it was critical for this project to meet the schedule and budget.

THE INITIAL PARTNERING WORKSHOP

Once the decision was made to use Partnering on the J6 project, a Partnering Workshop was scheduled and a neutral, outside facilitator was hired. The Workshop was held in Mobile, AL, where the Corps District offices are located. The model for the Workshop was the same as used for the pioneering Oliver Lock and Dam project.

The agenda included the following topics:

- ❑ Defining Interests and Goals
- ❑ Establishing Behavior Norms
- ❑ Use of Group Processes to Problem Solve and Build Relationships
- ❑ Partnering Charter
- ❑ Implementation and Follow-up Procedures

As part of the first agenda item, all the participating organizations were asked to independently develop their own sets of goals for the project, and then compare them in a joint session. There was remarkable similarity in the lists, as shown in Figure 3. Given the similarities, it was relatively easy for the team to come up with a set of Joint Goals to guide the J6 project (see Figure 4).

In order to achieve the Joint Goals, the team then considered behaviors it wished to promote, and behaviors it wanted to discourage. Each group engaged in an exercise to list Constructive and Destructive behaviors, activities, or attitudes that might affect success on the job. These features led the group to list joint Norms to Guide J6 (see Figure 5).

Then the group engaged in joint problem solving to work on issues that pertained to the organizational and technical challenges of the J6 project. Then a Partnering Charter was prepared, specifying team goals, and norms for behavior. The Charter for the J6 Team appears in Figure 6.

"Partnering is like marriage: The honeymoon is great, but the work begins the day after."

PRODUCTS FROM THE PARTNERING WORKSHOP - 28 FEBRUARY 1990

Figure 3
Interests and Goals

Government	Contractor
1. Quality facility, on time, which works	1. Satisfied customer - Desire is for future work - Professional Satisfaction - Good reference - other clients
2. Safety with no lost time accidents	2. Safety - Zero lost time accidents - Protection of owner's property
3. Limit contract cost growth to 2%	3. Quality - Do it right the first time
4. Max benefit from award fee and award 100%	4. Successful project completion - On time, on schedule - Within budget - Max Value Engineering - Earn 100% award fee
5. Outstanding project team performance and communication	5. Teamwork/Partnering - Establish and maintain for project duration - Joint community relations - Trust/communication/flexibility - Responsiveness

Figure 4
Joint Goals to Guide J6

- Satisfied Customer with a quality facility that works
- Safety with zero lost time accidents
- Successful project completion
  - Limit contract cost growth to 2%
  - 100% Award fee
  - Within respective budgets
  - Maximizing Value Engineering
  - On or ahead of schedule
- Total team approach with outstanding project team performance

Figure 5
Norms to Guide J6

- Quality
- Safety
- Teamwork and trust
- Cost and schedule
- Timely Pay
- Timely answers
- Effective on-site management
- High level management commitment
- Power-down on-site
  - Management team to facilitate decision-making at lowest level
- Recognition of common goals and interests

THE PARTNERING AGREEMENT OF THE J-6 TEAM FOR THE LARGE ROCKET TEST FACILITY ARNOLD AFB, TN

I. We, the J-6 Team, are committed to a positive utilization of PARTN[illegible]G in the construction and contract administration of this project. We believ[illegible] through PARTNERING we will be able to provide a safe, quality, functional pr[illegible]mpleted on time and within budget.

II. We are committed to open communications, joint problem solving, and teamwork to accomplish the following goals:
- A satisfied customer with a quality facility which works.
- A safe project with zero lost-time accidents.
- Successful project completion which includes:
- -- Contract cost growth limited to 2%
- -- Award 100% of the Award Fee
- -- Completion within respective budgets
- -- Maximizing Value Engineering
- -- Completion on or ahead of schedule
- Total team approach resulting in Outstanding Project Team Performance.

III. Our goals will be achieved through a commitment to teamwork and partnering characterized by mutual trust, responsiveness, flexibility and open communication. To accomplish these goals, we, the J-6 Team, commit to project decision-making at the lowest possible level within the Team at the project site.

U.S. ARMY CORPS OF ENGINEERS

U.S. AIR FORCE SYSTEMS COMMAND

EBASCO Constructors, Inc.

