Space Systems Company–Michoud Operations

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Mission Success Bulletin

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on-line

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Discovery cleared to launch to space station

At STS-128's final Flight Readiness Review on August 18-19, NASA – satisfied that ET-132 was ready to fly – cleared *Discovery* and the tank for launch August 25.

"I can't say enough about the quality of the review," said **Bill Gerstenmaier**, NASA associate administrator for Space Operations. "We had lots of discussion about foam. We let everyone state their opinion. No one chose to appeal the decision. I think we are ready to go fly."

The decision came after several weeks of intense investigation following foam loss from ET-131's Intertank, -Y Bipod closeout, and a Liquid Oxygen (LO2) Tank Ice Frost Ramp when STS-127 launched July 15.

Sometime during ET-131's ascent – the time hasn't been conclusively determined – foam debris came off the LO2 Ice Frost Ramp in question (fourth up from the LO2/Intertank flange, see Page 2 photo) that was roughly twice the allowable size if it came off during the critical aerodynamic time early in flight.

Investigators performed a terahertz x-ray in the Vehicle Assembly Building on the same Ice Frost Ramp on ET-132 as the one that released foam from ET-131. The imaging found no voids on ET-132's Ice Frost Ramp with the potential to generate foam losses in excess of the risk assessment mass, and the tank subsequently rolled out to the pad.

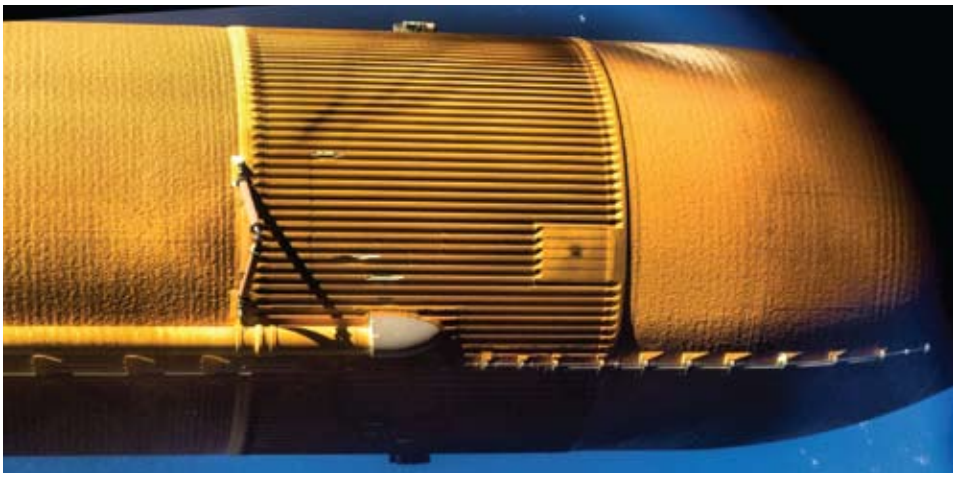
Then researchers started wondering about three other LO2 Ice Frost Ramps built the same way as the one that released foam on ET-131. "We did not collect NDE data before we left the VAB on those three because they had never shed, and we were not really aware of the risk at that point," **John Shannon**, NASA shuttle manager, explained. A debate ensued over whether *Discovery* should roll back to the VAB to perform the same Non-Destructive Evaluation on the other three Ice Frost Ramps on ET-132.

By this time, ET-133 had arrived at KSC. So NASA ran terahertz scans on several of ET-133's identical LO2 Ice Frost Ramps, and then sent the results to Michoud for analysis. "If we found a process problem on ET-133 or some other issue, we would end up rolling back and collecting more data to ensure we're in good shape,"

Continued on Page 2

Engineers Eugene Sweet and Dave Buras perform plug pulls on ET-132 before the tank rolled to the pad.

Cleared *Continued from Page 1*



This photo of ET-131 after ET separation shows the areas of foam release.

Shannon said. But the data came back within expectations.

The other area of concern related to Intertank acreage where more foam came off than in past missions. NASA and Lockheed Martin looked hard at the build process and concluded the most likely cause was an adhesion problem. So bond adhesion tests or plug pulls were performed both before ET-132 rolled to the pad (see Page 1 photos), and again after it reached the pad.

