National Aeronautics and Space Administration

The X-PRESS

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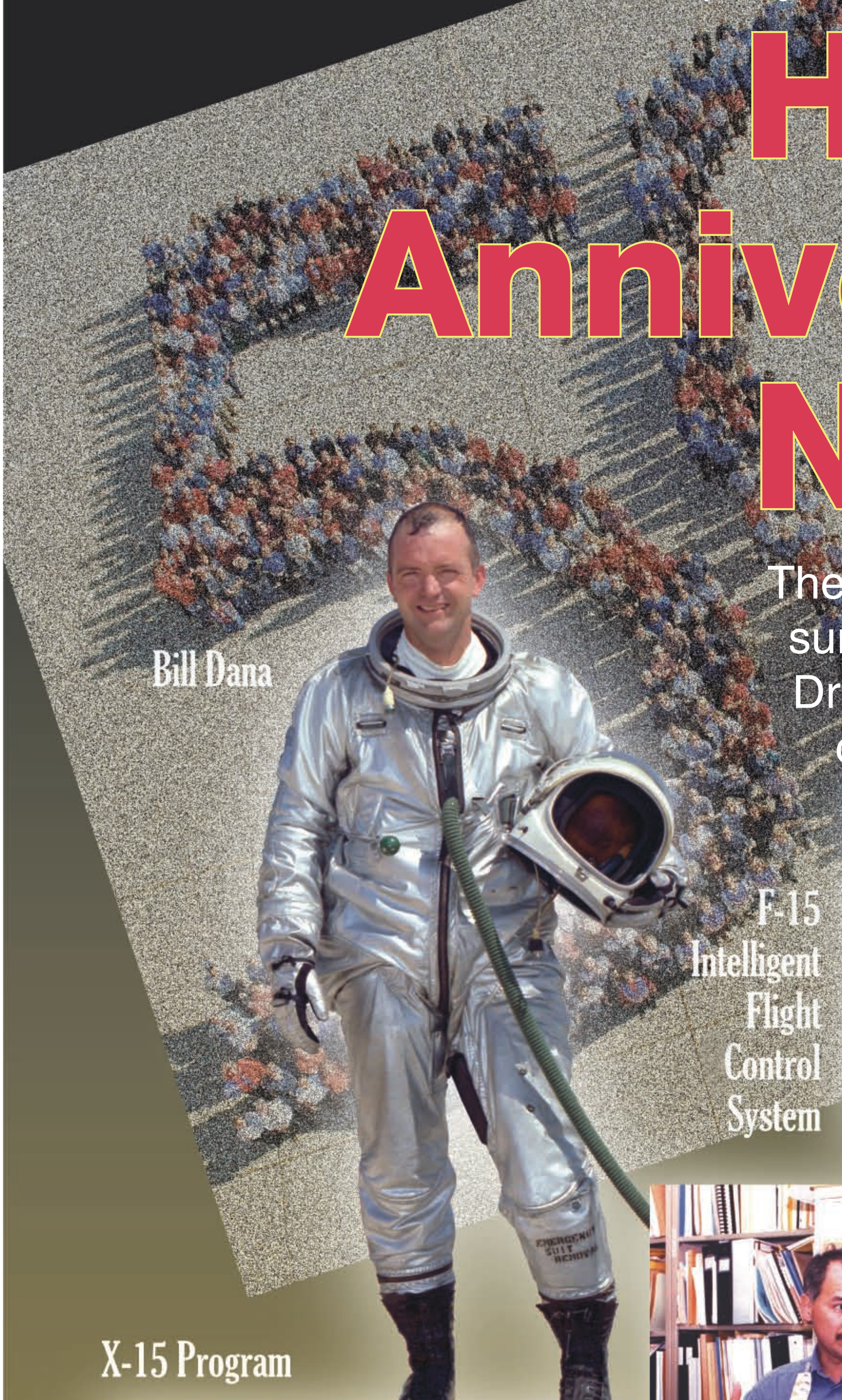
Happy Anniversary, NASA

The results of a center-wide survey on five decades of Dryden contributions and contributors to NASA



Bill Dana

F-15 Intelligent Flight Control System

Al Bowers

X-15 Program

The Results

Dryden employees and retirees returned surveys to identify Dryden's legacy in NASA since 1958

By Jay Levine
X-Press Editor

The X-Press borrowed from popular culture to do something that the publications staff has not previously attempted: conduct a survey to identify some of the significant projects and personalities at Dryden that have made lasting impacts on NASA's mission, or that have the potential to do so in the future.

The idea of a survey and the ensuing project on which it was based is to generate conversation, while bringing attention to Dryden's contributions to NASA's mission as part of the agency's 50th anniversary. The 270 surveys returned, an excellent return rate, illustrate that the goal was achieved. People talked about Dryden.

ED96 43403-4 NASA Photo

The National Advisory Committee for Aeronautics became the National Aeronautics and Space Administration on Oct. 1, 1958.

The survey provided an opportunity for established Dryden employees and retirees to reflect on careers and projects full of the innovation, enthusiasm and excitement connected with a successful flight, simulation or engineering marvel. It also meant the chance to highlight some new faces that will carry on Dryden's rich heritage through breakthroughs and milestones.

Dryden, however, is more than the sum of its projects. In a sense it's a home, where a family works together to achieve great things. An example of this is how people at Dryden work tirelessly on complex challenges beyond the commitment of a traditional job. Many of them do so in an attempt to achieve something greater than themselves and without the promise of reward. For that reason it can be hard to identify some of the great talents. Those individuals – unsung heroes that make it possible for the center to achieve its accomplishments – often are humble about highly significant contributions.

Former Center Director Ken Szalai said it best in his responses on the survey. "I always believed that every single person who came through the gate was essential for Dryden's success," he wrote. "Every single one."

In formulating the survey, solicitations were sought from Dryden employees and retirees months before the first survey was developed, to identify key individuals and projects in an attempt to avoid inadvertently leaving someone out. Due to space limitations, we have focused on the 25 people most mentioned in the surveys and those who tied with them for a total of 61 profiles. Everyone who was nominated and not included elsewhere in this publication is listed on the back page.

An infusion of new employees during the past five years impacted the make-up of survey results of people and projects that have been part of the center's work since 1958, when Dryden began NASA's work. To balance the influence of more recent arrivals, a special mailing was sent weeks ahead of the voting process to the approximately 200 retirees who read the Special Delivery employee newsletter and other of the X-Press publications.

Several respondents noted that too few people are being recognized in the overall effort and that the vast majority of Dryden's family deserved recognition.

That's true. For that reason, an eight-page photo supplement accompanies this edition to illustrate some projects in greater depth and showcase current and former employees that may or may not be recognized on these pages.

Profiles of work with the early X-series of aircraft were not included because that part of Dryden's history took place under the banner of the National Advisory Committee for Aeronautics, prior to NASA's inception. However, survey respondents consistently advocated for the inclusion of pilot A. Scott Crossfield in the results. Crossfield retired from the NACA in 1955 – three years before NASA was established. The reasoning was that although he retired from NACA, Crossfield's work in guiding the X-15 and making the first flights in 1959 qualified him.

The X-15 became one of the most successful flight research programs in history in no small part because of Crossfield's efforts to ensure that later pilots had a viable aircraft on which to complete vital research. Ironically, it was Bill Dana, the favorite of respondents and the number one choice in the Driving Forces category, who made the final X-15 flight.

Al Bowers was selected by survey respondents as the person with the most mentions in the Up-and-Coming category. This category also includes people who have been at the center for decades.

The following pages provide an at-a-glance guide for newcomers and capture precious memories for center employees who lived through the many projects and worked with those who made them possible.

Participants weren't shy about offering opinions about the roster of nominees. Many nominators looked to pilots for their selections in the Driving Forces section and survey respondents mentioned pilots on their surveys. One respondent, himself a nominee for his engineering accomplishments, offered an explanation as to why so many pilots were mentioned.

"I think pilots should have a primary and separate category purely on a risk basis," said Hubert "Jake" Drake.

Others commented that mechanics and technicians were not well represented. Anonymous respondents submitted these:

"Dryden's success depended and depends on the entire team. What is forgotten and ignored is the thousands of dedicated and committed ground crew, contractors, safety, human resource, payroll, finance, security and a number of other [staffing areas] without whose dedication and commitment, none of these people would have done anything!"

"They all deserve recognition, but as usual only managers, engineers and pilots get the rewards. Where are the grunts? The ones who got their hands dirty, had the planes ready to support the mission, like Ray White, Lunar Landing Research Vehicle crew chief; Jay King, support aircraft crew chief; Glenn Angle, inspector/quality insurance; Obie O'Brien, avionics; and so many others who gave 20 to 30 years or more to NASA and the government."

"We need to recognize the people who make the projects work. The crews on the vehicle were those who made the schedules work and the vehicles fly. These people put in long hours of overtime and had the vehicle operational on schedule. There were no people listed who made the vehicles work. The crew chiefs and ground crews worked long hours, through lunches, etc., to make the schedules. Such people were Larry Barnet, Bill Lapage, Gene Blizzard, Ray White, Charlie Baker, George Nichols, Mike Bondy and many other great maintenance personnel."

Others wrote to reaffirm why some selections were vital.

"[Paul] Bikle was the idea manager for a flight test organization. In the mid 1980s Bikle told me Fitz [Fulton] was the best test pilot he knew. [Ken] Illiff's work on parameter identification was [invaluable], while [Betty] Love was instrumental in preserving Dryden history and helping others to do so. [Dale] Reed was an innovative engineer who 'thought outside the box.' [Milt] Thompson was especially adaptable to new types of aircraft and [John] McTigue was a great manager who got things done due to his management style," retiree Bertha Ryan wrote on her survey.

Concerning the Top Contributions category at the heart of the survey, the top choices were the X-15, the lifting body aircraft and F-8 Digital Fly-By-Wire. Thrust vectoring\high-alpha

See Results, page 20

Dryden's colorful history

Dryden has made many significant contributions to NASA's mission since the agency's inception five decades ago. Many of those contributions and contributors are identified in two Special Edition X-Press issues.

This 20-page X-Press is entitled "Happy Anniversary, NASA" and reflects the results of a center-wide survey seeking input on what employees and retirees see as the best and brightest among five decades of Dryden contributions and contributors.

The issue contains 61 profiles of employees viewed by survey respondents as either driving forces or up-and-coming individuals in the work of the center. In addition, 28 current and past projects are profiled. The survey was conducted during March and April of 2008.

The companion supplement to this X-Press is entitled "NASA's 50th Anniversary: Five decades of Dryden Contributions and Contributors." That eight-page edition contains memorable photos and classic images including some projects and people not contained in the main edition as well as photos from the private collections of Dryden employees.

A fifty-year milestone is a time to reflect on the ways in which each and every employee contributes every day to a legacy forged by hard work and dedication. As we celebrate our past achievements – and they are many – we also continue on a course of adding to that list in the present, while planning to help NASA attain even greater achievements in the future. Dryden's accomplishments will live on eternally in America's aerospace lore.

Kevin L. Petersen,
Dryden Center Director

Cover story

Dryden graphic artist David Faust's vivid cover incorporates the center's 50th anniversary staff photo by Tom Tschida, a NASA photo cutout of Bill Dana by graphic artist Dennis Calaba, an F-15 Intelligent Flight Control System photo by Carla Thomas, a NASA photo of Al Bowers and a classic NASA image of the X-15 in flight.

Index

Dryden's Legacy

These 20 projects rose to the top

Autonomous Formation Flight

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Dryden engineers and research pilots explored wingtip vortex energy with a pair of F/A-18s in the Autonomous Formation Flight project. Flight tests confirmed that the airflow from an aircraft's wingtips provides energy to another aircraft flying in an optimum position behind the leader.

The goal of the AFF project was to demonstrate 10-percent fuel savings by the trailing aircraft. That goal was exceeded in December 2001 when an F/A-18 flying in the wingtip vortex behind another F/A-18 recorded a 14-percent fuel savings.

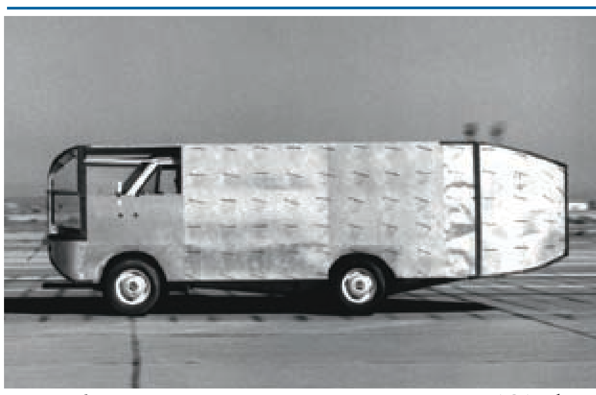
During the 96-minute flight, the trailing aircraft burned about 600 pounds less fuel than a third F/A-18 that flew outside the formation. The savings demonstrated that aircraft range could have been extended more than 100 nautical miles while flying in formation. The trailing F/A-18 and the solo aircraft made a second flight to verify fuel usage and prove the flight results accurate.

Fighter-type research aircraft were used for the technology demonstration, but commercial or military transport aircraft or uninhabited aerial vehicles could benefit from formation flight fuel savings and drag reduction. In addition to fuel savings by follower aircraft, there was another benefit – reduction in carbon dioxide and nitrous oxide compound emissions into the atmosphere.

Researchers said as aircraft computer systems become more advanced, a follower aircraft might one day maintain optimum formation position by allowing flight computers to handle some of the work automatically. Computer systems could monitor fuel flow and reposition the follower aircraft as needed to maximize factors contributing to optimum conditions for conserving fuel usage. The project drew on the symbiotic relationship of migrating formations of birds, where a traditional "V" formation allows each bird flying aft of the lead bird to reduce drag and conserve energy.

EC01 0328-12 NASA Photo by Carla Thomas

Smoke generators show the entwining paths of wingtip vortices behind two Dryden F/A-18s used in the Autonomous Formation Flight program.



E 38096 NASA Photo

Drag Reduction

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In 1973 Ed Saltzman began contemplating ways to reduce the base drag of long-haul trucks. His bicycle rides to work from North Edwards gave him firsthand knowledge of how much air these trucks were pushing around, and he pondered the benefits of drag reduction in the context of the country's first peacetime gas crisis.

Saltzman conducted his initial tests with Vic Horton and Horton's pickup. With the initial data in hand Saltzman approached Milt Thompson for support before going to the center director for funding. Wrote Thompson in a note, "the results of this [research] should be so obviously productive that it probably won't get approved." But it was. Saltzman and his team saw to the modification of the old mail delivery van into an aluminum shoebox, the shape of which they began modifying incrementally to see what reductions in drag they could achieve.

Rounding the corners and edges, and sealing the underside and wheel wells resulted in at least a 52 percent drop in aerodynamic drag. Adding a boat tail fairing to the rear gave the former van a coefficient of drag of .2442. Their work garnered attention outside NASA, including at the Department of Transportation, which asked Flight Research Center engineers to examine five aftermarket fairings for long-haul trucks.

After seeing what was available in the aftermarket, the team decided to see what they could do to a long-haul tractor-trailer unit. They rounded the front of the cab-over-engine tractor, radiused the corners, and then extended the fairing up and over the cab, right to the trailer. And they added sheet metal to the sides of the cab, sealing the gap between cab and trailer. Then they sent the truck out on the road to test it against an almost identical tractor-trailer on a 312-mile course. The results showed an aerodynamic drag reduction of 28 percent, considerably better than any of the existing aftermarket fairings. The results of the work migrated to the commercial trucking industry at the same time as fundamental changes to laws governing the length of over-the-road trucks and trailers. The latter led to the shift from cab-overs to conventional tractors. The highly faired, fuel-efficient, tractor-trailers of today owe a great deal to the work done by FRC engineers.

F-15 HiDEC

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The Highly Integrated Digital Electronic Control, or HiDEC, was developed on a NASA F-15 for investigating and demonstrating methods of attaining optimal engine/aircraft performance.

Jim Stewart, project manager on most of the research encompassed in the effort, explained that an increasingly complex set of projects began with development of the first digital engine control to mimic analogue systems. Stall margin was the most important variable in early development, with systems aimed primarily at keeping the aircraft from failing in any flight condition. For that reason, early digital engine systems focused on insuring stall margins, while showing potential for future optimization for the engine/aircraft system.

Major elements of the HIDEC included a digital electronic flight control system, a digital electronic engine control, an onboard, general-purpose computer, and an integrated architecture to allow all components to "talk" to one another. This was the first step in being able to optimize the integrated engine/inlet/aircraft system.

An adaptive digital engine control system began being flown on the HIDEC aircraft in 1986, trading excess engine stall margin for improved performance. Engine thrust increased from 8 to 10.5 percent (depending on altitude), and reduced fuel consumption up to 16 percent at 30,000 feet and constant thrust. Overall, engine performance improvements were in the range of 10 to 25 percent at maximum afterburning power. No stalls were encountered even with aggressive maneuvering, although intentional stalls were induced to validate the methodology.

The next research project on the HIDEC aircraft was performance-seeking control, or PSC, which was real-time optimization in place of preprogrammed schedules. PSC research began in 1990 and was completed in 1993; it optimized total engine/inlet/aircraft system performance real time. The system used integrated control laws to assure that peak engine and maneuvering performance were available to the pilot at all times.

The PSC flights resulted in reduction of fuel usage at cruise conditions; maximization of excess thrust during accelerations and climbs; and extension of engine life through reduction of fan turbine inlet temperature. Methods were also developed within the digital engine control system to detect component degradation – the origins of what today is known as aircraft health monitoring. The results showed up to 15 percent increase in thrust or a reduction in turbine temperature of 160° F while thrust was constant in the extended life mode. In addition, fuel flow was reduced by 2 percent.

EC91 677-1 NASA Photo by Jim Ross

Photo courtesy Jim Mills

Mike Allen, left, and Thang Quach work with the Active Aeroelastic Wing control laws.

Parameter Identification/Aircraft Sim

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Used in tandem, parameter identification and aircraft simulation are a valuable way to predict what an aircraft will do in flight. The technique also provides starting points for development of models that can help predict how an aircraft will react in flight to specific conditions.

Simulation can begin with facts like the mass of the airplane and, through physics, the forces on the aircraft can be calculated, said Al Bowers, director of Dryden's Aeronautics Research Mission Directorate. Through analysis, the aircraft's trajectory also can be determined. From there, acceleration and gravitational forces can be determined to develop a picture of how an aircraft will perform.

Once that information has been calculated, the results can be plugged into an aircraft simulator to determine the accuracy of the analysis. Wind-tunnel models based on the calculations also are valuable tools; from theoretical data, Dryden researchers might use the F-18 Iron Bird – an aircraft that doesn't fly, but its systems think it can – that can be fitted with hardware and software to see how the theoretical idea works in the lab.

There are two ways of looking at the same problem – one way looks at the challenge in actual conditions and the other looks at a prediction of what those conditions should be, Bowers said. Equations on a page must eventually be proven through flight.

The difference, he added, will "make known the unknown and unexpected," as Hugh L. Dryden once put it.

EC02 0162-58-2 NASA Photo by Tom Tschida

The Altus II was one of many ERAST aircraft. The legacy of this project is the Ikhana unmanned aircraft system that is flown at Dryden today for NASA.

ERAST Program

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The Environmental Research Aircraft and Sensor Technology program was a joint NASA/industry initiative to develop and demonstrate technologies that would lead to remotely or autonomously operated uninhabited aerial vehicles capable of carrying out long-duration Earth science and environmental missions at high altitudes.

A highlight of the program was when the solar-powered Helios Prototype flew into aviation history in August 2001, reaching an altitude of 96,863 feet during a maximum-altitude demonstration near Hawaii. It is a certified world altitude record for non-rocket powered aircraft. A second significant achievement was the development of a civil variant of the Predator B military reconnaissance aircraft. The Dryden Ikhana unmanned aircraft system is a Predator B.

Unmanned aircraft enable airborne sensing and imaging while alleviating the constraints of mission duration, altitude and flight over inhospitable terrain faced by aircraft with onboard crew. Such long-duration, high-altitude aircraft can be flown on upper-atmospheric science missions to collect data and images, which could help efforts to identify and monitor environmental and climatic changes.

Another of the ERAST program's primary goals was to transfer advanced technology to an emerging American UAV industry, and to conduct flight demonstrations of those technologies in controlled environments to validate the capability of the aircraft to fly operational science missions. A concurrent ERAST effort was the development, miniaturization and integration of special-purpose sensors and imaging equipment for UAVs.

Several remotely controlled prototypes were evaluated or served as flying testbeds for propulsion, aerodynamics, structures, materials, avionics and sensor technology. Among these have been the conventionally powered Altus II, developed by General Atomics Aeronautical Systems; the Perseus A and B, developed by Aurora Flight Sciences; the Demonstrator 2 and the "optionally piloted" Proteus, developed by Scaled Composites; and the solar-powered Pathfinder, Pathfinder-Plus and Centurion/Helios Prototype, developed by AeroVironment.

In its second phase, the ERAST project-completion focus was narrowed to three high-priority areas, including further development of solar-electric propulsion.

Active Aeroelastic Wing

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The Active Aeroelastic Wing project sought to verify a new structural design paradigm to enable future aircraft to use wing twist, rather than conventional methods of control, to improve overall performance.

Through flight tests with the AAW aircraft, researchers proved that wing twist is an efficient way to obtain roll control. Proving the technology means future designers can harness AAW research to reduce weight and increase efficiency on new aircraft ranging from fighters and uninhabited air vehicles to transports and cargo aircraft. Lighter wings could allow aircraft to travel greater distances or increase load limits.