Gust K. Newberg Construction, Co.

CBI Services, Inc.

SAIC

The Ralph M. Parsons Co.

DMJM

Figure 6 - Partnering Agreement of J6 Team

FOLLOW-UP AND IMPLEMENTATION PLAN AFTER THE WORKSHOP

Follow-up Partnering sessions were held on-site with the purpose of including more of the field level people in the Partnering spirit. The first follow-up session was held almost exactly a year after the initial workshop, in part because of the five-month suspension of activities. More than 90 people attended this session.

During this session, the team established the principle of open communication, and formed cross-organizational functional subgroups (see Figure 7). Planning and problem solving during the session occurring in these functional teams. A decision was also made to begin regular meetings of the functional teams.

In addition, an agreement was made that the Request for Information (RFI) process would be used as a documentation process rather than a problem identification method. The teams agreed to talk first, and write later. (On other projects, the RFI process has become a burdensome process which some say is used by the contractor to build a case for claims if the government is slow to answer the RFIs.) As a result of this agreement, information exchange and problem solving on the J6 project occurred informally and RFIs became the means to document what had been accomplished. This was a significant innovation.

Subsequent follow-up sessions paid more attention to foreseeing and solving problems and less attention to the relationship-building activities that had been important earlier on. Some participants even commented that the later sessions may not have been needed at all, since the team was working so well without the encouragement of follow-up sessions.

PARTICIPANTS' EVALUATION OF THE PARTNERING SESSIONS

As part of the development of this case studies, interviews were held with many of the participants in the Partnering sessions. Here is a summary of their observations of the Partnering sessions

Initial Partnering Workshop:

Larry Durden, the Corps of Engineers Project Manager, saw the primary benefit of the Partnering Workshop to be the commitment to teamwork. Though there was a prior commitment to work as a team, the Partnering Workshop made the commitment a concrete reality. Drafting common goals allowed everyone to concentrate on their common definition of success. Even when team members had different views on a particular issue, they were able to concentrate on their common goals. When differences of opinion began to affect the ability of the team to reach the common goal, they would agree to get back on track. As Mr. Durden put it, "I couldn't always get what I wanted, but commitment to the goals came ahead of personal interest."

LTC Pete Root, who preceded Mr. Durden as project Manager, felt the initial workshop was beneficial in beginning the process of thinking and acting like a team. People began to break out of their organizational molds, and reorganize themselves into functional groups. They also developed interpersonal relationships, and produced a good charter for the project. Another excellent aspect of the initial workshop was the support that was shown by the executives of the organizations involved. They came to the last day of the session, were given a briefing on the outcome of the workshop, and signed their names to the J6 Partnering Charter.

Barney Davis, Corps of Engineers Chief of Quality Assurance, felt the main accomplishment of the initial workshop was in building personal relationships. In three days, a process was completed that might take a year or more on the job. After the workshop, he was eager to promote the Partnering concept and "power-down the idea to the troops."

Frank Cantrell and Clyde Kunz, respectively Project Manager and Chief Technical Engineer for Sverdrup Technologies, valued the eyeball to eyeball commitments that were made at the Partnering Workshop, along with the personal relationships that were formed. They felt that as a result of the workshop, organizational affiliations were erased and the emphasis placed on functions and expertise. Also, the power down concept was instilled during the workshop. They noted that the power-down concept requires trust from the top down and acceptance of responsibility on the part of the empowered parties, and felt the workshop created these conditions.

Frank Jones, EBASCO/Newberg Project Manager, felt that the primary benefit of to build personal rapport, team spirit and the initial workshop was the opportunity for the group to become fragmented along organizational lines. The problem

