JOHN GEBHARDT IS SERVING IN IRAQ. This little girl’s entire family was executed by the insurgents. They intended to murder her too, and shot her in the head...but they failed to kill her. She was cared for in John’s hospital and was healing up, but continued to cry and moan. The nurses said that John is the only one who seemed to calm her down, so John spent four nights holding her while they both slept in that chair. The girl is coming along with her recovery. 

Editor’s Note: In this holiday season when most of the civilized world celebrates the birth of a Child, we celebrate the saving of a child. May God Bless John Gebhardt and all those proud Americans serving their country around the world. May your season be filled with faith, hope, and health.
Dear NAA Retiree Bulletin Subscriber

With this issue we come to the end of another year. It often amazes us at what we have accomplished with only five volunteers, and an incoming phone line and a mailbox at the Boeing Seal Beach facility. Of course, much of our success derives from the efforts of our splendid authors that have come forward to tell their stories. Often, these stories extend a window to events that have not been reported to the degree our authors have provided. As a result, several historians have requested copies of our bulletin to be archived in their libraries for future generations. This issue is no exception with articles about the Mustang, the X-15, the Space Shuttle, and finally, the closing of the North American Trisonic Wind Tunnel.

Astronaut John Young provides our first article written by a Gemini/Apollo/Space Shuttle astronaut with a critique of the first flight of the Space Shuttle in Space, STS-1. Cleve Kimmel concludes his penetrating and exciting three-part study of the X-15 program. Lowell Ford reports on the negotiations with the British Purchasing Commission before America entered the war and the preliminary design effort related to the building of the Mustang I for the RAF. Finally, an article by Andrea Woodhouse, reprinted from the Torrance Daily Breeze as a professional courtesy, on the closing of the North American Trisonic Wind Tunnel. The tunnel was donated to UCLA to be used as a university research facility, which never happened. Instead, it was rented to an aerospace company doing scientific research. Evidently, the hunger for money outgrew the need for learning! So much for making a donation to a major university!

The fourth B-1 reunion luncheon, held at the Golden Sails Hotel in Long Beach, was very successful with an overflow crowd of 225 in attendance. The speaker was Capt. Scott Higginbotham telling of his combat experiences as a B-1 pilot over Iraq and Afghanistan to a very appreciative audience. He is the second generation in his family to be a USAF B-1 pilot.

Our appeal for early renewal of subscriptions has hit a welcome chord and many of you have responded. However, if the date above your name and address on Page 20 remains DECEMBER 2007, this is your last issue. Please renew as soon as you can and save us the time and energy needed to mail out reminder cards. Thank you!

The 46th Bald Eagles Reunion Will Be Held on Saturday, April 12, 2008 at the Proud Bird Restaurant
11022 Aviation Blvd. (at 111th Street)
San Pedro, CA 90732-4529

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Doors Open for Social at 10:00 AM

Seating for Lunch at 12:00 Noon

Send your check for $22.00 payable to Bald Eagles Inc. to:
A.M. "Amby" Baccaro (310) 831-0945
3818 Stargazer Ave.
San Pedro, CA 90732-4529

Include with your check the name you wish on your badge and the name of each guest included in your payment. Tickets and badges will be issued as you register at the door. Tickets sold at the door will be $25.00. Sorry, no refunds after April 7, 2008. Order your tickets after the 1st of the year. But order early if you want preferred seating.

There are no service requirements to attend – just the love for Airplanes and Spaceships

Meet old friends—Make new ones!

Parking is limited—Carpool and Come Early!

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When the Apollo Program was over, then President Nixon along with the Department of Defense (DOD) decided we needed a new spaceship with wings to haul big payloads into orbit. It was decided to make the payload bay 15 feet in diameter and 60 feet long to haul a very large classified payload that supported the DOD.

On July 26, 1972, the STS Division of North American Rockwell in Downey, California won the contract to design and build the Space Shuttle Orbiter. Within months, I was using a T-38 to perform Shuttle approaches. In January 1973, we made our first trip to Los Angeles. We spent a lot of time at the Downey facility, working with some great engineers and technicians, helping to design the shuttle cockpit. One of our concerns was the sizes and shapes of the windows in the cockpit layout. The Orbiter has 42 systems, each of which was to be controlled from the Orbiter cabin. Our flight crews worked closely with the North American Rockwell engineers in coordinating the location of all the switches and software in the crew cabin. We laid out the panels for each system so that future flight crews could totally control the way the vehicle operated. To provide that capability, we made certain that all critical system switches and circuit breakers were located and installed where they would be accessible to the flight crews.

Needless to say, many meetings and design reviews were held. My flight log shows that I made 15 trips from Houston to Los Angeles in 1973. All of them were to support the early design layouts of the Space Shuttle Orbiter cockpit displays. The final configuration was then clearly defined in several publications such as the Aero Dynamic Design Data Book first published in May 1972 and the integrated vehicle configuration book called the Space Shuttle Definition Handbook, which showed and discussed in detail all of the Space Shuttle systems. It also listed the names of the NASA technical contacts and the counterpart North American Rockwell technical contacts.

The North American Rockwell engineers and technicians were living 24/7 with the design of the vehicle, working very closely with their NASA counterparts. For example, the Aero-dynamic Design (Loads and Response Group) was headed by C. Warner at Rockwell and his NASA technical contact was T. Modlin. In those days, it was stated, “The Shuttle System is capable of a 14-day turnaround from landing to lift-off in 160 working hours, two shifts a day, five days a week for two weeks.” You all know we never came close to that turnaround, but when we started, we believed we could do it.

Knowing what I knew about Shuttle approaches, I begged North American Rockwell to give us a subsonic lift-to-drag ratio of 5.0. They said the best they could do was 4.45. The STS-1 mission landing overestimated tile drag, so we actually achieved a 4.9!

Obviously from 1972 on, Downey was very busy. The Orbiter was being fabricated at Palmdale to be launched in 1978. That is when it was completed enough to be shipped to the Kennedy Space Center (KSC). When the Orbiter, now named Columbia, arrived at KSC, there was still a lot of work to be done. Working to an established schedule, KSC field personnel took on the tasks of completing all open work, testing the hardware at the subsystem and system level and, finally, rolling the orbiter out to the pad where the vehicle, now part of the Space Shuttle, underwent further testing and system checkout. To assist them in these preparations for launch, groups of engineers and technicians from Downey followed the Orbiter to KSC.

The intensity of the launch effort did not deter the will to constantly improve the vehicle. For example, in this same period, we introduced tile densification which increased the strength of critical tiles from 2-4 psi to 20-22 psi.

Bob Crippen and I were selected to fly the first Space Shuttle mission, STS-1. We ran a lot of all up end-to-end tests in the Orbiter. The first Columbia had ejection seats, which I am glad we didn’t have to use. It was a great honor for Crip and I to launch in the Orbiter on April 12, 1981. From this initial mission, we had learned a lot.
Due to the underestimation of the Solid Rocket Booster motors’ thrust and force loads, we staged very high. When we got to orbit, we had successful experiences in our opening and closing payload bay tests. Our Environmental Control Systems and orbiter radiators worked well. Unfortunately, our 10,000 pounds of Development Flight Instrumentation did not work due to a failed system on the middeck, which we could not access to remove and fix.

The Orbital Maneuvering System engines and the Reaction Control System engines worked very well. The Hydraulic System that controlled our elevons during entry was powered by Auxiliary Power Units. Those also operated well. These were the systems which we worried about for their ability to operate in zero gravity.

The entry was very normal except for an unexpected initial 4º of side slip, which automatically timed out before we got in the upper atmosphere. We felt very lucky. The rest of the entry was normal with the Columbia flying its normal 40º angle of attack to Mach 10 and then pitching over to subsonic angles of attack. I flew the Columbia manually around the Heading Alignment Circle and landed on Edwards Lakebed Runway 22. It was a great mission.

Dr. Chris Kraft said it best, “We just got infinitely smarter.” At the time, we didn’t have such things as all upwind tunnels at high mach numbers or computational fluid dynamics. So without all of the great work done by the North American Rockwell engineers and technicians, we would not have achieved the successes we had experienced. So many thanks for all you retirees.

