



# The Dryden X-Press

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## Altus II begins developmental flights

■ Altus II looks at combining high altitude and endurance flight

By Alan Brown  
Aerospace Projects Writer

The ALTUS II aircraft, a remotely piloted science platform aircraft being developed at Dryden, has begun developmental flights aimed at reaching and sustaining altitudes above 60,000 feet for several hours.

ALTUS II serves as a perfor-

mance and propulsion testbed aircraft in NASA's Environmental Research Aircraft and Sensor Technology (ERAST) program. Dryden manages ERAST for NASA.

"The primary goal of the ALTUS II test flights is to get a piston-engine, turbocharged, propeller-driven airplane up to 60,000 feet and to sustain that for several hours," said Gary Cosentino, Dryden's ALTUS II project manager. "This type of performance will begin to satisfy the needs of the science commu-

nity and other users of this capability."

During the current flight series, the slender-winged craft is operated by a pilot in a ground control station at El Mirage, Calif., about 40 miles from Dryden. All flights are monitored by Dryden range safety personnel from one of Dryden's mission control rooms.

The rear-engine ALTUS II reached about 37,000 feet altitude during initial developmental flights at Dryden in 1996. See Altus, page 7



Photo Courtesy of General Atomics

Remotely piloted Altus II flies over Southern California.

### SETP Symposium has Dryden presence

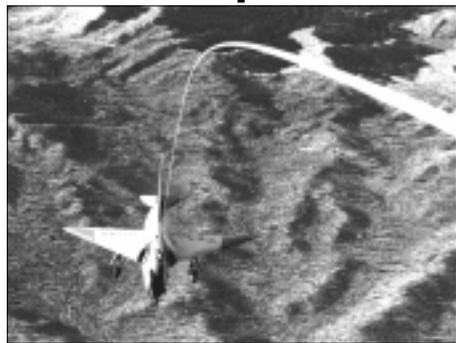
## Stucky details Eclipse tests

By Kirsten Williams  
Public Affairs Specialist

Dryden Research Pilot Mark Stucky and Air Force Test Pilot Stu Farmer captured the attention of flight test professionals Sept. 26, with their tale of a modified F-106, a C-141 and the 1,000-foot rope that joined the two aircraft.

The duo reported results of the Kelly Space and Technology/Air Force program, called Eclipse, and shared lessons learned in their presentation at the 42nd Annual Society of Experimental Test Pilots Symposium Sept. 23-26.

Kelly Space and Technology, Inc., San Bernardino, Calif., originated the idea for the Eclipse project. Their patented space launch concept involved towing a large winged reusable spacecraft called the Eclipse Astroliner to 40,000 feet. Upon reaching this altitude, the



NASA Photo by Tony Landis

An F-106 was towed by a C-141 during the Eclipse tests.



Mark Stucky



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## Two Dryden pilots named SETP fellows

By Kirsten Williams  
Public Affairs Specialist

Former Dryden Chief Engineer Bill Dana and Flight Operations Acting Director Rogers Smith joined a circle of aerospace legends Sept. 26, when they became fellows of the Society of Experimental Test Pilots.

Among its many goals, the Society aims to promote aviation safety, influence aeronautical progress, facilitate the exchange of information



Bill Dana



Rogers Smith

and ideas and stimulate children's interest in aviation careers.

Renowned fellows include Chuck Yeager, the first person to fly faster than the speed of sound; Scott Crossfield, the first person to fly twice the speed of sound; Pete Knight, former X-15

pilot and current California state senator; former

See Fellows, page 5

## Dryden's Iliff, Saltzman and Bohn-Meyer named aeronautic superstars

By Jay Levine  
X-Press Editor

Dryden has selected three people to appear on a NASA Headquarters produced poster called "Superstars of Modern Aeronautics." The poster is intended to influence students to excel in math and science and choose professions that utilize those skills.

NASA Headquarters will release the poster later this month, which also features three representatives from each of NASA's other aeronautical Centers. Drawings of Dryden's Marta Bohn-Meyer, Ken Iliff and Edwin Saltzman appear on the poster drawn by Alexander Bostic. The poster is the third in a series of posters entitled, "Your Attitude Determines Your Altitude."

The three people from each aeronautics Center were chosen by a selection committee at each location. The Office of Aeronautics and Space Transportation at NASA Headquarters supported the Center nominations.

"I am proud to see three of our best honored as 'Superstars of Modern Aeronautics.' Ed Saltzman, Ken Iliff and Marta Bohn-Meyer have all made long-standing contributions to flight research at Dryden and truly deserve this recognition. Their accomplishments and their careers will surely provide inspiration and role models for students of all backgrounds to consider careers in science and engineering," said Kevin Petersen, acting Center director.

Bohn-Meyer is deputy director of Dryden's Flight Operations Directorate. She also is one of two flight engineers qualified to fly the SR-71. She is the first woman crew member of either NASA or the Air Force - and the second woman - to fly one of the triple supersonic aircraft.

Prior to her current position, she managed the F-16XL laminar flow project that was designed to improve the understanding of air flow on aircraft flying at sustained supersonic speeds to help developers of future high-speed civil transports. A "glove" fitted over the



Marta Bohn-Meyer



Kenneth W. Iliff



Edwin J. Saltzman

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### Inside



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X-15 flight 199 was 30 years ago, please see page 3

Center employees select Dryden's very best

# Dryden Awards

The annual Dryden Awards recognized many of the Center's outstanding personnel Sept. 29. Here is a listing of those honorees.

**Milton O. Thompson Lifetime Achievement Award:** Bill Burcham, X.

**Minority Contractor of the Year: Analytical Services & Materials.**

**1998 Pride in NASA (PIN) Awards:** Don Black, X, Marta Bohn-Meyer, O, Larry Schilling, F, and Roger Whitney, FM.

## Dryden 1998 Honor Awards

**Administrative:** Valerie Zellmer, CF, for outstanding support and key contributions to the Integrated Financial Management Project (IFMP) for Dryden and NASA.

**Administrative Support/Secretarial:** Jill Helke, H, for outstanding support of aircraft consolidation and extra effort toward helping employees and their families through the relocation process.

**Best Paper for 1997:** Martin Brenner, RS, for his work, "Wavelet Analyses of F/A-18 Aeroelastic and Aerosevoelastic Flight Test Data."