J6 Interview List

Mike Abeln, *Corps of Engineers Area Engineer*

Lance Bubolz, *Chicago Bridge and Iron Project Manager*

Frank Cantrell, *Sverdrup Technology Project Manager*

Barney Davis, *Corps of Engineers Chief of Quality Assurance and Safety*

LTC Guy Demoret, *Air Force Project Manager*

Peggy DuBray, *Corps of Engineers Contracts Administration*

Larry Durden, *Corps of Engineers Project Manager*

Frank Jones, *EBASCO/Newberg JV Project Manager*

Rick Kendrick, *previous Corps of Engineers Chief Technical Engineer*

Clyde Kunz, *Sverdrup Technology Chief Technical Engineer*

Dave Maxwell, *Newberg Chief of Quality Control*

Boyd Poteat, *Newberg Chief Technical Engineer*

Jeff Quattlebaum, *Schneider Services Inc.*

LTC Pete Root (Ret.), *previous Corps of Engineers Project Manager*

Jerry Tipps, *Air Force Deputy Project Manager*

Lee Waters, *Corps of Engineers Lead Civil Engineer*

CPT Terry Watkins, *Air Force Chief Technical Engineer*

Don Wright, *EBASCO Lead Technical Engineer*

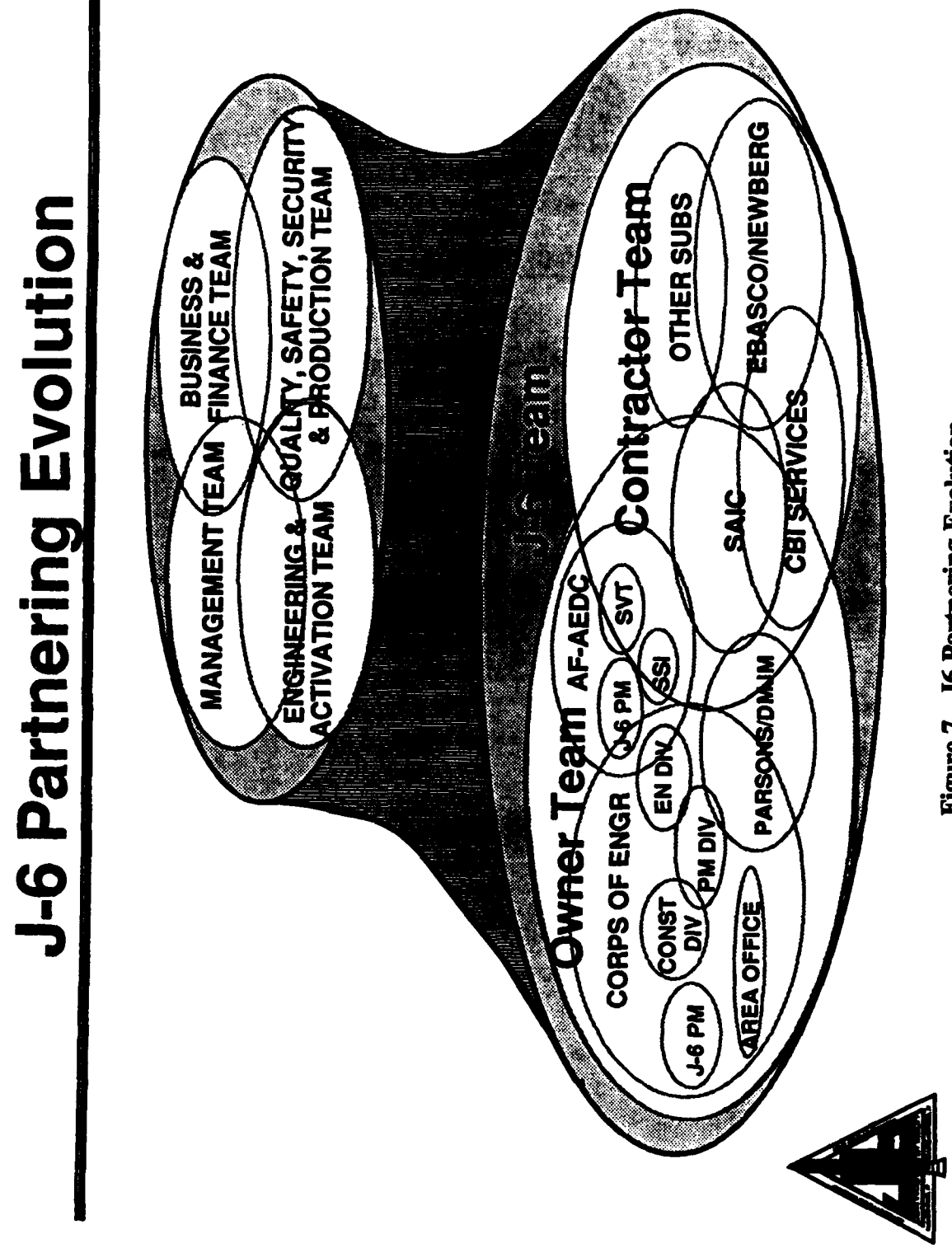


Figure 7 - J6 Partnering Evolution

solving sessions were always in cross-organizational groups, in order to promote the joint goals. The focus was on showing that a unified and integrated team concept could work to address problems through functional areas of expertise: management, engineering, technical, or administration. Organizational lines were blurred as attention turned to problem solving and overall efficiency. Mr. Jones also felt the initial workshop was valuable in giving the key leaders of the organizations the opportunity to build relationships. He believes that Partnering must be supported from the top down even though it gets its energy from the power of cooperation at the operational level. He noted that as a result of the 147-day delay at the start of the project, a few of the contractor people who attended the initial workshop were lost to the project. This was a setback but it did not seem to affect the later ability of the team to work together. Perhaps the reason was the effectiveness and inclusiveness of the follow-up session held at the site.

Lance Buboltz, CBI Project Manager, was pleased with the initial workshop because it addressed his major concern: efficient communication among the organizations. Although the outcome was good, Mr. Buboltz felt that the initial workshop could have included even more people. This would have increased the "buy-in" of more people on the job and would have broadened the understanding of Partnering.

Follow-Up Sessions

Both Corps and Contractor group members thought the first follow-up session was especially valuable. There was agreement that one year was probably too long to wait for a follow-up workshop, but the five month suspension intervened. In this regard, Frank Jones (EBASCO) and LTC Pete Root (USACE) both commented that the follow-up session should occur at a time when the contractor has at least 65 to 70% of the operational staff on site. It is important to include as many people as possible in the workshop to instill the Partnering spirit and give people the opportunity to experience problem solving with the other team members.