About the Author: The name John Young is synonymous with the word Astronaut. After graduating from Georgia Tech, he joined the U.S. Navy and served on a destroyer during the Korean War. Sent to flight training, he served with Fighter Squadron 103 for four years. Completing test pilot training, he established several world time-to-climb records before reporting to NASA. Selected as an astronaut, he is the first person to fly in space six times from earth and one time from the lunar surface. His first flight in Gemini 3 with Gus Grissom was the first manned Gemini mission. His second was with Mike Collins in Gemini 10, where he completed a dual rendezvous with two Agena target vehicles. On his third flight, John was the Command Module Pilot of Apollo 10, with Tom Stafford and Gene Cernan, which orbited the Moon. His fourth flight, Apollo 16, with Ken Mattingly and Charles Duke, was a lunar exploration mission where he set foot on the Moon and drove the lunar rover. His fifth flight was as Spacecraft Commander of STS-1. His sixth was as Spacecraft Commander of STS-9, the first Spacelab mission. He has logged more than 15,300 hours flying time and 835 hours in space. His academic, aeronautical and astronautical awards and honors are too numerous to list. He was inducted into six Aviation and Astronaut Halls of Fame. John Young retired from the U.S. Navy as a Captain in 1976 after 25 years of active military service, and on December 31, 2004, he retired from NASA with over 42 years of service.
To test the tubing, required two new items: how to see what was happening in the tubing, and what was the actual temperature. The first was accomplished by inventing a “see-through” port constructed of a Plexiglas type material, and thermally shielded from heat radiation. It was connected to high-speed cameras that picked up refracted background light from a light source fed into the port, thus providing a clear image of the liquid flow conditions. Although we didn’t recognize this feat as of any particular importance; about 10 years later the “fiber optics” innovation shook America with introduction of light transmission cables. These were the next generation of the light transmission port that I had earlier invented. The second was inventing a thermal couple indication system that accurately measured the tubing wall/LH$_2$ interface temperature.

After six months of thermal measurement investigation, it was discovered that apparently no one had ever been able to accurately measure dynamic temperatures in the -430°F region and lower. It was vital to the engine test that accurate temperatures be known. To accommodate the need, I constructed a diffusion bond between the thermal couple tip and the stainless steel tubing wall. Accurate temperatures were recorded when the diffusion bond was created within 10% penetration of the inner wall of the tubing line. Thermal response measurements were found to be virtually non-existent. Patents were filed for both, but never issued as the application was thought to be too limited. It wasn’t until a decade later that the invention of “fiber-optics” emerged. The little test port we used was the forerunner of that invention, but it was not recognized as such at this early time.

To allow the aircraft to attain Mach 8, additional fuel for the XLR-99 rocket engine had to be provided. It was determined that aerodynamically the only alternative would be to add external stores of fuel, and drop these storage tanks after the fuel was expended. These tanks would have to be separated from the X-15 under about a 6-g force, and at a speed under Mach 4. While others worked out this problem and established the dynamic forces at time of ejection, my task was to create a feed system that allowed the use of all existing components to the maximum extent possible, since money was very tight and weight was at a premium.

The major design problem was how to squeeze double the amount of helium into the airplane. The original helium tanks had been designed to operate at 3,000-3,600 pounds of pressure, with a safety factor of three. The regulators and all system components in the main pressure lines were designed to operate up to 3,600 psi. It was suggested to management that by reducing the helium bottles safety margin to one and a half at room temperatures, and at nearly 2-1/2 at -300° this could be accomplished. I believed that the current state-of-the-art was such, that the bottles could be fabricated very reliably to “burst” at precise conditions, not merely “over” some stated value, which was the practice at the time. New bottles were fabricated and tested. The design criteria were that the bottle had to burst at precisely 9,000 psi. Excess weight by overdesign could not be tolerated. When tested, the bottle burst at 9,023 psi. Getting the helium into the bottle proved to be more difficult than anticipated. Very little research had been done with helium gases at 6,000 psi and -300°F conditions. Unless the gas was at this initial condition, the flight couldn’t be made, since there would not be sufficient helium to pressurize the propellant tanks. Several attempts to fill the tank failed to produce the mass of helium required. According to all of the entropy charts available, it should have been there! Even after three days, the pressure remained at 6,000 psi, and the bottle temperature was at -300°F, so where did the mass go? Strangely enough, when
we measured the temperature inside the tank, it was discovered that the gases compressed into separate thermal layers, much like layers of cake, each about 10 inches thick, with some helium temperatures over 200°F. The gas bottle was about 9 feet long, and 16 inches in diameter. These thermal layers had virtually no thermal conductive properties, and as a result, they would not mix! The program couldn’t afford an elaborate mechanical mixing system, nor could any recirculation system be added. By modifying the filling system such that the helium was first cooled to -320°F before filling into a -320°F pre-chilled bottle, and keeping the bottle chilled by circulation of LN₂ for 24 hours afterwards, the design goal was met. NASA technicians designed, tested and built the modified servicing system.

To accommodate the need to retain the existing helium tank pressure regulators and other major pieces of equipment, it was necessary to design a system that prevented the 6,000 psi helium from reaching these devices during operation. The main system requirement was that the rocket engine had to have a steady pressure available at all times. This meant that the system pressure couldn’t be transferred from external to internal; but that in reality they had to be from the same source. This meant that the 6,000 psi helium had to be made available to the regulators that could only withstand 3,500 psi. Flow restrictors with pressure limiting controls were added between the bottle and the regulators, to keep the pressure at 47-1/2 psi during flow. They could not be configured to totally stop the helium flow during periods of nonuse. This required that a 100% positive zero-leak valve be designed to close off the helium supply until time to use it arrived. Easier said than done-for in the late 1950s, such things were not found lying about. The Marotta Valve Corporation was selected to design the valve, and after seven months of effort, they had one available for test. Needless to say, it failed miserably. Upon closer examination it was determined that the main closure device was a self-balancing poppet, and as such it would never operate. In discussions with their chief engineer, he stated “I’ve designed valves for 25 years, and that poppet is not balanced”. Then, when asked, “So, why doesn’t it work?” he responded, “The aircraft design was all wrong.” With that understanding their contract was terminated. Good things do happen though. Simply by accident, Consolidated Controls Corporation heard of our dilemma, and said they had a valve “off-the-shelf” so to speak. To support the Atlas Missile program, they had designed a zero leak helium shutoff valve that operated in almost the exact same thermal and pressure environment as the one needed for the X-15. This was their qualification unit. It was retrofitted, tested and delivered within two weeks. To attach it onto the pressure bottle, I used the same technique as developed earlier for the LH₂ line. After many rigorous tests, it was verified as flight acceptable. Throughout the life of the airplane, there were no failures.

Design systems for aircraft installations are normally created as two-dimensional drawings that show just small portions of the total picture; and as changes to the design are made, little sketches are attached that depict the new version. It was up to the installers to figure out what it looked like with the “attachments”. This system didn’t sit right with me, so I created a 1/4 scale 3-D drawing of the entire fuel and propulsion and pressurization system. There were so many parts to the system that in order to tabulate those for procurement would mean that at least six months of manual sorting and collating would be required. Having had previous access to the IBM 7090 computer, I decided that the computer would be used to create a Bill of Material (listing of the parts needed to make the system). What a shock! The computer could only perform simple calculations. The engineering, accounting and management principles had not been created by this time; and Fortran 2,
the newest version of programming language available for the computer, could not accomplish the sorting and tabulation of the thousands of part numbers in the system. Having already committed to do it, I found that by using “core” language, coupled with the alphabet and numerical hierarchy required, it could be accomplished. Two weeks later, the computer group personnel had created the first “alpha-numeric” computer sort routine for my use. As of this date I have not seen any other program computer spreadsheet program that can accomplish this feat. The existing programs invariably get the sort backwards, and intermixed with the incorrect sequence (e.g., 1, 11, 111, 2, 3, etc; instead of 1, 2, 3, 11, 111, etc.). This is due to their partial use of the ASCII identification table for reference. The computer personnel who created this matrix were exceptional.

The pressurization system was designed so that the main tank pressure regulators sensed the internal tank pressure, but delivered the gas flow to the external tanks for expulsion of their propellants. After external tank drop, it reverted back to internal pressure flow. This allowed the engine feed inlet pressure to remain constant. After the external tanks were empty, an indicator light on the pilot's cockpit panel would illuminate. This was his signal to eject the tanks. This action also closed a valve that separated the two-tankage systems. There was a 10 second safety margin built into the transfer to accommodate pilot reaction times. If the transfer did not occur within that time span, the main engine would shut down automatically. This could prove disastrous for the pilot and plane since the external tanks were designed to be ejected with forward thrust.