**Best NASA Series Report for 1997:** Jerald Jenkins and V. Michael DeAngelis, R, for "A Summary of Numerous Strain-Gage Load Calibrations on Aircraft Wings and Tails in a Technological Format."

**Continual Improvement:** Steve Hodsdon, FD and Dan Crowley, FD, for dedication, integrity, and outgoing drive and energy to go beyond the call of duty to provide the Investment in Excellence course for Dryden employees.

**Technical Support:** Betty Love, T, for her enormous generosity, persistence, and creativity in preserving Dryden's history by volunteering her time in the Dryden History Office.

**Facilities Engineer:** Dan Crowley, FD, for the skilled planning, coordination, and implementation of center-wide facility upgrades and modifications. Using his problem solving skills, these projects were completed with minimal impact to Dryden's daily operations.

**Special Appreciation Award:** Bob Baron, P.

**Group: Eclipse Team** for remarkable teamwork in the face of critical deadlines and unique challenges.

**Henry Arnaiz Mentor Award:** Al Bowers, RA, in recognition of his gracious and enthusiastic mentoring of numerous students and engineers in the areas of aerodynamics and aviation history.

**Outreach/Opportunity Award:** Lisa Bjarke, RA, for dedication to her coworkers and long-time involvement in volunteerism and portraying the spirit of Dryden.

**Project Engineer:** Bill Lokos, RS, for extraordinary efforts as lead structures engineer for the F-106 Eclipse Project, associated with the review, re-analysis and redesign of key structural elements.

**Research Engineer/Scientist:** Tim Moes, RA, for outstanding leadership in the development, aerodynamic testing, simulation, hazard analysis, and successful flight en-



Don Black



Marta Bohn-Meyer



Roger Whitney



Larry Schilling



NASA Photo by Tom Tschida

Minority contractor of the year went to Analytical Services & Materials. Acting Center Director Kevin Petersen presented the honor to L.K., AS&M Site Manager, Debby Parham, project control assistant for AS&M and Larry Casady, technical group leader of AS&M.

velope expansion of the SR-71 LASRE configuration.

**James Ferguson Safety Award:** Gary Pacewitz, SF, is acclaimed as Dryden's explosive safety technical expert in support of Dryden's flight projects.

**Steven B. Davis Outstanding Co-op:** Jennifer Georgie, RC, for exceptional performance on the Adaptive Performance Optimization (APO) project and exemplary work specifying, implementing and performing preliminary checkout of the real-time APO algorithm.

**Supervisor/Manager:** Carol Reukauf, P, for her skill, leadership, and commitment to the Eclipse Program at a time when Dryden involvement was critical to the program's success.

**Technical Support:** Sue

Wheaton, FI, for her outstanding support of the ISO software documentation system.

**Technician:** Robert Garcia,

OM, for outstanding dedica-

tion, leadership, competence,

and ability in coordinating the

modification effort on the F-

16XL No.1 Digital Flight Con-

trol System upgrade.



NASA Photo by Tom Tschida

Bill Burcham receives the Milton O. Thompson Lifetime Achievement Awards from Acting Center Director Kevin Petersen.

## Contractor Employees

Several people received honors for providing outstanding support to Dryden.

**Administrative:** Sylvia Harrison, SCSC, for outstanding customer service and her positive, team-player attitude.

**Employee Services:** Lea Ames and Arlene Washington, American Express Travel, for unparalleled customer service and expertise with the automated travel reservation system. **Venus Long, AAFES**, also was named for dependable, friendly customer service at Dryden.

**Engineer:** Rick Lind, NRC, for prolific technical accomplishments in the areas of aeroelasticity, structural dynamics and robust stability prediction, which has achieved national and international recognition. Also named in this category is **Keith Krake, Sparta**, for the innovative design of the Apex instrumentation system allowing research measurements in the demanding high altitude environment. These developments expanded Dryden's instrumentation capability.

**Manager:** Mike Nesel, Sparta, for excellent management of the Dryden Information Services during a troublesome period.

**Technician:** Kathleen Howell, Woodside Summit Group, for outstanding efforts as teacher, worker, and coordinator of software and operations at the Western Aeronautical Test Range Operations Group.

## Contractor Special Awards

**Ameriko-Omserv:** Outstanding performance: **Mike Monahan**.

**Analytical Services & Materials:** Special Achievement Awards: **Dennis daCruz, Tony Frackowiak and Ed Teets**. Spotlight Awards: **Vic Bender, Bill Clark, Casey Donohue, Becky Flick, Ross Hathaway and Michael Moore**.

**Kalman & Company:** System Safety Award: **Fred Watts**. Technical Writing Award: **Florence Norman**.

**OAQ:** Outstanding performance awards: **Jimmy Neal and Kelley Clark**.

**SCSC:** Employee of the Year: October 1, 1997 to September 30, 1998: **Carol A. Orr**. **Sparta:** **Stephen Jensen, Phil Dolber and Dan Maikai** received outstanding achievement awards.

**Woodside Summit Group Technical Documentation Support Contract:** Outstanding achievement awards went to **Kelly Blankenship, Pat Hill, Vicki Moore, Tracey Navarrette, Debra Rice and Meryl Zimmerman**.

**Woodside Summit Group Research Facilities and Integrated Support Systems Contract:** Outstanding achievement awards went to **Richard Batchelor, Manuel Castro, Dawn Dugan, Lisa Gardner, Kathleen Howell, Hector Rodriguez and for Woodside Administrative Support, James Shields** received an honor.