"We've done 170 plug pulls on the Intertank and have not found any adhesion problems at all," reported Shannon at an earlier news briefing. "But we're going to perform 18 more plug pulls on the sides of the Intertank – high up where it faces the Orbiter – in high-risk areas just in case contamination of the substrate prior to TPS application might have caused the foam debris."

Those tests too revealed no adhesion problems, and NASA subsequently declared *Discovery* and ET-132 ready to fly August 25.

"We'll continue to work with all members of the ET Project community, including a Lockheed Martin independent review team, to find the causes of foam liberation from ET-131 on July 15," said ET Program Manager **Mark Bryant**. "Even though we sustained foam loss from the Ice Frost Ramp, Intertank acreage, and also the –Y bipod, I want to say that overall the foam on the LOX and Liquid Hydrogen tanks performed well considering that the tank experienced six cryogenic loadings and subsequent pressure cycles. Right now, I'm ready to fly to show everyone what ET-132 can do." ■

Employees approach safety record

Michoud employees have worked 11 months – over 3.8 million hours – without a work-related injury that resulted in a day away from work. That puts Michoud on track to soon surpass four million hours.

The last time this happened was a time span from July 2003 to August 2004 when employees worked 13 months without a day away from work case.

The current 11-month stretch includes time worked at Michoud and its satellite operations at Kennedy Space Center and Marshall Space Flight Center.

"This is you, it's me, the folks in the office areas and those working on the factory floor," said Senior Safety Manager **Greg Lain**. "It's a true measure of our collective performance."

Space Systems Environmental, Safety & Health Director **Don Morrison** lauded Michoud workers for the achievement, saying every employee should be proud of this accomplishment, particularly considering current business conditions.

David Constable, the Enterprise Operations VP for Energy, Environmental, Safety & Health, added his congratulations, "A real tribute to the men and women working at Michoud – much to be proud about."

Michoud Operations has been tracking safety performance for nearly 30 years. The worst year on record, according to Lain, was 1984 when 20 percent of the work force was getting hurt. Today, Michoud is tracking around 4 percent injury cases among its workers.

Lain acknowledges even that number is too high. But Michoud's overall injury performance – the total number of employee injuries in a given month – is improving; not only the number of injuries, but also the severity of injuries that are occurring. "Everyone is doing their part to stay safe and to ensure the safety of their co-workers," he said.

For its class, Michoud Operations performs consistently better than the industry average. Within Space Systems Company, which has aggressive day-away target limits, Michoud currently performs better than its frequency and severity targets.

Safety and employee pride are the keys to Mission Success, and Lain sees this in employees as the final ET components move through the facility.

"It's an exciting and challenging time requiring everyone to remain focused on maintaining a safe workplace, elevating and maintaining awareness, and actively pursuing ways to prevent injuries and damage – so that we can successfully and safely fly out the External Tank." ■

ET-138 final crossbeam weld completed

Lockheed Martin has built the External Tank at Michoud Assembly Facility for over 35 years. In that time, welders here have fabricated 69 miles of welds on 138 External Tanks.

These tanks have met or exceeded all NASA requirements and sent humans to orbit for three decades. The winding down of the Space Shuttle program has and will continue to mark many historic events, not the least of which was the last weld on the final flight tank, ET-138.

Early on July 16, 2009, a warm and humid New Orleans morning, a small group of employees met at Column L-5 in Building 103 at 5 a.m. There was no crowd or fanfare, just a few dedicated workers preparing for one of the last procedures to be completed on the final ET.

Richard Oramous, a 32-year Lockheed Martin veteran, performed four manual welds to the ET crossbeam section to make a final bond linking the two halves. Within about 30 minutes the torch was extinguished and the two angled halves of the beam seemed to form a peak.

"Our welds have to be stronger than the sections we are welding," Oramous explained. "When the shuttle launches, this beam can straighten out because of the stress put on it."

Certified welders have years of experience and understand the extreme forces their welds will face going uphill. Accurate and strong, the welds that join the ET are backed up with the commitment and experience of the welders themselves.