Partnered with the U.S. Air Force Research Laboratory and The Boeing Co. Phantom Works, Dryden conducted research on a high-tech adaptation of the Wright brothers' basic "wing-warping" approach to aircraft flight control. The focus of AAW flight research was on developing and validating the concept of aircraft roll control by twisting a flexible wing on a full-size aircraft. A modified F/A-18A obtained from the U.S. Navy in 1999 was used as the project testbed.

The AAW project goal was demonstrating improved aircraft roll control through aerodynamically induced wing twist on a full-scale high-performance aircraft at transonic and supersonic speeds. Data was obtained to develop design information for blending flexible wing structures with control-law techniques. The data included aerodynamic, structural and flight control characteristics that demonstrated and measured the AAW concept in a comparatively low-cost, effective manner. The data also provided benchmark design criteria as guidance for future aircraft designs.

Roll rates were adequate for lateral control, or within 15 to 20 percent of rates obtained with a production F/A-18, both with active control of wing flexibility alone and without use of the differential rolling horizontal tail used in standard F/A-18s at transonic and supersonic speeds. Roll rates at 15,000 feet were highest at Mach .85 and Mach 1.2, and lowest at Mach .95, similar to those of a conventional F/A-18.

EC03 0039-1 NASA Photo by Jim Ross

The AAW flies a research mission above the high desert.

EC01 0328-12 NASA Photo by Carla Thomas

This flight of the Autonomous Aerial Refueling Demonstration is unique for what can't be seen – the pilot's hands on the controls. This was among the first demonstrations of a system that could refuel an aircraft with no interaction from the pilot other than activating the system. The AARD was a follow-on to the Autonomous Aerial Refueling project.

Automated Aerial Refueling

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To develop analytical models for an automated aerial refueling system for unmanned air vehicles, Dryden engineers evaluated the capability of an F/A-18A aircraft to act as an in-flight refueling tanker.

The Automated Aerial Refueling project and the follow-on Automated Aerial Refueling Demonstration showed how an operational tanker's drogue basket responds when in the presence of the receiver aircraft. Prior to flight tests at Dryden, little dynamics data had been gathered in flight. For the modeling studies, a second F/A-18 flew as the receiver aircraft.

The F/A-18A "tanker aircraft" expanded its flight test envelope with an aerodynamic pod carried beneath the fuselage. The 300-gallon aerial refueling pod on the belly of the aircraft also carried the refueling drogue. The idea was for the "tanker" in the study to develop an aerodynamic model for future automated aerial refueling, especially of UAVs.

During the 1990s, a refueling pod was integrated on the newer F/A-18E/Fs. The Dryden AAR flights were developed to demonstrate the operational flight envelope of an older-model F/A-18 carrying the pod and how a secondary aircraft could access the free-stream hose and drogue dynamics from the first aircraft. The AARD flights examined the process of autonomous refueling, without pilot intervention.

NASA, the Defense Advanced Research Projects Agency, the Air Force Research Laboratory, the Naval Air Systems Command, the Naval Air Force - Pacific Fleet, the Canadian Air Force, and aerospace companies Boeing and Northrop Grumman partnered to develop the versatile model for the refueling of UAV aircraft.

A joint effort of Dryden and DARPA led to AARD flights in September 2006 for the first-ever autonomous probe-and-drogue airborne refueling operation. With pilots in the aircraft, the autonomous refueling operation progressed flawlessly.

Airborne Science

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A DC-8, two ER-2 aircraft and a specially outfitted Gulfstream III are used in Dryden's Airborne Science program for missions around the globe in support of NASA's Science Mission Directorate. The highly modified DC-8 jetliner is called the "flying laboratory" for its abilities in transporting several science instruments used to research Earth's surface and atmosphere, sensor development, and satellite sensor verification.

Based at the Dryden Aircraft Operations Facility in Palmdale, Calif., the DC-8 serves as a platform for data collection on a wide variety of experiments in support of Earth and environmental science projects conducted not only by NASA, but also in academia and at research institutions around the world. It can accommodate over 20 sophisticated in-situ and remote sensing instruments.

Data gathered by the DC-8 at flight altitude and by remote sensing have been used for scientific studies in archaeology, ecology, geography, hydrology, meteorology, oceanography, volcanology, atmospheric chemistry, soil science and biology.

NASA's two high-altitude ER-2 aircraft, which are civil versions of the military U-2S reconnaissance aircraft, are based at Dryden. They can cruise above 70,000 feet, are used for long-duration, long-range, high-altitude science missions. The aircraft are to be relocated to the DAOF when renovations to that facility are complete.

The ER-2 supports science missions, including collecting information about the environment, earth resources, celestial observations, atmospheric chemistry and dynamics, and oceanic processes. The aircraft also are used for electronic sensor research and development, satellite calibration, and satellite-data validation.

Another program asset is the Gulfstream III. Informally known as the G-III, it is equipped with a centerline pod that houses an advanced radar system used for measurement of surface deformations. The sensor, referred to as the Uninhabited Aerial Vehicle Synthetic Aperture Radar, was developed at the Jet Propulsion Laboratory and will be used to study faults in the Earth's crust and volcanoes.

In 2009, Global Hawk unmanned aircraft will also become available for science missions. The NASA Global Hawk aircraft have extreme range and duration capabilities that will be used for unprecedented Earth science observations in the years to come. The long duration allows continuous data collection during the development process of hurricanes and other atmospheric phenomena. The long-range capability enables access to extremely remote regions of the planet.

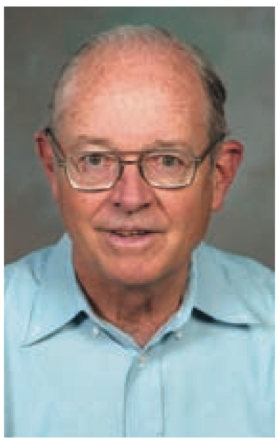
EC00 0037-13 NASA Photo by Jim Ross

The DC-8 Airborne Science aircraft departs for a mission at dawn. The DC-8's capabilites have led to the aircraft's moniker of "flying laboratory."

Driving Forces

Survey shows some of the people who helped made Dryden what it is today

William P. Albrecht



Former Dryden engineer William P. Albrecht was indispensable to thesuccessful flight test of Dryden's exotic research aircraft and was a trusted advisor, brilliant engineer and "a sterling human," according to his nominators. They also said he was an inspiration and a role model.

Albrecht retired from the center in 2002 after serving for 45 years in multiple capacities. He came to Dryden in October 1959, one year after the agency was established as NASA.

The first project to which he was assigned involved sounding rockets air-launched from an F-104. Albrecht was a member of the launcher design team.

He next was lead flight operations engineer on the second X-15 aircraft, where his duties involved resolving challenges with the aircraft, scheduling work on the it and other technical aspects. His work was instrumental in the successful flight test that led to the maximum speed recorded for a manned aircraft of Mach 6.7, a record that still stands.

"Bill had an uncanny ability to see potential safety of flight issues and was known for developing simple solutions to provide the needed safety features," said Johnny Armstrong, an Air Force engineer on the X-15.

Albrecht's next assignment as operations engineer for one of the YF-12 aircraft.

Albrecht directed maintenance as well as modification work to enable aircraft to be used for scientific research. He also participated in control room operations. Albrecht later served as chief of Flight Operations Engineering, and then as assistant chief of the Flight Operations directorate.

Paul F. Bikle

Paul F. Bikle was a former Dryden center director who for more than a decade guided the development of many historic Dryden research projects and was "the ideal manager for a flight test organization," his nominators said.

On Sept. 15, 1959, Bikle became the chief of the NASA High-Speed Flight Station. Later that month, the station became the NASA Flight Research Center. Bikle became its director, a position he held until 1971.

As director of the facility, he was responsible for flight operations on many major aeronautical research programs, including the rocket-powered X-15, the supersonic XB-70, the Lunar Landing Research Vehicle and the lifting body aircraft.

In 1947, after the first glide flights of the XS-1 Bikle participated in early plans for powered flights later made by Maj. Charles E. Yeager. He returned to aircraft evaluation in 1947, when he was appointed chief of the Performance Engineering branch and directed tests of the XB-43, the first jet bomber; the XC-99; and the F-86A.

As flight test was transferred to the newly formed Air Force Flight Test Center at Edwards, he advanced to assistant chief of the Flight Test Engineering Laboratory in 1951. In this capacity he directed the engineering phase of the flight evaluation of the Russian MiG-15 on Okinawa in 1953.

In 1954 Bikle was appointed technical director of the Directorate of Flight Test at Edwards. A year later he was named technical director of the Flight Test Center.

He wrote more than 40 technical publications.

Roy G. Bryant

Roy G. Bryant was best known as NB-52B project manager, but his work involved many projects during a Dryden career that spanned 48 years.

Bryant accepted an active-duty assignment May 3, 1957, as an aeronautical research engineer with the National Advisory Committee for Aeronautics, NASA's predecessor organization. He joined the Project Coordinator's group at the NACA High Speed Flight Station (now Dryden).

He became a full-time NASA employee just weeks after the NACA became NASA. He served as an aeronautical research engineer in the Special Projects office as project coordinator. Bryant was assigned to manage the Century Series fighters, which includes the F-100, F-104 and F-107. Some projects like the F-107A were of short duration, but he found himself associated with the F-104 for longer than the span of most people's careers; Bryant managed research projects involving the F-104 from 1957 to 1994.

In October 1959, Bryant was transferred to the stability and control branch. While continuing his work with jet aircraft projects, he also served as a member of the X-15 Research Airplane Flight Test Organization until the program's completion in 1968. The X-15, the first of the hypersonic rocket planes, was the centerpiece of what is considered one of the most successful aviation research programs of all time, tallying a record 199 missions.

Bryant became project manager for the NB-52B in September 1975. Originally modified as a launch platform for the X-15, the NB-52B became a workhorse. Bryant retired in April 2005 and died a month later.

Neil A. Armstrong

Neil A. Armstrong was a pilot and engineer who joined the NACA at the Lewis Flight Propulsion Lab (now Glenn Research Center) in 1955, but transferred to the High Speed Flight Station (now Dryden) later that year. A pilot through and through, Armstrong nevertheless retained his passion for engineering and approached his work with that background firmly in mind.

Armstrong served as project pilot on the F-100A and F-100C aircraft during NASA's investigation of inertial coupling. He also flew the X-1B, X-5, F-105, F-106, B-47, KC-135 and Paresev. He flew the B-29 motherships from which the early rocket planes were air-launched. An early project pilot on the X-15, Armstrong made seven flights before he was selected as one of nine men for the second class of NASA astronauts. He left Dryden with more than 2,450 flying hours.

Armstrong was actively engaged in both piloting and engineering aspects of the X-15 program from its inception. He completed the first flight in the aircraft when it was equipped with a new flow-direction sensor (ball nose) as well as the initial flight in X-15 no. 3, the only model equipped with a self-adaptive flight control system. He worked closely with designers and engineers in development of the adaptive system. During those fights he reached a peak altitude of 207,500 feet in X-15 no. 3, and a speed of 3,989 mph (Mach 5.74) in X-15 no. 1.

In March 1966 he served as commander of the Gemini 8 orbital mission (David Scott, who later was a Dryden center director, was the pilot) during which he performed the first successful docking of two vehicles in orbit. On July 20, 1969, during the Apollo 11 lunar mission, Armstrong became the first human to set foot on the moon. Armstrong has a total of eight days and 14 hours in space, including two hours and 48 minutes walking on the lunar surface.

Marta Bohn-Meyer

Marta Bohn-Meyer's legacy is the relentless pursuit of excellence for which she was so well known, her passion and service to principles larger than herself. She was the first female flight engineer from NASA or the U.S. Air Force to fly to Mach 3 in an SR-71, an event many have said broke the glass ceiling for thousands of young women seeking careers in aerospace.

Bohn-Meyer was Dryden's chief engineer and also served as both deputy director and director of flight operations, as director of safety and mission assurance, deputy director of aerospace projects and project manager for the F-16 XL Supersonic Laminar Flow Control project.

She worked on a variety of research projects, specializing in flight test operations, test-technique development and laminar flow research.

Among such efforts she worked with were flight tests of space shuttle thermal protection tiles with a NASA F-104, B-57 gust gradient evaluations and the F-14 aileron-rudder interconnect and variable sweep transition laminar flow programs in addition to work on the F-16XL laminar flow project before becoming project manager.

And in what she may have considered her most important role, she was a devoted and determined mentor for young girls interested in technical career fields. Bohn-Meyer frequently spoke to young people in classrooms or other educational environments in hopes of helping young women realize their dreams in fields traditionally dominated by men.

The annual Math and Science Odyssey at Antelope Valley College, in which she participated each year, now is named in her honor.

Bohn-Meyer lost her life Sept. 18, 2005, near Oklahoma City while practicing for an aerobatic flying competition. She was 48.

Frank W. Burcham

Frank W. Burcham retired as Dryden chief engineer but spent most of his career at the center as Propulsion Branch chief. He is best known for his contributions and leadership in developing and applying advanced integrated propulsion technology to modern aircraft and as a pioneer in the development of propulsion control systems and their integration to the flight control system. Nominators called Burcham "a respected propulsion pioneer and guru who has helped advance the state-of-the-art in propulsion flight testing," saying he is "always there to help."

Integrated propulsion systems have undergone revolutionary changes during the past three decades and designers have new opportunities to optimize engine, inlet and nozzle performance throughout the flight envelope as a result of work to which Burcham was a major contributor.

Programs he worked on such as the F-111E Integrated Propulsion Control System and YF-12 Cooperative Control demonstrated the significant performance and operational benefits integrated propulsion systems can have. The F-15 Digital Electronic Engine Control program led the way to the modern age of digital engine control and advancements in integrated propulsion control.

Burcham's influence and work also is seen in the flight evaluation and demonstration of the F-15 Highly Integrated Digital Electronic Control and the follow-on F-15 Performance-Seeking Control programs. Those programs proved the maturity of integrated propulsion controls and their flexibility in adapting to variations in engine health. The Propulsion Controlled Aircraft program, in which Burcham was the driving force, extended integrated propulsion controls technology to a safety-of-flight role. Flight demonstrations on F-15 and MD-11 aircraft proved the propulsion system could completely control and land an aircraft safely without the aid of conventional flight control surfaces.

EC87 0182-14 NASA Photo

The X-29 with its forward-swept wings engages in a bank maneuver. One of the two aircraft flown in the research project is on display at Dryden as vistors enter the center. The aircraft is seen as part of the public tours.

X-29

12

Two X-29 aircraft featuring one of the most unusual designs in aviation history were flown at the NASA Ames-Dryden Flight Research Facility as technology demonstrators to investigate advanced concepts and technologies. The multi-phased program was conducted from 1984 to 1992 and provided an engineering database that is available for the design and development of future aircraft.

The X-29 looked as though it was flying backward. Its forward-swept wings were mounted far back on the fuselage, while its canards – horizontal stabilizers to control pitch – were in front of the wings instead of on the tail. The complex geometries of the wings and canards combined to provide exceptional maneuverability, supersonic performance and a lightweight structure. Air moving over the forward-swept wings tended to flow inward, toward the root of the wing, instead of outward, toward the wing tip, as occurs on an aft-swept wing. This reverse airflow did not allow the wing tips and their ailerons to stall (lose lift) at high angles of attack (direction of the fuselage relative to the air flow).

Concepts and technologies explored with the fighter-size X-29 included the use of advanced composites in aircraft construction; variable-camber wing surfaces; the unique forward-swept wing and its thin supercritical airfoil; strake flaps; close-coupled canards; and a computerized fly-by-wire flight control system to maintain control of the otherwise unstable aircraft.

Research results showed that the configuration of forward-swept wings – coupled with movable canards – gave pilots excellent control response at up to 45 degrees angle of attack. During its flight history, the X-29s were flown on 422 research missions, 242 by aircraft no. 1 in phase one of the program; 120 flights by aircraft no. 2 in phase two; and 60 flights in a follow-on "vortex control" phase. An additional 12 non-research flights with X-29 no. 1 and two non-research flights with X-29 no. 2 raised the total number of flights with the two aircraft to 436.

Propulsion-Controlled Aircraft

11

On July 19, 1989, the center engine on a DC-10 exploded, disabling the triple-redundant hydraulic systems. The flight crew could minimally control the airliner using differential thrust from its two remaining engines. The DC-10 reached the Sioux City, Iowa, airport and made a crash landing. Of the 296 people on board, 184 survived the impact and fire.

Dryden engineer Frank W. Burcham read an account of the accident and began sketching out a system that would allow a pilot to land a jumbo jet without the use of aerodynamic control surfaces. Burcham used the F-15 simulator for initial tests, followed by the Boeing 720 airliner simulator. He gained the support of Center Director Ken Szalai, and recruited pilot Gordon Fullerton for the effort. On April 21, 1993, Fullerton made the first successful propulsion-controlled aircraft landing, flying an F-15. One witness said of the cheers in the control room, "It was like landing on the moon."

Next came a PCA landing of an MD-11 airliner, on Aug. 29, 1995, at Edwards Air Force Base. The aircraft touched down smoothly with all of its control surfaces locked. Additional PCA landings were done the following September and November. But while these tests were successful, they lacked the chaos of a real emergency.

On Nov. 22, 2003, the crew of a DHL Airbus 300 freighter applied PCA to save their airplane after it was struck by a surface-to-air missile at 8,000 feet while taking off from Baghdad International Airport. The left wing was damaged, the leaking fuel caught fire and the three hydraulic control systems failed. The three-man crew stabilized the A300 using the engines.

After ten minutes, they began an emergency landing approach but a right crosswind caused the A300 to drift, forcing a change to a shorter runway. Turbulence caused the right wing to dip. The crew recovered, but the A300 touched down off the centerline, went off the runway and stopped after some 3,000 feet. The crew was unharmed.

EC95 43247-4 NASA Photo

On Aug. 29, 1995, the MD-11 propulsion controlled aircraft touched down smoothly at Edwards Air Force Base with all its control surfaces locked. Additional PCA landings were done later in the year with the same result. While the flights were successful, they lacked the chaos of a real emergency, but that test would come in Baghdad, in 2003.

EC73 3468 NASA Photo

F-8 Supercritical Wing aircraft flights demonstrated increased cruising speed, improved fuel efficiency of about 7 percent, and better flight range than those made with conventional wings. As a result, supercritical wings are now common on most modern subsonic commercial transports.

Supercritical Wing/Winglets

10

In the late 1970s Richard Whitcomb of Langley Research Center, Hampton Va., developed winglets, which reduced drag on aircraft wings. They were the third of his major aeronautical discoveries. In the 1960s, he had originated the supercritical wing, an airfoil shape that reduced drag at speeds just below Mach 1. In the 1950s, Whitcomb developed the area rule concept, discovering that a narrowing in the fuselage over the wing reduced high-speed drag at transonic speeds.

Winglets typically have supercritical airfoils and serve as end plates on the wing that stop the spanwise airflow down the wing while diminishing wingtip vortices. They also "fool" the wing into behaving as if it had a longer span, making the wing more efficient without the performance penalties of a longer wing.

Whitcomb selected the best winglet shape for flight tests on a KC-135 tanker. These were large vertical fins installed on the tanker's wing tips. The modified KC-135 was flight-tested at Dryden during 1979 and 1980 and the data showed that the winglets provided a 7 percent improvement in range over that of the standard KC-135. The economic advantage eventually led to adoption of winglets on light aircraft, business jets, airliners and heavy military transports. Winglets were also retrofitted on older aircraft. While the KC-135 winglets were large, subsequent designs were smaller and lighter.

Whitcomb led a team of researchers to develop and test a series of unique geometric airfoil shapes, or wing designs, that could be applied to subsonic transport to reduce drag at high speeds. The result was the supercritical airfoil.

Compared with a conventional wing, the supercritical wing is flatter on the top and rounder on the bottom with a downward curve at the trailing edge. Dryden research flights validated that aircraft using the supercritical wing see increased cruising speed, improved fuel efficiency (about 15 percent), and better flight range than those using conventional wings. As a result, supercritical wings are now common on most modern subsonic military and commercial transports.

Missions at Mach 3

9

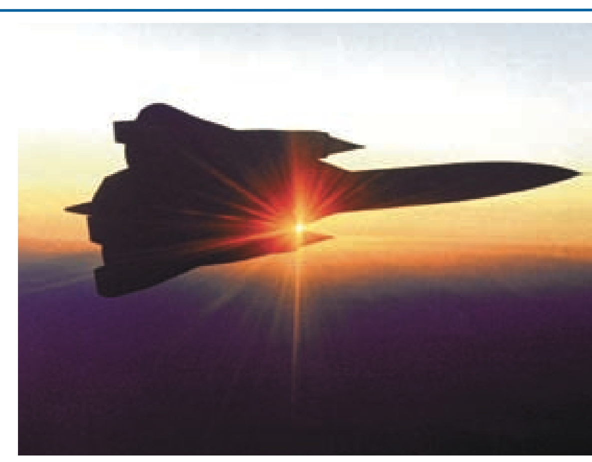
Dryden researchers conducted several programs involving aircraft capable of attaining altitudes above 70,000 feet and cruising at Mach 3 (more than 2,000 mph, or three times the speed of sound). Airplanes such as the XB-70, YF-12 and SR-71 served as unique assets for research in the areas of propulsion, heating and aerodynamics because their performance characteristics exceeded those of conventional jet aircraft.

The B-70 Valkyrie was designed to be the ultimate high-altitude, high-speed strategic bomber. It was, however, in development at a time when the future of the manned bomber was uncertain because military planners felt that the future belonged to guided missiles. As a result, only two experimental XB-70 prototypes were built. During the mid- to late 1960s they served as testbeds for development of technology applicable to a commercial supersonic transport, or SST. The XB-70 was the about same size as projected SST designs and featured similar structural materials, such as brazed stainless steel honeycomb and titanium. In a joint program with the Air Force, NASA used the XB-70 for research on high-speed aerodynamics, sonic booms, high-altitude turbulence and SST flight profiles.

