to tell Ray's story. Additional thanks to Norm Crabill and Linda Burdette for their help, encouragement & editorial input. Comments & questions are welcome: wonsey1@Juno.com

Note regarding Richard DuBose Tudor: an electrical engineer and Capt. in the Corps of Engineers, Marguerite's maternal grandfather was stationed in Norfolk in February 1942. Soon after, he and Col. Robert Neyland were assigned to work at Byrd Field from March to August 1942.

The FDR Albany-Chicago flight story is drawn from memories, Ray Wonsey's oral accounts and a written account penned by Richard Sanders Allen. For that story, other sources and thanks to:

- NASM abstracts: Dept of Comm/CAA/FAA file records.
- William T. Larkins, Pleasant Hill, CA , Larkins, author of "The Ford Story" (1958) discovered that the co-pilot of the Roosevelt Charter Flight to Chicago in 1932 was Fred Smith. Previous accounts, including those of American Airways personnel, had named the co-pilot as "Fred Clark", the name under which he flew at that time.
- Original material on the Roosevelt Charter Flight gathered by Ed Plaut of Greenwich, CT in 1964. Donated to and on file in the Franklin D. Roosevelt Library at Hyde Park, NY.

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A Legend Never Dies

Linda Burdette

Albert Scott Crossfield was born in Berkeley, California on October 2, 1921 and grew up in California and Washington. His father was a petroleum chemist who carried the scars of World War I gas warfare and was an executive with Union Oil Co. Union Oil was probably one of the first corporations to have a business aircraft fleet and Carl Lienesch was one of the company pilots. Lienesch gave Crossfield his first flight at the age of six in an oil company plane, an Alexander Eaglerock. Lienesch always claimed that Crossfield fell asleep during the flight, but nevertheless that flight awoke in Crossfield a passion for aviation.

Lienesch hired Florence (Pancho) Barnes to promote company products, which she did while flying the Travel Air Mystery Ship racing airplane. Crossfield recalled wryly that his mother "seemed to have a dim view" of Pancho, but did allow young Scott to visit her Burbank, California airport hangar and learn about the aircraft. Scott, however, wanted to do more than fly such aircraft – his dream was to design, build, and fly as did his childhood heroes, famed test pilots Eddie Allen, Jim Doolittle, and Benny Howard.

Crossfield had the opportunity to see Eddie Allen make an early flight of the Boeing Clipper on Seattle's Lake Washington. The Crossfields had moved to southern Washington and Lienesch took high-school student Scott to the event. Lienesch emphasized that Allen was Boeing's consummate engineer as well as test pilot and told Crossfield "Allen's job is the one you want to shoot for. Be an engineer. Help build the airplanes. Then fly them and find out what you did wrong." One wonders if Lienesch had any idea the heights to which his protégé would take that philosophy.

Crossfield began flying lessons in 1933 at the age of 12, at a small airport in Wilmington, California in return for delivering newspapers and washing airplanes. The flying lessons were kept secret from his parents, who

would have disapproved. Then in the late 30's he entered the Civilian Pilot Training program. His instructor was a Wyoming cowboy who had gotten tired of riding fences on horseback and taught himself to fly.

He began his educational career at the University of Washington in aeronautical engineering but dropped out in 1941, and went to work for Boeing on the DB-7/A20 line as a production expediter. He recalled it as "an invaluable educational experience with a reverse tuition of 42 cents an hour." He joined the Navy flight program in 1942, becoming a U.S. Navy fighter pilot and fighter gunnery instructor. He flew the F6F and F4U fighters, as well as SNJ trainers, and a variety of other aircraft during the war.

After the war he returned to the University of Washington and earned his Bachelor of Science degree in aeronautical engineering and master of sciences degree in aeronautical sciences. During this time he was in the Navy Reserves and led the 13th Naval District Aerobatic Team flying FG-1D Corsairs at air shows around the Pacific Northwest. Following his graduation, he was the Chief Operator of the University of Washington's F.K. Kirsten Wind Tunnel from 1946 to 1950. This experience served him well in later years.