The team that completed ET-138's crossbeam consisted of nine workers, but that number swells when one counts the support people involved. After leaving the welding area, the crossbeam moved to the paint shop, and eventually it will be joined to its ET in Final Assembly.

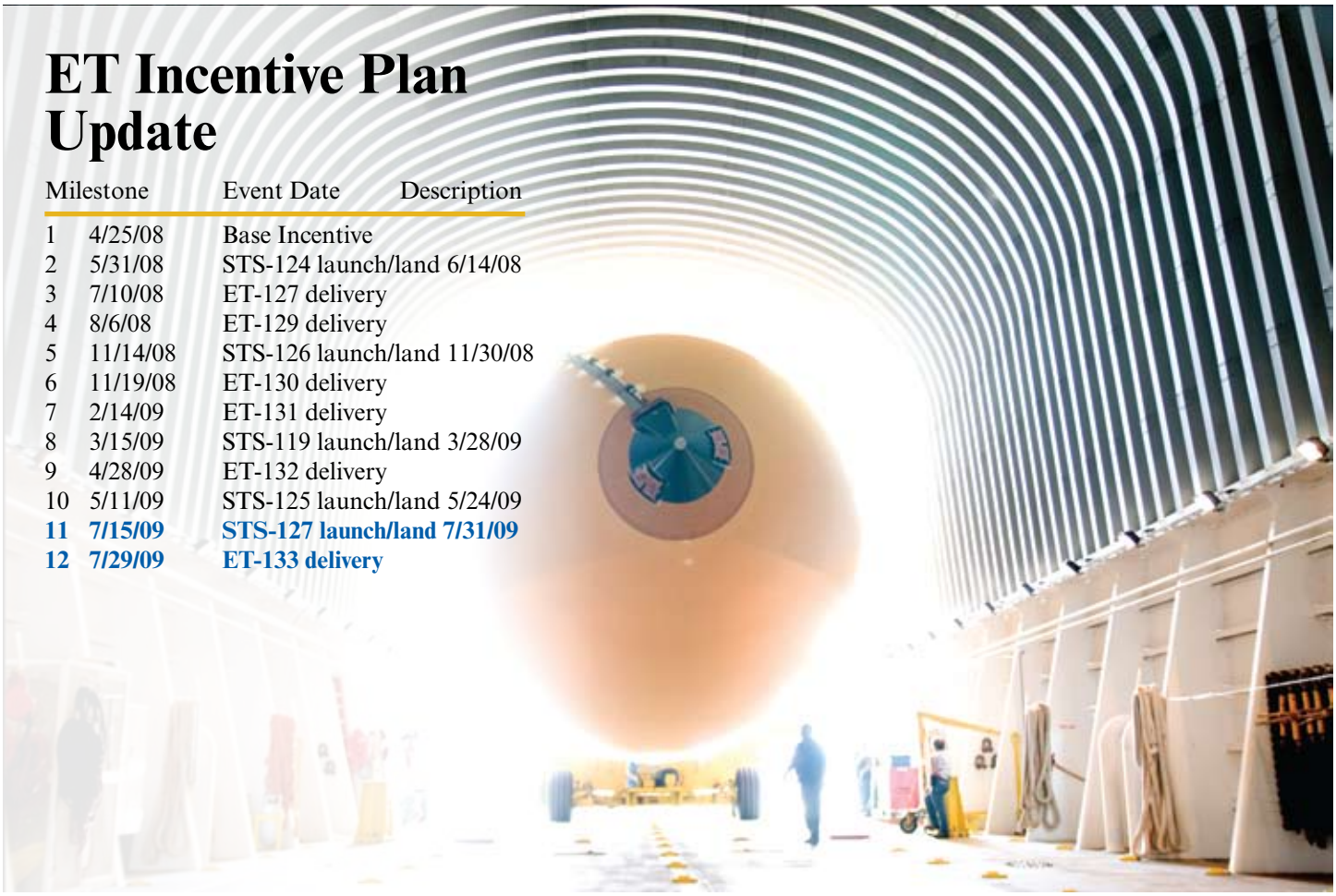
Richard Oramous welds the ET-138 aft crossbeam – the final piece of hardware for the final flight tank.