## Eclipse Team:

Juan Aguilar (RA), Joe Akers (OA), Randy Albertson (GRD), Bill Albrecht (O), Mike Allen (RA), Robert Allen (Aerotherm), Don Antcil (KST), Robert Anderson (OM), Julie Baca (OA), Bob Baron (P), Rod Benitez (OA), Larry Biscayart (OS), Steve Blank (OM), Andy Blua (OM), Daniel Bohlinger (AFFTC), Don Borchers (FR), Al Bowers (RA), Tony Branco (RI), John Breiding (OM), Tech Sgt. Dana Brink (AFFTC), Fred Brown (T), Gerry Brown (HQ), Gene Bush (OM), Randy Button (OI), Dennis Calaba (SCSC), Alex Castelazo (FO), Bill Chambers (FE), Richard Chambers (WSG), Young Choi (OA), Wayne Clair (AFFTC), Bill Clark (AS&M), Roy Coe (SF), Greg Coggins (WSG), Dodi Cohen (FE), Mark Collard (OE), Richard Copeland (WSG), Jerry Cousins (OM), Gray Creech (T), Marty Curry (FI), Larry Dale (AFFTC), Lawrence Davis (Kalman), Mark Davis (RA), Dick Denman (OM), Brian Dirrim (Sparta), Casey Donohue (AS&M), Bill Drachslin (KST), M Sgt. Ken Drucker (AFFTC), Judy Duffield (O), Roy Dymott (Modulus), Karen Estes (OA), Greg Ernst (RA), Gregory Faith (Sparta), Capt. Stu Farmer (AFFTC), Joe Fowler (FO), Bill French (WSG), Bob Garcia (OM), Joe Gera (AS&M), Tony Ginn (OE), Tamara Goetze (AFFTC), Phil Gonia (OA), Bob Gonzales (OA), Jeff Freulich (Aerotherm), Sam Groce (OM), Al Guajardo (WSG), Ed Haering (RA), Ken Hampsten (AFRL), Don Hermann (OM), Paul Herrick (OM), Vicki Hinckley (WSG), Monte Hodges (OM), Henry Hoffman (AFFTC), Steve Hoffman (AS&M), Robert Honeyman (ARC), Bob Horne (AFFTC), Bud Howell (KST), Kathy Howell (WSG), Larry Hudson (RS), Dave Huffman (OAO), Michelle Hurd (FR), Russ James (FR), Lynette Jones (WSG), Robert Jones (Sparta), Tom Jones (RA), Art Jury (OA), Bob Keltner (KST), Ray Kinney (FL), Nick Kiriokos (FL), Bill Ko (RS), Lt. Jeff Kuhn (AFFTC), Tony Landis (OAO), Maj. Kelly Latimer

See Awards, page 7



NASA Photo

The X-15 is considered one of the most successful flight research programs in history. Although a 200th flight was planned, the 199th mission was the final chapter in the research flights of the rocket-powered aircraft.

## ■ Last X-15 flight was 30 years ago, Oct. 26 at Dryden

By Peter W. Merlin  
Dryden History Office

A silver NB-52A made a graceful turn in the skies above Edwards Creek Valley, Nev. on the morning of Oct. 24, 1968. Slung beneath its wing, a black, stiletto-shaped aircraft waited to be set free. As Lt. Col. Emil "Ted" Sturmthal and Squadron Leader John Miller (a British Royal Air Force exchange pilot) guided the modified Stratofortress south toward Smith Ranch, Nev., launch panel operator Jack Russell worked with intense concentration. Dryden pilot William H. "Bill" Dana, pressure-suited and strapped into the black X-15, completed his cockpit checklist.

It was business as usual, a "routine" flight, inasmuch as any X-15 mission was ever routine. The vehicle, "airplane" is scarcely an adequate word for it, was essentially a propellant tank with stubby wings and tail fins, engine and cockpit. A 1,000-gallon tank of liquid oxygen (LOX) was located directly behind the pilot. A 1,400-gallon tank of extremely volatile anhydrous ammonia sat directly behind the LOX tank. Hydrogen peroxide tanks supplied the reaction control system (RCS) rockets on the nose and wingtips. Tanks of helium gas pressurized the propellant systems which fed a 50,000-pound thrust rocket engine.

The pilot sat in the "front office," a cramped cockpit filled with a dizzying array of instruments and switches. He typically spent the first part of his pre-flight preparations donning his pressure suit. This ordeal was a team effort akin to a medieval knight putting on a suit of armor. In a sense, this is exactly what the pressure suit was: armor to protect the X-15 pilot from the hostile environment at the edge of space. First technicians attached a host of biomedical sensors to the pilot's body to measure vital signs. Next, the pilot squeezed himself into a rubbery, tight-fitting garment with numerous hoses, fittings and a metal neck ring. Having zipped the inner garment shut, tech-

# X-15

## Requiem for a heavyweight



NASA Photo

When Bill Dana suited up and flew mission 199, he didn't realize it would mark the end of one of the most successful research programs in history.

nicians assisted the pilot into a baggy, silver outer pressure suit, boots, gloves and finally a helmet. A lengthy check-out procedure verified that all suit components were functioning and that there were no leaks.

Bill Dana was familiar with the suit up procedure. He had made 15 previous flights in the X-15, attaining a maximum speed of Mach 5.53 and a maximum altitude of 306,900 feet. The latter had earned him his astronaut qualification and was the last X-15 flight to exceed 300,000 feet. His 16th flight (the 199th flight of the X-15 program) was to be his last and was scheduled as the second to last mission for the aircraft. The program managers wanted to end with

an even 200 flights.

Four minutes prior to launch, Lt. Col. Sturmthal leveled the wings of the NB-52A mothership at an altitude of about 45,000 feet. Artwork on the bomber's side identified the plane as "The High And Mighty One," with a painting of an eagle launching the X-15. Dryden pilot Gary Krier, flying chase 10,000 feet below, pushed the throttle of his F-104 forward and climbed to join the bomber.

At one minute prior to launch, the aircraft passed abeam of Edwards Creek Valley Dry Lake, with Smith's Ranch slightly ahead on the right. Dana completed his prelaunch checklist: Prime switch to PRIME. Igniter ready light ON. Precool switch to PRECOOL. Igniter idle

switch ON. "Looks good here, Pete." Maj. William J. "Pete" Knight responded from the control room: "Looks good here, Bill."

Launch switch to LAUNCH. The X-15 dropped away from the B-52, and Dana ignited the engine. The black dart quickly outdistanced the mothership and even Krier's supersonic fighter. Trailing a white plume, Dana was soon passing through 80,000 feet.

The engine's mighty thrust pushed Dana back in his seat. His workload increased as he struggled to maintain his desired heading and prepared to activate various experiments. Nearly 84 seconds after launch, the X-15 attained a maximum velocity of Mach 5.38 at 148,000 feet altitude and continued to climb after engine shutdown.

The X-15 launch had been coordinated to coincide with a missile launch from the Western Test Range (WTR) at Vandenberg Air Force Base on the California coast. At 235,000 feet, Dana extended the WTR Launch Monitor Experiment and called out, "It's up Pete, and I saw the missile." Less than three seconds later, the experiment package unexpectedly lost power and retracted.