The start of the problems occurred when we selected a valve manufacturer, BH Hadley Company, to fabricate the 6-inch diameter butterfly shutoff valve to be used between the two LOX tankage systems. After delivery to NAA, when tested it failed to operate. It could be opened, or it could be closed, but not both in sequence. Their field engineer arrived at EAFB to examine the valve, and was amazed to see it “stick”. He tried taping the actuator with a pencil, and each time he did so, the valve operated! After about 20 times of repeating this action, he stated, “I can't see that anything is wrong with the valve!” Three of us had to restrain the Air Force's test site manager from strangling him. We canceled their contract, and re-examined the design. The unit had a “rack & pinion” style actuator, and analysis indicated that when subjected to a 500°F thermal change, the teeth in the rack did not quite match those in the pinion. It required thermal compensation to operate. By replacing the rack with material compatible with the pinion, the valve operated perfectly; and after six months of intensive testing, it was placed into the airplane.
Unsuspecting as I was, when it came time for the first real flight of the external tankage system, NASA assigned me to “man” the engine flight control panel. There are about a dozen different control panel operators in the flight control center, but this panel was the only one with command override control for mission abort—all of the others had to be directed through the control room flight director. I had the panel modified to reflect the new system, and since I was supposedly more familiar with the inner workings of the pressurization and propellant systems than the NASA engineers, it was felt that it should be my job to assure that all was okay. What an experience! With the external tanks mounted, the X-15 weighed a lot more than normal. Typically at DROP, the pilot would ignite the rocket engines within one second, never more. Based on that data, I selected 3.5 seconds for the margin of error in the initiation sequence; just to be on the safe side. On this occasion, the test pilot’s reaction time was slightly over three seconds before engine start. I could see that this was going to be a rough ride for me. The pressures and engine RPM came up to design limits and remained steady.

After about 90 seconds into the flight the external tanks propellant supply was exhausted, and the empty light illuminated on my panel. This was a dual feed system, so the pilot had to also have the light in order for me to have a signal. I announced that I was ready to eject the tanks to the control room crews, but nothing took place by the pilot. We all watched in pain as the seconds drifted by; it seemed like an eternity for each one to pass. There were only ten of them available. If the pilot didn’t eject the tanks before automatic engine shut-off, in all probability, according to aerodynamic analysis, ejection after engine shutdown could cause them to strike the airplane, and a crash was certain. The pilot, during this interval, unknown to the control room personnel, was having aircraft stability problems due to the slight shift in the center of gravity as the fuel was being depleted, and was trying to get the perfect heading for ejection. My finger inched toward the RED button that would end the test. If I pushed it too soon the mission would be aborted, but in all probability, so would the entire X-15 flight-test program. Skeptics in Washington at this point in time were still saying that manned flight into these aerodynamic regions was not safe or reliable, and they would have had a field day should the flight be aborted in such a drastic manner. In all probability the pilot may not have been able to control the flight with external tanks attached until the speed was reduced sufficiently so that they could be safely ejected. If I waited too long, the engine would shut down out of sequence and the immediate increased drag might destroy the plane in flight.

The RPM started to climb at about eight seconds of time, and was accelerating toward the RED LINE at 9+ seconds when the RPM returned immediately to normal. The pilot accomplished the external tanks ejection! My heart was pounding so hard, that for three days afterwards I couldn’t close my eyelids. After the onboard oscillograph was read, NASA determined that the RPM was within three rpm’s of automatic shutdown. My hesitancy and decision to “ride it out” and trust the pilot, probably saved the program, and I was feted as a hero having pure “gut”. None of them could believe that I was willing to go to the absolute design limit, with less than about 3 rpm remaining. They all stated that they would have shut it down within three seconds. To tell the truth, I simply couldn’t believe that the pilot failed to react to the needs for switching and was awe-struck by the gravity of the situation!

After the X-15A-2 aircraft was again turned over to NASA, Lt. Col. Robert Rushworth was assigned to be the first military pilot to test the new system. On his very first flight, the LOX external tank failed to feed into the main tank. He was about 30 seconds into the flight when he shut down the engines, and jettisoned both external tanks. An emergency landing followed at Mud Lake. Since it was considered vital that the pilot know whether or not propellant was flowing from the external tanks into the inner tanks; I installed a flow switch to detect that function. When the flow switch light in the cockpit failed to illuminate, at the 30-second point in the mission; the pilot shut down the engine. The ejected tanks were recovered and sent to NAA for me to inspect and determine the cause of failure. Initially, NASA suspected that the pressurization system had failed, but I assured them that such was not the case. A quick analysis indicated that the feed line in the tank had to be blocked; thus preventing the flow of propellant. I had the lab personnel x-ray the tank, so as to get a view of the inner feed tube. Within an hour, the results were back; showing that the line had collapsed! This line was designed for five times the expected worse case pressure differential, but somehow it failed anyway. The line was replaced with another; and beefed up with external stiffening rings to eliminate a potential for recurrence of the problem. The main thing to remember was the x-ray technology available in the early 1960s for the Space Programs. The resultant pictures of the tubing were of such clarity, that I thought I was looking at the real tube!

With the return of Ship No. 2 to NASA for flight, having been rebuilt after John McKay’s accident, new problems emerged that taxed the NASA flight crews. Normally, the aerodynamic flight differences were fed into the simulator, and future flights were routine with that airplane. However, it was now time to make way for the higher speed flights that required the X-15 to be covered with an ablative substance to withstand the high heat loads. This was the first application of such materials to a manned vehicle. A dummy-test ramjet engine was mounted on the lower ventral rudder to determine the effects that this shape might have on the airplane’s flight handling characteristics. The dummy ramjet’s shape actually approximated the real shape of the lower section of the ventral that was removed for the engine. The aerodynamic forces on the lower ventral (ramjet) were considerable, and the aircraft designers had it fastened to the fuselage by large Inconel-X framing members. It was behind these steel members that I had earlier in the design phase, connected the normal, secondary and emergency helium control pressure lines together. This flight had more than its fair share of problems:

Without the drop tanks, the NH3 tank was filled by one servicing vehicle. It was normal practice to have this truck accompanied by a large water truck. Should there be a leak or fuel spill, water was needed to prevent the ammonia vapor from leaving the area. If breathed, the respiratory system in the body would shut down, and resuscitation could not revive that person. But, as usual in businesses, money became a concern, and when Ship No. 2 was being tested and two ammonia trucks were required to complete the fill; NASA could not afford the costs of having a water truck accompany them! Fueling took place usually about 3 a.m. The two trucks started out on a
totally black night. The front truck's rear brakes overheated and caught fire. The driver stopped, and both drivers tried to extinguish the fire with their fire extinguishers, both of which were empty! The flames started to grow, and spread to the ammonia tanks shell. By this time the flames were about 15 to 20 feet high. If the tank was breached, the ammonia cloud would drift, and all in its path would probably be killed. Seeing a light nearby, at an adjoining test site, the driver knew he could get water there. These two huge tanker trucks came roaring in at high speed to the lighted test area, one ablaze and engulfed in flames leading the way. At the test site was a modified F-111 airplane undergoing some top-secret tests, and armed guards, with orders to shoot, heavily flanked the area! The guards were stunned by what they thought was a terrorist attacking the site with a burning vehicle. With gun muzzles pointed at the driver's throat they ordered him to get out of there. The heavy tanker truck, having run over sand-landing mats placed there, had caused them to be wrapped about the tires and axles, and the truck was frozen there. Among all of the shouting and screaming, the driver finally made his point that he was only a driver, and that the tank contained ammonia, and he needed to put the fire out. The F-111 test engineers came to his rescue, and extinguished the flames. Base crews came and extracted the trucks, and they continued on their way.

Next came the flight test itself. Piloted by Pete Knight on October 3, 1967, the airplane accelerated to about Mach 6+, the flight controls apparently became a concern for the pilot, and we thought he had ejected the ramjet. Immediately he radioed back that he lost all pressure control, and couldn't jettison the remaining propellants. He aborted the flight and thought he could make it back to base, but that he would have to go straight into the landing strip. Normally, the airplane would circle the base, and then descend. It would be touch and go if he could make it. After landing it was discovered that when the ramjet was ejected, it left a portion of the rear end of the airplane unprotected from the environment. Searing heat cut through several inches of metal in a matter of seconds, severing the triple redundancy connection I placed there for pressure control, and burned a hole in the hydrogen peroxide engine feed system tank, burning it all. It was amazing that the pilot could have flown the plane, let alone land! The fuel system reverted to a fail-safe condition, and automatically discharged the remaining propellants from all tanks. This was the last flight for the X-15A-2. Investigation of the incident revealed that "shock waves" burned through the leading edge of the lower ventral and ignited the pyrotechnic charges that ejected the ramjet. Pete didn't eject the ramjet. This and the next accident finished the program, and the remaining airplanes were placed in museums. Ship No. 2 is on display in the National Museum of the United States Air Force at Wright-Patterson AFB, Ohio. It reached an altitude of 249,000 feet, and a top speed of Mach 6.7.

