

# C-17 Program — From the Brink of Cancellation to Baldrige National Quality Award Winner

**Teamwork Can Turn Anything Around, Including a 585,000-Pound Aircraft**

MAJ. GEN. TIMOTHY MALISHENKO, U.S. AIR FORCE

## 1998 Malcolm Baldrige National Quality Award for Manufacturing

### Boeing Airlift & Tanker Programs

BOEING AIRLIFT & TANKER PROGRAMS, PRODUCER OF THE C-17, RECENTLY WON THE 1998 MALCOLM BALDRIGE NATIONAL QUALITY AWARD FOR MANUFACTURING. THE MALCOLM BALDRIGE NATIONAL QUALITY AWARD IS THE HIGHEST HONOR BESTOWED TO INDUSTRY IN RECOGNITION OF QUALITY AND WORLD-CLASS BUSINESS PERFORMANCE. BOEING AIRLIFT AND TANKER — AS CLEARLY VISIBLE BY THE SUCCESS OF THE C-17 PROGRAM — IS TRULY DESERVING OF THE AWARD, AND THE DEFENSE CONTRACT MANAGEMENT COMMAND IS PROUD TO STAND WITH ITS C-17 PARTNERS — BOEING AND THE AIR FORCE — AND OFFER SINCERE CONGRATULATIONS.



Just six short years ago, the C-17 — the much-needed replacement for an aging C-141 airlift fleet — was on the verge of cancellation. Congressional hearings were commonplace, the Defense Science Board concentrated efforts reviewing the program, and the C-17 “team” players — the Air Force program office, DCMC, and the contractor — were in an all-out, no-holds-barred adversarial relationship. In short, it looked as though the beleaguered aircraft was fast becoming a textbook example of programmatic failure. Today, the C-17 is a heralded success story, a benchmark in process improvement, and a cornerstone in teamwork history.

To help tomorrow’s program managers benefit from the C-17 team’s “lessons learned,” this article highlights some of the successful partnership efforts on the program — from teamwork in everyday processes to joint acquisition strategies to the changing roles of contractor and government personnel in acquisition streamlining.

### Everyday Teamwork

The type of teamwork that turned around the C-17 wasn’t “special projects” teamwork; that is, the kind one might form to tackle a specific challenge and then disband when the goal is met. Rather, teamwork on the C-17 is “fundamental” teamwork — the partners work together on everything from the “big picture” (e.g., establishing the program vision) to the minute details (e.g.,

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drivmatics automation process). “Teamwork was in fact the primary key to turning this program around,” asserted Rich Harstad, Chief of Manufacturing and Quality for the C-17 Systems Program Office (SPO). “If the program was to survive, we needed to work together to focus on the critical program goals.”

Gene Kluter, Director of Supply Chain Management for Raytheon Company, agreed with Harstad. Kluter was an Air Force colonel and commander of DCMC Boeing (then McDonnell Douglas) Long Beach during the tumultuous days of the C-17. “Initially, the parties weren’t aligned on goals and objectives ... We needed to rebaseline the program,” explained Kluter. “The government and the contractor got together and identified clear goals that we were all going to work toward ... Everybody then marched to these program goals. So it wasn’t as if the government had one set of goals and the contractor another. We had a common shared set of goals, a common set of values, and a supportive culture in which this program was going to operate.”

Randy Mizer, Vice President of Total Quality Integration for Boeing Airlift and Tanker Programs, concurred. “Teamwork gave us one shared, common vision of what the C-17 program could be – and what it needed to be – for success ... Once we identified this common vision, we realized we needed to create integrated – meaning multifunctional – product teams.”

“We got everybody into a room ... everyone who had anything to do with the C-17: the testers, the people who were going to field the airplane in Charleston, the Program Office, the Pentagon, the DCMC office, the contractor. We must have had 150 people,” explained Kluter. “We drew up the program structure built on a number of integrated product teams, and started assigning people to these teams.”

