

Overhaul Options for Piston Engines. See page 28

AVIATION MAINTENANCE

SEPTEMBER 2006

www.AviationMx.com

American **M&E** *People, Profits, and Pride*

TECHNOLOGY FOCUS:
Oil Analysis by Jet-Care

PRODUCT FOCUS:
*Clean & Green
Pratt & Whitney's Engine
Washing System*

SPECIAL REPORT:
Composite Tooling

Clark Gordon,
Account Manager
Commercial and Corporate
Sales, EMS Satcom and
Current PAMA Vice Chairman
See pg. 44



*"It is up to us to guide and
direct the future of the aviation
maintenance industry."*

AA.com

American M&E

Working Together Toward Profits

The best way to cut maintenance costs is to outsource, right? That's not the American way. The airline's Maintenance & Engineering wants as much maintenance in house as financially feasible, and that opinion comes from both management and labor.

Some financial advisers will suggest that to succeed in investing, simply conform to what the market wants. In other words, if most investors want to sell their stocks or bonds, buy them, and if a majority happens to be in a buying mood, then sell to them. Presumably you will be buying low and selling high.

American Airlines Maintenance & Engineering (M&E) appears to have adopted a variation of this paradoxical concept. The growing trend in air transport is to outsource as much aircraft maintenance as possible. The International Air Transport Association estimates that carriers outsource, on average, 40% or more

BY DAVID JENSEN, EDITOR-AT-LARGE

of their maintenance. That being the case, M&E's main facility in Tulsa, OK, has decided to increase its in-house maintenance, build capacity, and take in the repair and overhaul work other operators are so willing to outsource.

M&E management didn't make this bold decision alone, however. It was made jointly with Local 514 of the Transport Workers Union of America (TWU), which represents the bulk of the Tulsa facility's labor force. Indeed, virtually every decision made at M&E Tulsa, from maintenance processes to bidding on third-party contracts, stems

from agreement of management and labor. This policy, and the new corporate culture that accompanies it, emanates from a facility-wide policy called, plainly, "Working Together."

And there was further, outside influence in M&E's decision to expand its business and keep work (and workers) in house. The company received incentive from the City of Tulsa in the form of funding from a program to support local businesses called Vision 2025. Launched in September 2003, the program granted M&E \$22.3 million. "We're spending the money prudently, as if it were our own," says Carmine Romano, vice president of Tulsa-based maintenance. Funding has been invested mainly to improve work on the shop floor; remaining money will be used to buy IT systems, Romano adds. The Vision 2025 program ends in April 2007.

Tulsa's investment in M&E is understandable, given M&E's local employment of more than 7,000 people, some 5,500 of which are mechanics. "We pump \$2 billion a year into the Tulsa economy," says Steve Glime, M&E's product support manager-components and avionics maintenance. "We also spend \$72 million locally in supplies and materials."

A Goal Set

M&E's intent and its Working Together policy are fairly well known



The pulse line acts as the heartbeat of the Tulsa facility, reducing the number of mechanics needed for heavy C-checks.

Photos by Byron Tobby/American Graphics

in the air transport industry. What is less known is the company's progress in becoming a competitive, profitable maintenance, repair and overhaul (MRO) facility. Which is why **Aviation Maintenance** traveled to Tulsa on a hot August day to visit the world's largest airline maintenance center.

The company's ambitious goal was determined during a four-day offsite meeting of management and union personnel (150 in all) in March 2005. Though it was light-heartedly called a "pajama party," its importance couldn't be overstated; with



Winglets help lower fuel consumption and are installed at Tulsa.

American in serious financial difficulty since 9/11, the Tulsa facility's future was in doubt.

With the common goal of maintaining the facility's employment level, participants of the meeting set a "breakthrough goal" of achieving \$500 million by the end of 2006 through cost reduction and revenue enhancement. Specifically, the intent is to:

- Identify third-party work;
- Generate income using existing properties and personnel;
- Increase productivity through process improvement, such as lean manufacturing and Working Together;
- Material management, to reduce

inventory and, as often as possible, repair rather than replace;

- Identify and act upon alternative revenue opportunities, for example, by taking advantage of core competencies; and
- Maintain constant and open communications between management and labor.