Meanwhile, Ship No. 3, the one that blew up on the launch pad with the first installation of its XLR-99 engine was being rebuilt, one of the adaptive control systems from the Navajo Program was installed. This was the Minneapolis-Honeywell-96 Adaptive Control System. This unit was designed to have a 100% reliability factor. As a safeguard, it also contained a circuit that if it detected a fault it would automatically shut down. With the unit installed and operational, the airplane could fly relatively safely into the upper atmosphere.

These flights, and many others like them, allowed some pilots to gain their Astronaut Wings. This was very important, since

Post-flight photo showing heat damage to the X-15A-2 following Pete Knight’s record-breaking Mach 6.7 flight on October 3, 1967. Although Ship No. 2 was repaired and delivered to Edwards AFB in June 1968, it never flew again. The X-15A-2 is now on display at the National Museum of the United States Air Force at Wright-Patterson AFB, Ohio.
that gave them additional status, and allowed them to be considered more favorably for other space flights. After President Kennedy announced that “We would put a man on the moon before the end of the decade”, it meant even more to the pilots. Both the Mercury Program pilots and the X-15 pilots wanted a chance to be that first man! Virtually all of these flights were above Mach 5.

During these flights, stellar navigation systems and ground imaging systems were tested. These systems found their way into the U-2 and the Apollo. Horizon scanners, a new concept that collected light across the spectrum, was being developed to provide horizon control reference at extreme altitudes. Future guidance control systems on manned space flights would require such a device. Detection systems for micrometeorites and ionization trails were tested. The missile program was not forgotten. Secret tests using liquefied neon sensing systems were tested at high Mach numbers to determine if they could accurately deploy and vector control anti-missile-missiles. These missiles had tremendous velocity, and accurate guidance control was required. They worked great. While the remaining flights started to draw to a close, the lifting bodies were being conceived and wind tunnel models were being tested. These would be the forerunner of the Space Shuttle, and of course, broadcast weekly on the “Six-Million Dollar Man” TV series. These lifting bodies used the same identical Reaction Control’s XLR-11 rocket engines deployed for the early X-15 flight tests. They needed more engines than were readily available on site, so they removed them from museums and display cases around the U.S. and pressed them into service.

One of the newer pilots to the X-15 program, Major Michael J. Adams (USAF) had one last chance to get his astronaut wings on Ship No. 3. However, the flight plan called for the altitude to be about 7,000 feet short of the requirement for the astronaut wings award! All of us suspected that he would let the engine burn a fraction of a second longer, and “simply over-shoot” the test altitude. Without those wings, he could never be considered for the Apollo program. On this fateful flight the aircraft started to wobble soon after launch, and Mike tried to steer it back to the flight path. He did shut the engine down precisely on schedule as ordered and as planned to do, much to the surprise of all of us “second-guessers”, but nevertheless he still ascended to a very high altitude. The control room was deadly quiet, and you could almost hear each person’s heartbeat. The communication from airplane to the control center was short, indicating that he had lost YAW control and was trying to correct for it by using the attitude control nose jets!

For this flight, NASA was conducting some additional guidance control system tests and had removed the YAW control from the airplane’s true guidance system. It was coupled to the ROLL indicator (as I recall). If anything were to go wrong, all the pilot had to do was switch it off, and the attitude controls would return to normal. What everyone failed to realize was that after many hours of flight simulation for all contingencies—and then only a short briefing for this new switch operation—that once a failure occurred, the pilot would immediately reach back into his mind for corrective action. The override switch was clearly forgotten! The control room couldn’t reach him to provide assistance. The pilot reported that the jets weren’t working-YAW couldn’t be restored. He applied full thrust to the jets, spinning the airplane like a top. All communication was lost and we watched the attitude control of the airplane slowly recover as it descended into the atmosphere. All of us thought that when the plane “weather-vaned”, that control would be regained. At about 70,000 feet, all telemetry was lost, and the rescue teams went out to find the plane. When the plane was located, we went to the crash site and recovered the body of the pilot. Replication of the flight, showed what had happened. This was the last time anyone tampered with the horizon controls! The pilot was buried in his flight suit. The crash was blamed on “Pilot Error”, with which I disagree. This essentially ended the X-15 program, and the lifting bodies took over the spotlight. This truly fascinating program was officially canceled by USAF/NASA before 1968 yearend. I am proud to have been a small part of its history.

About the Author: After receiving a degree in Organic Chemistry from the University of Montana, Cleve enlisted into the Army and served for 3 1/2 years during the Korean War. Gifted with the ability to read and comprehend technical reports at 9,000 words per minute, he joined NAA in 1956 and was assigned to the Powerplant, Propulsion & Systems Group at LAD. He worked on various fuel and propulsion systems designs including the F-100, F-107, B-70, Navaho, Rocket Test Sled, Lunar Lander Simulator, Heavy Body Lift Buoyancy Transport, SST, and the X-15. He took early retirement at the age of 55 and currently resides with his lovely wife, Adonna, in Billings, MT.
After much tense negotiation, Contract A-250 for what became the British Mustang airplane was let on April 11, 1940. J.L. Atwood issued General Order NA-73 for the production of the British fighter on April 24, 1940. In this same G.O. he transferred all charges accumulated under Charge Number SC-1050, and the X73 company sponsored pursuit program to the NA-73 charge number. The X73 Prototype airplane now became known as the NA-73X Prototype airplane of the Mustang production Contract A-250 for 320 airplanes. It must be noted here, for research purposes, that “X73” was a valid and frequently used designation specifically for the Prototype airplane up to the end of its life cycle in December 1941. Another point is that until the fall of France, 300 of the contracted airplanes were for Britain and 20 were for France, according to information in Hap Arnold’s records on file with the National Archives and Records Administration (NARA).

At the time France fell, all French business in the United States was transferred to the British and Lee Atwood issued a revised General Order on May 29, 1940 to reflect the twenty-plane increase for the British. What was the “Anglo-French Purchasing Commission” now became the “British Purchasing Commission” or “B.P.C.”. The contract commitment with the British was to have a finished article 120 days from let of contract. The Prototype airplane, which was considered a secret project, was built in the Experimental Department under the direction of Carl Walterhoffer. Though the Prototype Mustang airplane was completed and ready for engine installation as early as August 20, the engine did not arrive until the first week of October.

Flight tests commenced on October 26 and eight flights were successfully completed before near disaster struck. On the ninth flight, with Test Pilot P.T. Balfour at the controls, the NA-73X experienced engine failure and crash landed in a bean field, to the west of the NAA main factory building, near Sepulveda Boulevard. Though the pilot escaped serious injury, the airplane suffered some structural damage when it nosed over in the freshly plowed ground coming to rest on its top side. The engine gear box and propeller were ripped off and there was damage to the upper deck of the fuselage, cockpit canopy, wing tips and tail surfaces. After being righted and returned to the NAA factory, the plane received a full inspection and was declared repairable. Work began almost immediately in order to return NA-73X to flight status as work on the NA-73 production line moved forward. The first production Mustang, the British assigned number AG 345, was the plane on which the changes resulting from the board reviews had a relative impact on the aircraft design and performance. What started out proposed as a sleek 400 mile an hour airplane now had some of its attributes shaved to accommodate the changes affecting weight, balance and aerodynamics.

Other changes would come about as the result of flight testing of the prototype airplane. The changes were then assigned to be implemented at specific points in the manufacturing process in order to maintain a most efficient production flow. However, there were changes that the customer sought to impose as afterthoughts in order to improve the systems and the operational envelope of the aircraft. Such was the case with a request to extend the specified operational range of the Mustang before the delivery of the first airplane.

The board reviews immediately following contract approval were intense and led to pre-production design modifications which justified the mockup of the NA-73 as an invaluable research form, fit and function tool. Cockpit revisions were a main issue, since the airplane had been built to Army Air Corps standards. The control quadrant was on the wrong side for the British, the original compass, the electrical junction box and the fluorescent lighting installations in the instrument panel were in contention. The armor plate and the markings used in electrical, hydraulic and other systems were also items of heated discussion, since they were not to British standards. The changes resulting from the board reviews had a relative impact on the aircraft design and performance.

The NA-73X being retrieved from a bean field west of the factory after a crash landing due to engine failure.

The Extended Range Mustang
by Lowell F. Ford

The board reviews immediately following contract approval were intense and led to pre-production design modifications which justified the mockup of the NA-73 as an invaluable research form, fit and function tool. Cockpit revisions were a main issue, since the airplane had been built to Army Air Corps standards. The control quadrant was on the wrong side for the British, the original compass, the electrical junction box and the fluorescent lighting installations in the instrument panel were in contention. The armor plate and the markings used in electrical, hydraulic and other systems were also items of heated discussion, since they were not to British standards. The changes resulting from the board reviews had a relative impact on the aircraft design and performance.