As the X-15 reached 255,000 feet, it described a ballistic arc and began the downhill slide toward Edwards Air Force Base. Other onboard experiments did not require the pilot's attention. Valuable data were obtained from a Fluidic Probe Experiment and a Fixed-Sphere Direction Sensor on the nose. Unfortunately, a High-Altitude Sky Brightness experiment failed due to a blown fuse. The vehicle crossed over Death Valley and, as the pilot's workload decreased, Dana had time for a little sightseeing. Over the China Lake Naval Weapons Center, Calif., he began preparations for entering the traffic pattern at Edwards. Descending through 75,000 feet, the X-15 slowed to Mach 3.2 and Dana caught a glimpse of his landing site on Rogers Dry Lake.

The rocket plane made a steep approach as chase planes raced to join it for the landing sequence. As Dana entered the pattern, he had time to banter with Knight. "And we got you coming downwind. Looks real good, Bill," Knight commented. "Looks real good

See X-15, Page 7



NASA Photo by Tony Landis

# Airplanes, Airplanes, Airplanes

By Jay Levine  
X-Press Editor

More than 100,000 people came to Edwards Air Force Base Oct. 3 to see a mix of Dryden research aircraft, classic warbirds and the cutting-edge Air Force fighters including the F-22 – the advanced tactical fighter now being tested at the Air Force Flight Test Center.

Dryden's exhibit included a one-eighth scale model of the X-33. The X-33 is scheduled to launch from Edwards Air Force Base next year and validate technology for a future reusable launch vehicle.

Also on display were the M2-F1 lifting body, the ER-2 high-altitude research aircraft, the YO-3A observation aircraft, and many of the Center's F-18 aircraft used for chasing and gathering photos and videos of research flights.

Another aircraft on display was the soon-to-be Active Aerolastic Wing F-18. The former High Alpha Research Vehicle (HARV) will be modified to research wing twisting techniques for flight controls versus traditional ailerons and flaps. Researchers want to determine if the twisting motion can make future wings lighter and aircraft more fuel efficient.

On the tarmac, long lines of people waited to see the aircraft that is used to transport Space Shuttles. Those who entered NASA's

**See Airplanes, page 5**



NASA Photo by Jay Levine

At top, there were plenty of planes and people at the Edwards Air Force Base Air Show and Open House. Many Dryden aircraft were on display, such as the B-52, NASA 747 Shuttle Carrier Aircraft and ER-2 high-altitude research aircraft. Above, a B-25 awaits visitors.



NASA Photo by Tony Landis

DarkStar, Lockheed Martin's remotely piloted spy drone, was one of many attractions.



NASA Photo by Les Teal



NASA Photo by Les Teal

Above, people look at a X-38 prototype underwing of a B-52. The X-38 is testing a way for International Space Station astronauts to return home in an emergency. At left top, the F-22 makes its air show debut. At left bottom, people look at Dryden's M2-F1.



NASA Photo by Tony Landis



NASA Photo by Tony Landis

The NASA 747 Shuttle Carrier Aircraft attracted many who wanted to see the aircraft that transports the orbiters.

## Airplanes ... from page 4

747 Shuttle Carrier Aircraft discovered it is mostly hollow on the inside and missing the seats and equipment found on commercial airliners. The seats and unnecessary parts of the interior are removed to compensate for the weight of an orbiter, and of the areas where the Shuttle is fastened to the gigantic 747 that are strengthened for the piggybacked transport of an orbiter.

Space Shuttle Atlantis recently returned to Kennedy Space Center in Florida on the back of a NASA 747 following a 10-month modification and maintenance down period at the Boeing Reusable Space Systems Space Shuttle Modification and Maintenance Facility in Palmdale.

Another Dryden heavyweight was nearby – the workhorse B-52. Under the wing of the B-52 was an X-38 aerodynamic prototype called Vehicle 132. The B-52 is expected later this year to drop Vehicle 132, which arrived at Dryden in September, and the first aerodynamic X-38 prototype, called Vehicle 131, later this year.

The two X-38 prototypes are the precursor to Crew Return Vehicles envisioned as an emergency spacecraft, to rapidly get crew members from the soon-to-be-built International Space Station back to Earth. Vehicle 132 has more instrumentation and moveable flight control surfaces than Vehicle 131.

## Students see Dryden, Hispanic Heritages

By Jay Levine  
X-Press Editor

About 70 sixth-grade students from Ocatillo Elementary School in Palmdale visited Dryden Sept. 23, where they saw aircraft, Dryden projects and learned about Hispanic heritage through song and dance.

Ocatillo sixth grade teachers Shelly Vidal, Rick Myers and Jane Dodes said the Dryden visit will help them teach their students a number of lessons in math and science using some of the aeronautical information they absorbed during the tour of the Center. In addition, they will have points of reference for cultural lessons based on the activities Dryden Hispanic Heritage organizers planned for the sixth graders.

For example, Dodes said having students talk to research engineers showed why math and science lessons



NASA Photo By Les Teal

Ocatillo Elementary School sixth graders had a look at the aerospace heritage at Dryden and then were exposed to Hispanic song, dance and customs.

students are now learning can help them later as they enter more advanced classes and possibly professions such as engineers.

Students Rashelle Wright and Windy Heath said the 2,000 mph SR-71 Blackbird was their favorite part of the tour.

"It was also explained to us how planes work. I liked seeing the inside of the cockpits," Heath said.

Students also liked the F-16 cockpit tour and a chance to see the high altitude, remotely piloted Centurion.

Ocatillo students also said they were interested in the demonstration of how engine thrust is directed to help control the aircraft. It is controlled by a method called thrust vectoring and it is researched on the F-15 Advanced Control Technology for Integrated Vehicles (ACTIVE), Myers said.

See Heritage, page 7

## SETP ... from page 1

Astroliner would ignite its rocket engine, release the towline, accelerate and climb to space.

To prove the concept would work, the company, which did not have significant flight research experience, turned to the Air Force and Dryden, Farmer said.

"One of our biggest program challenges was to meld the resources and

schedules of the involved parties with their vastly different priorities and agendas," Farmer said.

The Air Force provided the C-141A aircraft for the project, its flight and engineering support and the flight crew, while Dryden served as the responsible test organization and had flight safety responsibility. Dryden

also supplied engineering, simulation, instrumentation, range support, research pilots and chase aircraft, as well maintenance and modification personnel.

The Eclipse team met the goals for the project, according to Stucky and Farmer.