Unlike other airline maintenance organizations that have chosen to emphasize areas of expertise, M&E plans to pursue all areas of maintenance—engines, airframe, landing gear, avionics, cabin work and components—and has established an aggressive program of finding "gaps and drivers" to improve its maintenance services and become "best in class."

"We benchmark ourselves against our competition," Glime explained. "We're looking at data to identify areas in which the competition does a job better and then drive to see how we can improve. We plan to close those gaps."

Will the Tulsa facility reach its \$500 million goal? "We're on track," said Romano, just four months from the deadline. "We'll make it," Dennis Burchette, president of Local 514, added confidently. "We may even exceed it." The facility

is at 80 percent capacity compared to 50 percent two years ago thanks to increased MRO work. The M&E customer list includes eight for airframe overhaul and five for engine overhaul.

"We had planned to make the facility a profit center by the end of 2006," says Romano. "We're a bit behind, mainly because we still need to get some [management software] systems up and running; it may be in early 2007." M&E has doubled the MRO revenue in 2006 over 2005 and plans to double it again in 2007.

The decision to make the Tulsa facility a profit center required significant cultural change. M&E management had to shed the traditional command-and-control structure,

American Airlines Maintenance & Engineering is bucking the outsourcing trend. It seeks to maintain employment, increase its third-party work and become a profit center. To do so it applies the following concepts:

- Management and labor working together,
- Repair over replacement,
- Continuous improvement of maintenance processes, and
- Emphasis on maintenance reliability and fast turnarounds.

which produced a less-than-cooperative atmosphere with the work force. "Trust was lost, and labor-management relations were at their lowest ebb in 2003, when we had layoffs," Romano said. M&E had eliminated more than 4,000 maintenance jobs since 2001. "Now American has honored its commitment to labor, and morale has improved," he added. Further boosting morale is Arpey's commitment to "make good on \$11 billion of pension obligations" and offer more job security company-wide.

Burchette explained the union's change in thinking thusly: "At one time we wanted all the work in-house, and we didn't care if it was profitable or not. Now we make a case to have the work in-house. In fact, we have an agreement that if we're not profitable [performing a maintenance service] within two years and we can't fix it so it will be, then we let the work go outside."

"We wanted Tulsa to be a profit center," Burchette added. "As our vision matures, it will spread to the other two centers. The union president was referring to M&E centers at Alliance airport in Fort Worth, TX, and Kansas City, MO, the latter attained when American acquired TWA in January 2001. They, too, have had offsite meetings and recently established goals: Kansas City, with about 900 employees (most in TWU Local 530), plans to achieve \$150 million by late 2007 from revenues and efficiency, and Alliance, with 2,000 employees (most in TWU Local 567), \$400 million by the end of 2008.

Another offsite meeting was planned for September to determine a company-wide course of action and determine how all facilities can become profit centers. Fundamental issues were to be on the table, for



A mechanic is shown in the U-shaped gantry area, a space designed for efficient engine overhauls.

example, the workload distribution among the facilities, which is now organized by product line (aircraft type). “We’ll see if that still makes sense,” says Romano.

Currently, Tulsa, with 23 bays, maintains American’s narrowbody fleet, comprising MD82/83s, B737-800s, B757s and Airbus 300-600s; Alliance, with six bays, performs the maintenance and heavy C-checks on the airline’s widebodies, B767s and B777s; and Kansas City, with 12 bays, carries out heavy maintenance on the B757 and B767. KC also is preparing to do cabin modification on the B767 beginning in September, installing lay-flat seats in the business class section. And it currently has two maintenance lines performing heavy maintenance on American Eagle’s Saab 340s in revenue service and lease-return checks on ones the airline is returning.

In total, M&E performs more than 150,000 maintenance checks—from A-checks in the field to heavy C-checks—each year, and plans to see that number grow, according to Sheryl St. George, M&E director of MRO support.

Two Concepts

Whatever M&E’s goals, they will be achieved by a company-wide dual policy of Working Together and Continuous Improvement (CI).