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A letter from L.C. Costello, the Resident Technical Officer for the British Air Commission was received on January 7, 1941. The letter, sent in behalf of Air Commodore G.B.A. Baker, required information on the maximum possible range of the NA-73 Mustang, at several speeds, maximum possible takeoff weight and with all other than navigational and armament equipment removed. This request arrived at a critical time, as the first production aircraft of Contract A-250, for the British Mustang, was nearing completion and would soon begin flight tests. The post-crash rebuild of the NA-73X prototype was approaching completion and it would be returned to flight test status on January 13. Tests on the XX73 static test ship which would reveal flaws in structural design of the airplane were also under way.

Edgar Schmued of the Preliminary Design Department and Ed Horkey of the Aerodynamics Department were no strangers to the formulation required to achieve the configuration needed to meet the British Air Commission's request. They had been involved in the request for comments from the Material Command in response to CP39-770, a fighter competition, in early 1939, where the fuel load required by the provided specification dictated an airplane too large to be considered maneuverable enough to carry out its proposed mission. Ed Schmued suggested that external droppable tanks be used to carry the fuel overload, a practice that was contrary to Army Air Corps policy due to danger of fire in crash landings. At the time of this study, NAA was not asked to compete, as it had been relegated to the production of medium bombers, trainers and observation planes by the Army Air Corps.

In the usual course of business, a meeting was convened, which included the heads of the key departments involved, in the War Room of the Administration Building, to determine the feasibility and possible solution to the British request. Considering the sketchy requirements sent by the British Purchasing Commission and the work load on hand, NAA responded with a request to Mr. Costello for clarification. The minimum armament and communications that the customer considered sufficient, the range required and the limitations on takeoff run with the fuel overload in question were the key elements. NAA’s request was forwarded to the British Purchasing Commission on January 20 with a reply being returned on January 24, which indicated that all armor and armament were to remain in place, the radio weight could be reduced, the range was to be at least 1,500 miles, allowances in drag were to be made for external fuel tanks and no existing runway extension required.

On receiving this data, Ed Horkey of Aerodynamics prepared a letter report to Chief Engineer Raymond Rice. Horkey calculated that the amount of fuel needed to meet the range requirement was 197.24 gallons at 229 mph at 10,000 ft, with 53.86 gallons of fuel being carried in the gun and ammunition bays in the wings instead of using external tanks. The total fuel capacity would be 221 gallons, more than enough to meet the range requirements. This would leave the two .50 caliber fuselage machine guns for combat and require the wing guns to be stowed in the fuselage with no ammunition for ferry purposes, or removed from the plane entirely for a tactical mission. A subsequent investigation by John Young, of the Power Plant Department, showed that a total of 60 gallons of fuel could be carried in the gun and ammo bays.

On February 20, Raymond Rice delivered a letter report to L.C. Costello, which outlined NAA findings with respect to the B.P.C. requirements and requested comments on this proposal at the earliest possible date. The figures reported showed the total fuel required for the 1,500 mile required range would be 200 U.S. gallons, with consideration for engine warm-up, takeoff and climb to 10,000 ft at 75% rated power. The estimated weight of the airplane at takeoff would be 8,400 pounds and the takeoff distance was calculated at 1,600 feet to clear a fifty-foot obstacle.

Meanwhile, NAA prepared plaster molds of the gun and ammunition bays which were sent to the Firestone Tire and Rubber Company along with a description of the intended application. Firestone followed through with experiments on the construction of the cells and conducted a test with 100 octane fuel to determine if a reaction would be experienced with the cell material that would lead to contamination. This test ran for 216 hours, with no erosion or contamination being found.

John Young issued a memorandum report on the auxiliary fuel system on April 14, 1941 describing the system as consisting of three small cells for the ammunition compartments and one large cell for the gun compartment, or eight cells per airplane. He further calculated the actual fuel capacity of the added installation at thirty-five gallons per side minimum, or seventy gallons additional fuel per plane, actual capacity. The tanks, were made of 3/16-inch thick rubber and were expected to withstand exposure to fuel for a minimum of ten days. The tanks were to be interconnected through rubber tubing plumbed on the underside of the wing and protected by a metal fairing.
The gun compartment cell was to be connected directly to the main tank with gravity feed. The cost of the installation per ship was expected to be $125.00. This report put the maximum range of the Mustang airplane with the auxiliary fuel cell installation at 1,724 miles.

In the first week of June 1941, NAA received a formal request for a quote on the extended range fuel cell installation which had been developed for the Mustang. In the same instance, the request insisted that this modification “occasion no delay in the delivery of any of the airplanes”. This last statement posed a real challenge for NAA, since the results of the structural tests on the XX73 airframe had revealed changes required to strengthen the structure of the wing and fuselage to meet the requirements of a tactical aircraft. This combined with the changes brought about from the post crash analysis of the X73 (NA-73X) prototype had slowed production to allow for modifications in tooling and airframe elements.

The Extended Range Modification was to be provided as a Government Furnished Equipment item and in order to present the modification to the proper authorities, drawings, specifications and test results had to be compiled into a formal package for review. On June 11, 1941, Raymond Rice informed the British R.T.O. that these formal documents were not finalized at this time as the fuel cells were still under development.

Firestone Rubber Company had continued development work on the fuel cells in support of a potential new product and provided NAA with a requested update on their progress in a report dated June 11, 1941. By adjusting the thickness of the top, bottom and sides of the fuel cell design and compensating for irregularities in the wing compartments, they were able to provide capacity for 70.25 gallons, with a potential of 76.25 gallons per set of cells. The cells were retested to 216 hours of slosh test with 100 octane fuel and there was no change in the less than five milligrams of residue per 100 cc of gasoline. The cells also withstood 25.5 hours of oscillations without any sign of leaks.

Coincidental with Firestone’s report to NAA, the British R.T.O., L.C. Costello, approached Firestone independently for technical data related to the fuel cells under development for the Mustang. He was courteously informed that that the fuel cell development project was an effort entered into between NAA and Firestone and that NAA controlled the documentation, test results and rights to the project. Mr. Costello would have to go directly to NAA for any information he requested in this respect.

Subsequent conversations between Raymond Rice and R.T.O. Costello regarding the potential delays in production by introducing the fuel cell modification to the Mustang production line brought about an explanatory letter on June 18 to Mr. Roy E. Russell of the British Purchasing Commission. In it, Rice explained that since, as brought out by the R.T.O., the B.A.C. was not prepared to supply the necessary fuel tanks, NAA had been requested to provide a quote for the installation complying with this requirement. Rice addressed the production impact and stated that the modifications could be installed beginning with production ship number 143 to number 320 of Contract A-250 and on all the 300 ships of Contract A-1495, inclusively, at a cost of $245.35 per airplane. He reiterated the integrity derived from the testing of the cells and that the 1,500 mile range could be met.

The British Air Commission responded through the R.T.O. with a new request calling for NAA to make the installations necessary as stated to accept the Extended Range Modification. However, before all was said and done, a decision was reached that placed all the plumbing and fittings necessary to support the installation inside the wing. The tanks would be supplied as a kit to be included in the crate with each delivered aircraft as described in Rice’s letter of June 18. The economics of the final agreement were handled under the “Lend-Lease” program and the project moved forward causing minimal impact on the production assembly line.

Though the Extended Range Modification was discussed in terms of use as an improvement aimed at ferrying the Mustang over long distances, how or if the British employed the system remains without substantiation. One rumor that was encountered indicated the installation was used in order to do photo-recon work on a German heavy water plant in Norway.

Had it not been for altitude limitations, the Mustang could have appeared over Berlin as an escort fighter much earlier than history has shown it and perhaps the war could have been significantly shortened. To give one an idea of the potential application of a Mustang I equipped with this modification, depending on the departure point from England, round trip missions could be flown into Norway, Denmark, the Western two-thirds of Germany and the Northern three-fourths of France. In a one-way flight, the distance covered by a Mustang I with the Extended Range Modification and a full fuel load could reach the outskirts of Moscow.

Subsequent alterations to increase the range of the Mustang would include the addition of underwing drop tanks and eventually the addition of an 85 gallon fuel tank in the fuselage which, with underwing drop tanks and the Merlin engine, enabled the Mustang to do escort service with bombers to Berlin and back. This increased performance and a USAAC policy change from “Protect and Defend” to one of “Seek and Destroy” served to severely cripple the Luftwaffe’s efforts to defend its homeland.