James Moffett, Weld Operations & Mechanical Assembly senior manager, acknowledged that the final weld on ET-138 may have been a bittersweet moment for many, but explained, "The workers went after ET-138 just like any other tank before it. We have delivered on our commitment to quality and schedule. This is a proud moment." ■

The ET-138 Crossbeam Final Weld team poses in front of the final aft crossbeam. First row from left: Clayton Newbill, Benny Caruso, Adrianna Mabry, Bill Schneider, Michele Worden, Frank Duncan, Gary Jackson and Cliff Mitchell. 2nd row: James Moffett, Guillermo Ladut, Debbie Benz, Troy Alexander and Rick Nelson. 3rd row: Gilbert Etienne, Roger Meunier, Richard Oramous, Joe Carbo, Al Olivier, Pat Connelly, Clovis Crocker, Dilip Dudgaonkar and Tim Flannery.

ET Incentive Plan Update

Milestone	Event Date	Description
1	4/25/08	Base Incentive
2	5/31/08	STS-124 launch/land 6/14/08
3	7/10/08	ET-127 delivery
4	8/6/08	ET-129 delivery
5	11/14/08	STS-126 launch/land 11/30/08
6	11/19/08	ET-130 delivery
7	2/14/09	ET-131 delivery
8	3/15/09	STS-119 launch/land 3/28/09
9	4/28/09	ET-132 delivery
10	5/11/09	STS-125 launch/land 5/24/09
11	**7/15/09**	**STS-127 launch/land 7/31/09**
12	**7/29/09**	**ET-133 delivery**



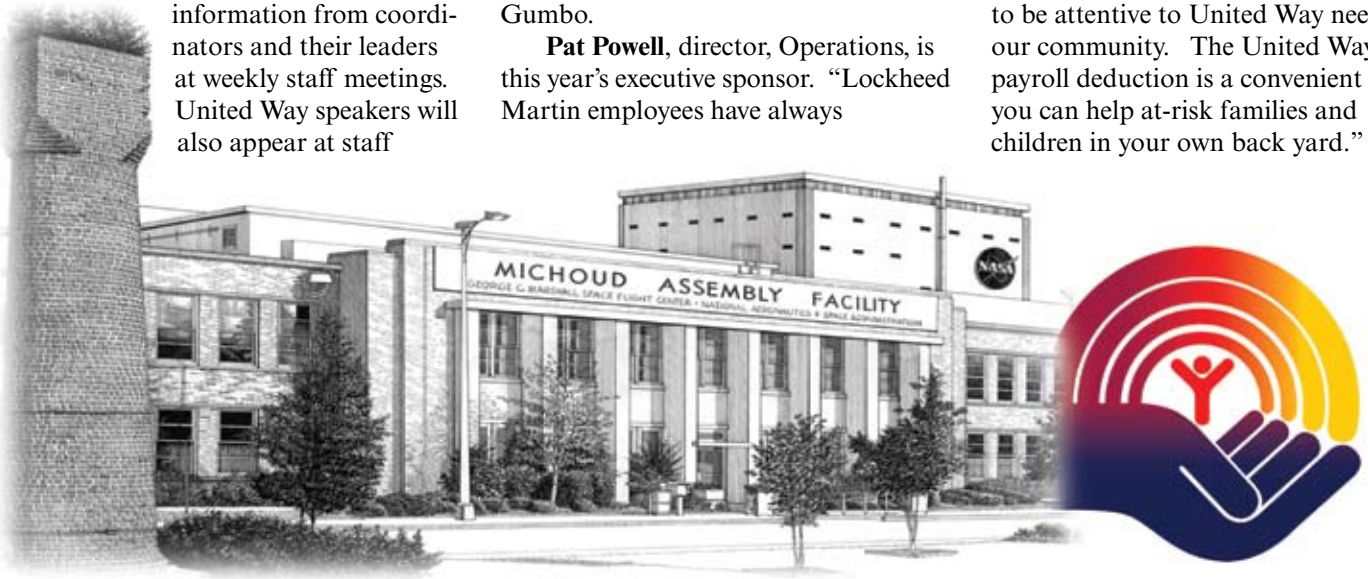
ET-133 rolled to the barge on July 29.