Beginning in 1969, two Lockheed YF-12A aircraft were flown at Dryden in a joint NASA-Air Force program aimed at learning more about the capabilities and limitations of high-speed, high-altitude flight. The YF-12s were prototypes of a planned interceptor aircraft that was based on a design that later evolved into the SR-71 reconnaissance aircraft. Following the loss of a YF-12A in 1971, an SR-71A joined the project under the designation YF-12C. Research data from the project helped validate analytical theories and wind-tunnel test techniques that improved design and performance of future military and civil aircraft.

Experiments included research on aerodynamic and heating loads, aerodynamic drag and skin friction, heat transfer, thermal stresses, airframe and propulsion system interactions, inlet control systems, high-altitude turbulence, boundary-layer flow, landing gear dynamics, measurement of engine effluents for pollution studies, noise measurements, and evaluation of a maintenance monitoring and recording system. On many YF-12 flights medical researchers obtained information on physiological and biomedical aspects of crews flying at sustained high speeds. The program concluded in 1979.

In the 1990s, two SR-71 aircraft were flown at Dryden as testbeds for high-speed, high-altitude research. With



EC74 4111 NASA Photo

the capability to cruise at speeds of Mach 3.2 (nearly 2,200 mph) and attaining altitudes up to 85,000 feet, the aircraft served as platforms for carrying out research in aerodynamics, propulsion, structures, thermal protection materials, high-speed and high-temperature instrumentation, atmospheric studies, and sonic boom characterization. Other experiments included those on a laser air-data collection system, an upward-looking ultraviolet video camera to study celestial objects in wavelengths blocked to ground-based astronomers, atmospheric ozone research, satellite communications, and development of a linear aerospike rocket engine.

Up and Coming

Survey identified these talented current and future stars

Jeffrey E. Bauer

Jeff Bauer is deputy director of the Dryden Advanced Planning and Partnership Office. His responsibilities include the center's development of test services and capabilities for remotely or autonomously piloted aircraft systems.

Nominators said Bauer will help Dryden in its business development efforts and called him "a great DFRC advocate." He received a NASA Leadership Medal in 2007 for his work with remotely flown aircraft. In 2006, Unmanned Vehicle Systems International presented him with the Catherine Fargeon Award for his contributions in enabling remotely or autonomously piloted aircraft to fly in the national airspace. In addition, he has received several group achievement awards.

Bauer previously served as deputy director for exploration systems at Dryden. He was responsible for coordination and management of Dryden's activities in support of NASA's Exploration Mission Directorate.

He has more than 15 years' experience in flight research with remotely piloted aircraft systems. He understands private industry's need for routine access to the national airspace. Bauer led the industry and government team that comprised the Access 5 effort, designed to develop suggested rules and certification guidelines for the Federal Aviation Administration for incorporating high-altitude uninhabited aerial vehicles into the national airspace. The team included six aircraft manufacturers, NASA, the departments of defense, homeland security and commerce, the FAA and the international aviation community.

Bauer was an Environmental Research Aircraft and Sensor Technology program manager. He also worked on the X-29 forward swept wing demonstrator, the X-31 aircraft and the X-43A, a hypersonic aircraft.

Albion H. Bowers

Albion H. Bowers is director of Dryden's Aeronautics Research Mission Directorate, but he still thinks of himself as an engineer and researcher.

Nominators called Bowers "extremely supportive and fair," "passionate," "bright," and an "aerodynamics guru." Others said he was a "great Aeronautics Research mission directorate advocate" with "inspired determination" and is a good leader who "helps keep Code R on track." In addition, nominators said Bowers worked well with students, was "insightful and forward-thinking" and a "great motivator, innovator, visionary and NASA promoter." He also has a wide base of knowledge and is an "agency-respected mover and shaker," nominators wrote.

Prior to his current post, Bowers was deputy director of research and engineering. Before accepting that job, he served as project chief engineer on seven projects at Dryden, including as the first chief engineer for research involving the SR-71s. Bowers also helped advocate for the first experiments flown on the Blackbirds.

He was the final chief engineer on the F-18 High Alpha Research Vehicle and worked on 204 of the total 396 missions. He credits such people as Don Gatlin, Ed Schneider and Joe Wilson for helping him to grow during the project. Bowers said he also learned much from the team that included Marlin Pickett, Joe Pahle, Bob Antoniewicz, Vicki Regenie, Brad Flick, Mike Earls, Art Tanaka and many others. He served as chief engineer for the Eclipse project.

For Bowers, people are what make Dryden a great place to work and are the reason great achievements are seen here. He especially appreciates the young people he has worked with as a mentor. He believes they are up to the challenges that lie ahead.

Jennifer H. Cole

Jennifer H. Cole is the Aerodynamics and Propulsion branch chief.

She has been a contributor to several Dryden research projects. Among her favorites was the Propulsion-Controlled Aircraft Recovery, or PCAR, project, a collaborative effort with other government entities and industry that sought to leverage NASA knowledge and experience.

Cole's first work at the center was on the Autonomous Formation Flight, or AFF, project, where she spent many hours in the control room exploring the benefits and challenges of formation flight. Technology demonstrated through the AFF project paved the way for several follow-on flight efforts, including the Automated Aerial Refueling project. Dryden's formation flight research and flight data are frequently referenced and requested, according to nominators.

Her "technical leadership and expertise" are seen as some of her strongest skills and nominators see her as "a rising star." Aside from being "extremely bright and competent" and possessing good people skills, her nominators also said she was "willing to get involved," was "a team builder" that "understands employees" and is "easily approachable," "a role model for young women," and "a talented, compassionate, thoughtful, great engineer and leader."

She also has helped mentor co-op students and inspires young people at Dryden events or in the community.

For example, at the 2003 Math and Science Odyssey, Cole used the Wright brothers' theme in her presentation to inspire students about the Centennial of Flight. Using a hands-on activity, she demonstrated concepts similar to those that helped the Wrights brainstorm solutions to some of their engineering problems. Students were engaged in her presentation.

John T. Bosworth

John T. Bosworth is Dryden's project chief engineer for the F-15 Intelligent Flight Control System aircraft.

Nominators wrote that Bosworth is an "outstanding chief engineer on the Intelligent Flight Control System;" "a huge proponent of IFCS and it contributions;" and a "brilliant principal investigator" who finds "practical solutions."

Nominators also called him a "world leader in controls," "expert in application of adaptive controls," a "model project chief engineer," a "smart guy," and noted his technical expertise in several disciplines.

Bosworth has worked in the area of flight control system analysis and design and handling qualities analysis for 27 years. His experience includes serving as NASA's chief engineer for the X-31 Enhanced Fighter Maneuverability Technology Demonstrator program and the F-16XL Digital Flight Control System upgrade program.

He also supported the F-14 High-Angle-of-Attack research program, the X-29 Forward Swept Wing Technology Demonstrator program, the X-30 National Aerospace Plane program and the X-38 Crew Return Vehicle program.

Bosworth is a senior American Institute of Aeronautics and Astronautics member and a core member of the National Engineering and and Safety Center (headquartered at Langley Research Center, Hampton, Va.) Guidance and Controls problem resolution team.

He serves as a co-associate principal investigator on NASA's Integrated Resilient Aircraft Control program. IRAC is part of the Aviation Safety Program under the Aeronautics Research Mission Directorate. Program goals are to develop technologies, tools, and methods to improve aircraft safety, and overcome technology barriers that could constrain full realization of a Next Generation Air Transportation System.

Trong T. Bui

Trong T. Bui is an aerospace engineer in the Research Aerodynamics, Propulsion, and Performance branch and is the group lead of the Flow Physics group.

Nominators said Bui had made significant contributions to propulsion and was "a true forward-thinking flight researcher." The engineer was also called an "ultra mentor" and "extremely talented, humble, inspirational and has a great attitude." Some nominators called him a "genius."

Trong was also honored for his humility and for his willingness to give honest assessments, even when it is difficult to hear. He also is known for having a flare for conveying his opinion in an unbiased manner and seeing the big picture.

Bui was the principal investigator on the Dryden Aerospike Rocket Test flight research project, in which two aerospike rockets and one conventional rocket were successfully flown to supersonic speeds, providing the first known set of transonic flight-performance data for aerospike rockets.

He originally proposed the Air-Launched Small Missile (or ALSM, pronounced "awesome") flight testbed for hypersonic systems and served as principal investigator for the initial advocacy and feasability study efforts.

Bui proposed using the U.S. Navy's surplus Phoenix guided air-to-air missiles, launched from the Dryden F-15B aircraft, as boosters for hypersonic flight research payloads. This proposal eventually evolved into the Phoenix Missile Hypersonic Testbed project at Dryden, but funding shortfalls led Aeronautics Research Mission Directorate officials to cancel the project.

He also is known as an excellent mentor, who sees a need to pass knowledge to the next generation of researchers. He is known to assist those who seek his help.

Gary B.Cosentino

Gary Cosentino is lead flight operations engineer for the Science and UAVs group at Dryden.

Cosentino "consistently does above and beyond for support" and is "passionate about getting the work done," nominators said. Many also pointed to his UAV knowledge, his contributions to the X-48B project and technical expertise that has made him an "unmanned aircraft expert (who) works well with outside customers, both government and industry." Another nominator's comments punctuated the nomination: "(he) gives 200 percent without asking for recognition."

He began his career at Ames Research Center, Moffett Field, Calif., where he worked on computational fluid dynamics for futuristic aircraft configurations, culminating in what became the X-36 research aircraft. He was known at Ames for computing data that compared well with wind-tunnel results.

Cosentino transferred to Dryden in January 1998 as project manager for the X-36 flight test project. He also was given project management responsibilities for other unmanned technology demonstration aircraft, including the Altus II and Perseus B.

After 6 ½ years leading the planning and flight test effort for the X-45A Unmanned Combat Air Vehicle and Joint Unmanned Combat Air System, Cosentino was then assigned to the X-48B.

The X-36 and X-45A projects featured two aircraft each, which are on permanent display in museums.

Cosentino said the center's role in the X-45A J-UCAS flight test program contributed to its reputation as the center of excellence in the country for uninhabited aerial vehicles and uninhabited aircraft systems and X-plane engineering and flight test.

John H. Del Frate

John H. Del Frate is acting director of the Dryden Advanced Planning and Partnership Office, where he works to bring future projects to Dryden.

Del Frate is "bringing new business to NASA," he's a "great PAG [Project Approval Group] leader" and he is "leading the effort to find partners," nominators wrote. In addition, many recognized his efforts in managing solar-powered aircraft projects at Dryden as part of the Environmental Research and Sensor Technology program earlier in his career.

While Del Frate was project manager for the solar-powered Pathfinder Plus and later the Helios Prototype, both aircraft achieved altitude records.

The Pathfinder Plus, which had set a world altitude record for propeller-driven aircraft of 80,201 feet, is now hanging in the Smithsonian Institution Udvar-Hazy Center in Virginia.

While he was project manager for the Helios Prototype, that aircraft surpassed the Pathfinder Plus by reaching a new world-altitude record in 2001 of 96,863 feet. The Pathfinder Plus and the Helios Prototype were built by AeroVironment Inc. The company started with Pathfinder and created an increasingly complex family of solar-powered aircraft to new heights – literally and figuratively.

The Pathfinder-Plus solar-electric flying wing also flew at Dryden in September 2005 for a flight series to investigate the effects of turbulence on lightweight flexible-wing structures. The Pathfinder-Plus made two low-altitude flights over the northern portion of Rogers Dry Lake. The first was a three-hour flight, followed by a two-hour mission.

Prior to Del Frate's work with solar aircraft, he was project chief engineer for the F-18 High Alpha Research Vehicle and led the effort to conduct smoke flow-visualization research flights to examine vortices generated by leading-edge extensions at high angles of attack.

Laurie A. Grindle

Laurie A. Grindle is NASA's Orion Abort Test Booster project manager. In that position she is responsible for NASA's management of the abort test booster, the launch vehicle for the crew module and launch abort system on the Orion ascent abort flights.

Nominators said Grindle is "always willing to help out," "will help [the Crew Exploration Vehicle] be a success," and that she "has touched almost all major Dryden projects."

In addition, nominators said Grindle is "technically sharp," "exceptionally bright," "a great engineer," "gets things done," is "well-rounded and thoughtful," "dependable" and displays "technical excellence."

Grindle is best known for her work with the X-43A program. She was deputy chief engineer for X-43A, flight 2 and X-43A chief engineer for flight 3. This project validated supersonic-combustion ramjet (scramjet) propulsion technology with the research aircraft sustaining hypersonic speeds nearing Mach 10, or almost 10 times the speed of sound.

The National Society of Black Engineers honored Grindle with the 2005 Golden Torch Award as the Outstanding Woman in Technology of the Year.

Prior to the X-43A project, Grindle was principal investigator on the Advanced L-Probe Air Data Integration experiment flown on Dryden's F-18 systems research aircraft.

In addition, Grindle was a researcher on the Supersonic Laminar Flow Control project with an F-16XL research aircraft, and also was involved in analysis of space shuttle maneuvers that resulted in expanding the shuttle's aeronautical database.

Her NASA career began in 1992 with an internship in the Aerodynamics branch of Dryden's Research Engineering directorate. She became a permanent employee a year later.

Stephen C. Jensen

Stephen C. Jensen is Dryden's Stratospheric Observatory for Infrared Astronomy program chief engineer. In that position, he is the lead technical coordinator between the SOFIA platform and science project teams.

Nominators said Jensen was "brilliant," "able to set a direction," is a "go-to guy," "knows system engineering" and "will help SOFIA be a success."

Nominators also recognized his technical excellence and leadership and said he was "extremely talented, humble, balanced" and the "quintessential systems engineer and great leader."

Nominators also said his ability to organize requirements and prioritize them is only matched by his follow up on what needs to be accomplished.

Prior to accepting his position with the SOFIA project, he was chief of the Flight Systems branch.

Dryden employees know Jensen's work as Dryden chief engineer on multiple projects, including the X-38 Crew Return Vehicle prototype and X-38 Actuator Control Test with partner Johnson Space Center, Houston. He also served as chief engineer on the X-37 and Ikhana unmanned aerial system projects.

Jensen was part of the first request-for-proposal development team at NASA Headquarters for the Crew Exploration Vehicle and served as an evaluator on the first CEV Source Evaluation Board.

Selection and development of new talent is paramount to the long-term success of any organization, and Jensen said, "Being able to hire a number of outstanding new engineers is probably my greatest accomplishment at NASA."

Jensen is known to make time to answer questions and make himself available to the people he works with. That includes new engineers that might need a helping hand learning their way around Dryden.

Bradley C. Flick

Bradley C. Flick is chief engineer at Dryden. He is responsible for providing independent technical guidance and oversight to Dryden flight projects to ensure conformance with center and agency standards, policies and processes.

As chair of the Airworthiness and Flight Safety Review Board, he is responsible for determining and providing the appropriate level of independent technical review for each project prior to flight.

Nominators wrote that Flick will influence new programs with his "superior knowledge of aircraft systems and structures." He is "respected," "a class guy," "forward-looking," "open-minded" and a "pragmatic and level-headed thinker."

They also said he was a "great manager," who had "common sense and a big brain" and "technical and leadership expertise," "innovative thinking" and "commitment to safety and following processes."

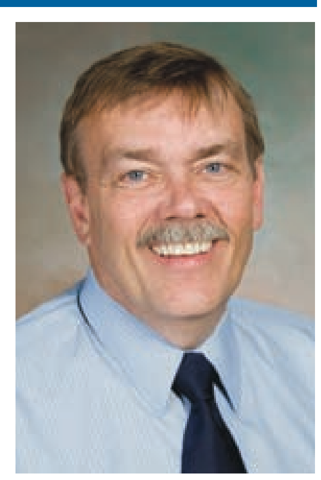
Flick served as chief engineer in an acting capacity from October 2005 until his permanent appointment to the post in January 2008.

He began his career at Dryden in 1986 as a flight systems engineer on the F/A-18 High Alpha Research Vehicle, or HARV project.

He transferred to Operations Engineering in 1988, where he continued work with the HARV, playing a lead role in the development of several experimental systems, including the thrust-vectoring control system, emergency electrical and hydraulic systems, spin recovery parachute system and actuated nose strakes. He served as mission controller on approximately 100 HARV research flights.

Flick also served as Flight Systems branch chief (from 1998 to 2001). From 2001 to 2005, he served in acting capacity as associate director for Flight Operations, deputy director for Research Engineering and director of Engineering.

Thomas J. Grindle



Thomas J. Grindle is chief of maintenance, a position he accepted in July 2007. He had been the acting chief of maintenance since February 2007. In a nutshell, if anyone touches the airplane, or builds anything that goes on it, he's in charge.

Prior to his current post he was chief engineer for F-15B no. 836, which was used in support of the joint Gulfstream Aerospace/Dryden project Quiet Spike to investigate suppression of sonic booms. The project focused on a retractable, 24-foot-long lance-like spike mounted on the nose of the F-15B that created three small shock waves traveling parallel to one another all the way to the ground, producing less noise than shock waves that build up in front of supersonic jets.

Grindle is perhaps best known as lead propulsion engineer for the X-43A project conducted at Dryden from 2001-2004. The 12-foot-long, experimental scramjet-propelled vehicles were flown at Mach 7 and Mach 10. Prior to that assignment, he worked in the area of fluids and environmental systems engineering for the X-43A.

People who voted for Grindle said he was "motivated and always willing to help" and that his "extensive experience, practical determination and no-nonsense approach" are the reasons he is well respected.

He began his career at Dryden in 1995 as an aircraft mechanic. Two years later he was an engineering technician in Dryden's Flight Operations branch, a position he had until June 1999. During that time, he was assigned to the F-15B, the F-16XL and Learjet projects. In January 2000, Grindle became an engineering technician in the Propulsion and Performance branch.

His duties included assisting on the Predator B for the Environmental Research Aircraft and Sensor Technology program and the DC-8 mission for Airborne Science's investigation of the Mt. Hekla Volcano, Iceland, volcanic ash incident. He also served as propulsion engineer for the F-15B simulator.

David N. Larson

David N. Larson is a research pilot in Dryden's Flight Crew branch. Larson joined NASA in February 2007 and flies the F-15, F-18, T-38 and ER-2.

Nominators said Larson was a "great instructor," who "flies them all" and is "a skilled test pilot."

Larson came to Dryden from the U.S. Air Force, where he flew and had extensive experience with the military version of the ER-2, the U-2. Larson's first contact with NASA was at the Glenn Research Center, Cleveland, where he had a college summer internship working on arcjet engines. He has accumulated more that 4,900 hours of military and civilian flight experience in more than 70 fixed and rotary-winged aircraft.

At Dryden, Larson has flown an F-18 is support of sonic boom research, the F-15 Intelligent Flight Control System, the F-15 Rake Airflow Gage Experiment, F-16 Automatic Collision Avoidance Technology aircraft and assisted with a Lunar Landing Training Vehicle trade study. He also serves as a operations scheduler and Aviation Safety Officer.

In 1991, Larson was assigned to Beale Air Force Base, Calif., were he flew 88 operational U-2 missions from Korea, Saudi Arabia, the United Kingdom, Panama and other locations. In addition, Larson commanded U-2 operations for Warner Robins Air Logistics Center's Detachment 2 located in Palmdale, Calif.

Larson became a flight commander and assistant operations officer for the 445th squadron at Edwards Air Force Base. He flew the radar, avionics integration and engine tests in F-15 A-D; the early flights in the glass cockpit T-38C; and airworthiness flights in the Coast Guard RU-38.

He was deputy group commander for the 412th Operations Group at Edwards before retiring from active duty in 2007 with the rank of lieutenant colonel. He also was an instructor at the U.S. Navy Test Pilot School.

Jeanette H. Le

Jeanette H. Le is chief of Dryden's simulation branch, a position she has held since 2003.

Nominators said her technical leadership and expertise is evident and described her as a "great role model" who is "sharp, energetic and caring" and a person who is "quietly enabling major leaps."

Le was hired in 1989 just after graduation from the University of California, Los Angeles, to work in the simulation branch. Her first exposure to Dryden prior to her selection was through a senior design class that was part of the Universities Space Research Association.

After working as a simulation software engineer from 1989 to early 2002, Le served as acting deputy branch chief for nine months. Next, she served as acting branch chief for another nine months before accepting her current post.

Well-respected by her peers and a recipient of a NASA Exceptional Service Award, Le says the best part of her job is "working with the people on the projects. I get exposure to a lot of different engineering disciplines, so I get to learn from a lot of different people. That provides a diverse perspective on flight research."

Le also enjoys it when the simulation work pays off when the project aircraft takes to the skies for the first time.

Among her favorite projects are the first one to which she was assigned, a feasibility study for the Propulsion Controlled Aircraft project, and work as a simulation engineer on the X-43A. The hypersonic vehicles, flew a single time before landing in the ocean, but recorded the first data of a supersonic combustion ramjet engine in flight. The program marked two speed records for such a vehicle.

Le also has mentored new and junior engineers for projects such as the X-43A and the X-45 Unmanned Combat Attack Vechicle/Joint Unmanned Combat Aircraft System. She has also mentored student engineers in NASA's co-op program.

Robert R. Meyer Jr.

Robert R. Meyer Jr. is described by his nominators as "a visionary," as "hard-working and fair" and "a gifted pilot" and is one of Dryden's most important present-day leaders.