About the Author: Lowell hails from Ocean Springs, MS, just a few miles east of Keesler AFB which accounted for many AT-6 and B-25 flights over his home. He developed an early interest in aviation and began flying forward swept wing gliders in 1949 while still in high school. He moved to California in 1962 and joined NAAR-LAD as a Blueprint Folder and Trimmer. Except for a four-year stint in the military he continued working until he retired from Boeing North American in 2003. He currently resides in Torrance, CA with his charming wife, Linda.
For the first time in a long while, the air was still inside the North American Trisonic Wind Tunnel. Not a single breeze passed through the 500-foot long tunnel, which is capable of generating wind speeds faster than three times the speed of sound.

And the air was thick and heavy Friday -- possibly from the stubborn late-summer heat, or maybe from the sadness as the few lingering employees at the landmark El Segundo facility prepare to close up shop this month for good.

“It’s very sad for everyone involved in this tunnel,” said Rick Hayes, the facility’s director of operations. “It’s just so unique. We love to show it off, but it is in very sad shape right now.”

Using the same technology and equipment as it did in its first run 50 years ago, the tunnel performed its 807th -- and final test August 29th, Hughes said.

The past two weeks have been filled with writing final reports, last-minute archiving and impromptu visits from old employees nostalgic for one last look at a facility that through the years tested high-profile projects like the Apollo space program and XB-70 supersonic airplane.

“This was the first generation of big, supersonic wind tunnels,” Hughes said.

The tunnel’s landlord, UCLA, has opted to close the facility, mostly citing environmental concerns over previous PCB spills, said Brad Erickson, UCLA’s director of campus service enterprises.

Original owner Rockwell International, formerly North American Aviation, donated the property to UCLA in 1998 for use as a university research facility, which never really materialized, Erickson said.

Since then, Triumph Aerospace Systems has continued to operate the plant, paying rent and sharing profits with UCLA, Hughes said.

With a 49-square-foot test section allowing for larger test models and letting engineers actually stand up, the Trisonic is unusually large, considering most tunnels have a 16-square-foot test area, Hughes said.

“Boeing, Douglas and Lockheed all built smallish tunnels, and North American built a tunnel nearly twice as big,” he said. “It remains to this day unique in size and performance.”

But the tunnel’s real claim to fame is it’s ability to perform tests at up to 3-1/2 times the speed of sound, making nearby Northrop Grumman’s tunnel that hits about 100 mph look like an oscillating fan.

Sans wind, the slick tunnel would make a dream playground for children or an awesome skateboarding venue.

On the tunnel’s northern end, its smooth walls lead through a pitch-black corridor, ending at a 28-foot tall screen, from which the forceful gusts pass and voices cast echoes.

The other side of the tunnel leads to a cement hall and giant, curved grate that catches any flying objects and lets air pass through a vent.

Circular holes cut into the “colander” as Triumph employees call it, filter light through and provide an excellent grip for little hands, making for a fine jungle gym.

The tunnel routinely blows about 1,300 hours a year, and in January alone clocked 300 hours, Hughes said. Tests cost $3,500 an hour, he said.

And though the tunnel has been all business for the past 50 years -- testing planes, rockets and bombs for aerospace giants, as well as the government and private companies like Cessna – Triumph’s remaining half-dozen have invited Trisonic veterans for a nostalgic-fest Saturday.

A crew will spiff up the tunnel this week, making it clean and safe for former employees, vendors and old friends to walk the spans one last time, Hughes said.

In tears off and on for the last few days, the Playa del Rey resident sent an emotional invitation to old friends: “Those of us who worked here in the final generation of staff and crew feel that it has been the job of a lifetime – an honor and a privilege to have been part of the Trisonic Wind Tunnel Story,” Hughes wrote.

The Trisonic is the latest casualty in what industry insiders have called a “wind-tunnel crisis”, as high capability are frequently scrapped, forcing rocket and plane manufacturers to go overseas for testing.

About five years ago, Lockheed Martin dismantled its tunnel near Santa Clarita and sent it to Asia. NASA has shut down several tunnels, and Douglas Aircraft shuttered its facility in El Segundo in the mid-1980s, Hughes said.

“They can get the same capability if they go to Europe or Russia. But they do not want to do that, especially if they have secure projects.”

A trend of outsourcing testing has contributed to the tunnels’ disappearance, exacerbated by the explosion of computer technology, Hughes said. “Computer prediction is sexy,” he said. “Simulation is not sexy.”

But the accuracy from a wind tunnel cannot be beat, said long time employee Gary Wilhelm. “Computers have not come close to this,” he said, adding that his 34 years working at the tunnel have been “more than fun.”

UCLA has still not decided what to do with the land, Erickson said Friday. Environmental remediation is a must, but the university has been approached by the federal government for a possible sale and is open to salvaging materials, he said.

As the South Bay says goodbye to the antique facility, a remaining nod to the area’s aerospace heyday of the 1950s, Triumph employees are busy looking for new jobs. But Hughes, a native of England, said Friday he didn’t have final plans yet, as he toured the facility with the look of a proud father in his deep blue eyes.

“It’s just such neat stuff,” he said.

Editor’s Note: We are grateful to Mr. Phillip Stanfield of the Torrance Daily Breeze for permission to reprint this article in its entirety.
Space Shuttle Mission STS-120 Completed Successfully
by Ed Rusinek

With Shuttle Mission STS-120, Orbiter Discovery completed the 23rd shuttle mission to the International Space Station. Commanded by retired USAF Col. Pamela A. Melroy, the orbiter delivered the the Italian-built U.S. multi-port Node 2 module, named Harmony. The module will provide attachment points for European and Japanese laboratory modules. Marine Corps Col. George D. Zamka served as the pilot. The mission specialists were Scott E. Parazynski, Army Col. Douglas H. Wheelock, Stephanie D. Wilson, and European Space Agency astronaut from Italy Paolo A. Nespoli, and Expedition flight engineer Daniel L. Tani. Zamka, Wheelock and Nespoli were making their first spaceflight.

Discovery docked with the International Space Station and its Expedition 16 crew of Commander Peggy A. Whitson, and Flight Engineers Yuri Malenchenko and Clayton Anderson.

Commanders Melroy and Whitson became the first female spacecraft commanders to concurrently lead Space Shuttle and Space Station missions—a historic, yet unplanned event.

Discovery’s crew also performed four spacewalks which involved relocating the Port 6 or P6 truss and solar arrays to their permanent positions on the Space Station. During the second spacewalk, a problem was discovered with one of the Solar Array Rotary Joints (SARJ) where metal shavings were found under the SARJ housing.

A critical situation on the third spacewalk developed when a guy wire got entangled with a solar array being unfurled, causing almost a three-foot hole in one solar panel and a slight rip in another. The damage would have a severe impact on the station power system.

Teams of engineers and astronauts went to work to develop a plan to repair the damaged panels. Emergency room doctor/astronaut Scott Parazynski was selected to perform this feat of daring on the fourth spacewalk.

NASA downplayed the danger of Parazynski being shocked or electrocuted but the risks were very real. Although damaged, the array still produced 97% of its power output capacity and as long as the array was deployed—even partially—there was no cutoff switch!

Equipped with a pair of needle nose pliers, wire cutters and a Kapton tape-covered “hockey stick” fashioned out of Teflon, Parazynski began his improvisation. In a moment of rare audacity, and 215 miles above the Earth, he had to use Douglas Wheelock’s backpack as a stepping stool to boost himself onto a boom controlled by the 58-foot robotic arm which was operated from inside the station by Daniel Tani and Stephanie Wilson.

During the 45-minute ride from the air lock to the damaged array, Paolo Nespoli read to the dangling astronaut from the NASA mission instructions manual of the dangers implied.

The first sign of trouble became evident upon arrival at the damaged solar array. At 6’-2”, Scott Parazynski is one of the tallest astronauts but his reach fell several inches short. All work would have to be accomplished with his hands fully stretched above him.

Using the hockey stick deftly, he pulled the soft blanket-like array towards him to darn the tear together using wire harnesses NASA calls “cufflinks”. At times the harness ends would not fit into the holes. With gloved hands, he would try to force the ends through, pushing them close to the orange panels which he could not touch for fear of risking a shock.

The hoped-for 30-minute timeline to repair the array was dashed when Parazynski found a “hairball” of frayed wires, ripped grommets and broken hinges. He also located a snarled wire which held up the unfurling of the array. On the count of three, he cut the wire and watched the array unfurl to its full 110-foot glory. Parazynski and Wheelock were ferried back to the air lock. Total time outside the station was 7 hours, 19 minutes.

Discovery undocked from the Space Station and Pilot George Zamka performed a fly-around maneuver to inspect the Space Station. After detailed inspections to the Shuttle’s thermal tile system, Discovery reentered Earth’s atmosphere and returned to Kennedy Space Center on November 7, 2007 after 15 days, 2 hours and 23 minutes in space—one of the longest duration, and most challenging and dangerous Space Shuttle missions ever accomplished.