From 1950 to 1955, he was an aeronautical research pilot for the National Advisory Committee on Aeronautics (NACA) at the Edwards High Speed Flight Station (now the NASA Dryden Flight Research Facility). Initially, Crossfield was involved with the X-1 program. The X-1 was the first of the Air Force's post-war research airplane series. Its purpose was to see if man could exceed the speed of sound with a manned aircraft. Of course, it had accomplished its goal of flying supersonically in 1947 with Chuck Yeager at the controls. One interesting fact about the X-1 is that when they were designing the aircraft, the engineers did not have the capability to do wind tunnel testing transonically. So they made the fore body of the X-1 shaped like a 50 caliber bullet which was a well-known supersonic projectile at that time. Crossfield often pointed out that one of the main reasons for a research airplane program was that they had no testing alternatives to actually flying the planes.

While at NACA, on November 20, 1953, he made history by becoming the first man to fly at twice the speed of sound (Mach 2) piloting the D558-II Skyrocket. The D-558-II was a research airplane funded by the Navy (only aircraft funded by the Air Force had the "X" designation) and its purpose was to review what the transonic effects of the swept-wing would be. The Skyrocket was taken aloft by a Boeing P2B-1S (the Navy designation of the B-29) "mother ship". It was dropped clear of the bomber at 32,000 feet and taken to 72,000 feet before diving to 62,000 feet where it achieved Mach 2. The Skyrocket was a very successful program and experts reckon that almost every airplane in the air today has in its design a little bit of the D-558-II basic information or information learned from it.

NASA Dryden Flight Research Center Photo Collection

Scott Crossfield in cockpit of the Douglas D-558-II after first Mach 2 flight

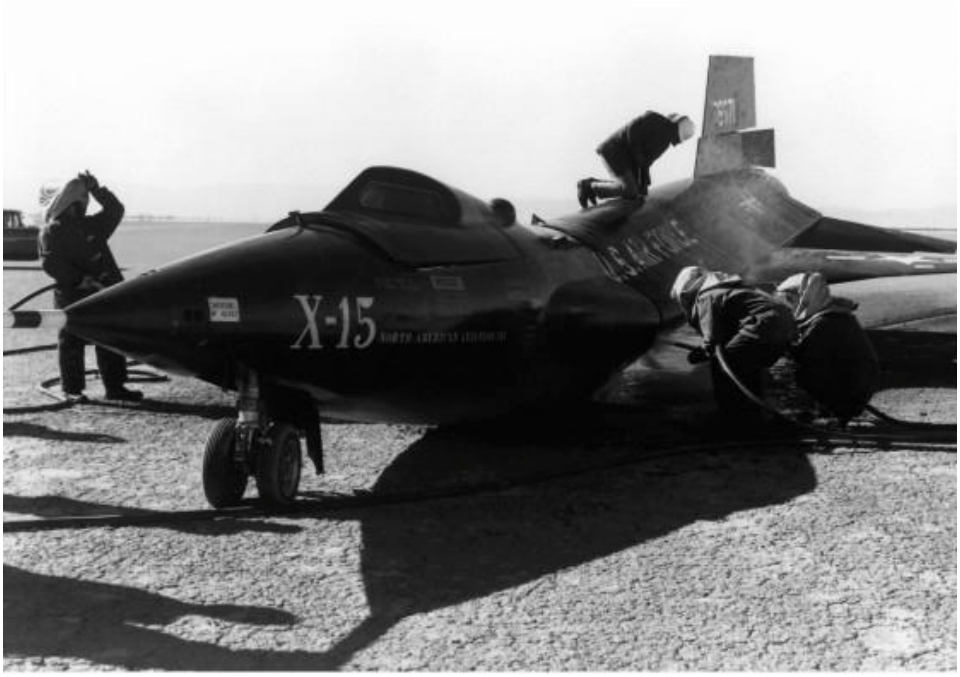
Flights in that airplane had sometimes been hair-raising. During the first air launch of the Skyrocket, the airplane suffered engine trouble and the windshield iced over. Crossfield had to land without electrical power or radio communications. He recalled later "all I could do was put

the sun in one place on that windshield and pray that I was right-side up." He managed to operate the radio with battery power and received landing assistance from a chase pilot.