#### INTEGRATED PRODUCT TEAMS

Integrated Product Teams (IPT) – a concept that was in its infancy at the time –



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introduced a comprehensive approach to solving problems and managing program risk while ensuring all members successfully met their responsibilities (SPO: define requirements; DCMC: assure contract compliance; Boeing: execute contract). IPTs, quite simply, are self-directed, multifunctional teams that effectively help manage risk. With IPTs, the C-17 transitioned from a functional-process focus to a sharp focus on product. For instance, an integrated master program plan and schedule were established that incorporated every significant milestone and schedule. And, perhaps most importantly, with IPTs the C-17 evolved from adversarial, guarded communications to cooperative, open teamwork.

“IPTs brought empowerment down to the lower levels to help resolve issues,” said Mizer. “In the past, the first reaction of senior management was, ‘I’ve got a problem. I must fix it.’ Now the reaction is, ‘We’ve got a problem. Has this been dealt with in the IPT? Have you talked with your counterparts?’”

Communication is a key ingredient to IPT success: ensuring shared metrics and joint decision making. “IPTs help move things along faster and help communication. Our IPT people know about things the same time the SPO and DCMC do. They all talk to their [government] counterpart at least once a day if not twice a day,” said Mizer. Kluter echoed Mizer’s IPT assessment, “With IPTs, decisions are made faster and they are better decisions. There is better coordination.”

#### SHARED METRICS

At the outset of the teaming arrangement, the partners agreed to a joint set of project and process measurements – or metrics – as well as a shared process for gathering and disseminating data. “We got everyone in agreement so we didn’t argue about metrics nor how to get data for metrics. Instead, we now focus on how to improve performance and discipline processes,” recalled Mizer.

#### BALDRIGE ASSESSMENT TOOLS

Shifting the focus to examining processes in order to improve performance is a key

element of Baldrige management principles. The C-17 team made a decision from the outset to use Baldrige assessment tools to help turn the program around. "I remember the meeting in Don Kozlowski's [then Senior Vice President, Military Transport Aircraft, McDonnell Douglas] office when we first suggested using Baldrige criteria as a roadmap for the program," recalled Air Force Lt. Gen. Ronald Kadish, Commander, Electronic Systems Center. Kadish was the C-17 Program Director from October 1993 to August 1996. "First there was a chuckle. But after we thought it through, we all agreed and said, 'Let's do it!' Baldrige gave us a roadmap to follow."

### PBM & PROCAS

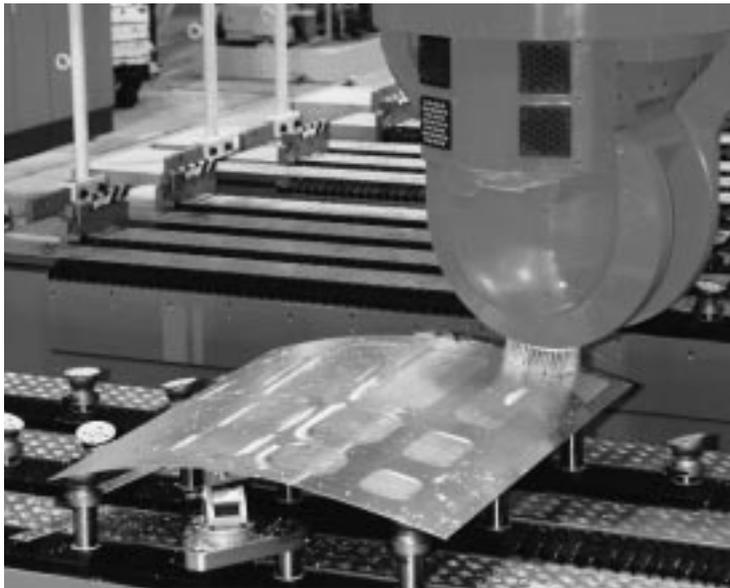
That reform came in the form of Process Based Management (PBM) — a concept that was new to the C-17 program. PBM was a universal cultural change for all of the team players. It shifted the focus from inspection/detection to prevention/design, from temporary resolutions to continuous improvements, and from isolated answers to systematic solutions.

At DCMC, we instituted PBM through an approach called Process Oriented Contract Administration Services (PROCAS). On the C-17, Boeing and DCMC signed a formal PROCAS/PBM agreement, which ensured the parties focused on problem-solving processes.

"The major change is rather than arguing over whose data is right ... we've got an agreement ... And even though we keep our own perspective — maintain our fiduciary responsibility — it's not an adversarial relationship," explained Mizer. "They're really partnerships focused at the end point rather than at the median point ... Everybody is focused on getting a task done rather than everybody working toward their own goals individually."