Peggy DuBray, from Corps' Contract Administration, valued the first Partnering follow-up session because it gave her a chance to get out of her usual setting, away from her desk, and allowed her to view the "bigger picture." She was able to see problems that might be coming, and then to work on them with her colleagues. She found valuable practical solutions were generated at the workshop.

Mike Abeln, Corps of Engineers Area Engineers was particularly pleased with the commitment to open communication, so that CBI, for example, could get information directly from Sverdrup, the operating contractor, if required. He also was pleased with the change from thinking within organizational limits to working as functional teams.

Mr. Buboltz (CBI) believed that many benefited from understanding how personality types differ and the effect that has on communication styles. People learned that differing personality types are complimentary and add to a productive team. Perhaps most useful, he felt, was moving to solve specific issues and problems in functional groups which included all the organizations represented. Personal relationships were solidified by the practical experience of productive work-related problem solving.

As noted earlier, there were some questions about whether later follow-up sessions were needed, since the team seemed to be working together effectively. Larry Durden, Corps Project Manager, suggested that: "One goal should be to have no more need for Partnering workshops. We should work ourselves out of having to be reminded of partnering because we are truly partners."

PARTICIPANTS' ASSESSMENT OF THE BENEFITS OF PARTNERING

J6 team members mentioned many benefits they attributed to Partnering. These included:

- **The adversarial "us" versus "them" attitude was replaced by "we" thinking.** Team members looked for ways to promote joint gains in their problem solving, i.e. they worked to create win/win situations.

- There was an up-front commitment to success. The parties realized that they shared fundamental interests in several key areas which defined success for the project. The Partnering process made those goals clear to all parties, in the form of the Partnering Charter.

- **Communications were improved.** Normally communication between organizations is limited. On the J6 project, the major subcontractors, CBI and SAIC, were allowed to get information directly from the Air Force, the A/E or the Corps.

- **People enjoyed coming to work.** The cooperative atmosphere on site made the job a pleasure. Many commented on the sense of professionalism that they felt was promoted by the Partnering spirit.

- **Problem solving was proactive, rather than reactive.** Due to the openness, candor and trust among the team members, there was no reluctance to raise potential problem issues for discussion at the earliest moment. This allowed the team to develop strategies to avoid problems before they became emergencies.