He was appointed as program manager of the Stratospheric Observatory for Infrared Astronomy program in 2006. Nominators called him "a savior of the SOFIA" for his orchestration of the program in its overall development and for his work preparing the aircraft for operational service. The observatory features a German-built 17-metric-ton telescope integrated in the body of a specially modified NASA 747SP.

Prior to his appointment as SOFIA program manager, Meyer was Dryden associate director for programs from 2004 to 2006. In that role he was responsible for implementing program activity and planning and advocacy for future research activity at the center.

He previously had served as acting deputy center director, director of Aerospace Projects, director of Research Engineering, assistant director of new program development and assistant for plans and programs.

Earlier in his Dryden career, Meyer served as chief of the Research Engineering Aerodynamics Branch and chief engineer on the F-18 High-Angle-of-Attack Vehicle research project. The HARV produced technical data to validate computer codes and wind tunnel research, to help improve the maneuverability of future aircraft.

He also was involved with aerodynamic loads tests on the space shuttle thermal protective tile system, development of a real-time cockpit trajectory guidance system and studies of laminar (smooth) airflow involving the F-111, F-14 and F-15 aircraft.

He has authored or co-authored some 25 papers on these topics. Meyer was one of two flight engineers who flew in the SR-71 flight research program.

James E. Murray

James E. Murray is an engineer working on with the Stratospheric Observatory for Infrared Astronomy and an aerodynamic researcher on the Blended Wing Body aircraft.

His work with the SOFIA involves looking at the approximately 1,000 tufts on the aircraft visible with one of three cameras (one on each wing looking inward and one on the tail looking downward) that can be used to gather analytical information. Data to be gathered includes measurements such as flow direction and flow state that can be compared with computational fluid dynamics results that together can be used to refine analytical models. On the BWB, he is studying how the aircraft reacts to wind shear and turbulence.

Nominators said this "old school inventor" is "smart," "a great thinker, problem solver," and an "innovator." Some nominators called him the "local mad scientist" and said he often works on "unseen, but important research."

Murray has worked on a wide variety of projects including the Autonomous Aerial Refueling project and demonstration, the Eclipse, the Inflatable Wing I-2000, the human-powered Daedalus aircraft, the F-18 High Alpha Research Vehicle, Dryden's Aerospike Rocket Test flight research project, Mars airplane concepts at Dryden and Langley Research Center, Va., and the Shaped Sonic Boom Demonstration flights.

He first came to Dryden in 1981 as a cooperative education student. Space shuttle missions had just begun and researchers were studying stability and control derivatives. Murray assisted Ken Iliff and Richard Maine with that work.

Murray knows Dryden capabilities and people and he offers these tips for succeeding at the center: "Volunteer for good projects before you get assigned to a bad one," and "Use the following selection criteria for choosing a project: Is this project really going to fly?"

Kendall D. Mauldin

Kendall D. Mauldin is a Dryden electrical engineer specializing in flight systems and avionics engineering work for the Flight Systems branch.

He integrates electrical systems into testbed aircraft and research vehicles. Included in that work is electrical circuit design, verification and integration testing, computer programming, research-requirements definition, procedure development, flight operations, test operations support and embedded systems design.

Mauldin's nominators had much to say about this "extremely sharp and personable" up-and-coming technical leader who is "reliable, smart and honest" and has demonstrated "outstanding leadership in [Crew Exploration Vehicle] avionics." "A bright, smart rising star," was one nominator's comment, while another said Mauldin is a "talented, innovative thinker." Described as a motivated engineer, nominators said he "leads with high expectations of himself and his team." He's also a team player, "collaborative and brings out the best in others."

He is known for his F-18 aircraft integration work on the Autonomous Airborne Refueling Demonstration project. Mauldin and the AARD team integrated a system that would autonomously refuel the F-18 while it is airborne, and successfully tested the system in flight in less than 14 months. The project required significant modifications to the F-18 flight control system. The project team developed data with which additional autonomous refueling work for uninhabited aerial vehicles could be completed to support U.S. Department of Defense UAV fleet upgrades, or future NASA autonomous UAV work.

He also has worked on the X-37; the F-15B Lifting Insulating Foam Trajectory flight test series; an ER-2 hurricane mission; and the Orion Flight Test crew module. Abort flight test with the latter is set for spring 2009 at White Sands Missile Range, N.M., and will evaluate the Orion's launch abort, landing and recovery systems.

Leslie M. Molzahn

Leslie M. Molzahn is deputy chief of the Operations Engineering branch.

Molzahn was called "sharp" and "driven" by her nominators, who consider her a "great mentor and leader." In addition, nominators also said she "has an understanding of operations requirements," is "an excellent motivator," "has technical and leadership expertise," "is enthusiastic and skilled," "has operational integrity," is "open-minded and caring," "high energy" and is a "pragmatic and future thinker."

She started at Dryden as a Spiral Technology contract employee in 2001. She supported the Active Aeroelastic Wing, Autonomous Formation Flight and Autonomous Aerial Refueling projects as a mission planner until the summer of 2003. During this time, she supported over 100 research missions from the control room. In 2003, Molzahn took a position as a civil servant in the Operations Engineering branch.

As an operations engineer, Leslie has supported research projects on the Gulfstream III/C-20, the DC-8 Flying Laboratory, the ER-2 high-altitude aircraft, and the F-15B and F-18 research aircraft.

She also fills the roles of mission controller, flight test engineer and senior operations representative. In 2008, she was part of the Quiet Spike Flight Test NASA/Gulfstream team that won an Aviation Week Laureate Award. The Quiet Spike researched suppression of sonic booms.

Molzahn currently represents Dryden as a member on the American Institute of Aeronautics and Astronautics Flight Test Technical Committee.

Having learned the importance of mentoring at Dryden, Molzahn focuses on mentoring cooperative education students and new employees. She enthusiastically supports outreach activities for the general public and local schoolchildren. She believes that NASA is an exciting place to work for the current generation and that ongoing research activities are key to inspiring future generations.

Chris Naftel

Chris Naftel is the Global Hawk project manager, which is fitting since he is known as the guy who convinced the Air Force to transfer two of its early Global Hawk test aircraft to Dryden.

Nominators pointed to his "abilities to organize" and said he "never gives up." In addition, one said, "Chris and his team have been critical in making NASA the first and only civilian agency to have access to these phenomenal vehicles that will revolutionize our scientific understanding of hurricanes, atmospheric rivers, atmospheric diurnal chemistry and radiation effects, storm development, ice melting, interactions and monitoring, (and) ocean current change effects."

Also with the Global Hawk project, Naftel established the project team and cultivated a partnership with Northrop Grumman. That partnership led to an April 30, 2008, agreement with Northrop that includes a five-year commitment to support Dryden's Global Hawk capability development and operations of the system.

Global Hawk is a fully autonomous high-altitude, long-endurance unmanned aircraft system. More information about the aircraft is available (on page 18) on new Dryden projects.

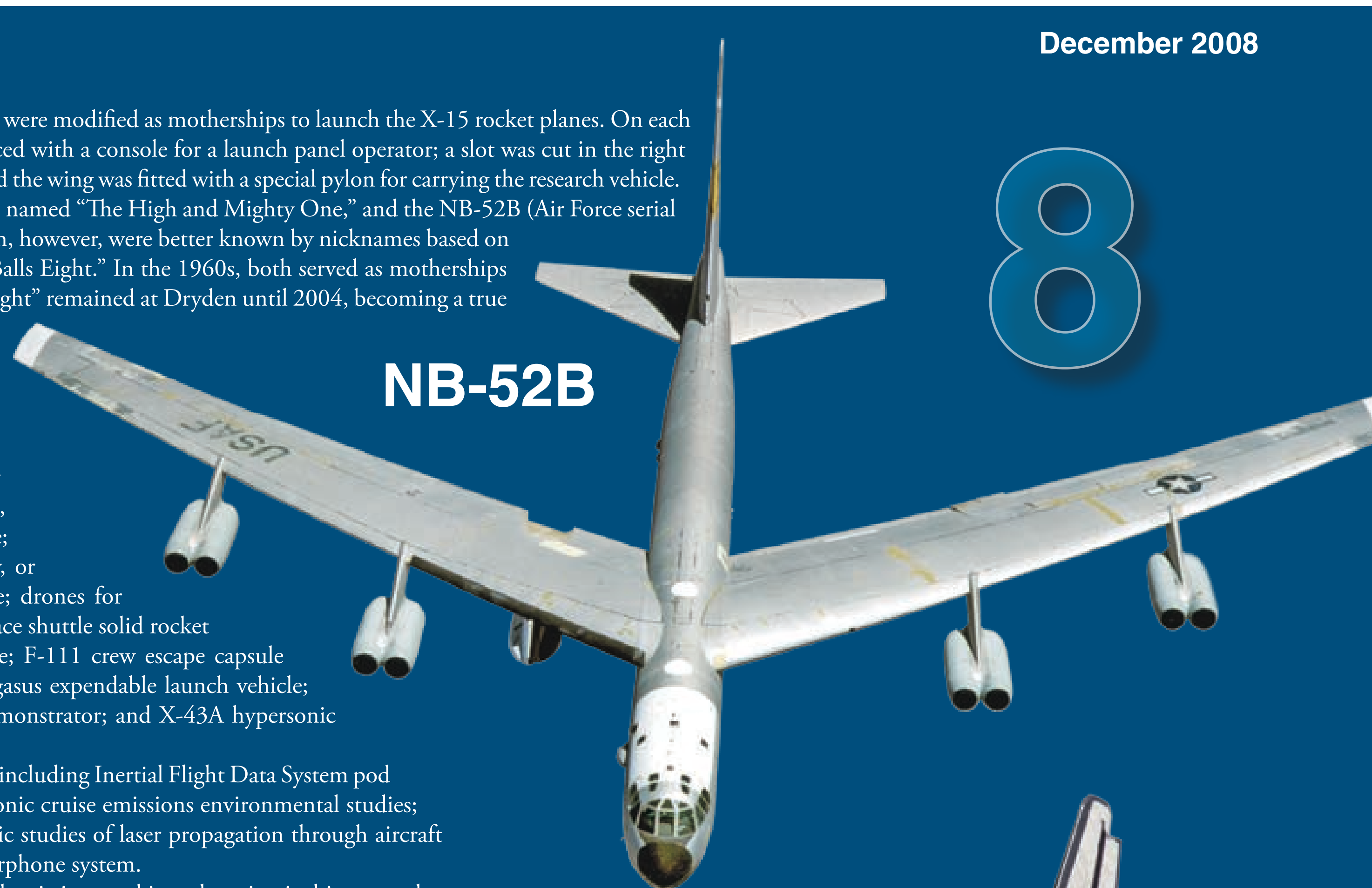
Dryden Global Hawk missions are expected to begin in spring 2009.

In addition to his Global Hawk work, Naftel is known for his contributions during the initial planning of the Crew Exploration Vehicle project. He has supported test planning and interface with the launch vehicle representatives at Marshall Space Center, Ala., from which he first came to Dryden in 2001 as a liaison on the X-43A program.

In 2004, he transferred to Dryden and supported work with the larger X-43C vehicle, which was designed to go even faster than the Mach 10 X-43A using a similar propulsion system, but that project was later cancelled.

8

NB-52B



Two Boeing B-52 Stratofortress bombers were modified as motherships to launch the X-15 rocket planes. On each aircraft, the bombardier's station was replaced with a console for a launch panel operator; a slot was cut in the right wing to accommodate the X-15's tail fin; and the wing was fitted with a special pylon for carrying the research vehicle. The NB-52A, Air Force serial 52-0003, was named "The High and Mighty One," and the NB-52B (Air Force serial 52-0008) was called "The Challenger." Both, however, were better known by nicknames based on their serial numbers – "Balls Three" and "Balls Eight." In the 1960s, both served as motherships for the X-15 and lifting bodies but "Balls Eight" remained at Dryden until 2004, becoming a true workhorse of aeronautical research.

The NB-52B was first used to launch an X-15 on Jan. 23, 1960, the fifth X-15 flight. It served as launch aircraft for 106 of the 199 X-15 research missions and several captive flights. It was also used as mothership for the lifting bodies (HL-10, M2-F2, M2-F3, X-24A, X-24B); F-15 Spin Research Vehicle; Highly Maneuverable Aircraft Technology, or HiMAT remotely piloted research vehicle; drones for aerodynamic and structural testing; as a space shuttle solid rocket booster parachute system drop test vehicle; F-111 crew escape capsule recovery system parachute test vehicle; Pegasus expendable launch vehicle; X-38 Crew Return Vehicle technology demonstrator; and X-43A hypersonic research vehicle.

It was used in numerous other programs, including Inertial Flight Data System pod tests; space shuttle drag chute tests; supersonic cruise emissions environmental studies; F-16 radar target studies; Air Force strategic studies of laser propagation through aircraft wake vortices; and tests of a prototype interphone system.

The airplane's fuselage was decorated with mission markings denoting its history and accomplishments. The NB-52B made a total of 1,051 flights and logged 2,443.8 flight hours. It was retired by NASA and returned to the Air Force on Dec. 17, 2004.

7

Lunar Landing Research Vehicle

Once NASA had been challenged to put a man on the moon and return him safely to Earth, attention turned to a delivery system for the mission. Less visible to the nation was how to resolve the matter of landing on the moon itself and then leaving it safely. Simultaneously but independently, engineers at the Flight Research Center (now Dryden) and Bell Aircraft Co. of Buffalo, N.Y., conceived of a free-flying machine meant to replicate the lunar environment – that is, the absence of an atmosphere, and one-sixth Earth's gravity.

NASA awarded Bell the contract to build two Lunar Landing Research Vehicles that were then sent to the FRC for research. The LLRV was built of lightweight aluminum tubing for reduced weight. A double gimbal held a General Electric CF700 fanjet engine in vertical position. It had small hydrogen peroxide thrusters at the four corners, and a cluster of larger thrusters anchored to the frame around the double gimbal.

For nearly three years pilots and engineers flew the LLRVs in various configurations, experimenting with thrust levels to determine settings ideal for replicating the Lunar Module's controls. Once a pilot reached altitude (200-300 feet), he engaged the lunar simulation mode. The computers weighed the vehicle, reduced engine thrust to compensate for only five-sixths Earth's gravity, and unlocked the engine gimbals.

All the Apollo spacecraft commanders trained in a Lunar Landing Training Vehicle – the training version of the research vehicle. Each commander credited the LLTV for making the actual lunar landing familiar. Perhaps the most remarkable feature of an extraordinary aircraft was the control system: engineers chose an analog fly-by-wire system with no mechanical backup. It became the first genuine fly-by-wire aircraft, and its success led directly to Dryden's 1970s-era digital fly-by-wire experiments with an F-8.

6

Approach and Landing Tests, space shuttle support

Support for the space shuttle program had been provided at Dryden in many ways, some of which predate the very design of the orbiters.

More than a decade before the Enterprise research flights, Dryden pilots and engineers were testing and validating design concepts of lifting body aircraft that provided data for development of the shuttle's configuration. Dryden also made significant contributions to development of the shuttle's thermal protection system, solid rocket booster recovery system, flight control system computer software, drag chutes, which helped improve landing efficiency and safety, and tests of the shuttle landing gear and braking systems with a specially designed Landing Systems Research Aircraft.

Experience in energy management with lifting body aircraft also contributed to development of the space shuttles and landing techniques used today. Lifting body data led to NASA's decision to build the orbiters without air-breathing jet engines that would have been used during descent and landing operations, and would have added substantially to the weight of each vehicle as well as to overall program costs.

Achievements with the rocket-powered X-15 aircraft also contributed directly to the space shuttle program, or aided in its development. As the X-15 program was establishing winged aircraft speed (4,520 mph) and altitude (354,200 feet) records that still stand (except for those established by the space shuttles), it was generating information on aerodynamics, structures, thermal properties, and flight controls and human physiology that quickly found its way to conventional aircraft designers and engineers and those connected with the early stages of shuttle development.

In 1972, Dryden began research flights with the first aircraft equipped with a digital flight control system (see F-8 DFBW entry for more information), which had implications and direct application for the space shuttles.

The concept of using a mothership for the space shuttle ferry mission between California and Florida was proposed at Dryden. The Boeing 747 Shuttle Carrier Aircraft evolved from recommendations made by center engineers. The SCA was subsequently used to launch the prototype Enterprise and now serves as one of two ferry vehicles when weather requires an orbiter to land at Edwards and return to Kennedy.

In 1977, Dryden hosted approach and landing tests made with the prototype orbiter Enterprise to evaluate the glide and landing characteristics of the 100-ton vehicles. Dryden has also been the primary or alternate landing site for 51 space shuttle landings since the first orbital mission in 1981.

5

NASA made aviation history with the first and second successful flights of an X-43A scramjet-powered airplane at hypersonic speeds – speeds greater than Mach 5, or five times the speed of sound.

Compared to a rocket-powered vehicle like the space shuttle, vehicles powered by scramjet (supersonic combustion ramjet) engines promise more airplane-like operations for increased affordability, flexibility and safety on ultra-high-speed flights within the atmosphere and into Earth orbit. Because they do not have to contain their own oxidizer, as rockets must, vehicles powered by air-breathing scramjets can be smaller and lighter – or be the same size but carry a larger payload.

No vehicle powered by an air-breathing engine had ever flown at hypersonic speeds before the successful March 2004 X-43A flight that collected the first data from a scramjet engine in flight. In addition, the rocket boost and subsequent separation from the rocket to get to the scramjet test condition had complex components that had to work properly if the mission was to succeed. Careful analyses and design were applied to reduce risks to acceptable levels though some level of residual risk was inherent to the program.

Three unpiloted X-43A research aircraft were built. Each of the 12-foot-long, 5-foot-wide vehicles was designed to fly once and not be recovered. They were identical in appearance, but engineered with differences relating to their designed Mach speed. The first and second vehicles

See X-43A, page 20

X-43A

Thrust Vectoring, High-Alpha Research

4

The center used an F-18 as the High Angle-of-Attack Research Vehicle in a program from 1987 to 1996. Fresh from its reconstruction (it was assembled from many parts and affectionately dubbed "Silk Purse"), the aircraft was extensively instrumented both to record data at high angles of attack and as a means of developing flight research techniques in high-alpha flight. Researchers also conducted visual studies of the airflow over various parts of the aircraft at high alpha using tracer smoke, tufting and anti-freeze with dye.

The potential of vectored thrust to achieve greater maneuverability and control at high angles of attack was also examined, while correlation of data gleaned through wind-tunnel tests and computational fluid dynamics continued. Three paddles were mounted around each engine's exhaust nozzle, providing both pitch and yaw forces to enhance maneuverability when aerodynamic controls were either unusable or less effective than desired because of the angle of attack. The thrust vectoring control system added 2,200 pounds to the aft of the aircraft, leading to the comment that the aircraft "had a ton of thrust vectoring."

Thrust vectoring yielded dramatic results; demonstrated capabilities included stable flight at approximately 70 degrees angle of attack (the previous maximum being 55 degrees) and high roll rates at 65 degrees angle of attack. Controlled rolling would have been nearly impossible above 35 degrees without vectoring.

The "Silk Purse" was then modified with an engine inlet pressure-measurement system, providing unprecedented understanding of engine airflow behavior during extreme maneuvers. The final step in the program was addition of moveable strakes on both sides of the aircraft's nose to provide yaw control at angles of attack high enough to render conventional rudders ineffective.

This research informed two subsequent programs, those with the F-15B Advanced Control Technology for Integrated Vehicles and the X-31 aircraft, both of which incorporated types of thrust-vectoring technology. The X-31 proved itself not only stunningly maneuverable but it demonstrated a shocking kill ratio margin in mock combat. Thrust vectoring has been partially adopted by the U.S. military, appearing for the first time on the F-22, which flies with a single-axis exhaust vectoring system. The Russians have also embraced the concept, and thrust vectoring appears as an option on the MiG-29, the Su-30 and Su-37.

F-8 Digital Fly-By-Wire

3

The Digital Fly-By-Wire project pioneered the use of an electronic flight-control system coupled with a digital computer to replace conventional mechanical flight controls.

A modified F-8 DFBW Crusader was the first to be used to validate the concept in 1972 at the Flight Research Center (now Dryden). It was the forerunner of the fly-by-wire flight control systems now used on the space shuttles and on today's military and civil aircraft to make them safer, more maneuverable and more efficient.

The system is safer because of its redundancies and because, for military aircraft, wires are less vulnerable to battle damage than the hydraulic lines previously used. The aircraft was more maneuverable because computers could command more frequent adjustments than a human pilot and designers could eliminate features that made the plane more stable and less maneuverable. A fly-by-wire aircraft also is much more responsive to pilot control inputs.

For airliners, computerized flight control ensured a smoother ride than a human pilot alone could provide. Finally, digital fly-by-wire was more efficient because it was lighter and took up less volume than hydraulic controls and thus either reduced the fuel required to fly with the extra weight of the hydraulics and/or permitted aircraft to carry more passengers or cargo. It also required less maintenance than the systems it replaced.

In addition to pioneering the space shuttle's fly-by-wire flight-control system, the F-8 DFBW testbed was used to explore pilot-induced oscillations and validated methods needed to suppress them. PIOs occur when a pilot over-controls an aircraft and a sustained oscillation results. In 1977, on the last of five free flights of Enterprise during approach and landing tests, a PIO developed as the vehicle settled onto the runway. The problem was duplicated with the F-8 DFBW and a PIO suppression filter was developed and tested on the aircraft for use in the orbiter.

Lifting body aircraft

A fleet of lifting-body research vehicles were flown at Dryden from 1963 to 1975 to validate the concept of flying a wingless craft back to Earth from space and landing it like a conventional aircraft at a pre-determined site. Aerodynamic lift – essential to flight in the atmosphere – was obtained from the shape of the vehicles rather than from wings, as on a normal aircraft.