Not all of Crossfield's flights ended so successfully. In September 1954, he made a dead-stick landing in a North American F-100A during its first NACA research flight. After receiving a fire warning signal, Crossfield shut down the jet's engine and made a gliding approach and landing on the dry lakebed, similar to the type of landings he had performed numerous times in rocket planes. He admitted later that he was showing off a bit. He knew that they had three cycles on the brakes even without power and thought that if he held the brake down on the last cycle, he could stop the plane. He intended to coast across the lakebed and up a concrete ramp to the NACA hangar. Unfortunately, his plan didn't work and on the third brake cycle, the airplane kept rolling. He could only watch in horror as the aircraft rolled into the hangar (barely missing other research airplanes) and penetrated the building's southwest wall. This spawned a frequently repeated joke that Chuck Yeager may have broken the sonic wall, but Crossfield broke the hangar wall.

With 99 flights in the rocket powered X-1 and D-558-II, he had more experience with rocket planes than any other pilot in the world by the time he left Edwards to join North American Aviation in 1955.

From 1955 to 1961, he was the design specialist, X-15 project pilot, and chief engineering test pilot for North American Aviation, Inc., Los Angeles Division. He was involved in all phases of X-15 specification and design, cockpit and control systems, engine systems, structures, and so forth. Crossfield and Walt Williams (his boss at NACA) were returning from a fishing trip and heard on the radio that a 75,000 pound thrust Viking rocket engine was successfully fired at Santa Suzanna. That led to the discussion of what they could do to man a plane with a 75,000 thrust rocket and that discussion became the X-15. The X-15 was a rocket-powered aircraft 50 feet long with a wingspan of 22 feet. It was a missile-shaped vehicle with an unusual wedge-shaped vertical tail, thin stubby wings, and unique side fairings that extended along the side of the fuselage. It weighted about 14,000 lb empty and approximately 34,000 at launch. The XLR-99 rocket engine, manufactured by Thiokol Chemical Corp., was pilot controlled and capable of developing 57,000 lbs. of thrust. The specifications of the X-15 were that it would fly to 250,000 feet and reach a speed of 6,600 miles, 6,600 feet per second. This allowed the study of aeronautics, thermodynamics, and heat transfer. Because of the large fuel consumption,



NASA Dryden Flight Research Center Photo Collection

One of the earlier X-15s suffered a "broken back" after a hard landing by Crossfield

the X-15 was air launched from a B-52 aircraft at 45,000 feet and a speed of about 500 mph. Depending on the mission, the rocket engine provided thrust for the first 80 to 120 seconds of flight. The remainder of the 10 to 11 minute flight was powerless and ended with a 200 mph glide landing. The X-15 aircraft was developed to provide in-flight information and data on aerodynamics, structures, flight controls, and the physiological aspects of high-speed, high-altitude flight. A follow-on program used the aircraft as a test bed to carry various scientific experiments beyond the Earth's atmosphere on a repeated basis. Much of the information learned from the X-15 is in the space systems developed since then.

On June 8, 1959, Crossfield completed the airplane's first flight, an unpowered glide from 37,550 feet. The check-out was rather rushed as he had only three minutes and fifty-eight seconds to learn how to fly the airplane and bring it in for a landing. He found that the airplane appeared to be unstable and pitched, making it very difficult to control. He was able to safely land the airplane by figuring out a way to get it on the ground at the bottom of the pitching oscillation. They realized that there would be some rather violent motions of the controls during some of the maneuvers and the weight of the pilot's arm fed the action of the airplane. So they designed a control system with a sidearm controller such that the pilot could put his arm into a rest that would resist the external forces and control the airplane only with the movement of his wrist. This armrest prevented the violent g forces from upsetting the pilot's control of the stick. The basic design is something we find very often in our current-day fighter airplanes.

Another X-15 innovation attributed to Crossfield is the inclusion of engine controls into the cockpit. Previously, all engine adjustments were done by technicians making adjustments on the ground based upon results of flight profiles.

Crossfield also worked with the David Clark Company to develop a full-body pressure suit, which evolved into the Project Mercury astronaut suit. "It's funny how that happened," Crossfield said. "It was 1951 and we knew we needed something better than the partial pressure suits we'd been using if we were going to keep climbing higher and pushing the edge of the operational envelope. I knew Clark was working with the Navy on a full pressure suit project, so I contacted him and got involved. Joe Ruseckus, one of Clark's research engineers, came out to Edwards and stayed at my house. We built much of the hardware and plumbing for a prototype in my garage workshop and sewed the suit on my wife's sewing machine. Marion Carl wore an exact copy of that very suit when he set the world's altitude record in the D-558-II. Can you imagine the government letting something like that happen today?" he said. "But you know what? That suit evolved into the pressure suits eventually used by all military pilots and NASA astronauts."