THE C-17 (ABOVE AND OPPOSITE PAGE) IS A HIGH-WING, FOUR-ENGINE, T-TAILED AIRCRAFT WITH A REAR LOADING RAMP. IT IS 174 FEET LONG AND 55.08 FEET HIGH, WITH A WINGSPAN OF 169.75 FEET. MAXIMUM TAKEOFF GROSS WEIGHT IS 585,000 POUNDS. MAXIMUM PAYLOAD IS 170,400 POUNDS. WITH A PAYLOAD OF 160,000 POUNDS, THE C-17 CAN TAKE OFF FROM A 7,600-FOOT AIRFIELD, FLY 2,400 NAUTICAL MILES, AND LAND ON A SMALL, AUSTERE AIRFIELD IN 3,000 FEET OR LESS. THE C-17 CAN BE REFUELED IN FLIGHT.



THE FIRST OF SEVERAL GIANT MACHINE TOOLS TO AUTOMATE FUSELAGE SKIN PANEL ASSEMBLY FOR THE U.S. AIR FORCE C-17 GLOBEMASTER III AIRLIFTER HAS BEEN INSTALLED AND IS NOW IN OPERATION AT BOEING FACILITIES. "THIS NEW MACHINE, AND THE OTHERS THAT WILL FOLLOW, WILL ALLOW US TO SATISFY OUR AIR FORCE CUSTOMER WITH THE HIGHEST-QUALITY PRODUCT AT A REDUCED COST, WHILE ALLOWING US TO INCREASE OUR PRODUCTION RATE," SAID BILL GENDRON, DEPUTY C-17 PROGRAM MANAGER AT BOEING.



fordable C-17 prices for a variety of aircraft quantities. To accomplish this goal, the partners drew up a strategy that consisted of several ingredients, including conducting a major should-cost effort, streamlining government requirements, and developing a common cost and pricing methodology.

The goal of the should-cost effort was to identify the lowest executable, most probable cost. The should-cost review of the C-17 was considerably more complex and visible than most should-cost reviews: It was led by a three-star general, Retired Air Force Lt. Gen. Richard Scofield, then-Commander of Aeronautical Systems Center, and over 70 senior government personnel were dedicated to the six-month effort. And, unlike traditional should-cost reviews, this review was conducted jointly with the contractor and the government. "We decided we were going to do a joint should-cost [review] ... We set common goals and objectives of

how much money we had to get out of the airplane. By working together, we challenged everything, including how the government does business and how the contractor does business," noted Kluter.

The review ultimately determined a number of factors including the hours required to manufacture the C-17, the number of people required to build the aircraft, the cost of sub-contracted components, the potential application of commercial business practices, and the possibility of using nontraditional government business practices.

### PROCESS OWNERS MANUAL

As part of the agreement, DCMC worked with Boeing to write a *Process Owners Manual* describing a seven-step procedure and tools for improving processes. The two partners then identified critical processes and designated "process owners," who are Boeing personnel, and "process specialists," who are DCMC personnel. These professionals are empowered to manage processes and establish metrics to provide a balanced view of process health. Of course, the metrics results are shared with all team members throughout the C-17 program. And PRO-

CAS/PBM success on the C-17 is measurable. From 1994 to 1998, performance on key quality measures improved 50 percent, cycle time was reduced 80 percent, and efficiency increased 70 percent.

PROCAS proved to be such a success, in fact, that DCMC instituted it as the "way to do business" throughout the 13,000-member command.

### Joint Acquisition Strategies

From the outset, all of the C-17 team members agreed to one acquisition strategy goal: a long-term commitment to af-

This last part of the should-cost review, using nontraditional government practices, allowed the team to streamline government requirements. The team studied the essential performance requirements and determined the safeguards that were necessary; kept key practices, policies, and procedures; and developed lessons learned from past issues. When they were done, they found that some of the military specifications and standards were either unnecessary or required excessive detail, that many were open to conflicting interpretations by government and contractor personnel, and perhaps most damaging, the specifications oftentimes provided a shield for "business as usual."