"The Eclipse experimental demonstrator proved the aerotow concept was feasible," Stucky said. "We spent a total of

over five hours on tow. On our last flight we reached a maximum altitude of just under 25,000 feet, which was the physiological limit set for the unpressurized C-141 crew."

The movement of the rope and the wake turbulence from the C-141 affected the stability of the modified F-106 aircraft during towed flight, as predicted, Stucky said, but the stable tow area was larger than predicted. He said he could maintain control in the unstable area.

Stucky and Farmer also passed on several lessons learned from the project.

They encourage flight test teams to carefully record changes made to simulations. They also encouraged groups pursuing towing projects to make sure they have good aerodynamic modeling of the tow rope. In addition, the project showed the Global Positioning System continued to serve as a valuable tool for flight research and flight test. Also, use of the Eclipse simulator ensured that the crew was prepared in case any glitches occurred.

Finally, Farmer and Stucky encouraged flight test teams to review all of their sources of data from tests, including flight video and photos, which can pinpoint potential safety hazards.

## Fellows ... from page 1

Dryden Research Pilot Fitz Fulton; Tom McMurtry, Dryden associate director for operations; Gordon Fullerton, former NASA astronaut and Dryden research pilot; and Ed Schneider, acting chief of Dryden's Flight Crew Branch.

The Society, which has about 2,000 members, selects only six people each year from its group of associate fellows to become full-fledged fellows.

"New fellows are selected by their peers," said Society Executive Director Paula Smith. "The fellows select those who have done the most in the industry."

Bill Dana became a member of the Society in 1961 after working as a test pilot for one year.

Dana said becoming a fellow is both

an honor and a matter of practicality.

"It's comparable to why engineers join the American Institute of Aeronautics and Astronautics," Dana said, referring to a major aerospace professional society. "It broadens your knowledge. It allows you to network. Besides, it's a lot of fun."

Dana was a project pilot on the hypersonic X-15 research aircraft and flew the rocket-powered vehicle 16 times, reaching a top speed of 3,897 mph and a peak altitude of 310,000 feet (nearly 59 miles high). He also was a project pilot on the lifting body program, as well as the F-15 Highly Integrated Digital Electronic Control research program. He served as co-project pilot on the F-18 High Angle of Attack research program.

Smith is a former president and current

board member of the Society.

At Dryden, Smith has worked as co-project pilot for the SR-71 and F-15 Advanced Control Technology for Integrated Vehicles project. In addition, Smith has been a project pilot on the X-31 Enhanced Fighter Maneuverability Demonstrator project and the F-104 aeronautical research aircraft, as well as the X-29 Forward Swept Wing, the Advanced Fighter Technology Integration F-16 (AFTI F-16), and the AFTI F-111 Mission Adaptive Wing research programs.

Dana and Smith received their certificates of fellowship from Society President Addison Thompson Sept. 26, during the awards banquet that capped the 42nd Annual Society of Experimental Test Pilots Symposium.

## Research Roundup

# Ground breaks on X-33 tracking site

By Gray Creech

Aerospace Projects Writer

A ground breaking ceremony for part of the X-33 Advanced Technology Demonstrator flight test range was held Sept. 10 at the U.S. Army's Dugway Proving Grounds in Utah. The ceremony marked the beginning of construction for an important portion of the range for the initial X-33 flights, which will originate at Edwards Air Force Base and land at Dugway.

The construction site consists of the needed infrastructure, including a nine meter telemetry tracking antenna, to operate the X-33 range. Additional systems such as special test equipment and mobile tracking systems will be placed on the 350x85 square-foot pad to support the X-33 test flight operations.

"The development of the X-33 range site at Dugway is a major step to being ready to turn goals into reality for the X-33 flight test program," said Dale Mackall, Dryden's Extended Test Range Alliance team leader.

The overall X-33 range, which extends from Edwards to both Dugway and Malmstrom Air Force Base, Mont., consists of several tracking antennas and vehicle communications stations along the



Photo Courtesy of U.S. Army

Officials attended the ground breaking of the X-33 landing site at the U.S. Army's Dugway Proving Grounds in Utah. A Dryden Range Control Officer, Bill McMullen, fifth from left, attended.

vehicle's flight path, as well as the landing site tracking and support equipment at Dugway and Malmstrom.

Dryden is the X-33 program lead for X-33 range tracking and vehicle communications tasks. A flight test range alliance between the Air Force Flight Test Center and Dryden, called the Extended Test Range Alliance, is providing for the sharing of various NASA and Air Force range

equipment, such as radar sites and range communications centers.

This alliance is helping keep X-33 range operations costs down by the sharing of personnel and equipment. Range coverage extends from the launch site at Edwards up to Dugway Proving Grounds, Utah, for the first set of flights, with additional coverage up to Mountain Home Air Force Base, Idaho, for flights to

Malmstrom in Great Falls, Mont.

Dryden has nearly 20 primary tasks on the X-33 program. This list will continue to grow as more tasks are identified. Dryden's role encompasses providing ground support, engineering support in aerodynamics, structures, operations and flight controls, and range support.

Initial lower speed and altitude flights will take the X-33 to Dugway, with the higher speed and altitude flights landing at Malmstrom. A total of fifteen flights are scheduled for the X-33, beginning in July 1999.

The autonomous, suborbital X-33, capable of altitudes up to 50 miles and speeds of Mach 13, will integrate and demonstrate the technologies in a half-scale version that would be needed for industry to build a full-size reusable launch vehicle.

The X-33 is part of NASA's Reusable Launch Vehicle program to develop and demonstrate the kinds of technologies required by industry to build new launch systems that will provide truly affordable and reliable access to space. The X-33 program is being conducted under a cooperative agreement between NASA and Lockheed Martin.

### Goldstone



NASA Photo by Tom Tschida

Jerry McKee, Dryden Western Aeronautical Test Range manager, accepts a framed Goldstone Complex picture from Acting Goldstone Complex Manager William F. Schnittger. Goldstone, which is about 10 miles from Fort Irwin, Calif., recently turned over its on-orbit video and data tracking support of the Space Shuttles to Dryden. In fact, Dryden will for the first time on STS-95, which is set for later this month, provide telemetry tracking support to a satellite-sized spacecraft called Spartan. Spartan will be released from the Space Shuttle and maneuver on its own.