In 1962, Flight Research Center director Paul Bikle approved a program to build a lightweight, unpowered lifting body as a prototype to test the wingless concept. The M2-F1's half-cone shape looked like a "flying bathtub" and featured a plywood shell over a tubular steel frame. Initially towed aloft by a Pontiac convertible driven at speeds up to 120 mph across Rogers Dry Lake, the vehicle was later towed behind a C-47 and released for glide flights from greater altitudes. More than 400 ground tows and 77 aircraft tow flights were carried out with the M2-F1 before it was retired. A historical artifact now owned by the Smithsonian Institution National Air and Space Museum, the M2-F1 is on long-term loan to Dryden for display purposes.

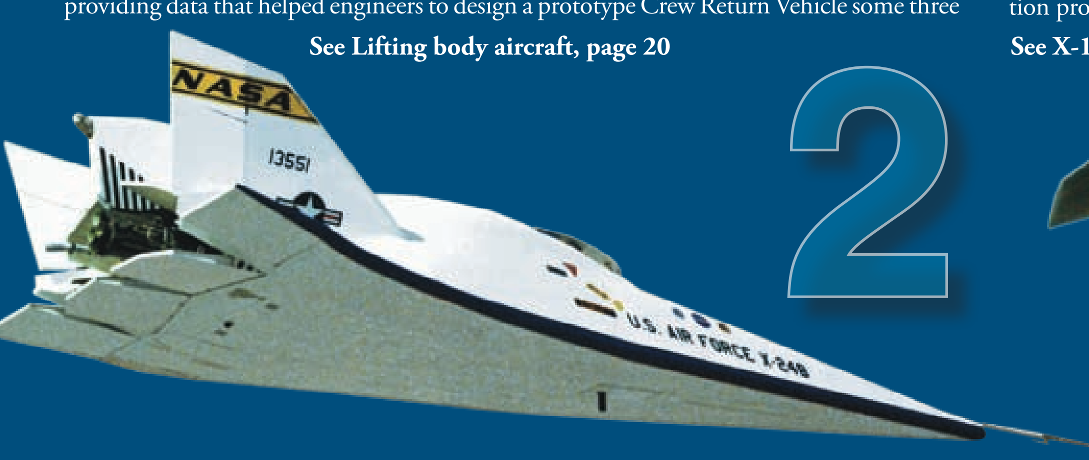
The success of the M2-F1 program led to development and construction of two heavyweight lifting bodies, the M2-F2 and the HL-10, that were carried to launch altitude beneath the wing of a modified B-52 and launched to complete rocket-powered flight profiles followed by a glide landing on the dry lakebed. The first flight of the M2-F2 (which looked much like the M2-F1) took place on July 12, 1966. On May 10, 1967, during the 16th flight, a landing accident severely damaged the vehicle and seriously injured NASA research pilot Bruce Peterson. It was subsequently rebuilt with modifications for improved control characteristics and re-designated M2-F3. During more than two-dozen flights, the M2-F3 reached a top speed of 1,064 mph (Mach 1.6) and a maximum altitude of 71,500 feet. It is now on display in the National Air and Space Museum in Washington, D.C.

The HL-10 had a more streamlined aerodynamic shape than did the M2-series vehicles. It featured a longitudinally curved bottom and a laterally rounded top and had a delta planform. Following its maiden flight on Dec. 22, 1966, it set several program records, including the fastest speed reached by any of the lifting bodies – 1,228 mph (Mach 1.86) – and highest lifting body flight – 90,303 feet. Data from these flights contributed substantially to development of the space shuttles. The HL-10 is now on public display at the entrance to Dryden.

In 1969 another shape, the bulbous X-24A, was introduced. It was flown 28 times, providing data that helped engineers to design a prototype Crew Return Vehicle some three

See Lifting body aircraft, page 20

2



X-15

The X-15 program is widely considered the most successful research aircraft program in U. S. history, leaving a legacy of scientific data and aeronautical firsts that remains unparalleled. Between June 8, 1959, and Oct. 24, 1968, a dozen pilots flew three rocket-powered X-15 research vehicles 199 times. The program contributed to numerous advances in aerospace technology, including those in materials, hypersonic aerodynamics, astronomy and spaceflight. Researchers generated more than 760 technical reports and earned numerous awards and honors for the X-15 team.

Launched from beneath the wing of a modified B-52, the X-15 was the first piloted aircraft to exceed Mach 4, 5 and 6, and ultimately attained a maximum speed of Mach 6.7 (4,520 mph). Eight of the pilots earned astronaut wings for flight above 50 miles altitude. NASA research pilot Joseph A. Walker achieved the highest flight, with a maximum altitude of 354,200 feet (roughly 67 miles). The X-15 vehicles exceeded design specifications and yielded a treasure trove of data of great value to the design of future aerospace vehicles. They have also provided many lessons for future flight research, many of which could not have been anticipated at the time the project was initially approved and funded.

Technological contributions of the program include experience afforded in the design, fabrication, and welding of titanium and Inconel X, a nickel-chromium alloy from which the X-15 was constructed to withstand extreme aerodynamic heating. Advanced titanium and nickel alloys and structures were subsequently employed throughout the aerospace industry in aircraft and spacecraft, including those used in the Apollo lunar exploration program.

See X-15, page 20

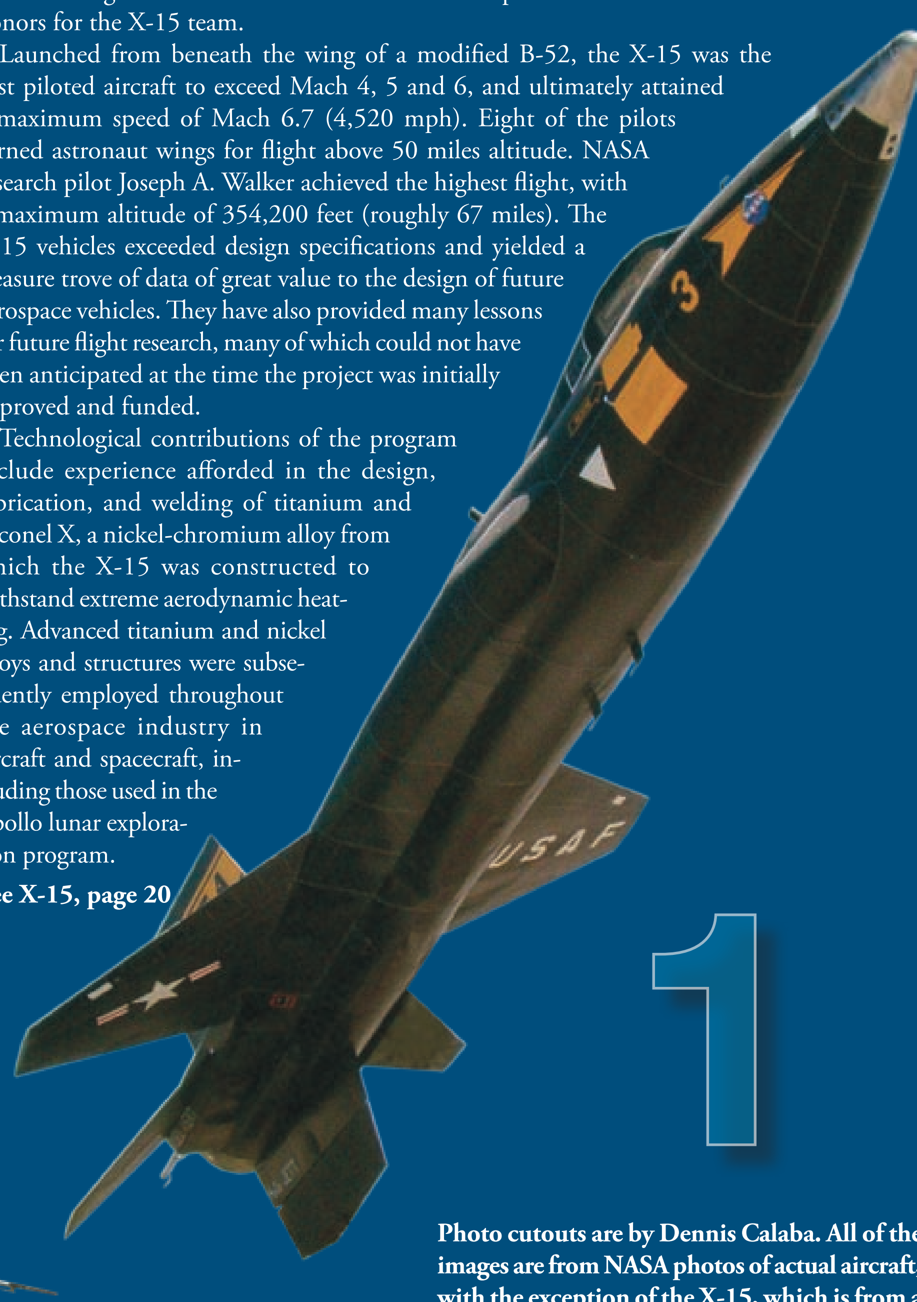


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Photo cutouts are by Dennis Calaba. All of the images are from NASA photos of actual aircraft, with the exception of the X-15, which is from a photo Calaba took of the replica X-15.

Stanley P. Butchart

Stanley P. Butchart was a research pilot at NASA's Flight Research Center (today known as Dryden). When he started work on May 10, 1951, the center was known as the NACA High-Speed Flight Research Station.

He flew several research aircraft, including the Douglas D-558-I Skystreak, Douglas D-558-II Skyrocket, the Northrop X-4 and the Bell X-5 research aircraft.

As the center's principal multi-engine aircraft pilot, Butchart flew the Boeing B-29 (plus its Navy version, the P2B) motherships for air-launches of the D-558-II and several of the X-1 rocket planes. As the pilot in command on the B-29/P2B motherships, Butchart directed operations. As pilot of the B-29/P2B, Butchart launched the X-1A once, the X-1B 13 times, the X-1E 22 times and the D-558-II 102 times.

Butchart served as launch panel operator on the B-52 used for air-launching the X-15 rocket plane. In addition, he towed the M2-F1 lightweight lifting body 14 times behind a Douglas R4D, the Navy version of the C-47, and the DC-3. Butchart also flew the Boeing KC-135, B-47, 720 and 747, the Convair CV-880 and CV-990.

Additional aircraft he flew included the North American F-100A, McDonnell F-101, Convair F-102, Lockheed F-104 and General Dynamics F-111 fighters and the Lockheed JetStar (which he considered his favorite).

Butchart was head of the Research Pilots branch (chief pilot) for six months and then was chosen as acting chief of flight operations. He was selected as chief in December 1966 and held the post until retirement.

Butchart received the NACA Exceptional Service Medal for his decisions and action when the X-1A exploded while attached to the B-29 on Aug. 8, 1955. Although the X-1A had to be jettisoned and was destroyed in the ensuing crash, X-1A pilot Joe Walker, the B-29 and its crew landed safely without injury or damage.

Butchart retired in 1976 and died Oct. 1, 2007, at the age of 85 in Lancaster, Calif.

A. Scott Crossfield

A. Scott Crossfield tallied the most experimental aircraft rocket flights of any test pilot in history. He joined the National Advisory Committee for Aeronautics at the High Speed Flight Research Station (the predecessors to NASA and Dryden) as a research pilot in June 1950. He flew the X-1, X-4, X-5, XF-92A, D-558-I and the D-555-II, which included 87 rocket flights in the X-1 and D-558-II.

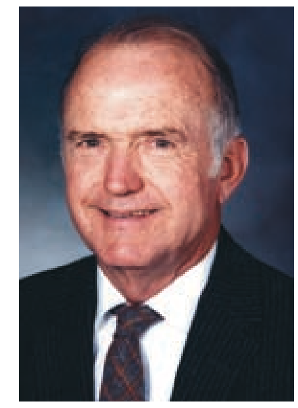
He made aeronautical history on Nov. 20, 1953, when he reached Mach 2, or more than 1,320 miles per hour in the D-558-II Skyrocket. Taken aloft in the supersonic, swept-wing research aircraft by a Boeing P2B-1S (the Navy designation of the B-29) mothership, he was dropped clear of the bomber at 32,000 feet and climbed to 72,000 feet before diving to 62,000 feet, where he became the first pilot to fly more than twice the speed of sound. Crossfield left the NACA in 1955 to join North American Aviation as contractor pilot for the X-15. In this role and as a result of his extensive rocket plane experience, he was responsible for many of the operational and safety features incorporated into the X-15 and was intimately involved in the aircraft's design.

He piloted its first free flight in 1959 and subsequently qualified the first two X-15s for flight before North American delivered them to NASA and the U.S. Air Force. He completed 16 captive-carry (mated to the B-52 launch aircraft), one glide and 13 powered flights in the X-15, reaching a maximum speed of Mach 2.97 (1,960 mph) and a maximum altitude of 88,116 feet.

Crossfield also was system director responsible for systems test, reliability engineering and quality assurance for North American Aviation on the Paraglider vehicle, the Apollo Command and Service Module and the Saturn V rocket second stage.

From 1977 until his retirement in 1993, he served as technical consultant to the U.S. House of Representatives Committee on Science and Technology, advising members on civil aviation. Crossfield died on April 19, 2006, when his private plane crashed near Ranger, Ga.

William H. Dana



Garnering the most mentions of any nominee is William H. "Bill" Dana, who started work at Dryden on the day the NACA began business as NASA, Oct. 1, 1958.

His most recognized work came as a project pilot on the X-15 research aircraft, which he flew 16 times, reaching a top speed of 3,897 mph and a peak altitude of 307,000 feet (nearly 59 miles).

He also was the pilot on the final (199th) flight of the program. He was awarded his astronaut wings in 2005 for his X-15 altitude flights.

In the late 1960s and the 1970s, Dana was a project pilot on the manned lifting body program, in which he flew the M2-F1, the M2-F3 and the HL-10. He also made the last flight in a rocket-powered X-24B.

Dana retired as Dryden's chief engineer following an almost 40-year career. Before his assignment as chief engineer, he was assistant chief of the Flight Operations division, a position he accepted after serving since 1986 as chief pilot.

During his career, Dana also flew the F-100 variable stability research aircraft and the Advanced Fighter Technology Integration F-16 aircraft. He also was the project pilot on the F-15 Highly Integrated Digital Electronic Control research program, and co-project pilot on the F-18 High Angle of Attack Research Vehicle.

Dana has been recognized for his involvement in some of the most significant aeronautical programs carried out at Dryden. For his service as a flight research pilot, he received NASA's Distinguished Service Medal in 1997. In 2000, Dryden officials awarded him with the Milton O. Thompson Lifetime Achievement Award.

For his contributions to the lifting body program, Dana received the NASA Exceptional Service Medal. In 1976 he received the Haley Space Flight Award from the American Institute of Aeronautics and Astronautics for his research work on the M2-F3 lifting body control systems.

"Dana is approachable, humble and one of the living legends of Dryden lore," a nominator wrote. "His career behind the stick speaks volumes of the pilot Dana was and he still evokes awe and wonder in us all."

Griffin Corpening

Griffin Corpening was Dryden's X-43A chief engineer for flights one and two and senior project advisor for the final flight.

Corpening had worked on the X-43A project since its 1997 inception at Dryden. The opportunity to work on the hypersonic aircraft was a key reason Corpening said he came to NASA. As Dryden's chief engineer on the X-43A, he oversaw technical operations and research objectives for the vehicles. He also coordinated activity with project team counterparts at Langley Research Center, Hampton, Va., and industry partners ATK-GASL, Orbital Sciences Corp., and The Boeing Company's Phantom Works.

Project engineers' biggest obstacle was figuring out how to separate the research vehicle from the adapter-booster combination while the pair was flying at Mach 7. The engineering feat had never been accomplished and the test bed's irregular shape added to the challenges.

Corpening and the team examined options for the separation and the one that made the most sense was pushing the two vehicles away from each other at the highest possible rate of speed. The X-43A hypersonic vehicles also had unique systems that required testing and integration, presenting yet another set of challenges.

After a first flight failure, all elements of the launch and research vehicles were reexamined. A Mishap Board made recommendations and a return-to-flight plan was developed leading to successful second and third X-43A research flights.

Corpening worked on a number of programs in addition to X-43A at Dryden, but all were related to hypersonic vehicles and their propulsion systems. Among these are the Linear Aerospike SR-71 Experiment, or LASRE, in which a scale model of an X-33 propulsion system was flight-tested; HYFLITE, a proposed hypersonic flight experiment associated with the National AeroSpace Plane program; and the proposed SR-71 External Burning Experiment.

Joseph D'Agostino

Joseph D'Agostino retired in 2007 as Dryden's space shuttle manager. In fact, a majority of his work since starting at Dryden in 1976 involved space shuttle operations.

He was a security officer for the approach and landing tests of the space shuttle prototype Enterprise. His tasks included developing and enforcing security in a place where there were no gates, badging was frowned upon and the culture was not suited to following protocol, he recalls. D'Agostino drew from previous experience when overseeing security for an event that included former President Lyndon B. Johnson when President Ronald Reagan attended Columbia's landing at Edwards Air Force Base on July 4, 1982.

His jobs at Dryden have included communications officer, center deputy director, transportation officer, facilities chief, and head of photography, video and security. In his post as communications officer, he wrote the proposal for the first digital phone system at Dryden. The system also was used at other NASA centers. As transportation officer, he was able to replace a fleet of vehicles that averaged 15 years of age with a fleet that averaged about five years in age.

A highlight of his career was moving the first two orbiters from the production site at Air Force Plant 42 in Palmdale, down 10th Street East – now Challenger Way – to Edwards. He also won numerous peer and NASA awards for his space shuttle work. He also assisted with the space shuttle's return to flight following the Columbia accident. That shuttle landed at Dryden. D'Agostino retired in February 2007.

Many of his management philosophies originated with legendary astronaut Deke Slayton, who D'Agostino worked for early in his NASA career. A key component of that is to exercise scenarios about known challenges. "If there are 10 major problems, but you've had a chance to practice eight of them, that means you can spend your best efforts on the two you have to worry about. But every situation is different, and the unexpected always happens," D'Agostino said.

C. Gordon Fullerton

C. Gordon Fullerton was a Dryden research pilot and a former NASA astronaut before his retirement in January 2008.

He served for 21 years as a research pilot on a number of high-profile projects. Fullerton also served later in his Dryden career as associate director of flight operations and as chief pilot. In addition, Fullerton logged 382 hours in space flight on two space shuttle missions while a member of the NASA astronaut corps from September 1969 until November 1986.

Fullerton was project pilot on the NB-52B aircraft, which included piloting the air launch of the "stack" that contained the Pegasus rocket booster and hypersonic X-43A testbed. He was project pilot on the Propulsion Controlled Aircraft project, in which he successfully landed in separate flights a modified F-15 and an MD-11 transport using only engine thrust modulation for control.

He also served as project pilot for a series of high-speed landing tests of space shuttle landing gear components installed on a modified jetliner.

Fullerton flew aircraft such as the F-111 Mission Adaptive Wing, X-29 vortex flow control and experiments on the F-18 Systems Research Aircraft. He also served as pilot-in-command of NASA's 747 Shuttle Carrier Aircraft on numerous ferry flights of space shuttles from Edwards to the Kennedy Space Center, Fla.

During Fullerton's assignment to Johnson Space Center, Houston, he served on the support crews for the Apollo 14, 15, 16 and 17 lunar missions. In 1977, Fullerton was assigned to one of two flight crews that piloted the Enterprise during the Approach and Landing Test program at Dryden. Fullerton was the pilot on the eight-day STS-3 space shuttle orbital flight test mission and commander of the STS-51F Spacelab 2 mission.

He piloted more than 135 different types of aircraft during his Air Force and NASA career, amassing more than 16,000 flight hours.

Fitzhugh L. Fulton

Fitzhugh L. Fulton was a research pilot and chief test pilot on several Dryden aircraft.

His 20-year Dryden career involved piloting research missions. As a research pilot his duties included planning, briefings, reviewing mission safety requirements, flying the missions, debriefing them and writing a report detailing mission accomplishments. As chief pilot, he supervised research pilots and other crewmembers. He also supervised technicians in the Flight Crew branch.

Fulton was assigned as primary pilot, or one of the primary pilots on aircraft such as the XB-70 high-speed research aircraft, the YF-12/SR-71 aerodynamic research project, the NASA 747 Shuttle Carrier Aircraft project, and the NASA B-52B aircraft used to air launch the X-15, lifting body aircraft and uninhabited aircraft.

Fulton was the project pilot on all early tests of the 747 SCA used to air launch the Space Shuttle prototype Enterprise in the Approach and Landing Tests at Dryden in l977. During these flights, the SCA carried the unpowered Enterprise to an altitude of about 25,000 feet, where it was separated from the 747 and flown to a landing by the Shuttle test crew. Several uncrewed and crewed captive flights preceded the initial free-flights.

For his work in the ALT program, Fulton received NASA's Exceptional Service Medal. He also received the Exceptional Service Medal again in 1983 for flying the 747 SCA during the European tour of Enterprise. After orbital flights began in 1981, Fulton continued to fly the SCA during ferry missions returning Orbiters to the Kennedy Space Center, Florida.

He also was the project pilot for the Boeing 707-720 Controlled Impact Demonstration. The aircraft was flown remotely from the ground and used to test a special fuel additive and survivability of the aircraft, which crashed under controlled conditions.

Fulton considers his greatest accomplishment to be more than 18,000 hours of flying during more than 50 years with the Air Force and NASA without having to eject from an aircraft and without a single serious crewmember injury.