### ADVANCED QUALITY SYSTEM

One of the military specifications the team deleted was Mil-Q-9858A (Quality System). This specification was deemed unnecessary because of the implementation of a Contractor Advanced Quality System (AQS), compatible with commercial quality systems, consisting of three elements: ANSI/ASQC 9001 quality program, an Interface Key Characteristics process, and a Closed-Loop Corrective Action System. To ensure AQS success, the C-17 team – Boeing, DCMC, and the SPO – established a detailed implementation plan. "The three of us agreed that we needed to get out of the old quality framework and implement a system based on ISO [International Standardization Organization]," said Mizer. "That was easy to do because we were well along with our process-based management. ISO is based on process management. Once we agreed to use ISO on our processes, we were well on our way to a relationship of trust."

### JOINT COST MODEL

The teamwork that helped establish ISO 9000 in the contractor's plants, also helped establish a new vehicle for estimating costs and establishing common prices: the Joint Cost Model (JCM). The C-17 JCM was created by a team of all parties inherent to the cost and pricing process: the contractor, DCMC, the SPO, the Defense Contract Audit Agency (DCAA), and suppliers. JCM moved the team from a serial process (that began

with the Request for Proposal; moved to Proposal, Fact-Finding, and Technical Evaluation; and ended with Negotiations) to a joint integrated process that allowed for concurrent work content, fact finding, and cost formulation.

The benefits of JCM include parametric estimating, continuous Forward Pricing Rate Agreements (FPRA), flexibility to change with circumstances, and the concurrence of all team members on the validity of the results. Use of the JCM resulted in a proposal that contained significant reductions (20 percent) from the should-cost baseline, the accomplishment of formal review and negotiations in just weeks (as opposed to months), and the negotiation of FPRAs in just a few days (down from months).

It's a system that worked well ... and continues to work well for all parties. "Since [implementing JCM], we have totally avoided anything resembling classical negotiations with months of fact-finding and so forth," said Harstad. "But it takes a level of trust. You have to have an open sharing of financial information, a joint understanding of where you're heading in the future, what kinds of actions you expect to implement, and what you believe the costs and benefits of those actions to be. Without the kind of trust and shared data that was made possible by our teamwork, I don't believe we could have built the Joint Cost Model."

### Changing Roles of Contractor and Government Personnel

One of the continuing benefits of the C-17 teaming arrangement was the move to a process-oriented environment through PROCAS and PBM. This cultural change had three distinct advantages for the C-17: improved customer satisfaction, reduced contractor cost, and reduced cost of government oversight. The C-17 SPO (the customer) no longer had to rely on inspectors for quality and process control (there were at one point 290 company inspectors and 41 DCMC inspectors on the program). With PROCAS, contractor performance improved,

defects were reduced by 76 percent, and mandatory inspections decreased (company inspectors reduced 50 percent; DCMC inspectors reduced 60 percent).

"At the time, it was an 'arm's length' relationship. The government wrote and then checked compliance with the contract," said Kluter. "We decided it was more important to work together toward a common goal and use the contract as a vehicle for reaching that goal ... The idea was to concentrate on those things that were really important."

Another change in the roles of C-17 team members involves the delegation of government source inspection (GSI), a time-intensive process usually delegated to DCMC. The requirement of GSI on contracts is an issue of intense interest in the Department today. In fact, DCMC is leading a team of Service and Agency experts exploring the GSI issue under Department of Defense (DoD) Management Reform Memorandum (MRM) No. 10, Redesigning DoD Source Acceptance Policies and Procedures.

The C-17 program is a leader in this reform, which has already proven successful. Prior to PROCAS, there were 1,257 components requiring GSI on the C-17. After the institution of the teaming agreement, component and vendor performance were tracked allowing for the removal of GSI at minimum performance levels. The result was a reduction of GSI on the C-17 by 61 percent.

### Teaming Means Success and Savings

*"This [winning the Baldrige Award] could never have been done without the help of the SPO and the DCMC ... Everybody considers it a win."*

–Randy Mizer

VP Boeing Airlift and Tanker Programs

The tremendous success of a once-troubled program is undeniable proof that teamwork can turn anything around. But perhaps most importantly, it's proof that when it comes to C-17 teamwork, *the real winners are the American taxpayers.*