### Atlantis leaves



NASA Photo by Carla Thomas

Atlantis' 10-month stay at the Boeing Reusable Space Systems Space Shuttle Modification Facility ended Sept. 22. Following 443 structural inspections and 363 modifications, the orbiter was positioned on the NASA Shuttle Carrier Aircraft and transported back to Kennedy Space Center in Florida. The maintenance and modification program was the most extensive in Space Shuttle history.

## Discovery has full plate during STS-95



**Launch date:** Oct. 29.

**Crew:** Curtis L. Brown, commander; Steven W. Lindsey, pilot; Scott E. Parazynski, mission specialist; Stephen K. Robinson, mission specialist;

Pedro Duque, ESA mission specialist; Chiaki Mukai, NASDA payload specialist; and John H. Glenn, payload specialist.

### Shuttle Update

**Payload:** A variety of science experiments in the pressurized SpaceHab module are planned.

Also, Spartan 301 free flyer will be deployed and retrieved using the Space Shuttle's mechanical arm. Dryden will provide telemetry tracking support for the first time for Spartan, which is a satellite-sized space-

craft.

In addition, the Hubble Space Telescope Orbiting Systems Test (HOST) platform is carrying experiments to validate components planned for installation during the third Hubble Space Telescope servicing mission and to evaluate new technologies in an Earth orbiting environment.

There are four experiments on the Host platform.

Glenn also will participate in some aging experiments.

**Duration:** The mission is estimated to be eight days, 22 hours, and four minutes.

**Landing:** Nov. 7.



NASA Photo

**U.S. Senator John H. Glenn, D-Ohio, checks the communications inside his Shuttle launch and re-entry suit during a fit check at Johnson Space Center. Lockheed Martin's Carlous Gillis assists Glenn.**

## Awards ... from page 2

(AFFTC), Morgan LaVake (AFFTC), Art Lavoie (OA), Steve Lawler (OAO), Kevin Le (RS), Joe Leung (ARC), Lisa Logan (WSG), Bill Lokos (RS), Mark Lord (OE), Lori Losey (OAO), Terry Mahurin (L), Danny Maikai (Sparta), Dave Martin (OS), A1C Benedict McCracken (AFFTC), Bob McElwain (RF), William McGrovy III (OM), Paul McLard (AFFTC), Bill McMullen (FO), Tom McMullen (OM), Candi Meres (WSG), Katrina Miller (WSG), Tim B. Miller (Sparta), Tim D. Miller (OAO), Jim Murray (RA), Chris Nagy (RF), Tom Nault (Aerotherm), Keith Ness (OM), Dave Neufeld (FO), Joy Nordberg (OAO), Ken Norlin (FE), Todd Norville (AFFTC), Mark Nunnelee (FO), Dave Oates (OM), Ernie Ozuna (OAO), Allen Parker (RS), Steve Patterson (OA), James Pavlicek (Sparta), Joe Pengilly (OM), Sal Perea (A), Linda Peters (AS&M), Todd Peters (RS), John Phyl (Sparta), Denis Plasschaert (OAO), Bob Plested (AFFTC), Gregg Poteat

(OM), Ron Pound (Sparta), Dana Purifoy (OF), Debra Randall (FE), Larry Reardon (RS), Mike Relja (SF), Carol Reukauf (P), Dave Richwine (RA), Wes Robinson (KST), Hector Rodriguez (WSG), Jeanette Ross (AFFTC), Jim Ross (OAO), Richard Rowland (OA), William Sabo (OA), Barbara Salisbury (WSG), Elisio Sanchez (FO), Don Sheley (AFFTC), Trace Short (OAO), Karla Shy (FE), Josie Silva (WSG), Tammy Smeeks (Kalman), David Smith (WSG), Kelly Snapp (OF), Steve Spandorf (Sparta), Clint St. John (RA), SMSgt. John Stahl (AFFTC), Phil Starbuck (PSG), Caren Stencil (AFFTC), Al Stewart (RS), John Stipe (SF), Mark Stucky (OF), Monique Sullivan (A), Roy Surovec (AFFTC), Ed Swan (OM), Alan Sylvestre (AFFTC), Bill Tarvin (AFFTC), Sym Taylor (WSG), John Taylor (FR), Les Teal (FI), Lt. Art Tecson (AFFTC), Ed Teets (AS&M), Carla Thomas (OAO), Chris Torrence (FO), Daryl Townsend (OM), Howard Trent (OA), Casey Tull (OA), David Upton (WSG), Charles

Vatcher (AFFTC), Archie Vickers (KST), Aric Warner (OM), Dave Warner (AFFTC), Don Warren (OM), Mark Watson (AFFTC), Cathy Webb (WSG), Mike Webb (Sparta), Sue Wheaton (FI), Donna White (OAO), Donald Whitfield (OM), Lt. Col. Bill Williams (AFFTC), R. Joe Wilson (RC), Howard Winsett (OA), Pete Young (OAO), Jim Zeitz (SCSC).

### Honor Award Committee:

Chair: Yvonne Kellogg.  
 Members: Jo Ann Barnicki, Don Black, Kristie Carlson, Pat Harrington, Greg Poteat, Mark Stephenson and Anthony Thomas.  
 Employee Recognition Committee: Chair: Debbie Ackeret  
 Members: Art Cope, Bob Garcia, Christine Irizarry, Art Lavoie, Lori Losey, Joy Nordberg, Greg Poteat, Roberta Ross, and Annette Talpas.

## Altus ... from page 1

when its engine was equipped with a single-stage turbocharger. Later that year, it set an endurance record for remotely operated aircraft, flying for more than 26 hours during a science mission. A second ALTUS aircraft with an identical propulsion system built for the Naval Postgraduate School—the ALTUS I—reached 43,500 feet altitude during developmental flights at Dryden last summer.

Both ALTUS aircraft were designed, built and are operated by General Atomics Aeronautical Systems, Inc., of San Diego, Calif., a member of the NASA and industry ERAST Alliance.

General Atomics upgraded the NASA ALTUS over the past two years to incorporate a new two-stage turbocharger built by Thermo-Mechanical Systems, Canoga Park, Calif. The upgraded Altus has a larger propeller, additional intercooling capacity and a larger air scoop at the base of the vertical tail to provide increased airflow to the engine at high altitudes.

Cosentino cited performance analyses of the propulsion system in a test chamber that show the ALTUS may reach a top altitude of 65,000 feet with the improved powerplant.