United Way campaign kicks off September 1

This year, Lockheed Martin's United Way drive runs from September 1-17 and will be more of a face-to-face campaign. Rather than a General Assembly kickoff, employees will receive much of the campaign information from coordinators and their leaders at weekly staff meetings. United Way speakers will also appear at staff meetings to explain the work that UW agencies perform.

Specifics about the campaign will be publicized through videos at staff meetings and on *Info SPACE*. Much of the information will also be available on Gumbo.

Pat Powell, director, Operations, is this year's executive sponsor. "Lockheed Martin employees have always supported United Way agencies. Many of us have been helped by the United Way since Katrina. Even though we are in a different situation now with the shuttle flying out next year, I encourage employees to continue to be attentive to United Way needs in our community. The United Way payroll deduction is a convenient way you can help at-risk families and children in your own back yard." ■



Town Hall for all LM employees

with Joanne Maguire, executive vice president, Space Systems Company

9 a.m. Thursday, August 27 in front of Final Assembly in factory

Cell L performed like a pro

In 1996, engineers and technicians processed the first of 42 Intertanks through Cell L. On July 29 the final Intertank passed through the cell for ET-138.

Lockheed Martin Tooling & Manufacturing engineers designed the Cell L system and put it into production as part of a plan to reduce the weight of the Super Lightweight Tank. **Jeff Best**, manufacturing engineer, says that was the sole purpose of the cell – to reduce the Thermal Protections Systems (TPS) weight on the Intertank.

The approximate TPS weight savings per ET equaled 465 lbs., accomplished by machining Intertank foam down to the required thickness. The total weight savings on 42 tanks accounted for approximately 19,530 lbs. or almost 10 tons of additional payload to orbit.

With the Intertank 22.5 feet long, the Computer Numerical Control system on Cell L executes about 120,000 commands per ET, and the vertical carriage travels up and down 6.3 miles per Intertank. Over 42 tanks, that's a total of 265 miles traveled while executing over five million commands.

"During development there was great concern over using a diamond cutter running at 18,000 rpm while cutting TPS as fast as 200 inches per minute," Best said. "As a result of those concerns, a very robust control system with state-of-the-art horsepower and load monitoring capabilities was installed."

In its ET lifetime, Cell L never experienced a component failure or malfunction that resulted in substrate damage during automated machining operations. "The entire Cell L team should be proud of their personal contributions to Mission Success," Best asserted. ■

Some of the key members of the Intertank Trim team through the years have included 1st row left to right: David Jenkins, Richard Walker and Byron Craddock. 2nd row: Christianna Kooney, Mark Javery, Jeff Best, Mark McCloskey, Brian Gorr and Dustin Duke. Not pictured: Hassan Boroujerdi, Wayne Dossett, James Dunn, Clyde Hutton and Mike Mathes.

Ares I-X rocket stands tall

For the first time in more than a quarter-century a new space vehicle stands ready in KSC's Vehicle Assembly Building. The *Ares I-X* rocket, its simulated crew module, and launch abort system are assembled for its 2½ minute flight test, targeted for October 31.

The final segments were stacked earlier this month, completing the 327-foot launch vehicle and providing the first look at the rocket's distinctive shape. The test is a critical step in continuing the design for the *Ares* vehicle and the first flight for the Constellation Program. NASA will also be able to gather data on how *Orion* will integrate with *Ares I* during ascent.

Mark your calendars

Lockheed Martin's
final Blood Drive of 2009

8 a.m. to 3 p.m.
Monday, September 14
Bldg 351 East Cafeteria

8 a.m. to 3 p.m.
Tuesday, September 15
Bldg 351 East Cafeteria

8 a.m. to 3 p.m.
Wednesday, September 16
Bldg 103, Special Events Room

8 a.m. to 5 p.m.
Thursday, September 17
Bldg 103, Special Events Room

Emergency Information

To find out work status during hurricane season at Michoud, go to www.mafstatus.com or call 257-1MAF or 1-800-611-3116, check ETV or listen to WWL-870 radio or visit wwl.com or watch WWL-TV, Channel 4 or go to wwltv.com

Baseball, hotdogs, apple pie and…records disposition?