Kenneth W. Iliff

Kenneth W. Iliff had experience in writing computer programs to simulate the flight behavior of aircraft when he joined the Flight Research Center (now Dryden) in late 1962. To put those skills in perspective, flight data at that time still was recorded on film and measurements were made with a ruler. His skills were immediately put to use on study of the handling qualities of the X-15 and, later, on a heating study and analysis of proposed modifications. Iliff became Dryden's chief scientist in 1994, a position he held until his retirement in 2002.

Iliff also worked on the M2-F1's controls. He applied then state-of-the-art control analysis techniques of Bode plots and root locus and then used the FRC computer to do the calculations. Iliff's work sped up the process and demonstrated the advantages and pitfalls of the different control configurations. He worked on the M2-F2 heavyweight lifting body aircraft, before transferring to the XB-70 program – and also provided support on the HL-10 lifting body aircraft.

Iliff developed a technique to assess data called "maximum likelihood estimator." A revised version called the "modified maximum likelihood estimator" is used worldwide for analysis, test and research flight data.

Iliff also worked on the X-24A, M2-F3 and X-24B lifting body aircraft and participated in early studies of the space shuttle, including computer simulations of the re-entry and landing of various shuttle designs, and was instrumental in assembling the shuttle's Aerodynamic Data Book, a collection of aerodynamic data from wind tunnels and flight tests. The book was used in predicting the shuttle's flight characteristics, and once the shuttle was making orbital flights, Iliff analyzed the re-entry data. In addition, he worked on projects like the X-29 forward swept wing, the F-18 High Angle of Attack program, the F-15 Spin Research Vehicle, and with thrust-vectoring and super maneuverability.

He received NASA's highest scientific honor, the Exceptional Scientific Achievement Award in 1976, followed by the Society of Flight Test Engineers Kelly Johnson Award in 1989. He has authored more than 100 technical papers.

Gary E. Krier

Gary E. Krier is a former Dryden research pilot and director of several departments within Dryden.

He is best known as a team member and project pilot for the F-8 Digital Fly-By-Wire aircraft, co-project pilot for the F-8 Supercritical Wing project and project pilot of the Integrated Propulsion Control F-111E.

He also is known for leading the initial effort to consolidate aircraft operations and form the Airborne Science organization at Dryden using the aircraft transferred from Ames Research Center, Moffett Field, Calif.

Krier was an aerospace research pilot and engineer at Dryden after first starting to work at NASA in 1967. He was the first pilot to fly the F-8 DFBW aircraft and the Integrated Propulsion Control System F-111E with digital fuel and inlet control. The F-8 DFBW was the first to be used to validate the concept in 1972. It was the forerunner of the fly-by-wire flight control systems now used on the space shuttles and on today's military and civil aircraft to make them safer, more maneuverable and more efficient.

In addition, he flew the YF-17 research aircraft and has flown more than 30 types of aircraft ranging from light planes to the NB-52B and the triple-sonic YF-12.

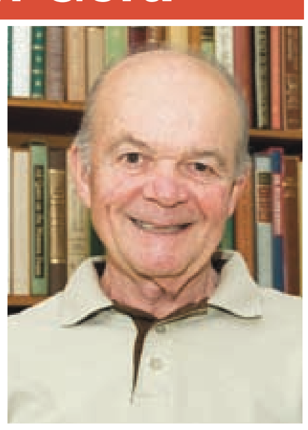
He served in numerous positions during his Dryden career, including acting deputy director, chief engineer, director of the Systems Management office, and director of the Airborne Science directorate. He also headed the center's Aerospace Projects directorate and led the Intercenter Aircraft Operations directorate.

Krier also served in several NASA Headquarters positions as well, his last in 1994.

He served for two years as manager, Operations and Facilities, for the New Launch System. Prior to that assignment, he held two management positions at Headquarters relating to space shuttle operations.

Krier also was director of the Commercial Development Division, Office of Commercial Programs, and as director of the Aircraft Management Office. At Ames, he was an attorney in the Office of the Chief Counsel.

Joseph Gera



Joseph Gera retired from Dryden in 1995 as chief of the Dynamics and Controls Branch and returned to work at the center for Analytical Services and Materials Inc. on the Eclipse and Active Aeroelastic Wing projects. Many of those at Dryden know him best for his work as a flight controls engineer.

Gera began his NASA career at Langley Research Center, Hampton, Va., in 1962 and transferred to Dryden in 1979. He worked as flight controls lead on a spin-prevention system for the F-14B Aileron Rudder Interconnect, a joint Dryden/Langley project.

He worked on the Highly Maneuverable Aircraft Technology project flight controls system as lead engineer during an 18-month exchange assignment at Dryden. Gera returned to Langley and six months later, requested and received a permanent assignment here.

In that assignment, he worked with Ken Szalai on the F-8 Digital Fly-By-Wire aircraft. He worked on flight control systems design and was a contributor on both the flight control system and aircraft simulator.

He also was lead engineer on the control system for the X-29 forward-swept-wing aircraft. In addition, Gera was a contributor to the X-31 flight control system. During the X-31 program he was promoted to chief of the Dynamics and Controls Branch. Prior to his retirement in 1995, he also served on the X-31 accident investigation board.

Gera also gained experience as a NASA representative working with international partners. He worked with Saab on the Gripen multi-role fighter for Sweden and assisted the Defense Advanced Research Projects Agency in evaluation of the Russian Wingship for civilian and military use.

He also assisted European countries in development of the Eurofighter Typhoon multi-role aircraft, independent of his work at NASA.

Calvin R. Jarvis

Calvin R. Jarvis for a decade was Dryden's deputy director or director of the Dryden Aerospace Projects Office.

Guidance and flight controls, electronics, handling qualities, and integrated systems were Jarvis' specialties. He worked extensively in the research, development, evaluation and management of numerous state-of-the-art flight control systems beginning with the X-15, the Lunar Landing Research Vehicle, the F-8 Digital Fly-By-Wire program, the F-18 High-Angle-of-Attack Research Vehicle development, to name a few.

Jarvis was a key F-8 DFBW flight research program advocate and project manager for phases I and II. The F-8 DFBW program was instrumental in establishing the baseline hardware and software requirements used in the development of advanced digital flight controls for military and commercial aircraft, including the shuttle. DFBW technology evolved out of the LLRV program; the LLRV had an analog fly-by-wire system.

He served as director of the Dryden Aerospace Projects Directorate, through which Dryden's flight research projects were managed. These included joint activities such as the NASA and U.S. Department of Defense X-29 forward swept wing aircraft and X-31 experimental aircraft programs to in-house flight research experiments such as the F-18 HARV. He also was part of the management of a cooperative NASA and Russian International Aerospace program to refurbish and utilize a Tu-144 supersonic airliner as a testbed in support of a joint NASA/industry program to develop a commercial hypersonic transport aircraft.

Jarvis was deputy director of the inter-agency F-16 AFTI joint test force through which the first Air Force operational digital fly-by-wire flight control system was developed. He served as director of the Ames Research Center, Moffett Field, Calif. and Dryden National Aerospace Plane Project Office. He also authored 20 NASA technical publications and reports.

Wilton P. Lock

Wilton P. Lock is described by his nominators as one of Dryden's many unsung heroes and pioneers. Lock has been at the center for more than 40 years.

An often quiet and soft-spoken man, when Lock speaks, people listen, according to his nominators. He was instrumental in the development, flight test and success of the F-8 Digital Fly-By-Wire research program, one of Dryden's most significant contributions to modern flight controls. That project (see entry on the F-8 DFBW) had significant influence on the flight controls not only for modern civilian and military aircraft, but also for NASA's fleet of space shuttles.

As operations engineer for the F-15B, Lock contributed to the success of the Active Controls Technology for Integrated Vehicles project, in which new engine technologies such as thrust vectoring (using the engine's thrust for directional control) were demonstrated. He also is a team member for the F-15B Intelligent Flight Control System programs. IFCS efforts are focused on developing concepts such as health monitoring and adaptive flight controls.

Nominators also praised Lock's knowledge and experience with the aircraft. That experience has been vital to keeping the aging aircraft available for flight research projects.

In addition, Lock contributed for more than four decades to Dryden projects involving the X-15 aircraft no. 1 and no. 2; the Lunar Landing Research Vehicle simulation; the XB-70 no. 1 Structural Mode Control System; and the F-8 Super Critical Wing.

Lock also worked on the F-111 Mission Adaptive Wing; the increasingly complex projects on the F-15 Highly Integrated Digital Electronic Control; the F-15 Self Repairing Flight Control System; and the MD-11 Propulsion Controlled Aircraft.

Lock also has been an inspiring mentor to many engineers, according to his nominators, some of whom he helped start their careers.

Betty S. Love

Betty S. Love came to the NACA Muroc Unit in 1952 to work as a "computer."

Women were hired by the NACA and by most military branches as "computers" to reduce raw data into something engineers could read. The exception was the Navy, which replaced its women computers with the Electrical Numerical Integrator And Calculator, or ENIAC. Love read and time-marked film, transferred data points to paper, and graphed research results derived with various X planes. One such task was reducing the film data from the X-1A's Dec. 12, 1953, flight, during which the aircraft experienced violent instability and tumbled before the pilot recovered the aircraft.

By 1955 she had risen to Aeronautical Engineering Technician in the Aero Structures Branch. There she worked closely with engineers in data analysis and the creation and presentation of flight reports. She was co-author on several professional papers.

She also became keeper of the flight logs for all three of the X-15s and for two XB-70 flights. In addition, she became the holder of pertinent data on the aircraft, data needed for configuration changes, and photographs documenting the programs.

She retired in 1973, but returned in 1996 as a volunteer in the center's history office, where her experience and knowledge have been invaluable, according to nominators. In addition to cataloguing various collections in the history office collection, she is one of the few who can identify faces in historic photos, either from her own memory or through the contacts she maintains. Betty Love represents one of the rare links to the center's early history and helps to bridge the center's past and present.

Another of Love's many contributions was her work to gather film clips featuring former pilot Joe Walker, also included on this list of Dryden's Driving Forces, for the 1960s-era movie made about Walker entitled "Pathway to the Stars."

John B. McKay

John B. McKay was a "steel-nerved" test pilot, nominators said. He specialized in high-speed research programs when he came to Dryden in 1952 (then the High-Speed Flight Research Center) after interning at Langley Research Center, Hampton, Va., in 1951.

McKay flew such experimental aircraft as the D-558-1, D-558-2, X-1B and X-1E. He finished his career as one of the most accomplished and experienced rocket plane pilots of all but also flew a variety of other aircraft, including the F-100, F-102, F-104 and F-107.

McKay was second only to Scott Crossfield in the number of rocket-powered aircraft he flew.

It didn't always go well. McKay suffered crushed vertebrae on the second-worst crash of the X-15 program on Nov. 9, 1962. He lost power shortly after takeoff and was forced to land at Mud Lake, Nev., at 300 mph. The left skid collapsed on landing and the aircraft tumbled violently with McKay trapped inside. As a testament to his grit and determination, he later returned to the X-15 program and logged another 22 flights.

"McKay was one of the smoothest pilots. I remember a landing that was so smooth I don't remember when the landing gear hit," said John McTigue, an operations manager for the X-15.

McKay also was responsible for coining a Dryden phrase on a day when the weather was not good. His droll assessment, which has lived on in center lore was, "Any improvement will be for the better."

He was one of the first civilians chosen to fly the X-15 and made 29 flights in the aircraft between 1960 and 1966 – the second-highest number of flights in the program. His peak altitude was 295,600 feet and fastest speed was 3,863 mph, or Mach 5.64.

In 2005, he was awarded astronaut wings posthumously in a ceremony at Dryden where his accomplishments were celebrated.

R. Dale Reed

R. Dale Reed was a NASA aeronautics researcher who pioneered lifting body aircraft and remotely piloted research aircraft programs at Dryden. He worked on numerous research programs during his nearly 52-year career at Dryden.

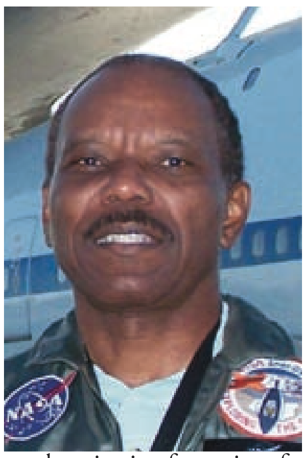
The lifting body program grew out of Reed's confidence that a wingless, low lift-to-drag aircraft could serve as an orbiting vehicle equipped to re-enter Earth's atmosphere and land safely. In the lifting body concept, the entire vehicle becomes a controllable airfoil, eliminating the need for wings. With backing from Paul Bikle, then director of the Flight Research Center, Reed was a prime mover in development of the prototype lightweight M2-F1 lifting body that flew successfully in 1963. The success of the unpowered M2-F1 led to development of the rocket-powered lifting bodies, such as the M2-F2 and M2-F3, HL-10, and the Air Force X-24A and X-24B. Reed's lifting body research provided guidance in the design of the space shuttle.

Reed's use of model drone airplanes for flight research led to the Remotely Piloted Research Vehicle program. In place of the model aircraft operator's simple switch console, Reed substituted an actual ground-based cockpit containing all the flight instruments and sensors of a fully equipped airplane. Using a radio uplink, Reed tested his concept with the Hyper III, the first RPRV to have a test pilot fully in the loop. He carried the concept further with the PA-30 and three-eighths-scale F-l5. Early in his career, Reed was responsible for aerodynamics loads measurements on the early X-series research aircraft as well as aerodynamics heating measurements on the X-15 rocket plane.

Reed retired in 1985, but returned as a contract aerospace engineer to work on the X-33, X-36 and X-38 research vehicles, two of which featured lifting body configurations. In all, Reed managed 19 projects and designed a dozen aircraft during his career.

He died March 18, 2005, in San Diego.

Bobby McElwain



Dryden's life support chief Bobby McElwain has literally made a career out of saving people's lives.

Nominators said McElwain is "intelligent" and "genuinely concerned about every aviator who walks into his training room."

McElwain was hired as a life-support technician at Dryden in December 1991 and he soon put together a training program devoted to ejecting from aircraft, parachuting and survival techniques. His responsibilities included teaching fliers what to do from the moment they have to eject until they are rescued. To accomplish that task, he acquisitioned and put to use the appropriate training gear in which flight crews could gain hands-on experience in all aspects of their training. Another training method he established at Dryden is a yearly review of each aircraft-survival-kit component. He ensures that everyone who flies is aware of what is in the kit and how to properly use each component. McElwain gives training on all Dryden aircraft, including the F-15, F-16, F-18, T-34, C-12, C-20, DC-8 and the Stratospheric Observatory For Infrared Astronomy.

McElwain learned his trade through a 26-year career in the Air Force. He attended and worked at survival schools, worked in and managed life-support shops for several fighter and cargo aircraft at numerous U.S. bases and in Thailand, Guam, Japan, Korea and Taiwan. His favorite assignment was at Langley Air Force Base, Va., at the Tactical Air Command Headquarters. In that post, he helped oversee and manage the life-support programs for all U.S. Air Force bases in that command. He assisted upper management in establishing policies and procedures for all units and was responsible for distribution of newly developed equipment technical-data changes and overseeing the command's suggestion program.

He retired from the Air Force in 1991 with an associate degree in survival and rescue operations from the Community College of the Air Force.

Thomas C. McMurtry

Thomas C. McMurtry retired in 1999, concluding a 32-year career at Dryden as a pilot and administrator.

His nominators called him "humble" and "a true team player who worked well with others to make the projects and programs that he was associated with successful ones."

"It's always the team that produces success," McMurtry is noted for saying.

Since joining Dryden as a research pilot in 1967 and advancing to chief pilot, he also was associate director for operations. As operations director, he managed the Avionics, Operations Engineering, Flight Crew, Quality Inspection, Aircraft Maintenance and Modification, and the Shuttle and Flight Operations Support branches.

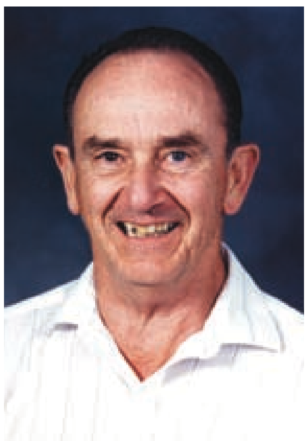
McMurtry was project pilot for the AD-1 Oblique Wing program, the F-15 Digital Electronic Engine Control project, the KC-135 Winglets project and the F-8 Supercritical Wing program. It was for the F-8 SCW project that he received NASA's Exceptional Service Medal.

In 1998 he was named as one of the honorees of the Lancaster, Calif., ninth Aerospace Walk of Honor ceremonies. In 1999 he was awarded the NASA Distinguished Service Medal.

In 1982, McMurtry received the Iven C. Kincheloe Award from the Society of Experimental Test Pilots for his contributions as project pilot on the AD-1 Oblique Wing program.

McMurtry was also co-project pilot on the F-8 Digital Fly-By-Wire program, and on several remotely piloted research vehicle programs such as the joint Federal Aviation Administration/NASA 720 Controlled Impact Demonstration and the subscale F-15 spin research project. On Nov. 26, 1975, the X-24B lifting body dropped from the sky for the last time, piloted on this 36th flight by McMurtry. He also co-piloted the 747 Shuttle Carrier Aircraft as it transported the prototype shuttle Enterprise on its first launch on Aug. 12, 1977.

Edwin Saltzman



Edwin Saltzman applied to and received job offers at several NACA facilities, including Ames Research Center, Wallops Flight Facility, Lewis Research Center (now Glenn), the Flight Research Center (now Dryden), and Langley Research Center. Just why his wife Lois picked the garden spot of the nation here in the desert is unclear, but Saltzman started work at the Flight Research Center in 1951.

His first project was calculating lift-over-drag ratios for the X-1E, which currently is perched in front of building 4800 at Dryden.

Within two years, he again worked on lift-over-drag ratios, a critical data component for rocket planes, this time on the X-15. In the era of 20-inch slide rulers, difficult work was even more challenging. When he completed his assignment on the X-15, he was assigned to the supersonic XB-70 Valkyrie.

He also worked on Supercritical Wing projects on the F-8 SCW and the F-111 Transonic Aircraft Technology aircraft.

Saltzman is well known for his innovative work on truck fairings, work he began with Vic Horton. Starting with a van, and moving on to a tractor-trailer unit, Saltzman and his team demonstrated that significant aerodynamic improvements to blunt vehicles could lead to dramatic improvements in fuel mileage.

His team's work on these and other land vehicles migrated to the automotive and truck industries, with visible and tangible results. But in order to gain support for the first aerodynamic van project, Saltzman went to Milt Thompson, then director of Research Projects, with his proposal.

While giving his full support to the project, Thompson wrote dryly in the margins, "The results of this should be so obviously productive that it probably won't get approved."

Saltzman retired in 1981 and continued to work at the center as a contractor until 2003.

Lawrence J. Schilling

Lawrence J. Schilling retired in January 2008 as Dryden's associate director for operations, concluding a 32-year career. He was an architect of Dryden's digital real-time simulation capability and a driving force in establishing key Dryden infrastructure.

In November 1975, he joined Electronic Associates Inc. as an onsite simulation engineer assigned to the F-8 Digital Fly-By-Wire project. Three years later he was hired as a civil servant and served as Simulation Technology leader from March 1987 until March 1993, when he became branch chief.

Schilling led the development of simulations for Dryden's space shuttle engineering; the remotely piloted, three-eighths-scale F-15 Spin Research Vehicle; the Highly-Maneuverable Aircraft Technology research vehicle; and the Advanced Fighter Technology Integration F-111 research aircraft. He also was the government-wide simulation lead for the X-30 National Aerospace Plane. In 18 years as a simulation engineer, he contributed to the F-111 Mission Adaptive Wing; F-18 High-Angle-of-Attach Research Vehicle; F-18 Systems Research Aircraft; SR-71; Forward-Swept Wing X-29; and the X-31 Enhanced Fighter Maneuverability demonstrator.

Schilling also served on a small design team that developed the Integrated Test Facility (renamed the Walter C. Williams Research Aircraft Integration Facility on Nov. 17, 1995). Schilling designed the simulation elements, defined aircraft-in-the-loop simulation requirements and influenced building layout. He also had a long-term advocacy role in the management of the Western Aeronautical Test Range and Dryden's information technology systems.

He also was research systems director; acting deputy center director; acting associate director; acting director for research facilities; and deputy director for research facilities. Prior to his retirement, he was associate director for operations for three years. Schilling led the organizations that perform Dryden's programmatic work – Flight Operations, Research Engineering, Test Facilities, Safety and Information Technology.

Rogers E. Smith

Rogers E. Smith was best known as Dryden chief pilot.

Nominators recalled Smith, who currently is a consultant, lecturer and instructor at the National Test Pilot School, Mojave, Calif., as a team builder on efforts such as the X-31 Enhanced Fighter Maneuverability Demonstrator project. Smith remembers his work as a project pilot with the multi-axis, thrust vectoring X-31 and as well as acting director of flight operations.

Smith participated in a wide variety of test efforts, including the X-29 Forward Swept Wing, Advanced Fighter Technology Integration F-16 and the AFTI F-111 Mission Adaptive Wing programs.

He also was a project pilot for the SR-71, the F-15 Advanced Controls Technology for Integrated Vehicles project and the F-104 aeronautical research aircraft. Smith was a co-project pilot on the F-15B aeronautical experiment testbed aircraft and flew the F-18 and NASA's DC-8 airborne science platform.

Also associated with Langley Research Center in Virginia in 1967 as a research pilot, Smith has specialized in the areas of advanced flight control systems, stability and control, and flying qualities throughout his flying career.

Smith served as a pilot with the Royal Canadian Air Force from 1955 to 1963. He was a fighter pilot in the United States Air National Guard from 1970 until he concluded his service as a Group Commander of an F-16 Air Defense Unit in 1994.