Fourth B-1 Reunion
The Fourth B-1 Reunion was held on September 22, 2007 at the Golden Sails Hotel in Long Beach with more than 200 in attendance. It was a splendid mix of current employees working on the program and retirees from California, Nevada, Arizona, Oregon, Washington, Utah, Idaho, Missouri, Ohio, and Florida.

The speaker, Captain Scott “Disco” Higginbotham began flying the B-1 in 2000. He has four combat deployments, 58 combat sorties, 3 missions during Operation Anaconda, the 2005 General Curtis E. LeMay Combat Crew Award and many other awards and accomplishments. He is currently assigned to a test and evaluation squadron at Edwards AFB. He is the only B-1 Pilot whose father also flew the B-1. He kept the audience captivated with his presentation and received a rousing response of appreciation at the conclusion of his talk.

It was another great effort by Lynn Isomoto, Karen Fraser and Lee French.
On the morning of 16 August 1956, Navy personnel at Point Mugu prepared an F6F-5K Hellcat for its final mission. The aircraft had been painted overall high-visibility red. Red and yellow camera pods were mounted on the wingtips. Radio remote control systems were checked, and the Hellcat took off at 11:34 a.m., climbing out over the Pacific Ocean. As ground controllers attempted to maneuver the drone toward the target area, it became apparent that it was not responding to radio commands. They had a runaway.

Ahead of the unguided drone lay thousands of square miles of ocean into which it could crash. Instead, the old Hellcat made a graceful climbing turn to the southeast, toward the city of Los Angeles. With the threat of a runaway aircraft approaching a major metropolitan area, the Navy called for help.

Angeles. As soon as it passed over an unpopulated area, they would fire into a second aircraft. The interceptors roared south after their target. The hunt was on.

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Five miles north of NAS Point Mugu, two F-89D Scorpion twin-jet interceptors of the 437th Fighter Interceptor Squadron were scrambled from Oxnard Air Force Base. The crews were ordered to shoot down the rogue drone before it could cause any harm. Armed with wingtip-mounted rocket pods and no cannon, the Scorpion was typical of the Cold War approach to countering the “Red Menace.” Each pod contained 52 Mighty Mouse 2.75-inch rockets. Salvo-launched, the Mighty Mouse did not have to have precision guidance. Large numbers of rockets would be fired into approaching Soviet bomber formations to overwhelm them with sheer numbers. Today, they would be used against a different kind of red menace.

At Oxnard AFB, 1Lt. Hans Einstein and his radar observer, 1Lt. C. D. Murray, leapt into their sleek F-89D. Simultaneously, 1Lt. Richard Hurliman and 1Lt. Walter Hale climbed into a second aircraft. The interceptors soared south after their target. The hunt was on.

Einstein and Hurliman caught up with the Hellcat at 30,000 feet, northeast of Los Angeles. It turned southwest, crossing over the city, then headed northwest. As the Hellcat circled lazily over Santa Paula, the interceptor crews waited impatiently. As soon as it passed over an unpopulated area, they would fire their rockets.

The interceptor crews discussed their options. There were two methods of attack using the fire control system, from a wings level attitude or while in a turn. Since the drone was almost continuously turning, they selected the second mode of attack. In repeated attempts, the rockets failed to fire during these maneuvers. This was later traced to a design fault.

The drone turned northeast, passing Fillmore and Frazier Park. It appeared to be heading toward the sparsely populated western end of the Antelope Valley. Suddenly, it turned south toward Los Angeles again. Time seemed to be running out. Einstein and Hurliman decided to abandon the automatic modes, and fire manually. Although the aircraft had been delivered with gun sights, they had been removed a month earlier. After all, why would a pilot need a gun sight to fire unguided rockets with an automatic fire control system?

The interceptors made their first attack run as the Hellcat crossed the mountains near Castaic. Murray and Hale set their intervalometers to “ripple fire” the rockets in three salvos. The first crew lined up their target and fired, missing their target completely. The second interceptor unleashed a salvo that passed just below the drone. Rockets blazed through the sky and then plunged earthward to spark brush fires seven miles north of Castaic. They decimated 150 acres above the old Ridge Route near Bouquet Canyon.

A second salvo from the two jets also missed the drone, raining rockets near the town of Newhall. One bounced across the ground, leaving a string of fires in its wake between the Oak of the Golden Dream Park and the Placerita Canyon oilfield. The fires ignited several oil sumps and burned 100 acres of brush. For a while the blazes raged out of control, threatening the nearby Bermite Powder Company explosives plant. The rockets also ignited a fire in the vicinity of Soledad Canyon, west of Mt. Gleason, burning over 350 acres of heavy brush.

Meanwhile, the errant drone meandered north toward Palmdale. The Scorpion crews re-adjusted their intervalometers and each fired a final salvo, expending their remaining rockets. Again, the obsolete, un-piloted, un-guided, un-armed, prop-eller-driven drone evaded the state-of-the-art jet interceptors. In all, the jet crews fired 208 rockets without scoring a single hit.

The afternoon calm was shattered as Mighty Mouse rockets fell on downtown Palmdale. Edna Carlson was at home with her six-year-old son William when a chunk of shrapnel burst through her front window, bounced off the ceiling, pierced a wall, and finally came to rest in a pantry cupboard. Another fragment passed through J.R. Hingle’s garage and home, nearly hitting Mrs. Lilly Willingham as she sat on the couch. A Leona Valley teenager, Larry Kempton, was driving west on Palmdale Boulevard with his mother in the passenger seat when a rocket exploded on the street in front of him. Fragments blew out his left front tire, and put numerous holes in the radiator, hood, windshield, and even the firewall. Miraculously, no one was injured by any of the falling rockets. Explosive Ordnance Disposal teams later recovered 13 duds in the vicinity of Palmdale. It took 500 firefighters two days to bring the brushfires under control.

Oblivious to the destruction in its wake, the drone passed over the town. Its engine sputtered and died as the fuel supply dwindled. The red Hellcat descended in a loose spiral toward an unpopulated patch of desert eight miles east of Palmdale Airport. Just before impact, the drone sliced through a set of camera pods on the airplane’s right wingtip dug into the sand and the Hellcat cartwheeled and disintegrated. There was no fire.

The Battle of Palmdale
as recalled by Dr. Raymond Puffer, Historian

There are four things that you cannot recover:
The stone… after the throw!
The word… after it is said!
The occasion… after it has passed!
The time… after it is gone!
Dear Ed,

I thank you and your bulletin staff for the fine job you do. I am 93 years old and I plan to read the retirees bulletin for several more years.

—Victor McLaughlin, Santa Maria, CA

Ed's Ans.: Well, God Bless you, Victor. We always love to hear from our readers that are 93 years young!

Dear Ed,

In the “Eddie and the Elephant” article, Fall 2007 Issue, it mentioned that NAA opened a second factory in Grand Rapids, Texas. I believe it should have read Grand Prairie, Texas.

—Roger Song, Vancouver, WA

Ed's Ans.: Roger, you are absolutely right. Texas is BIG but it doesn't stretch all the way to Michigan. Good catch!

Dear Ed,

I look forward to receiving the NAA Retirees Bulletin but I am particularly enjoying the wonderful articles on the X-15 program. They bring back truly fond memories. I was a secretary for Jim Doell, an X-15 Program Engineering manager, from 1965 until the program ended in 1969, and found the program exciting. Clearly, it WAS exciting. Those were wonderful years and I had the privilege of working with some unique and bright people.

—Ann DeBriere, Fallbrook, CA

Ed's Ans.: Thank you, Ann, for those kind words. You know, looking back, every program seemed more EXCITING than the last one! The bulletin only reflects the quality of the people and products that were part of North American Aviation and they were the best!

Dear Ed,

I pass along all issues to my oldest daughter and her family. You are enabling people to know about the great things that happened (and are still happening).

My husband, Ken, really enjoyed working for North American/Rockwell at Autonetics.

—Martha West, Long Beach, CA

Ed's Ans.: Thank you for your kind words. Our publications are now being archived at several aviation history offices because they provide insights into the industry that cannot be found anywhere else.

Dear Ed,

Enclosed is my check for a two-year renewal subscription to the bulletin. I did not use the form in the bulletin as it would have ruined the wonderful picture of the Navaho launch. I happened to witness the last Navaho launched at the Cape as I had just moved there with my husband who worked for Convair at the time. Incidentally, if memory serves me right, the Navaho blew up. It was really very sad.

I want to congratulate all of you for the marvelous work you are doing. The Bulletin is one of the few links I have left of some of the good days of my past. If I lived closer, I would volunteer to help in some way, but Seal Beach would be one heck of a commute for me.