On Sept 17, he completed the first powered flight in the X-15 and in 1960 he was the first to survive flying the X-15 three times the speed of sound. He was also the pilot for the first 30 demonstration flights. Altogether 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 miler per hour) and a maximum altitude of 88,116 feet. (Unofficial records show him exceeding Mach 3.) The X-15 was flown over a period of nearly 10 years – June 1959 to October 1968 – and set the world's unofficial speed and altitude records of 4,520 mph (Mach 6.7) and 354,200 feet in a program to investigate all aspects of manned hypersonic flight. Information gained from the X-15 program contributed to the development of the Mercury, Gemini, and Apollo manned spaceflight programs.

As usual, Crossfield had his share of potential catastrophes in the airplane. Shortly after launch on his third flight, one of the XLR-11 rocket engines exploded. He was unable to jettison his propellants and forced to

make an emergency landing during which the excessive load on the aircraft broke its back just behind the cockpit. Miraculously he was uninjured and the airplane was repaired. On June 8, 1960, he had another incident, this time with the replacement XLR-99 engines. Testing the larger engine in flight would require some very precise controls on the engine and to ensure that the systems would respond, they decided to test the engine on the airplane on the ground. To do this, the pilot would get into the airplane and the rest of the crew would go into protection in the block house. (Crossfield described this as an exercise in "developing the confidence of the aviator.") He was seated in the cockpit when a malfunctioning valve caused a catastrophic explosion. The fore part of the airplane, including the cockpit, was blown about 30 feet away. Crossfield's only injury was that his pants got wet from the water the firemen hosed onto the plane. He pointed out that the cockpit was actually a pretty safe place for the pilot since the structure was designed to resist very high temperatures of reentry flight.

During his time with the research airplane program, Crossfield flew 100 different types of experimental airplanes and jets, including X-1 through X-15. The research airplane program's primary goal was to develop technology that could be put to useful purpose – supersonic high-speed aerodynamics. And the success of that program has impacted aviation enormously over the years. Crossfield was proud of the economics of the research airplane program. "The entire program from the X-1 through the X-15 – 33 years with about 30 different configurations of about 13 different airplanes – all that explosion of technology and engineering, cost less than $500 million. By comparison, the Apollo program cost about $40 billion."

In 1956, while working at North American Aviation, Crossfield bought his first general aviation airplane, a Bonanza. He related that he flew it all over the country on business and never got paid a nickel. It seems that North American's lawyers didn't think it was safe for him to fly the Bonanza to and from Edwards, and so would pay his travel expenses for any other mode of transportation, but not flying. He flew over the San Gabriel Mountains that separate the Los Angeles basin from Edwards and had to deal with the cloud deck that came in every night. The company lawyers protested because their chief engineering test pilot didn't have an instrument ticket. He had taught instrument flight in WWII, but never actually got the ticket. (He finally got his instrument ticket in 1989.)

After completing the X-15 program at North American he served as systems director in the company's Space and Information Systems Division where he oversaw quality, reliability engineering and systems test activities for such programs as the Hound Dog missile, Paraglider, Apollo Command and Service Module, and the Saturn V second state. He put his concerns in writing about the use of 100% oxygen in the Apollo capsules during ground tests. Program officials did not listen and about a year later, the Apollo 1 fire killed three astronauts. Federal investigators collected the Apollo 1 documentation and that was the last Crossfield saw of his warnings.

In 1967 Crossfield joined Eastern Airlines as a division vice president for research and development. After four years, he was promoted to staff vice president working transportation development issues for the airline, especially working with U.S. military and civilian agencies on air traffic control technologies. From 1974 – 75, he served as Senior Vice President at Hawker Siddley; setting up its U.S. subsidiary for design, support, and marketing of the HS-146 transport in North America.

In 1977, he joined the U.S. House of Representatives Committee on Science and Technology where he served, until his retirement in 1993, as a technical advisor on all aspects of civil aviation research and development and became one of the nation's leading advocates for a reinvigorated research airplane program.