Sporting their favorite Records Retention jerseys are 1st row from left: Melissa McIntyre, Amber Ellinwood, Hollie Randazzo, Michelle Currie and Belinda Chaplain. 2nd row: Steve Garner, Kevin Lowe, Glenn Schmitt, Theresa Dowdy, Kathy Hegeman, Lisa Blaum, Terry Marsh and Mark Arthur.

If you've observed some employees dressed in costume lately, don't worry, you're not seeing things. It's just the Contracts, Configuration and Data Management, and Estimating organizations tackling the arduous task of records disposition in a most creative way.

With the ET contract winding down, efforts have accelerated to identify and retain the critical records of the 30+ year program. "Determining which records need to be retained and which ones can be destroyed is a monumental task involving every department," points out **Amber Ellinwood**, records coordinator for Michoud.

"Energizing the team to commit to the effort seemed daunting until we decided to host 'themed' records disposition days," added **Theresa Dowdy**, department manager.

Now once a month the group selects a records-day theme that can be easily carried out with food, decorations and attire. July's theme, "Take Me Out to the Ballgame," gave employees the opportunity to don shirts and hats from their favorite baseball teams.

Lunch was a buffet of hotdogs, hamburgers, chicken wings, nachos, peanuts, cracker-jacks and more – everything you might enjoy at a ballgame. Someone even brought in an apple pie! During the meal a friendly baseball trivia competition ensued.

Afterward, the group worked together to identify sensitive, proprietary and historic departmental information and to properly disposition the records. Employees capped the day off with another ballpark favorite – snowballs!

"These successful events have boosted morale, fostered creativity, and in general brought positive energy and excitement to an otherwise tedious task," reflected Contracts Director **Brad Cartwright**. Next month's theme is anyone's guess but you can be sure that a mix of work and fun will again be achieved in the organization.

All departments are encouraged to work with their records coordinator to accomplish their retention and disposition goals in a timely manner. For more information on getting involved in the effort, contact Amber at 7-2300 or Theresa at 7-0438. Hotdogs are optional. ■

Space Shuttle Schedule

Mission	Launch Date	Tank	Tank Delivery Date
STS-128	August 25, 2009	ET-132	April 28, 2009
STS-129	November 12, 2009	ET-133	July 29, 2009
STS-130	February 4, 2010	ET-134	October 27, 2009
STS-131	March 18, 2010	ET-135	December 18, 2009
STS-132	May 14, 2010	ET-136	February 24, 2010
STS-133	July 29, 2010	ET-137	May 5, 2010
STS-134	September 16, 2010	ET-138	June 29, 2010

NASA hosts two-week LSU educational initiative

Again this summer as part of the NASA Education Fellows Program with LSU, Lockheed Martin subject matter experts explained the role of the External Tank to school teachers from St. Tammany and Iberville parishes. Pictured in the front row from left are Dr. Pam Blanchard, Dr. Paulette Perrin and Russell Trahan III. The back row included Dr. Mark Hazlett, Dr. Ian Binns, Donna Frank, Margaret Piazza – and Lockheed Martin's Joe Schuyler, Dave Carver and Ryan Cochran who showed the teachers around the Mission Support Room and discussed how to apply science and physics to the classroom.

Milestones

Employees celebrating anniversaries with Lockheed Martin in August and September 2009

35 Years
David Willick

30 Years
George Bruder
Joseph Garcia
Marty LeCour

25 Years
Gilbert Atilano
Sudhir Gopinath
Todd Jennings
Greg Lain
Kevin Lowe
Shan McEvoy
Tony Napolitano
Stephen Stefancik
Terri Stewart
Ted Veazey

20 Years
Mike Bankester
Herbert Bush
Sybil Jolly
Larry Jones
Terry Lee
Fred Ogden
Bonnie Roper

15 Years
Kirk Drumm
Connie Johnson
LaSonya Merrill

10 Years
Andrew Bullard
Mark Casemore
Rachel Encalarde
Agneiszka Kozlowska

5 Years
Don Brewster
Terry Cantrell
Christina Houghton
Jeremy Kelley
Terry Oldfather

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