—Beatrice McCoy, Boise, ID

Ed's Ans.: Thank you, Beatrice, for your kind offer to volunteer. However, we no longer have an office in Seal Beach. Boeing only provides us a mailbox and an incoming phone line to record messages. The entire task is performed individually from our homes with the printing and addressing done by commercial vendors. We have survived these past seven years almost entirely thanks to the wonderful support provided by readers like you. God Bless!

Dear Ed,

I am enclosing a check to renew my subscription and to send a gift subscription. I didn't use the renewal form because I didn't want to cut out the P-51 picture on the cover. As a teenager, I installed the bullet-proof windshields and the canopies for the P-51B, then the P-51D, during World War II.

I retired from Autonetics in 1987 after 30 years of service.

—Lila Lev, Lakewood, CA

Ed's Ans.: When we think of North American Aviation, we usually think of the men that made the company great. But, in the final analysis, there were a lot of ladies like you, Lila, that provided that extra touch of quality that made our products the best in the world. God Bless!

Dear Ed,

I enjoyed the “California Boomerang” story about John Conroy and his impressive 1955 dawn-to-dusk flight. Actually, a VR-31 pilot named LCDR George Whisler, USN was the first to make this historic round trip flight in 1954. We were friends and shipmates in a Navy ferry squadron based at NAS, Norfolk, VA. We flew almost all of the Navy aircraft then operating, new and old, from factory to grave. Most of us were young Junior Officers, fresh from Fleet squadrons or flight school and several of us tried to make this flight for fun! At least two of us almost made it in 1952 flying new Grumman F9Fs from Norfolk to San Diego and new Douglas F3D twin engine jets back home.

I met John Conroy years later when we were civilian test pilots at an LA SETP meeting. He gave me some great advice-never try for a record without a PR guy on your team. When George Whisler read about John’s 1955 record flight, he went to work and had his own 1954 flight officially recognized. This led to a correction of the National Aviation Records which can now be easily verified.

—Rick Cotton, Punta Gorda, FL

Ed’s Ans.: On June 23, 1953, Whisler flew west in an F9F-6 Cougar (BuNo 127432) and returned east in an F3D-2 Skynight (BuNo 127076). Conroy did it in the same F-86A, Aircraft S/N 49-4049 going east and coming back west. It still makes for a good story.
The Silent Majority
by Stan Guzy

ADAMS, JOHN T., 91 – passed away peacefully at home in Hermosa Beach, CA on October 14, 2007. He retired in 1979 from LAD after 41 years of service as a military contract negotiator. His loving wife, Maxine, survives him. When John turned 90, he was asked for wisdom. He replied, “To love and to be loved.”

ARPEA, ERNEST D., 85 – of Torrance, CA, passed away on June 3, 2007 from complications of heart failure. Ernie served as an engineer in the metals analysis group of Quality Control at LAD before he retired in 1990 with 35 years of service. His loving wife Sachiko survives him.

BALDucci, JOHN, 74 – died of cancer on September 13, 2007 with his family at his bedside. John was employed at the Autonetics Division for 29 years. His beloved wife Marie preceded him in death.

BRASKAMP, LEON, 78 – of Placentia, CA passed away on September 7, 2007. Leon joined NAA in Downey and retired from Autonetics in 1984 with 36 years of service.

BROWN, DALE L., 92 – passed away quietly at home in Rossmoor, CA on September 21, 2007. Dale accepted a position on the Technical Staff with the Aerophysics Laboratory of NAA, which later became the Autonetics Division. Dale worked on experimental radar, weapons systems and systems integration on the Apollo Program before retiring in 1975.

BROWN, VERA T. “GIGI”, 92 – died on September 22, 2007 in Rosamond, CA. Vera was the first woman to be hired by NAA at Plant 42 in Palmdale in 1951. She was secretary to Richard Stacey in Engineering Flight Test Operations at Palmdale and at EAFB. Vera retired after 27 years of service. She was a president of the National Secretary Association and an active member of the Rockwell Retiree Golf Club.

CHESTER, LEONARD, 93 – passed away on June 2, 2007 at Cherrywood Village Retirement Center in Portland OR from complications attributed to aspirational pneumonia. He joined NAA in 1940 and worked in manufacturing engineering, and engineering management when the P-51 Mustang was in production. He worked on many NAA/RI programs and also worked in Tulsa on the Boeing 747 aircraft before retiring in 1974. His loving wife Virginia preceded him in death.

DAO, LAP, 62 – a resident of Tustin, CA passed away suddenly on September 13, 2007. Before retiring Lap had worked at NAA/RI for many years in the Logistics Engineering area. His wife Lyn Ngo survives him.

DONATONI, LINO, 91 – died on August 3, 2007 from undisclosed causes. Lino had served as Manager for Transportation and Traffic at NAA/RI in El Segundo prior to retiring after 47 years of service. He leaves behind his loving wife of 21 years, Elsie Wagner.

DOWNIE, WILFRED J., 97 – passed away in late 2006 in Vancouver, BC. He started at LAD in communications, navigation and avionics engineering in the 1940s and transferred to Autonetics in the 1960s where he worked in avionics engineering until he retired in the 1970s.

GARCIA, GILBERT “GILBY”, 73 – died in Long Beach, CA on October 9, 2007. He retired from Rockwell in 1990 after 27 years of service. In his free time, Gilbert taught ballroom dancing and golf. His loving wife Yolanda survives him.

GASPER, RICHARD “PARKER”, SR., 80 – of Long Beach, CA, passed away on October 19, 2007 of complications related to diabetes. Parker served at Autonetics for 30 years before retiring.

GIBB, JOHN W., 88 – died at his home in Claremont, CA on November 8, 2007. John joined NAA at LAD in 1949 where he rose to management of the X-15 propulsion systems design. He transferred to the Space Division in 1961 to head up the Apollo Reaction Control System design and later, the management of the Space Shuttle Orbiter Environmental Control and Life Support Systems. He was highly respected, both as a man and as an engineer.

HESEL, RONALD W., 82 – passed away on August 17, 2007 from undisclosed causes. With a UCLA engineering degree Ron went on to have a long and distinguished career at the Rocketdyne Division of NAA/RI before retiring after 40 years of service. Colleen, his wife of 61 years, survives him.


KELLER, GERHARD R., 76 – of Rancho Palos Verdes, CA, died on July 27, 2007. A graduate of Ohio State University, Gerhard joined NAA at El Segundo in 1956 and served there for 30 years. His wife Kathy survives him.

LARSON, W. HAL, 90 – of Pasadena, CA, Bulletin returned stamped “Deceased”. Hal died as a result of a fall. He served as an electrical engineer at LAD and Space Division for over 20 years before retiring in 1972. His wife Miriam survives him.

LONG, JAMES, 87 – passed away in Lawndale, CA on September 11, 2007. Jim rose above the harshness of a childhood raised in an orphanage during the Depression and obtained a scholarship to the Colorado State College of Mines in Greeley, CO. He joined NAA in 1940 as an inspector and worked his way up to management in charge of Product Inspection Quality Control on the Apollo Program at Downey. He retired in 1980 after 40 years of service.

MAIER, WESLEY H., 91 – died on August 30, 2007 in Temecula, CA, Wes worked in the Long Beach shipyards during World War II. He joined NAA at LAD as an electrical design specialist, eventually transferring to Rocketdyne where he worked on the electrical circuitry for the Mercury rocket engines. His wife Hilda survives him.

MARTIN, ENID P., 86 – passed away peacefully on August 13, 2007 from undisclosed causes. Enid had been Executive Secretary to the President of NAA/RI Autonetics Division, retiring in 1983 after 33 years of service. Norman, her devoted husband preceded her in death.

MITCHELL, EDWARD E., “ED”, 82 – died in Long Beach, CA on October 8, 2007. Ed retired from Assembly Tooling at LAD in January 1988 after 41 years of service. Ed’s health had been failing having had three bypass surgeries. His wife Ellan survives him.
The Press vs. The Generals

In view of the recent actions by the Congress and the Press in calling General David Petraeus a liar, the following seemed fitting.

“It appears we have appointed our worst generals to command forces, and our most gifted and brilliant to edit newspapers. In fact, I discovered by reading newspapers that these editor/geniuses plainly saw all my strategic defects from the start, yet failed to inform me until it was too late. Accordingly, I am readily willing to yield my command to these obviously superior intellects, and, I will, in turn, do my best for the Cause by writing editorials—after the fact.”

—Robert E. Lee, 1863
The best of American aviation descended on Rickenbacker International Airport, just south of Columbus, Ohio during the week of September 27 through 30, 2007 to celebrate Air Force Heritage Week. This included the Gathering of Mustangs and Legends, paying tribute to the P-51, one of the greatest fighter planes of World War II and the people that flew or built them.