Some team members did express that concern that the Partnering relationship may blind government managers to situations where the public interest conflicts with the private interest of the contractor.

This is an important concern. Clearly, Partnering does not mean that the government consents to every change the contractor suggests. Nor does Partnering mean that the checks and balances inherent in the role of a government employee should be forgotten. Though government and contractor interests often coincide, there are also areas where the interests of the government and the contractor diverge in fundamental ways. While the contractor organization is responsible to shareholders and the board of directors, the government manager must consider the interests of the government and the taxpayer.

Where these interests diverge, the government employee must put the public interest ahead of the Partnering relation. The construction contract requirements provide the framework for the relationship where there is a fundamental divergence of interest. Partnering attempts to create a situation where all of the parties,

including the public, can participate in the win/win outcome. But Partnering should not become a self-fulfilling prophecy, such as could happen if the government manager were to neglect the public interest in favor of the partnering interest.

PROJECT RESULTS

One of the difficulties of determining the value of a strategy like Partnering lies in demonstrating the link between the action and the results achieved. It's unusual to find a direct cause/effect relation when you evaluate management techniques whose purpose is to promote qualities like cooperation and improved communication. However, the interviews showed that the team members perceived that a large part of the success of the J6 project was due to the commitment to Partnering.

How successful was the J6 project? One yardstick is a comparison of the actual record of achievement to the goals that the team defined for themselves at the initial Partnering workshop. Here are the original goals and the results achieved:

Goal: A satisfied customer with a quality facility that works.

Result: All quality control/ quality assurance tests were met or exceeded specifications.

Goal: A safe project with zero lost time accidents.

Result: 950+ days, 2.2 million man-hours with 4 lost time accidents. The lost time incident rate was 0.39 compared to a national average of 6.2. A milestone of one million accident-free hours was reached before the first accident. All levels of management and labor were involved in the safety effort.

Goal: Contract cost growth limited to 2%.

Result: Negative cost growth.

Goal: Award 100% of the Award Fee.

Result: Earned 100% four periods, 95% one period. The Award Fee is only given for exceptional performance, not for merely meeting the requirements of the contract. The contractor team consistently achieved exceptional performance ratings.

Goal: Completion within respective budgets.

Result: The project was completed within budget.

Goal: Maximizing Value Engineering (2% or more of contract value).

Result: 1.53% VE savings. Considering that the extended contract negotiation process identified and corrected many ambiguities, reducing opportunities for value engineering, the 2% goal was ambitious, and the 1.53% actual level is a good result. VE savings have contributed to the low cost growth for the project.

Goal: Completion on or ahead of schedule.

Result: The project was completed 5 months ahead of schedule. Current progress may

allow the Air Force to test its first rocket motor at least 7 months ahead of the original target date.

Though it was not an explicit goal identified at the workshop, another significant indicator of the success of the project is that no claims were filed by the contractor for additional compensation. As a result, there will be no claims litigation regarding the J6 Project.

As a further measure of the success of Partnering, members of the team also pointed out a number of instances where the team used mutual problem solving so address a significant technical challenge. Examples included:

DHC Roof Redesign

One of the design challenges was the construction of the roof of the DHC building. The design called for constructing the roof as a free-standing, four-foot-thick concrete structure. Heavy scaffolding would support the roof until the roof cured. The difficulty lay in placing a matrix of water pipes in the space under the roof while the scaffolding was there. The contractor noted this difficulty and suggested a redesign of the roof to allow both the roof and the piping to be constructed at the same time. The solution proposed by the contractor was to use a stay-in-place system of steel decking to support the concrete roof. Stabilizing roof support beams eliminated most of the need for scaffolding to shore up the roof.