According to Romano, Gerard Arpey, American Airlines’ chairman and chief executive officer, “has a lot

of faith” in the Working Together program, which was launched in 2003, the same year he came on board. “The world’s largest airline cannot become more efficient without such collaboration,” Arpey was quoted in a *New York Times* article.

Though M&E personnel admit the policy’s implementation “is still in development,” its existence in the company was readily apparent during **Aviation Maintenance’s** visit. Both Romano and Burchette hosted a business lunch, and management and union personnel jointly provided a facility tour.

M&E Tulsa has established a hierarchy of management-labor teams from the floor level up to company management. The top tier, a Joint Leadership Team (JLT), comprises M&E executives and Local 514 board members. Meeting weekly, JLT sets priorities, highlights problems and looks for solutions. During our visit, the JLT’s primary agenda was a bid for an MRO contract. “We jointly will figure out how we would man and organize for the project in order to put in a bid,” said Romano. “After determining that we can do the job, we give all the information to the marketing department to make the bid.”

As often as possible, problem solving is accomplished closer to maintenance work. Area leadership teams (ALTs)—which oversee the work done on powerplants, auxiliary power units (APUs), landing gear, avionics and

other components—and the product leadership teams (PLTs), divided by aircraft type, will resolve department-wide issues and how an incoming job will be carried out. Below the ALTs and PLTs are the floor leadership teams (FLT), which address problems and issues down to a specific maintenance task. “If a team at one level can’t resolve an issue, it goes up to the next level,” Glime said.

The Continuous Improvement concept goes hand-in-glove with M&E’s team structure and the company’s goal to “fill gaps” to become best in class. The concept was started in the landing gear department and has spread throughout the Tulsa facility. M&E intends to have it applied to the non-maintenance operations, too, such as IT, building administration, and facilities maintenance. “Everyone works to avoid waste,” said Glime, suggesting CI’s number one goal. Indeed, the concept is being adopted throughout American to include flight operations as well as maintenance operations.

CI represents a separate department at M&E Tulsa; however, its 30 members, both management and union, are spread throughout the facility. Their main purpose is to identify and resolve workflow and inventory problems. “It used to be if we had obstacles in these areas, we’d just have to deal with it,” said Burchette. “Now we set a goal of resolving the issue within three days or less, or we come up with a time line for the solution.”

One significant CI solution was to kit parts and place them on wheeled racks. These carefully arranged, mobile kits have allowed the landing gear shop, for example, to cut its shop pool of parts by 40 percent, according to Keith Mulkey, mechanic-landing gear reclamation. “We got rid of parts we didn’t need and made a lot of parts ourselves.”

Each kitted part is easily identified on a chart attached to the wheeled rack. In the landing gear department, the chart shows a photo of a part along with the appropriate part number. In the seat repair department, each a sample of each part is attached to a board for easy identification.

The landing gear department, incidentally, has two complete landing gear ship sets for the B777, in anticipation of the aircraft's warranty expiration. It plans to begin work on the nose gear in October and the main gear by the end of 2006. The first B777 landing gear to enter overhaul is scheduled for February 2007. M&E plans a comparable service for B737-800 landing gear.

"Seven to eight years ago, the landing gear shop wasn't competitive," said Romano. Putting CI into effect, the shop is at capacity and bidding on



An Honorable Tradition

The personnel at American Airlines Maintenance & Engineering (M&E) contribute to the Tulsa community in many ways. "We sponsor baseball, football, hockey—all kinds of events for kids," said Kevin Crosser, executive board member with the Transport Workers Union of America. "We want to give back to the community for what it has done for us," he added, referring to the City of Tulsa's Vision 2025 program, which provided \$22.3 million to update M&E's operation and help assure maximum employment at the company.

M&E employees probably take most pride in their blood drive for the Red Cross. At 52 years, "it's the oldest blood drive in the country," Crosser said. "It's been estimated that we've saved more than 250,000 lives."

third-party work. It services, or plans to service, the landing gear for all of American's aircraft except the B757, and M&E is looking at bringing that in-house, as well.