His many awards include the International Clifford B. Harmon Trophy for 1960 and the Collier Trophy for 1961 from the National Aeronautics Association, both presented by President John F. Kennedy at the White House. He was inducted into the National Aviation Hall of Fame (1983), the International Space Hall of Fame (1988), the Aerospace Walk of Honor (1990), and the Virginia Aviation Hall of Fame (1998). He received the Lawrence Sperry Award, the Octave Chanute Award, Iven C. Kincheloe Award, the NASA Distinguished Public Service Medal, and was named an Honorary Fellow by the American Institute of Aeronautics and Astronautics in 1999. He had an elementary school named in his honor near his last residence in Herndon, Virginia, and a ribbon named after him is one of the Aerospace Education Awards in the Civil Air Patrol Senior Members program. Crossfield was always interested in encouraging young people in aviation and was a strong supporter of the Civil Air Patrol. He created the A. Scott Crossfield Aerospace Education Teacher of the Year award to recognize and reward teachers for outstanding accomplishments in aerospace education and for their dedication to the students they teach.

From 2001 to 2003, Crossfield became involved with the Wright Flyer, which was scheduled to fly on the 100th anniversary of the Wright Brothers' flight at Kitty Hawk. He was the senior trainer for the two prime pilots for the aircraft and considered the Wright Flyer to be one of the more difficult airplanes he had flown. This situation was aggravated by the fact that the Wright airplane required all the pilots "unlearn" some of the piloting basics they had been using for years. "The Wrights left no legacy of data, or an account of all the difficulties they had" said Crossfield. "I've taken 10 flights, none of which ended well, trying to find the flight envelope for this aircraft … the problem with wing warping is that it gives you yaw in the opposite direction you're trying to turn. It's quite an amazing aircraft … it's hard to fly, and unstable." It is appropriate that one of Scott's last endeavors was not something that looked to the future, but attempted to recreate the past. It's just the kind of adventure he relished.

EAA's Countdown to Kitty Hawk Photo Gallery

Scott Crossfield mans the towline pulling the training glider for the Wright Flyer's pilots in training

Crossfield died on April 19, 2006, when his private plane crashed near Ranger, Georgia, during a flight from Prattville, Alabama to Manassas, Virginia, near his home. While the cause of the crash has not yet been determined, there were severe thunderstorms in the area when air traffic monitors lost radio and radar contact with Crossfield's plane. He is survived by his wife of sixty years, Alice Crossfield; six children; and two grandchildren.

Crossfield described himself as "an aeronautical engineer, an aerodynamicist, and a designer" and said "My flying was only primarily because I felt that it was essential to designing and building better airplanes for pilots to fly. My professional endeavor really was more in that line than being a pilot per se. It was part of the whole circumstance of designing and building airplanes."

It was fitting that Crossfield be involved in the recreation of the Wright airplane because his role models had always been the Wright Brothers. Like Crossfield on the X-15, they were involved in the concept, the criteria, the requirements, the performance, the details, the manufacturing and quality control, and the managing of a new and innovative work. He considered them to be the first systems integration engineers and felt that their business process could well be emulated today.

In 2003, Scott Crossfield wrote an article for Aviation Week and Space Technology's March 24, 2003 issue in which he decried the bureaucracy, timidity, and the burden of "engineering/operational decision by popular vote" that he believed hampers today's aeronautical research and space program. He reiterated his strong belief in manned flight test. He distrusted the limits of simulation, and believed unmanned aircraft could not be taken as close to the edge of the envelope. But there was a more basic reason as well. "My view is that if you do not make a manned vehicle and have a man ride in it …what use is it to the human experience?"

So what was his view for the future? For all his concerns about the current state of aeronautical research, he turns out to have been an optimist. He stated "there are tremendous opportunities to be discovered to improve life on Earth with orbital technology. Like the Wrights' opinion on the future of aeronautics a century ago, my view on the future of cislunar operations today is that we don't know what it will be, except that it will be spectacular….I find these new generations of young engineers intelligent and remarkably well educated….The coming generations will not long suffer the current hiatus in aerospace progress. They will throw out the prevailing timidity and create a whole new era of their own…. [W]e are first and foremost engineers on the way to the stars."

And we carry with us the legacy and the legend of a man named Scott Crossfield.

* Author's Note: "A legend never dies" is part of a line from a song by another well-known pilot, Jimmy Buffett. The complete line is "Our lives change like the weather, but a legend never dies."