Research data obtained from these flights will assist in the design and development of Alliance I, a follow-on remotely operated aircraft. The Alliance I also will be powered by a turbocharged, gasoline-fueled piston engine and be designed to carry science payloads to 85,000 feet altitude for up to four hours.

ALTUS—the name is Latin for “high”—is designed to carry up to 330 pounds of atmospheric sampling and other scientific instruments in its forward fuselage payload compartment.

The ERAST program is a multiyear effort to develop the aeronautical and sensor technologies for a new family of remotely piloted aircraft intended for upper atmosphere science missions. Designed to cruise at slow speeds for long durations at altitudes of 60,000 to 100,000 feet, such aircraft could be used to collect, identify and monitor environmental data to assess global climate change. They also could serve as airborne telecommunications platforms, performing functions similar to communications satellites at a fraction of the cost of lofting a satellite into space.

## Heritage ... from page 5

Trenton Evans said he knows he will need more math and science to pursue his dream of becoming a pilot. The sixth grader said he already is studying to pass flight ground school exams, and he is determined to continue learning the concepts he will need to become a pilot as soon as he is old enough to take the test.

After a tour of Dryden's aircraft and projects, the students were introduced to a variety of Hispanic Heritage events including a Latin jazz combo and singers and a raffle of two piñatas.

Cecilia Cordova, one of the Heritage Day organizers and Dryden Hispanic Advisory Group Chairperson, said a lot of Dryden employees came to help make the event successful.



Ocatillo Elementary School sixth graders from Palmdale had a look at Dryden projects and history and then learned about Hispanic song, dance and customs during Heritage Day.



Photos by Les Teal

## X-15 ... from page 3

to me,” Dana replied. “That’s the one I was worried about,” said Knight, wryly. “The downwind?” asked Dana. Knight shot back: “No. Looking good to you.”

The black plane, now just a stub-winged glider, touched down on the hard-packed clay surface of the lakebed, raising a plume of dust. Two silver F-104 chase planes followed it to the ground, then climbed away as the X-15 continued its long slide across the playa.

Bill Dana celebrated his final X-15 flight, but to the program engineers it was still business as usual. Data from flight 199 were collected and reduced. Plans were made for Flight 200, which was to be the final flight of the program. Knight was selected to fly the mission, which included a variety of experiments.

It was initially scheduled for Nov. 21, 1968, as a Smith Ranch launch. During engine runs a few days before launch, technicians discovered a few small discrepancies that resulted in a delay of about a week. The X-15 was mated to the second mothership, the NB-52B, on Nov. 25, but electrical problems and leaks in the liquid nitrogen and helium systems pushed the mission back a few more days.

Following pilot entry on Nov. 27, a hydrogen peroxide leak was discovered.

The leak apparently stopped, but the flight was canceled due to another mechanical malfunction. Since the NB-52B was scheduled for maintenance, the X-15 was demated. The NB-52A “The High And Mighty One” was unavailable because it was supporting the HL-10 lifting body program, so the X-15 flight slipped to Dec. 10.

On Dec. 9, the X-15 was mated to the wing of the NB-52A, but poor weather and an inertial guidance system malfunction resulted in cancellations over the next seven days. On Dec. 17, the weather was within limits, but the flight was canceled due to lack of a C-130 support aircraft from the Air Force. The following day, inclement weather again plagued the launch lake. Flight planners changed the mission profile to begin with a launch from Hidden Hills, west of Las Vegas, Nev. This meant flying a shorter distance and lower altitude, sacrificing some of the science.

On Dec. 20, poor weather closed in again. Flight planners discussed launching the X-15 over Rosamond. This short hop would preclude obtaining any scientific data. As a rare desert snowstorm moved in on Edwards, Bill Dana prepared to make a weather reconnaissance flight

in a Lockheed F-104. Rolling down the taxiway, Dana's aircraft vanished into a white wall of snow that obscured even the nearest hangars. Fellow Dryden pilot John Manke called him on the radio to advise him to return. There would be no 200th X-15 flight. Following this final attempt, the ground crew sadly de-mated the X-15 from the NB-52A, and prepared it for indefinite storage. And so, the program ended not with a bang, but with a whimper.

It did not, however, fade into obscurity. Perhaps the most successful research aircraft program in U.S. history, the X-15 left a legacy of scientific data and aeronautical firsts that remains unparalleled. Over a nearly 10-year period, 12 pilots flew three X-15 research vehicles 199 times. The program contributed to numerous advances in aerospace technology, including materials, hypersonic aerodynamics, astronomy and spaceflight. The X-15 even served as a testbed for insulating materials and celestial navigation equipment for the Apollo lunar exploration program and contributed to development of the Space Shuttle. The program generated more than 760 technical reports and earned numerous awards and honors for the X-15 team.

The original X-15 made both the first flight, on June 8, 1959, and the final flight. It now resides in the National Air & Space Museum in Washington D.C. The number two aircraft broke nearly in half on its third landing, was repaired, then badly damaged on its 31st landing. It was rebuilt as the X-15A-2 and, with Knight at the controls, set an unofficial world speed record of Mach 6.7 on Oct. 3, 1967. It is now on display at the U.S. Air Force Museum at Wright-Patterson Air Force Base, Ohio. Eight pilots earned their astronaut qualification in the third X-15. That aircraft was lost in the only fatal accident of the program, and Maj. Michael J. Adams received his astronaut wings posthumously.

As the years pass, the legacy of the X-15 continues to support hypersonic research and development. Lessons learned from the X-15 have helped engineers conceive and design the X-33 demonstrator (from which the VentureStar single-stage-to-orbit booster may be developed), the X-34 reusable launch vehicle (RLV) prototype and the hypersonic X-43 unpowered research vehicle. Doubtless, contributions of the X-15 team will continue to influence aerospace vehicle design for decades to come.

## People & Places

# Afterburner heading on new course

By Jay Levine  
X-Press Editor

Dryden's Fitness Center, the Afterburner, is taking on a fresh look in a new place with some new faces.

As some additional rooms are becoming available in the gym's location in building 4809 for some of the equipment, the fitness center is a bit less crowded. And new Fitness Coordinator Barbara Ann Allen and aerobics instructor Amy Brickley are looking to help Dryden employees meet their fitness goals.