Proof in the Pudding

Working Together, Continuous Improvement, Best in Class—they all sound like buzz words from a management-consulting firm. (And, in fact, Overland Resource Group, specializing in labor-management relations, was hired to help develop the Working Together program.) But do the concepts collectively bring results? A facility tour provided the answer.

Perhaps M&E'S most ambitious change in operation is the pulse line set up in early 2006 for heavy C-checks (M&E doesn't use the term

D-check) of the MD82/83, American's workhorse aircraft. It was a labor-management creation to improve turn time, said Romano. It also cut the cost of overhaul by at least 25 percent and aims to save more money through Continuous Improvement.

Instead of parking an aircraft in a bay and then assigning hundreds of workers to it, M&E has the aircraft move through three stations:

- In station one, some 140 mechanics inspect and tear down the aircraft, removing seats panels and overhead bins for back shop restoration. This process takes three days.
- The aircraft is then moved to one of two bays that serve as station two. There, with about 120 technicians, the heavy maintenance takes place and the aircraft cabin components are reinstalled.
- Finally, the aircraft is transported to station three, where 40 to 50 technicians test it.

M&E found MD82/83 overhaul needed only four bays instead of seven as before, and a heavy C-check could be completed in about 12 days instead of 19 to 23 days. Efficiency in MD82/83 maintenance is critical at M&E, as American operates the largest fleet of type, with 335 aircraft, or about 25 percent of the fleet worldwide. "We're experts on the MD82/83," says Romano.

In addition to saving space and time, the pulse line also reduced the number of mechanics needed for the heavy C-checks by about 300. They have been freed to take on other jobs, for example, heavy maintenance and modification of 29 Fokker F-100s, which American retired about two years ago and since sold to the Columbian operator, Synergy Aerospace. Signed in May 2005, the Synergy contract represents one of M&E'S largest; other contracts are with FedEx (structure repair), North American (gear change), Avitas Leasing Co. (B777 component overhaul) and Harmony (B757 engine repair), among others.

Art Anderson, one of the MD82/83 station managers, listed ways the pulse line delivers efficiency. "It stan-

dardized our work more; we make better use our resources and manpower; and we managed workflow 'down to a gnat's behind,'" he said.

Regarding workflow, Anderson explained, "We have three major skills: avionics, cabin and systems, including engines. There used to be times when one crew would really get ahead of another crew; it wasn't coordinated. Now we're working together."

Simple logistics improved efficiency on MD82/83 overhaul, as well. The distance mechanics have to walk to collect tools and parts was reduced from about 4,000 feet to 1,000.

The pulse line is subject to Continuous Improvement. The crew chiefs for MD82/83 overhaul meet regularly with members of a "bullpen," or team that monitors and analyzes tooling, parts availability and workflow. During AM's visit, the bullpen was working on a process to assure that stores received all rotatables after an overhaul is completed.

Other Innovations

M&E management and union members also designed a line for overhauling the CFM56-7B that powers B737-800s. The decision to bring CFM56-7B overhaul in house two years ago coincided with a plan to design a state-of-the-art overhaul process. Vision 2025 funding paid for the line's equipment and, through Continuous Improvement, the company was able to free up 24,000 square feet of space in the engine department to construct a U-shaped gantry. The engine is stripped down at one end of the gantry; then, instead of remaining stationary, it advances to be reassembled.

Tooling is placed handily on both sides of the assembly line. M&E applies "point of use tooling" to reduce needless walking for many of its repair and overhaul processes.

Initially, the overhaul process took approximately 65 days to complete. Currently, this has been trimmed to 60 days, and their target is 45 days. Glime says that at full capacity, the CFM56-7B shop "is capable of producing an engine every eight hours."

The Tulsa facility overhauls a total of about 200 engines yearly, including the General Electric CF6-80A and -80C and the Pratt&Whitney JT8D-217/219, as well as the CFM56-7B. M&E entered into a joint venture with Rolls-Royce to form TAESL (Texas Aero Engine Services Ltd.) in Alliance, TX. TAESL maintains the RB-211 engines powering the B757 and the Trent powerplants for the B777. Over a two-year span, American plans to retire the 19 Pratt & Whitney PW2037-powered B757s it inherited from TWA as "a means to increase profitability," because M&E doesn't have a maintenance program for that engine, according to Curtis Coble, product manager of the Kansas City facility shops.