He has also served with the National Research Council of Canada, flying variable stability helicopters used for flying qualities research.

He is a former president of the Society of Experimental Test Pilots and a member of the American Institute of Aeronautics and Astronautics.

Smith also has written more than 30 technical papers during his career.

Milton O. Thompson

Milton O. Thompson joined the NACA on March 19, 1956, as an aeronautical research scientist, beginning a career at Dryden that spanned 37 years. He transferred to the pilots' office in January 1959.

In his first major project, an F-104 was used to test the feasibility of large-scale laminar flow at supersonic speeds.

In 1959, Thompson was named a pilot-consultant to the X-20 Dyna-Soar project, involving a small delta-wing spacecraft that was to be launched by a rocket and capable of making a horizontal landing. The project faced challenges, however, and was never flown.

Thompson began to look at alternative concepts that would allow a spacecraft to make an airplane-like landing. It was this work for which he is best known.

The first effort was the Paresev vehicle, featuring a triangular fabric wing similar to those later seen on hang gliders and attached to a tubular framework. The vehicle flew successfully, but technical difficulties prevented a similar wing's use on the Gemini spacecraft.

Thompson also supported efforts to build the M2-F1 wooden lifting body. After early control problems, Thompson flew the M2-F1, initially towed by a car and later behind a C-47. This success led to construction of the "heavyweight" M2-F2, which was launched from the B-52 mothership. Thompson piloted the vehicle's first five flights. Amid the lifting body flights, Thompson also made 14 flights in the X-15, reaching a top speed of Mach 5.48 and a peak altitude of 214,100 feet.

Thompson retired from research flying in January 1967, moving into management. In 1969, he was put in charge of all flight projects at the center. He urged that the space shuttle be built without landing engines, arguing that a glide landing would be safer. In April 1975 he was named chief engineer, a job he held until his death on Aug. 6, 1993.

Edward T. Schneider

Edward T. Schneider was as a Dryden research pilot from 1983 to 2000.

During his career at the center, Schneider was best known for his nine-year stint as project pilot for the F-18 High Alpha Research Vehicle, in which he became the first pilot in history to conduct multi-axis thrust-vectored flight.

Schneider was project pilot for the F-18 Systems Research Aircraft, the F-8 Digital Fly-By-Wire research program, the Boeing 720 Controlled Impact Demonstration, the F-14 Automatic Rudder Interconnect and the laminar flow research programs. As a project pilot, he also flew the F-104 Aeronautical Research and Microgravity programs, the F-15 Advanced Controls Technology for Integrated Vehicles, the SR-71 High-Speed research program, the NASA B-52B launch aircraft, and the F-15B aeronautical testbed aircraft.

From July 1998 through March 2000, Schneider was acting chief of the Flight Crew branch, heading a team of 13 research pilots. He then served as deputy director of Flight Operations at Dryden from March through September 2000. In this position, Schneider helped manage the Avionics, Operations Engineering, Flight Crew, Quality Inspection, Aircraft Maintenance and Modification, and the Shuttle and Flight Operations Support branches.

In September of 2000, Schneider transferred from Dryden to Johnson Space Center, Houston, where he was a staff pilot and T-38 instructor pilot. When he left Dryden, he had accumulated a career total of more than 6,700 flight hours in 84 different models of aircraft and had flown "first flights" on five unique aircraft configurations.

In 1996 he received both the NASA Exceptional Service Medal and the American Institute of Aeronautics and Astronautics Chanute Flight Award for the conduct of hazardous F-18 high-angle-of-attack flight testing. Schneider was honored with the NASA Distinguished Service Medal in 2004, and was inducted into the Aerospace Walk of Honor in Lancaster, Calif., in September 2005.

Kenneth J. Szalai

Former Center Director Kenneth J. Szalai was a strong advocate for Dryden who promoted and oversaw the reemergence of the facility as a center during his tenure from 1990-98.

From 1982 until December 1990, Szalai directed the Dryden Research Engineering division. Prior to that position, he was Director of Engineering. From 1964-1982 Szalai was a research engineer and technical supervisor.

His first project was as a research and flight test engineer on the JetStar Airborne Simulator. Szalai was principal investigator and chief engineer on the F-8 Digital Fly-By-Wire program, which involved the first aircraft equipped with a digital electronic fly-by-wire control system with no mechanical-reversion capability.

Szalai participated and led numerous experimental and X-plane aircraft programs in areas of flight controls, flight dynamics, aerodynamics, propulsion, structures and integrated systems. In addition, Szalai initiated the U.S. and Russian Tu-144LL research program. Tu-144 research allowed comparisons of full-scale supersonic aircraft flight data with results from models in wind tunnels, computer-aided techniques and other flight tests. The flight experiments provided aerodynamic, structures, acoustics and operating environment data on supersonic passenger aircraft.

He said his objective was to create an environment in which the extraordinary and unparalleled team at Dryden would be free to demonstrate their "creativity, talent, commitment, and dedication to safe and important flight programs of discovery." Szalai said he took pride in the Dryden team's ability to work in partnership with virtually every company and government agency in the United States and with international partners.

In a reponses on the ballot for the vote that is the basis for this project, Szalai said, "I always believed that every single person who came through the gate was essential for Dryden's success. Every single one."

Joseph A. Walker

Joseph A. Walker joined the NACA in March 1945 and became chief research pilot at Dryden during the mid-1960s.

He was project pilot on such pioneering research projects as the D-558-1, D-558-2, X-1, X-3, X-4, X-5 and the X-15. He also flew programs involving the F-100, F-101, F-102, F-104 and the B-47.

Walker made the first NASA X-15 flight on March 25, 1960, eventually flying the legendary research aircraft 24 times. Some of his most significant achievements on the X-15 program included reaching a speed of 4,104 mph, or Mach 5.92, during a flight on June 27, 1962, and an altitude of 354,300 feet on Aug. 22, 1963, his final X-15 flight. He was awarded astronaut wings posthumously in 2005 for the X-15 altitude flight.

Walker was the first man to pilot the Lunar Landing Research Vehicle that was used to develop piloting and operational techniques for lunar landings.

Nominators said he expected the best of those who worked for him when he was the chief pilot and had high expectations of others as he had for himself.

During World War II he flew P-38 fighters for the Air Force, earning the Distinguished Flying Cross and the Air Medal with Seven Oak Clusters.

Walker was the recipient of many awards during his 21 years as a research pilot. These include the 1961 Robert J. Collier Trophy, 1961 Harmon International Trophy for Aviators, the 1961 Kincheloe Award and 1961 Octave Chanute Award. He received an honorary Doctor of Aeronautical Sciences degree from his alma mater in June of 1962. Walker was named Pilot of the Year in 1963 by the National Pilots Association.

He was a charter member of the Society of Experimental Test Pilots, and one of the first to be designated a Fellow. He was fatally injured on June 8, 1966, in a mid-air collision between the F-104 he was piloting and the XB-70 bomber prototype.

Walter C. Williams

Walter C. Williams was the first chief of the facility that became Dryden. He saw its transformation from a makeshift organization housed in a single hangar and a decaying wartime building through construction of a permanent facility to the initial flights of the X-15 rocket plane.

Williams joined the NACA Langley Memorial Aeronautical Laboratory in 1939 as an aeronautical engineer. He initially worked in aircraft stability and control. In September 1946, he was named NACA project engineer for the X-1 flights.

To his assignment at the Muroc detachment, he brought with him an attitude about flight research that focused on systematic testing. His methodology included advance planning, incremental progress with flight series, and using data gathered to plan the next step in a research program. This, he argued, was "how to avoid killing pilots."

When the Muroc NACA detachment was made into a permanent operation, Williams was named its chief. His tenure spanned the golden age of flight test, as aviation progressed from subsonic flight to the dawn of the space age. Williams' career reflected this change; he left the High-Speed Flight Station on Aug. 28, 1959, to direct tracking and recovery operations for the Mercury manned spacecraft.

"His connections convinced the [Air Force] that the XB-70 program could be done by NASA. He brought business to the center because of his reputation for perfect oversight of test operations," said Gary Krier, another member of the Dryden Driving Forces category.

"His 8:45 a.m. coffee-in-the-cafeteria sessions provided access to the center director every work day. He was accurately described by one fan as 'sensitive, but not necessarily sympathetic,' Krier added.

Williams began with the X-1, a single hangar, and decaying facilities, and transformed this into a state-of-the-art flight research center preparing to fly the X-15 to hypersonic speeds and to the edge of space. Williams died Oct. 7, 1995.

Robert Navarro

Robert Navarro is project manager for the ER-2 high-altitude, long-range flying laboratories at Dryden. The Earth science aircraft are civil versions of the U.S. Air Force U-2S.

Navarro was nominated for his "knowledge and expertise" and his ability to "encourage the project (staff) to do the best that they can."

Prior to his current position, Navarro served as project manager for the Altair uninhabited aerial system and the Pathfinder Plus high-altitude, long-endurance project. The Altair flew research flights during the 2006 Western States Fire Mission, when it carried an Ames Research Center, Moffett Field, Calif.-developed wildfire sensor. The payload and aircraft monitored and provided the U.S. Forest Service with imagery of the Esperanza fire in Southern California.

For the Pathfinder Plus project, the UAS aircraft was instrumented for gathering data to improve existing analytical tools. Flight-test research was analyzed for validating new multidisciplinary models that described the aeroelastic qualities, or structural flexing, of high-altitude, high-aspect-ratio aircraft.

A brief flight series at Dryden in September 2005 was set to investigate the effects of turbulence on lightweight flexible-wing structures. Navarro was project manager for those flights as the aircraft made two low-altitude flights over the northern portion of Rogers Dry Lake.

Previously, Navarro served as chief engineer for the Helios prototype solar-powered aircraft and the F-18 Systems Research Aircraft. The Helios reached a record for its class, marking an altitude of 96,863 feet on Aug. 13, 2001.

New technology experiments for applications in future aircraft were flown on the SRA. Navarro was principal investigator on the SRA electronic actuator tests. Research conducted with the SRA included electric actuation, sensor technology, fiber optics and structural investigations.

Joseph Pahle

Joseph Pahle is an aerospace engineer in the Dryden Flight Controls and Dynamics branch.

With more than 26 years at Dryden, he has been a lead flight controls engineer, project chief engineer, principal investigator, branch chief, mishap investigation team member, and member or chairman of flight readiness review teams.

Nominators wrote that Pahle is a "control system visionary" who excels at "providing leadership and practical application" of adaptive control technology.

In addition, nominators said Pahle exhibited "technical excellence and vision," has "sharp wit," is a "mover and shaker," and is an "excellent engineer with good humor" and "high energy."

Pahle has worked in Dryden's Advanced Flight Controls branch since 1982. He has primarily been involved with flying qualities and flight controls research on projects such as the Advanced Fighter Technology Integration F-16, the F-8 oblique wing research aircraft, the F/A-18 High Alpha Research Vehicle, and the X-38 Crew Return Vehicle projects.

His work also includes research with the hypersonic X-43A, the X-48B Blended Wing Body and the inflatable wing demonstrator. He also was one of Dryden's chief engineers on the X-37A. The X-37A was intended to be an advanced technology demonstrator.

"If I've been successful, it's only because of the talented professionals I'm privileged to work with," he said.

"I had the most fun working on the two inflatable wing demonstrators, with our share of hard problems, new technology, unknown outcomes, great team members and difficult flight operations."

Pahle also is known as an excellent mentor. He is very approachable, has a broad base of knowledge and is an excellent communicator who can break down complex concepts into understandable elements.

Roxanah B. Yancey

Roxanah B. Yancey was head of the NACA Muroc Unit "computers."

Women were hired by the NACA and by most military branches as human "computers" to reduce raw data into something engineers could read.

From the inception of the Muroc Unit in 1946 until 1960, Yancey led the computers and was one of the first two women who worked at what would later become Dryden. As was the practice of the day, Yancey and other "computers" were selected for earning a mathematics degree.

She accepted a position as an aerospace engineer in 1960, which she retained until her retirement in 1973. During her tenure, she was a supervisory mathematician and branch head of the Computing Service and an engineer in the Manned Flight Control branch.

Yancey was known for her knowledge in data reduction work on the Air Force XS-1 flight nine, Oct. 14, 1947, which was the first supersonic flight. Identifying traces on film, marking time to coordinate all data recordings and reading film deflections before converting them into engineering units for the legendary flight were key responsibilities, ones her nominators said she was well prepared to do.

She was considered by her nominators to be an excellent teacher as well as a mathematician. It was her responsibility to teach new members of the computer group – in the 1950s referred to as "mathematic aids," who did not have math degrees – to reduce and evaluate the flight records from research aircraft.

In the 1960s, when Yancey accepted a new job title as aerospace engineer, her new responsibilities included determining stability and control derivative characteristics for all three X-15 airplanes. The derivatives were used in flight planning for the X-15 simulator. Later, Yancey studied the characteristics of the aircraft at speeds exceeding Mach 6.

She died in April 1974.

Bradford A. Neal

Bradford A. Neal is Dryden deputy chief engineer. The Dryden chief engineer's office provides independent technical oversight of flight research and science projects.

Nominators said Neal is "an excellent engineer with management skill," "quietly efficient," "talented," "a people person," someone who "understands needs," is "considerate" and "can make anything fly." Nominators also said he is "professional and experienced" and "a great operations engineer who exhibits technical excellence and dedication to mission."

Neal was lead operations engineer for the Stratospheric Observatory for Infrared Astronomy aircraft. He oversaw the return to flight of NASA's integrated Boeing 747SP and the German-built, 17-metric-ton infrared telescope that comprise the flying observatory. Neal also played key roles on the team that helped reorganize the SOFIA program, see it brought to Dryden, and prepare center organizations for participation in the program.

He also was lead operations engineer on the X-43A project and a mission controller on the first two flights. Integrating different organizations to carry out the hypersonic experiment was among his biggest challenges. No vehicle powered by an air-breathing engine had ever flown at hypersonic speeds prior to the successful March 2004 X-43A flight that collected the first data from a scramjet engine in flight.

Operations engineer is a position Neal considers "the best at the center." He served as acting Operations Engineering branch chief from September 2002 to January 2003.

Neal first came to Dryden as a cooperative education student in 1982, serving as an operations engineer. In 1987 he was hired into the Operations Engineering branch. He also was an operations engineer for the SR-71 Linear Aerospike engine project. He specialized in operation of the high-pressure systems and helped integrate project hardware with the SR-71 aircraft. On that project, he also was a mission controller and flight test observer.

Allen R. Parker

Allen R. Parker is a systems engineer on the fiber optic wing shape sensor system project, now being flown on the Ikhana unmanned aircraft system.

The new sensor is 20 feet long and is the diameter of a human hair. Six of these on the wing surface of the Ikhana can be used to record thousands of measurements without the weight penalty associated with conventional strain gages. Parker developed the system and implemented the data processing algorithm, which was developed by Parker, William Ko, Lance Richards and Anthony "Nino" Piazza.

Parker's nominators were most impressed with his problem-solving skills and willingness to help out. They considered Parker a "fiber optics pioneer" and "a super genius in fiber optics," who made "significant contributions in strain measurements." Nominators also wrote, "Allen produces ingenious data-acquisition designs."

Parker is known not only as a researcher, but also for his work in helping to inspire the next generation.

He was a volunteer for the inaugural robotics team from Lancaster High School in 2000 and for the 2001 team. The Lancaster High School team has fielded an entry into the For Inspiration and Recognition of Science and Technology robotics competition every year since Parker assisted the early teams.

FIRST is a non-profit orgaization that has a series of robotics competitions for different age groups to spark interest in math and science. That's the role that Parker had with the Lancaster team as he worked long hours to mentor, help and inspire students turn a box of parts into a robot.

In 2000 he also served as a national judge at the national Afro-Academic, Cultural, Technological and Scientific Olympics sponsored by the National Association for the Advancement of Colored People. Technical and science submissions for the competition were evaluated by NASA staff, and Parker also assisted with a tour of Dryden given to finalists.

Kevin L. Petersen

Kevin L. Petersen is Dryden's director. He was named center director on Feb. 8, 1999, after serving as deputy director beginning in January 1996.

Nominators cited Petersen as a Dryden key contributor for his work on the F-8 Digital Fly-By-Wire program and as center director. Nominators called Petersen "a great center director" and the "friendliest center director at NASA." Nominators also recognized him for his ability to "focus on bringing us the right project activities for Dryden."

In addition to efforts to stabilize the center's work force and balance and diversify its program portfolio, Petersen developed the business case and successfully advocated for the DAOF. Located in Palmdale, the facility currently houses the DC-8 and the SOFIA. Petersen also made the case within NASA for the center to be awarded supplemental infrastructure funding to sustain critical capabilities. His efforts resulted in the center receiving an additional $25 million annually to sustain Dryden's flight operations and test infrastructure.

Petersen's early assignments at the center included chief of the Dynamics and Controls branch. Programs he supported included the F-18 High Angle of Attack Research Vehicle and the X-29 Forward Swept Wing technology demonstrator aircraft, serving as chief engineer on the latter project. He also headed the center's National Aerospace Plane project office from February 1992 through November 1993, when he was named the center's acting deputy director.

Early in his Dryden career he worked as a research engineer on the three-eighths-scale F-15 Remotely Piloted Research Vehicle, the F-8 DFBW and the Highly Maneuverable Aircraft Technology projects. Petersen has received NASA's Exceptional Engineering Achievement Medal (1985), Exceptional Service Medal (1987), Outstanding Leadership Medal (2000), Equal Employment Opportunity Medal (2001) and Exceptional Achievement Medal (2004) for his contributions to the agency.

Carrie M. Rhoades

Operations engineer Carrie M. Rhoades was described by nominators as "energetic," "motivated," "sharp," and "reliable" – all with "a great attitude."

Her current work includes the F-15 Intelligent Flight Control Systems aircraft, on which she coordinates project work and keeps progress moving smoothly.

In addition, she is a mission controller – the individual who directs pilots on which maneuvers to perform – and ensures that paperwork for the aircraft is in order as well as keeping track of configuration changes and entries in the aircraft's log book.

Rhoades' current assignment also involves work on the F-16 Automatic Collision Avoidance Technology aircraft. Her coordination role is larger on the ACAT project because it is a program of the NASA Aeronautics Research Mission Directorate under the direction of the U.S. Air Force Research Laboratories at Wright-Patterson Air Force Base, Ohio, and coordinated with the Air Force Flight Test Center and industry partner Lockheed Martin.

The project's goal is to integrate the ACAT system into the F-16 to validate it for eventual operational use in the F-16, F-22 and F-35 aircraft.

Rhoades has worked in the areas of structures and aeronautics and in operations engineering on a number of programs.

Some of those programs include the hypersonic X-43A (all three vehicles), the Active Aeroelastic Wing that researched wing twist for roll control and the E-2C Hawkeye. She supported work on the Stratospheric Observatory For Infrared Astronomy and the Orion Crew Module.

Known for an ability to get things done, "she is outspoken when she needs to be," according to nominators, but is a dedicated professional whose opinions are valued. Rhoades attributes her ability to get nonstandard tasks accomplished successfully to her work and experience across multiple disciplines at Dryden.

Michael P. Thomson

Michael P. Thomson is Dryden deputy director for flight operations. In this position, which he has held since 2005, he assists the directorate chief in planning, coordinating and directing all engineering and technical support functions and in determining overall directorate programs and objectives. Thomson also provides technical guidance and direction for flight-operations activity.

Nominators said Thomson is an "organizational leader" and "good guy."

As a flight test engineer for a variety of research aircraft, Thomson partners with test pilots in planning, development, coordination and execution of research missions. In this role, he has acquired more than 200 flight hours in high-performance aircraft. Since 1999 Thomson has accepted increasingly responsible engineering management posts, including deputy chief of the Flight Systems Branch of Dryden's Research Engineering directorate, chief of the Operations Engineering branch in flight operations and deputy director of the Research Engineering directorate.

For nearly two decades Thomson was an aerospace engineer specializing in verification and validation of airborne, flight-critical control systems. As Honeywell's lead flight control software engineer, Thomson developed test procedures for verification and validation testing of the flight control system for the X-29 aircraft. At PRC Inc., Thomson served for three years as lead flight systems engineer for development of research flight control system software for Dryden's F-18 High Alpha Research Vehicle.

Thomson accepted a civil service position at Dryden as an aerospace engineer in 1994. He worked as chief engineer on the F-15 Advanced Control Technology for Integrated Vehicles project and led the advocacy and formulation of the Intelligent Flight Control online learning follow-on program. He also provided expert consultation to NASA, U.S. Air Force and private industry in the verification and validation of airborne flight-critical control systems.

Christopher D. Regan

Christopher D. Regan is Dryden's X-48B chief engineer.

A "bright, smart, rising star," "a hard worker," "talented," "well rounded and speaks his mind," nominators said about Regan, also calling him "an innovative researcher."

Nominators also said he is a level headed and honest about what he sees in his engineering work and his work with others. He brings professionalism to everything he works on, but also has a sense of humor and an approach to problem solving that allows people to be at ease with him, according to nominators.

For the past three years he has worked on the X-48B, or blended wing body aircraft. The X-48B is being used to investigate low-speed stability and control characteristics of a full-scale blended wing body aircraft. In May 2007 he was named X-48B chief engineer. He developed and implemented an in-flight stability analysis tool for initial flight envelope clearance.

The X-48B is entering its fourth block of research flights as the 500-pound, remotely piloted test vehicle continues to perform well. The latest phase involves parameter identification and maneuvers to research the limits of the engine in stall situations. The X-48B first flew on July 20, 2007 and 37 flights have been tallied to date.