The solution was innovative and saved money and time. Perhaps most innovative was the way the redesign was handled, however. The architect/ engineer, Parsons/ DMJM, had prior knowledge of the design parameters for the DHC. This was particularly important because the building had been specially designed to withstand an explosion should there be an accident during a test burn. Usually the contractor would be responsible for any design work needed for a VE proposal, but since Parsons/ DMJM had special knowledge of the structure, the contractor proposed that it would be most efficient for Parsons to redesign the DHC roof. The Corps recognized the great benefit to the project of the proposal and the need for Parsons/DMJM to be involved in the redesign. The Corps reviewed the contractor's proposal with the A/E for feasibility and asked for an estimate of the cost. The Corps agreed, in the spirit of Partnering, to take the redesign cost "off the top" of the VE savings before splitting the savings 45/55 as is the usual practice. The team attributes the creative solution for the redesign to the ability to communicate and explore how existing resources and expertise can combine for a mutually beneficial solution.

The DHC Foundation

The foundation of the DHC had to be solid to maintain the rigidity of the building under the loads expected from testing rocket motors. The contract called for excavating to grade (approximately 20 feet), then over-excavating an additional foot and compacting the soil to 95% compaction before pouring concrete for the foundation. The problem the team faced was water. The bottom of the

excavation at the 20-foot depth was below the water table. When the contractor tried to compact the soil, the result was a muddy soup completely unsuitable for a foundation.

Normally, when a contractor encounters such a situation, there is a differing site condition claim. The usual solution would be to excavate several feet below grade, and then fill with rock to get the proper compaction specified. This approach would have been very expensive considering the size of the DHC.

The Corps and contractor considered a lime stabilization treatment for the soil in hopes of getting better compaction. However, a trial treatment was unsuccessful. The soil was still too wet to compact properly.

The Corps foundation expert who had advised the designers on the foundation requirement was called in for consultation. In the course of the consultation, he said the reason the one foot over-excavation and compaction was called for was to ensure a firm foundation even if the excavation work was not skillfully done. He would be satisfied with another solution, as long as it provided a suitably solid foundation.

In consultation with contractor experts and the site managers, a proposed solution was devised. To avoid the mush created by the attempt to compact the soil, it was decided that there would be an initial 14 to 15 feet of excavation. Then, following the installation of a French drain system for dewatering, the remaining material would be excavated to grade level. But only as much material would be excavated as could be covered with concrete that day. Thus the base of the foundation was built in pieces, and the foundation was laid on solid, relatively dry earth.

This solution satisfied the foundation expert and it was a good solution from the government's point of view. It avoided a differing site condition claim and the added expense and potentially soured relations. The contractor may have been delayed somewhat since it had to pour concrete in sections rather than all at once. However, Mike Abeln, the Corps' Area Manager credits EBASCO/ Newberg for working hard with its subcontractor to avoid the need for a differing site condition claim. According to Mr. Abeln: "A differing site condition claim like this usually comes early in construction. It can sour the relations on a project. We didn't let that happen. Partnering helped us cooperate on the solution."

The Ringer Crane

CBI Services was the major subcontractor to EBASCO/ Newberg, responsible for constructing the water storage tank and the transition duct which connects the test cell to the dehumidification cooler. A 4600 ringer crane has the capacity to reach the four hundred foot distance between the two buildings, and lift the heavy metal segments of the transition duct. CBI had a ringer crane available at the scheduled start of the J6 project. However, during the long suspension of work, CBI had the

opportunity to sell the crane. Not knowing at that time whether the J6 project would be approved, CBI sold its crane. When the project was given the go-ahead, a crane had to be found.

There was no rental crane available in the area and the project faced a delay and added expense, which could reasonably be attributed to the suspension of work. A rental crane might have added as much as a million dollars to the project cost. In an attempt to explore all options, the contractor located a ringer crane at a TVA facility in the area which might be available. However, regulations would not allow TVA to rent the crane to a private entity; only another public agency could rent the crane. The Corps rented the crane from TVA and then rented it to EBASCO/Newberg, who rented it to CBI. Frank Jones (EBASCO) and Mike Abeln (Corps) agree that this solution would not have been considered without the attitudes and joint problem solving spirit that Partnering created. As a result of the creativity, a potential claim was avoided, the project remained on time and within budget, and the TVA got the rental payment and a refurbished crane when the rental term was over.