American Eagle has approached the Tulsa facility to repair and overhaul the General Electric CF34 that powers its Bombardier CRJ 700s. The CF34 would fit on the CFM56-7B gantry. Glime estimates the up-front cost of tooling and test equipment for the CF34 would be "close to \$6 million"

and adds that the company probably will make a decision regarding the engine's in-house overhaul "within 30 to 60 days."

Overhaul instead of replacement is another policy that has brought work in house while helping to save money. For example, failed pumps in aircraft toilets were once replaced for \$3,000 but now are repaired for just \$50. M&E's avionics department, which works on electronic systems in all American aircraft, once sent EFIS (Electronic Flight Instrument System) displays to the OEM but now maintains them and, as a result, has saved \$1.2 million since January 2006. The department also is building two automatic test equipment (ATE) stands for electronic engine controls, one for tests at room temperature and the other, connected to a thermal chamber, for testing at a wide range of temperatures. The cost to purchase the two ATEs would have been about \$2 million; M&E's budget to build them is \$350,000.

The Tulsa facility also has found



Dennis Burchette and Carmine Romano (left to right).

ways to save time, as well as money. "Our machine shop makes the fuel tank plates that attach to the MD82/83 wings," says Mulkey. "Boeing couldn't make them fast enough, so we entered plate production, and we're saving money, too."

All of these cost savings add up and are credited to M&E's goal of achieving \$500 million and becoming

a profit center. Further savings are no doubt in the future, however, M&E officials are realistic about competing for MRO work based on price. "We don't try to compete with cheap labor. We can't," says Romano, referring to MROs in countries where workers receive less pay. "But what we can offer is better reliability in half the turnaround time."

Mod Work

M&E's three major facilities perform modification work, as well as overhaul and repair. Among the major projects at Tulsa are the installation of fire-retardant Mylar insulation in American MD82/83s, a response to the burning crash of Swissair 111 off Nova Scotia's coast in September 1998, and a cockpit upgrade that puts the Honeywell electronic flight instrument system (EFIS) in the MD82/83s.

As with repair and overhaul, the M&E management and labor have put their heads together and found ways cut modification costs—including through the company's manu-



American Airline Fleet

(September 2006)

Airbus A300-600	34
Boeing MD82/83	335
Boeing 737-800	77
Boeing 757	143
Boeing 767	74
Boeing 777	46
Total	709

facturing capabilities. For example, M&E is replacing the MD82/83s' composite tail sections from one that's cone shaped to one that is "pinched," or wedge shaped. American saves two ways: the new design offers 0.5% better fuel efficiency, and M&E can produce the new tail at a cost of \$40,000, as opposed to the OEM price of \$240,000. Two American MD82/83s have the new tail installed, and 13 others "are in production," says Glime.

Another in-house modification is winglet installation on American's B737s and B757s. The job has been completed on eight aircraft. American initially ordered 20 winglet sets, and upon determining that the new wing tips conserve up to 4% fuel burn, the airline decided to order enough kits

from Boeing to modify all aircraft in both fleets. (B757s fitted with the winglets burn about 300 fewer pounds of fuel per hour, allowing an average 200 nm greater range and increased lift by 14,000 pounds.) M&E officials believe they are one among only three MROs capable of installing the winglet modification.

M&E has a training department in Tulsa and offers on-line training, as well as classroom instruction. Employed to save time, the on-line training covers largely safety issues, such as chemical handling and fire prevention. Other instruction is provided as a result of moving personnel from one department to another. For training to repair a particular product, the company usually sends the designated crew chief to the original equipment manufacturer (OEM) training, and he or she, in turn, relays the instruction to his crewmembers. M&E requires no training for new hires because when new positions open up, it first seeks the employees it let go several years ago. **AM**