Allen moved to the Antelope Valley from Idaho in 1985 and earned a kinesiology degree from California State University at San Bernardino. She also has experience as an athletic trainer, gymnastics instructor, aquatic instructor, certified arthritis instructor and lifeguard. Her other affiliations and skills include membership in American Alliance for Health, Physical Education, Recreation and Dance, emergency medical technician, Exercise for Life aerobics instructor certified and United States Water Fitness certified.

Amy Brickley, who has taught aerobics for eight years, is originally from Long Island, N.Y. She is Aerobics Fitness Association of America and Exercise for Life certified and a certified spinning instructor. Brickley won third place in the Miss Fit Contest

in 1994.

"Our goal at the center is to expand programs and increase enrollment with safety as our number one priority. Another goal is for everyone to obtain a Physical Fitness Assessment Test. This test could be completed every six months to measure improvements," Allen said.

Programs at the fitness center will include lunch speakers, stress-management through exercise and education and cover topics such as weight measurement.

Center hours are from 7:30 a.m. to 4 p.m. Monday, Tuesday and Thursday. Wednesday's hours are from 10:30 a.m. to 1 p.m. and Friday's hours are from 7:30 a.m. to 3 p.m. Changes to these hours are posted on e-mail messages.

Those who want hours either before or after work are asked to sign a survey located at the front of the gym, e-mail the request, or call the fitness center. People with questions regarding the equipment or classes are asked to call Allen at extension 2661.

Men over 35 years old, or women over age 40 are asked to get a physical from the Health Unit (extension 3570), before participating in fitness activities. A physical from a private medical doctor also is acceptable. People under those age categories can sign a health waiver.

## Superstars ... from page 1

aircraft wing – with numerous holes and a suction device to draw air off the wing – looked at limiting the turbulent air on the trailing edge. Turbulent air causes aerodynamic drag and increased fuel use.

Bohn-Meyer advises students to, "spend some of your time and energy preparing yourself to be the one with the 'right' qualifications and enthusiasm for your chosen career. Then take advantage of being in the right place at the right time."

Bohn-Meyer earned the NASA Exceptional Service Medal in 1996 for her work in flight operations and project management in support of several national flight research programs.

Iliff, another of Dryden's representatives on the poster, is the world's leading expert in aircraft parameter identification, which is one of the most significant analytical advances in flight research and flight testing. He continues to be the pioneering influence in advancing the science and technology of this field.

Iliff explains parameter identification as, "Given the answer, what is the ques-

tion? Given what we know about what an aircraft has done (its flight data), what made it perform that way?" Iliff helped develop differential equations that extract otherwise unobtainable aerodynamic values from aircraft responses in flight.

His advice to students is: "Learn all you can in math and science, starting at an early age. Besides courses, there are many sources to take advantage of, such as libraries, the Internet, books and compact disks."

The 36-year NASA veteran and Dryden chief scientist was awarded the NASA Exceptional Scientific Achievement Medal in 1976. His work is the basis for aircraft parameter identification computer codes used by flight test organizations worldwide.

The third Dryden representative is Saltzman. He devised and demonstrated how to measure boundary-layer and skin friction in flight to Mach 5. He also pioneered the concept of evaluating aircraft performance component by component. His method was used to evaluate such aircraft as the X-1, X-15, X-29 and the lifting bodies.

His research influenced basic design of transonic, supersonic and hypersonic aircraft. During the energy crisis of the 1970s, Saltzman applied his aeronautics experience to box-shaped vehicles, such as semi trailer vans. His research demonstrated the potential to save 26 million barrels of fuel each year in the United States. In 1980, he received the President's Council Award for Energy Efficiency.

His contributions to the field of lift over drag research has resulted in more efficient airliners and supersonic aircraft. On the ground, his work helped motorists save fuel and cut the costs of



Flight research photos and video at Dryden are the focus of the latest NASA Nights in Apple Valley. Lori Losey and Jim Ross will show how their images are used to support research projects and what is happening during an experiment as it is unfolding, or in "real time."

The lecture is set for Wednesday, Oct. 21 at the Lewis Center for Educational Research, which is located



Lori Losey and Jim Ross

at 20702 Thunderbird Road in Apple Valley. The lecture starts at 6:30 p.m.

transporting consumer goods. Although he is retired from the civil service, he continues to work at Dryden as an engineer.

His advice to students is: "Accumulate the technical tools that will ensure your usefulness in aeronautics ... Once you are employed in aeronautics, be very determined that you will not be easily fooled. By this I mean, employ healthy skepticism, asking the decisive question that will reveal the truth."

Also represented on the poster is Dryden's F-18 High-Alpha Research Vehicle (HARV). Alpha, or angle of attack, is an aeronautical term to describe the angle of an aircraft's body and wings relative to its actual flight path.

In high-performance aircraft, pilots often perform maneuvers at extreme (high) angles of attack, with the nose pitched up while the aircraft continues in its original direction. The lift provided by the wings is reduced and often insufficient to maintain altitude or control of the aircraft. Information from this research gives engineers and aircraft designers a better understanding of aerodynamics, effectiveness of flight controls and air flow phenomena at high angles of attack, enabling them to design better and safer high-performance aircraft.

Information on the back of the poster

explains: "NASA's role in aeronautics is to pursue the development of long-term, high-risk, high-payoff technologies and to achieve advances in aircraft safety, efficiency, affordability and environmental compatibility – key requirements for the 21st Century."

"Aviation plays a significant role in the economic and national security of the United States. The aeronautics industry generates almost \$100 billion in annual revenues, accounts for 10 percent of U.S. manufactured exports, and creates hundreds of thousands of jobs for skilled professionals and trade people. Air travel has become an enormous and critical element of our national economy, providing the backbone for long-distance and global transportation. The aeronautics industry also is key to our national defense, the most sophisticated in the world."

### In Memory

#### James H. Palmer

NASA retiree James H. Palmer died Sept. 16, 1998. He was 77.

Mr. Palmer had a 15-year career with NASA starting in 1958 as a purchasing officer at Dryden.

He retired from Dryden in January 1974 as director of procurement.

Mr. Palmer is survived by his son, George Palmer of Long Beach, Calif., and two grandchildren.

A memorial service was Sept. 24, 1998 in Eastsound, Wash.

### Exchange events

■ **Laughlin, Nev. Trip, Dec. 4-6:** The details of the annual trek to the eastern desert are in the works, but those who have an interest in going to Laughlin can mark their calendars.

## The Dryden X-Press

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