Cracking In The DHC Concrete

The J6 dehumidification cooler is in essence a huge, unlined concrete vacuum bottle. For it to be able to hold the vacuum which simulates high altitude conditions, it must be virtually air tight. The maximum leak rate allowed in the contract specifications was less than 4 pounds per second; this would be roughly equivalent to what would leak from a two-inch-square hole. The design called for stringent concrete mix requirements and temperatures, and also specified that concrete would have to cure for 30 days before adjacent concrete was placed, to avoid leaks at the joints.

During the early stages of placing concrete, hairline cracks were discovered in some slabs and wall sections of the DHC. Cracking could have compromised the ability of the building to hold a vacuum, thus jeopardizing the mission of the entire facility. When the cracks were discovered, a joint team was formed to investigate the problem. It was clear that the contractor was meeting the standards for concrete mix as specified. In fact, the contractor's mix often contained more cement than specified, regularly producing concrete that exceeded the strength required.

Concrete experts were called in from Mobile District and the Corps' Vicksburg laboratory, as well as from the EBASCO and Newberg organizations. The experts investigated the situation, and reviewed the specifications. There was the potential for a great deal of expense and liability if the cause of the cracking was not found and corrected.

The investigation showed that the cracking was apparently caused by the extra cement generating heat in the curing process. The experts proposed cutting back the amount of cement in the mix (thus reducing the strength but also the heat generated), and monitoring for further cracking. The contractor had to change the sequence of removing forms somewhat because of the change on mix,

but there were no other adverse consequences.

The result was no further evidence of cracking. This translated into excellent performance on the pump-down tests of the facility. While the contract called for a maximum leak rate of no more than 4 pounds per second, the actual leak rate was less than .25 pounds per second, more than 16 times better than the standard.

Corps Area Engineer Mike Abeln describes this as a real team effort to investigate a potentially critical problem. According to Abeln: "Dave Maxwell, EBASCO/ Newberg Chief of Quality Control, and Barney Davis, Corps Chief of Quality Assurance and Safety, spent long days at the concrete batch plant working together to optimize the mix. That's how partnered problem solving worked for the benefit of this project."

The J6 Safety Program

Beginning with the initial Partnering Workshop, safety was a key goal of all the organizations represented. From the start, the Corps Quality Assurance Branch worked closely with the contractor's Safety Office, and a joint safety program was created. Some of the stricter safety codes in the program were controversial with the workers on the job. For example, the program called for a 100% tie-off policy for anyone working more than six feet above the surface. This policy met some resistance from the ironworkers. However, team leaders felt that the 100% tie-off policy was a critical feature of insuring a safe job. The dehumidification cooler was 100 feet high, and all the steel had to be tied-up off the ground. All of the concrete placements were made at elevation. Any fall from these heights would have been life-threatening.

The safety performance on the project was outstanding. Managers point to what they call a culture change on the part of workers, especially the ironworkers. Frank Jones, EBASCO/Newberg PM, said, "The biggest safety problem you'll ever have on any job is an individual's nature. One of the things that we've succeeded in getting here, at least we think we have, is a culture change. A lot of people who came to this job weren't as safety conscious as they are now. For safety to become effective it has to become a habit. To get that habit you have to have a culture change." Managers believe that the workers now realize that the Corps and contractor were interested in their safety, and the safety program was there for their benefit.

LESSONS LEARNED

Here are some of the "lessons learned," as reported in the interviews:

- **Prepare for construction by "front loading for success."** On the J6 project, this touchstone phrase referred to a number of things that were done to set the stage for a successful construction phase. It meant a commitment to streamlined joint management, and "power-down" to the operating level where the most efficient decisions must be made. It meant ensuring that technical experts were available and directly involved in the team. It required a commitment by the government team of resources and facilities up-front to make the "front loading" successful.

- **Select the most qualified contractor, not the lowest bidder**. For the J6 project, the government used a Request for Proposal (RFP) process in which a weighted evaluation method allowed the government to choose the most qualified contractor rather than the low-cost bid. In addition, special management items were included in the RFP and the contract which contributed to engaging a contractor team with both technical and management expertise for the project.

- **The government team must be unified.** The relationship between the Corps and the Air Force at AEDC had been strained by the difficulties of a previous job. Fundamentally, the two organizations needed to clarify their respective roles in the construction of a major facility like J6. The two organizations chose to form a cooperative team whose purpose was to create a climate for excellence in which the best facility possible could be constructed. They did this in a coordinated way, using team building and strategic planning.