Prior to work with the X-48B, he worked as a flight control team member on intelligent flight control systems for the C-17 and for the F-15B, IFCS "generation two." As part of his IFCS work, he evaluated control allocation techniques.

The F-15B IFCS generation-two team received a 2007 NASA group achievement award "for the successful design, development and safe flight evaluation of a direct adaptive neural network-based flight control system in the presence of simulated failures."

The F-15 IFCS project recently completed its last flight (see article on page 19 for more information).

Joel R. Sitz

Joel R. Sitz is Dryden's deputy associate director for programs. He is responsible for supporting the associate director for programs in the task of assisting center leadership in defining Dryden's roles in carrying out NASA and center programs and projects. Prior to his current position Sitz was mission director for Dryden's Exploration Systems Mission Directorate. He was responsible for development, management and technical direction of all Dryden space exploration activities and projects.

He is known best by nominators as manager of the X-43A experimental aircraft project, a position he held from July 1998 to December 2004. Sitz was responsible for the overall flight-research portion of the Hyper-X program, which successfully demonstrated hypersonic, air-breathing propulsion featuring the first free flight of a hypersonic airframe-integrated, supersonic combustion ramjet (scramjet) engine at Mach 7 and Mach 10. The X-43A is known as the world's fastest air-breathing aircraft.

Nominators had a lot to say about Sitz's successful management of the X-43A project, calling him "determined," "energetic," "talented," "insightful and inspiring," and "passionate, with a grand vision," saying that "if you need a project done, get Joel."

Sitz has 22 years of experience in the aerospace industry, including 14 years as project manager of several flight research projects at Dryden. He also was mission development director for the Uninhabited Air Vehicle Technology project from January 2005 until October 2005.

In addition, his program and project experience includes deputy program manager at Dryden for NASA's Aviation Safety program, which included the F-18 Systems Research Aircraft and the L-1011 Adaptive Performance Optimization projects. He was also deputy project manager for the F-16XL no. 2 Supersonic Laminar Flow Control project.

Gwendolyn V. Young

Gwendolyn V. Young is Dryden's Associate Director for Management. She is responsible for the center's offices of Procurement, Diversity and Equal Opportunity, Facilities Engineering and Asset Management, Human Resources Management and Development, Security, Strategic Communications, Management Systems, and Employee Assistance.

Nominators said she was "smart," "friendly," "a good communicator" and exhibited "positive leadership."

"I firmly believe that people are at their best when they collaborate, especially because no one individual or single organization can accomplish their job without others," Young said. To that end, she brought together the present Code XM team. In the past, the functional organizations met only when there were challenges but now hold regular forums to exchange information and focus efforts. Aligning the team's resources and ensuring that one organization is not optimizing its results at the expense of another is maximizing effectiveness. For accomplishments like those of her work with the XM team, Young earned the rank of Meritorious Executive in 2005 for sustained service and accomplishments in NASA program management.

Young's previous position at Dryden was as chief financial officer. She was responsible for overall financial and budget activities and served in that position from May 1995 to September 2001. Prior to the CFO position, she worked at Stennis Space Center in Mississippi as the Resources Management officer, responsible for all budget activity.

Earlier in her career, Young worked as a program analyst in the Office of the Space Station at NASA Headquarters and in the Space Station Freedom Program Office in Reston, Va. Young began her career with NASA in 1983 as a Presidential Management Intern in the Office of the Comptroller at NASA Headquarters and worked in the Budget Resources office. During her internship, she worked for then-U.S. Rep. Daniel K. Akaka of Hawaii.

On the Horizon

These projects are what's next

Global Hawk

8

Dryden acquired two Northrop Grumman Global Hawk Advanced Concept Technology Demonstration aircraft when the U.S. Air Force transferred the assets in September 2007.

Research flights are expected to begin in 2009 in support of NASA's Airborne Science program. The ability of the unmanned Global Hawk aircraft to autonomously fly long distances and remain aloft for extended periods brings a new capability to the science community for measuring, monitoring and observing Earth's remote locations.

The two Global Hawks were the first and sixth aircraft built under the original development program sponsored by the Defense Advanced Research Projects Agency, and were made available to NASA when the Air Force had no further need for them.

As the world's first fully autonomous high-altitude, long-endurance unmanned aircraft system, a Global Hawk can fly up to 65,000 feet for more than 31 hours at a time. With a range of 11,000 nautical miles, the aircraft's endurance and range allow for nonstop flight from Dryden to the North Pole, with a seven-hour loiter period before returning.

Under a Space Act Agreement signed April 30, 2008, NASA and Northrop Grumman will share flight time on the aircraft.

The Earth Science division of the Science Mission Directorate is the primary NASA sponsor for the project. It is intended that the Global Hawks will be used for atmospheric chemistry and radiation science missions and hurricane research.

ED07 0244-096 NASA Photo by Tony Landis

ED08 0044-17 NASA Photo by Tom Tschida

DAOF

7

The Dryden Aircraft Operations Facility opened for business in 2007 at the former Rockwell International/North American Aircraft production facility in Palmdale. The Los Angeles World Airports Board of Airport Commissioners endorsed a 20-year lease agreement with NASA for use of a large hangar and surrounding acreage at the facility adjacent to U.S. Air Force Plant 42.

Specialized science platform aircraft, such as the DC-8 flying laboratory and the Stratospheric Observatory for Infrared Astronomy, are based at the Palmdale facility. Dryden officials plan to house the center's two high-altitude research aircraft ER-2s, civil versions of the military U-2s, and two Gulfstream IIIs at the DAOF.

When the facility is renovated for use in science missions, it is estimated about 250 Dryden civil service and contractor staff will be based there. In addition, visiting scientists from around the world will be based at the site while experiments or missions are in progress.

NASA leases building 703, one of five major buildings on the site, and about 16.2 acres as an aircraft operations facility to support science programs. NASA will invest about $10.5 million in facility modifications and upgrades and about $1.4 million per year for the lease. LAWA has agreed to invest about $4 million.

Building 703 contains about 422,000 square feet of floor space, including 210,000 square feet in the central hangar area and an equivalent amount of office space on four floors.

Ikhana

6

Dryden's Ikhana aircraft illustrated some if its capabilities when it flew fire-imaging missions in the summer of 2008.

NASA and the U.S. Department of Agriculture Forest Service partnered to obtain imagery of the wildfires in response to requests from the California Department of Forestry and Fire Protection, the California Governor's Office of Emergency Services and the National Interagency Fire Center.

The Ikhana imaged almost 4,000 square miles from Santa Barbara north to the Oregon border during a flight on July 8. In as little as 10 minutes, the flights provided critical information about the location, size and terrain around the fires to commanders in the field.

The Ikhana team obtains data by using instrumentation developed at the Ames Research Center, Moffett Field, Calif. They combined the sensor imagery with Internet-based mapping tools to provide fire commanders on the ground with information enabling them to develop strategies for fighting the blazes.

The Ikhana is a civil variant the Predator B aircraft built by the San Diego-based General Atomics Aeronautical Systems Inc. NASA dubbed the aircraft Ikhana (ee-KAH-nah), a Native American word from the Choctaw Nation meaning intelligent, conscious or aware.

The Ikhana also was used for research on the use of fiber optics wing shape sensors located along the top of the Ikhana wing surface. The sensors provide about 2,000 strain measurements in real time and show the shape of the aircraft's wings in flight. Fiber optic sensors offer weight reduction that has potential for reducing costs and improving fuel efficiency.

ED07 0243-37 NASA Photo by Jim Ross

ED08 0278-23 NASA Photo by Carla Thomas

Sonic Boom Research

5

Flight tests in support of the Lift and Nozzle Change Effects on Tail Shock, or LaNCETS, project are being conducted at Dryden. The goal of the project is to develop and validate computational prediction tools to be used in the design of civilian supersonic aircraft that can fly over land without generating unacceptable sonic booms.

The flight portion of the LaNCETS project consists of measuring the aft-shockwave structure of a modified F-15 test aircraft using another F-15 as the probing aircraft. The aft shockwave includes those shock waves emanating from the lead F-15's tail surfaces, exhaust plume and wake.

The effort is funded through the supersonics office of NASA's Aeronautics Research Mission Directorate. The supersonics office is directing fundamental research that will lead to reduction of sonic-boom noise as part of its overall goal of eliminating barriers to development of practical civil supersonic aircraft.

LaNCETS is the latest in a series of research efforts that have examined aircraft shaping effects on sonic boom and the transmission of shock waves through the atmosphere. NASA previously teamed with Northrop Grumman Corp. on the Shaped Sonic Boom Demonstrator project and with Gulfstream Aerospace Corp. on the Quiet Spike project. Both projects successfully validated design tools for aircraft forebody shaping.

Blended Wing Body Aircraft

Dryden and The Boeing Co. are expanding the flight envelope for the X-48B blended wing body research aircraft.

Flight tests with the 500-pound, remotely piloted test vehicle are now in a block 4 phase involving parameter identification and maneuvers to research the limits of the engine in stall situations.

X-48B flight-testing is taking place at Dryden with center staff providing critical support to a Boeing-led project team that also includes the U.S. Air Force Research Laboratory in Dayton, Ohio, and Cranfield Aerospace Ltd., of Bedford, England.

The X-48B first flew on July 20, 2007. Thirty-seven flights have been tallied to date in the four blocks of research. Project officials said the aircraft has performed well and flight data has been consistent with wind-tunnel data attained with the first of the two blended wing body research vehicles. The second vehicle is currently being flown for project work, although the first remains available if needed.

NASA's participation in the blended wing body research effort is focused on fundamental, advanced flight dynamics and structural design concepts within the Subsonic Fixed Wing project, part of the Fundamental Aeronautics program managed through NASA's Aeronautics Research Mission Directorate.

Potential benefits of the aircraft include increased volume for carrying capacity, efficient aerodynamics for reduced fuel burn and possibly significant reductions in noise due to propulsion integration options.

ED08 0092-02 NASA Photo by Carla Thomas

ED08 0230-362 NASA Photo by Tony Landis

Orion

Dryden plays a significant role in the development of next-generation NASA spacecraft as part of the Constellation program. The spacecraft currently being developed, the Orion Crew Exploration Vehicle, is expected to take astronauts to and from the International Space Station and, eventually, back to the moon.

Center engineers conducted preliminary definition and planning for the Orion Crew Module test article abort flight tests, drop tests, and landing and recovery tests. That work involved development of abort profiles, range safety requirements and integration, flight test support and independent analysis. The Abort Flight Test effort is managed at Dryden under the leadership of the Project Orion Flight Test Office at Johnson Space Center, Houston.

NASA's first full-scale flight-test article of the Constellation program, which is called the Orion flight test crew module, is undergoing preparations at Dryden for the first flight test of the spacecraft's launch abort system in 2009. The Orion flight test crew module arrived at Edwards Air Force Base March 28. After being painted in the Edwards Air Force Base paint hangar, it was delivered to Dryden for installation of flight computers, instrumentation and other electronics.

Following systems installation, the completed vehicle will be shipped from Dryden to the U.S. Army's White Sands Missile Range in New Mexico, where the launch abort system will be integrated with the vehicle for the first abort flight test. Four abort flight tests will launch from White Sands, with the fifth and last test of the system flying from Kennedy Space Center in Florida.

SOFIA

NASA and the German Space Agency are developing the Stratospheric Observatory For Infrared Astronomy – or SOFIA – as a world-class airborne observatory that will complement the Hubble, Spitzer, Herschel and James Webb space telescopes and major Earth-based telescopes.

The SOFIA features a German-built 100-inch-diameter far-infrared telescope weighing 17 metric tons and mounted in the rear fuselage of a highly modified Boeing 747SP aircraft. It is one of the premier space science programs of NASA's Science Mission Directorate.

Major aircraft modifications and installation of the telescope were accomplished at L-3 Communications Integrated Systems' facility at Waco, Texas. Completion of systems installation, integration and flight test operations through 2010 are being undertaken at Dryden. After development of the observatory is complete, Dryden, the Universities Space Research Association and the Deutsches SOFIA Institut, under leadership of the SOFIA Science project at the Ames Research Center, Moffett Field, Calif., are planning SOFIA science operations jointly.

Once operations begin in about 2010, the SOFIA'S telescope will provide astronomers with access to the visible, infrared and sub-millimeter spectrum, with optimized performance in the mid-infrared to sub-millimeter range.

Currently, the telescope and the aircraft's telescope cavity door system are being adjusted, which will lead to open-door ground operational testing. These activities will be followed by six to eight open-door flight tests in spring 2009 to study the handling qualities of the aircraft as air flows over and into the telescope cavity. First airborne astronomical observations with the telescope are expected in the summer of 2009.

ED07 0100-03 NASA Photo by Jim Ross

ED08 0278-24 NASA Photo by Carla Thomas

IFCS

Dryden's NF-15B Intelligent Flight Control System flight research project seeks to exploit revolutionary technological breakthroughs in aircraft flight controls that can efficiently optimize aircraft performance in normal and failure conditions. The IFCS is designed to incorporate adaptive control concepts into the flight software to enable a pilot to maintain control and safely land an aircraft that has suffered control surface failures or airframe damage.

Major control surface or airframe damage hinders an aircraft flight control system's design integrity, rendering traditional non-adaptive control systems useless. The IFCS team has integrated innovative adaptive control technologies and state-of-the-art control algorithms that will correctly identify and respond to changes in aircraft stability and control characteristics, enabling the system to immediately adjust to maintain the best possible flight performance during an unexpected failure. The adaptive software "learns" the new flight characteristics, on board and in real time, helping the pilot maintain or regain control and prevent a potentially catastrophic aircraft accident.

The project's primary goal is to develop adaptive and fault-tolerant flight control systems leading to unprecedented levels of safety and survivability for both civil and military aircraft. The IFCS project is representative of the type of flight research used to explore new control technologies, blending intelligent flight controls with adaptive airframe structures to expand aircraft performance and capabilities.

The IFCS testbed aircraft formerly flew in the Advanced Control Technology for Integrated Vehicles project at Dryden from 1996 through 1999.

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research category was fourth, with the X-43A rounding out the top five. In positions six through 10 were Approach and Landing Tests of Enterprise and space shuttle support; the Lunar Landing Research Vehicle; the NB-52B; missions at Mach 3; and supercritical wing/winglets research. The top 20 projects are listed.

As for Dryden's more recent contributions, Intelligent Flight Control Systems work edged out the Stratospheric Observatory for Infrared Astronomy by just eight mentions. Third, and just 17 mentions behind the number one choice, was the center's work on the Orion Flight Test Crew Module. The Blended Wing Body was fourth, with sonic boom research rounding out the top five. The top eight projects are listed elsewhere in this edition.

A proposed addition to the projects list was the series of shops that make up the Structural Fabrication Branch, which includes the weld, fluids, composites, machine and sheet metal shops. The work accomplished there impacts a number of Dryden projects. While it was not mentioned as often in the survey, a mention here is in order.

Similarly, the Flight Loads Laboratory also received mention from survey respondents for its work on a number of projects. Some of that work has included thermal/structural testing for the X-15, YF-12, space shuttle elevon seals, panels for the National Aerospace Plane, structural components and X-37 flapperon flight qualification.

It's not possible to contain all of the good work and good people who have made Dryden what it is today in a single publication, nor is that the intent. The value of this effort is to stir recollections, stimulate debate and to retell stories about the people and projects that have made – and that make – Dryden a place people want to be part of.

X-43A ... from page 10

were designed to fly at Mach 7 and the third at Mach 10. At these speeds, the shape of the vehicle forebody compresses the air entering the scramjet. Fuel is then injected for combustion. Gaseous hydrogen fueled the X-43A.

After the first flight attempt, in June of 2001, failed when the booster rocket went out of control, the second and third attempts resulted in highly successful, record-breaking flights. Mach 6.8 was reached in March of 2004, and Mach 9.6 was reached in the final flight in November of 2004.

Both flights began with the combined test vehicle/rocket "stack" being carried by a B-52B aircraft from Dryden to a predetermined point over the Pacific Ocean, 50 miles west of the Southern California coast. Release altitude from the B-52B was 40,000 feet for both successful flights. At that point, each stack was dropped from the B-52B, and the booster lifted each research vehicle to its test altitude and speed.

Guinness World Records has recognized both the Mach 6.8 and Mach 9.6 accomplishments.

Lifting body aircraft ... from page 11

decades later. The X-24A was later modified into a new configuration, the X-24B – nicknamed the "flying flatiron" – with a rounded top, flat bottom and a double-delta planform that ended in a pointed nose. To reduce the costs of constructing a new research vehicle, the new shape was built as a shell around the original X-24A vehicle. Significantly, it was used for two landings on the main concrete runway at Edwards Air Force Base, demonstrating that accurate unpowered re-entry vehicle landings were operationally feasible. Following its retirement in 1975, the X-24B was placed on display in the National Museum of the U.S. Air Force at Wright-Patterson Air Force Base, Ohio.

X-15 ... from page 11

Lessons learned from X-15 turbulent heat-transfer studies contributed to the design of the Apollo capsule after designers found they could build lighter-weight vehicles with less thermal protection than was previously thought possible. The X-15 program also produced a wealth of biomedical data that paved the way for humans to travel in space and helped spacesuit designers refine protective garments. In addition, the project pioneered mission control techniques that are useful for coordinating successful spaceflight and aeronautical research missions.

Eddie Zavala

Eddie Zavala is deputy Stratospheric Observatory for Infrared Astronomy program manager, a position he assumed in March 2008.

Nominators called Zavala "exceptional," "personable," "sincere" and "easily approachable." In addition, he is seen as "passionate," "bright," and with "vision." Other nominators said he was a "positive role model," a "leader for the future," a "really talented, technically astute leader," "respected," and a person that exhibits "professionalism" and "a good understanding of the way things are and an ability to see the big picture."

Zavala was mission director for Aeronautics Projects in November 2006. He supervised nine project managers and oversaw implementation of all Aeronautics Research Mission Directorate activity at Dryden. Zavala also supported NASA Headquarters/ARMD as a center representative for program-level reviews, investigative teams and advocacy efforts. During a recasting of ARMD programs at NASA Headquarters in fiscal year 2006, Zavala was Subsonic Fixed Wing project manager under the Fundamental Aeronautics program.

In 2004, he was a project manager within the Vehicle Systems program for the Flight and System Demonstrations project, and later in 2005, he served as the center's executive officer. In 2000, Zavala returned to Dryden – after a two-year assignment at Johnson Space Center, Houston – where he had been a space shuttle flight controller. He worked on shuttle avionics upgrade projects, including the shuttle's glass cockpit. Upon returning to Dryden, Zavala was lead systems engineer for the Autonomous Formation Flight project, and later served as chief engineer for the F-15 Intelligent Flight Control Systems project before becoming a project manager in the Intelligent Systems technology area.

Up-and-Coming honorable mentions

Honorable mentions in the Up-and-Coming category include: Carmen Arevalo, Paul Aristo, Ethan Bauman, Eric Beker, Shedrick Bessent, Glenn Bever, C.J. Bixby, Jonathan Brown, Gustavo Carreño, Alexis Castelazo, Vince Chacon, Tony Chen, Matt Cheung, Bob Clarke, Brent Cobleigh, Dan Crowley, Frank Cutler, Ryan Dibley, David Dowdell, Tracy Edmonson, Kim Ennix, Russ Franz, Mike Frederickson, Gemma Fregoso, Van Tran Freischer, Robert Garcia, Bob Gardener, Monica Garvin, Tony Ginn, Leslie Gong, Craig Griffith, George Grimshaw, Ronnie Haraguchi, Claudia Herrera, Tom Horn, Larry Hudson, John Huffman, Tom Jones, John Kelly, Theresa Kline, William Ko, Tim Krall, Sunil Kukreja, Sirell Lane, William Lokos, Jessica Lux, Regina Maddock, Heather Maliska, David McAllister, David McBride, Jerry McKee, Chris Miller, James Mills, Mark Mungelsdorf, Larry Myers, Jeff Nelms, David Neufeld, Denise Otra O'Neil, Anthony Piazza, Marlin Pickett, Robert Quinn, Ron Ray, Lance Richards, Jack Ryan, John Saltzman, Rosemary Sanchez, Steve Schmidt, Larry Schuster, Mark Skoog, Mark Smith, Clint St. John, Craig Stephens, Jim Stewart, Pat Stoliker, Daryl Townsend, Roy Tryon, Casey Tull, David Voracek, Randy Wagner, Alan Wallace, Mary Whelan, Peggy Willis-Hayes, David Wright and Michael Young.

Driving Forces honorable mentions

Honorable mentions in the Driving Forces category include: Bill Andrews, Jenny Baer-Riedhart, Charlie Baker, Bob Baron, Roger Barnicki, De E. Beeler, Don Bellman, Larry Biscayart, Michael Bondy, Don Black, Vance Brand, Bill Brockett, Dick Day, Robert Downing, Hubert "Jake" Drake, Angel Dunn, Lance Dykoff, Dale Edminister, Tom Finch, Michael Harlow, Bob James, Marty Knutson, Jack Kolf, Don Kordes, Mary Little, Jim Love, Richard Maine, Gene Matranga, John McTigue, Dick Monaghan, Al Myers, Harold O'Brien, Wayne Ottinger, Jack Russell, William Schweikhard, Jim Stewart, Tim Stidham, Ed Teets, Tom Toll, Gerry Truscynski, Joe Vensel and Joe Weil.

Special thanks to the key people that helped with this publication

Many people helped this year-long effort come to fruition.

Jaimie Baccus developed the online survey, Justine Mack created the boxes for the paper surveys, David Faust created the cover and Dennis Calaba created the graphics for the center spread.

Christian Gelzer, Peter Merlin and Curtis Peebles wrote a number of the people and project profiles. Gelzer also played a big role as devil's advocate.

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