- **The end user should be given a direct role in planning and in advising during the construction phase.** In this case, both the Air Force and their operating contractors (Sverdrup and SSI) were included as integral members of the design, procurement and construction team. They provided invaluable technical assistance available nowhere else. By involving them in the team, the Corps and contractor were able to have a better sense of what was required in the construction phase to satisfy the needs of the user.

- **Artificial barriers to problem solving communication should be eliminated.** When a technical question had a direct impact on the construction process, the team members knew that they could go directly to the people who had the information to review and answer questions, regardless of their

organization. The J6 team members were chosen for their expertise and it was a primary goal of the team to make problem solving as efficient as possible. If the contractor needed to know a technical detail, he was able to ask the operating contractor personnel directly for information. Often, that conversation solved the problem through the information exchange. If it led to a solution which would affect the schedule or budget, management was immediately informed. This process short-circuited bureaucracy and improved on-the-spot problem solving.

- **Get the right people for the job.** Some people are able to work more effectively in a cooperative environment than others. With the right people, the Partnering process will develop the commitment to succeed which is, ultimately, the factor which drives the relationship and the cooperation.

- **Ultimately, the success of Partnering rests on personal commitment.** Without the commitment to work hard on Partnering, the relationship won't succeed. The Partnering Charter was kept visible on everybody's walls as a daily reminder of the commitment.

- **Complacency is at least as much of a threat as conflict**. Follow-up workshops are important to avoid complacency and to work with team members, in a new setting, on job-specific problems.

- **Act decisively when problems are first perceived.** Avoiding crisis management was an all-important plus on this job.

- **Look at both sides of issues and understand the perspective of the other viewpoint.** This attitude was promoted by Partnering and is fundamental to positively addressing the conflicts that will arise on the job. People then concentrate on the fair solution to problems, and the solution which will benefit the project.

- **Management must be committed to "power-down."** The "power-down" concept was a big part of the day-to-day success of the project. The people on site built the facility, not the managers. People on the site bought-into Partnering because they were given the authority and expected to use it responsibly. Management followed through on its commitment to the people on the ground, and they it turn remained committed to work hard through good and bad times.

CONCLUSION

When the author visited the J6 site, one of the immediately obvious things to an outsider was the spirit of the people and their genuine sense of pleasure in having been part of the team which completed the job. Everyone on the J6 project team talks about their pride in the accomplishment; many mention what a pleasure it was to come to work every morning knowing that there was a common goal that all had agreed to work toward and that they could do so cooperatively. Professionalism was the word most often used to describe this attitude. It made the effort worthwhile.

Still, many people cautioned against expecting too much of any technique like Partnering. Partnering is no panacea for every problem and it can't be applied in a cookbook fashion with any expectation of success. Partnering succeeds because people are convinced it's a better way of working, and they are willing to commit to doing whatever it takes to make it work and achieve the joint goals of all the parties.

APPENDIX

"Partnering is like marriage:
the honeymoon is great, but
the work begins the day after."

Abeln/Demoret/Jones

"Partnering is not anything new.
It's not a revelation, or a revolution.
It's not a panacea, nor is it a cookbook process that works the same way every time.
Successful Partnering requires the emotional commitment to success by all."

Frank Jones, EBASCO/Newberg JV

"The managers don't build the project.
They gave us the authority and the responsibility to solve problems
ourselves. That's what the 'power-down' concept
was all about."

EBASCO/Newberg JV supervisors

"There is a common understanding; there is a common goal; there is a common work effort. Problems that have been identified have been worked to mutual benefits. One organization's problem can affect that mutual goal, therefore mutual working on a solution to a problem benefits all organizations."

Frank Jones, Project Manager EBASCO

"We hardly ever have any
crisis management on this job."

Larry Durden, J6 Corps Project Manager

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This case study describes the use of a disputes prevention process, Partnering, on a large (in excess of $150,000,000) construction project. This study describes the whole process from finalizing the contract and decision to use Partnering to the participants' assessments of Partnering. This study provides an example of "how to" accomplish Partnering for a large construction project.

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