WALTER CRONKITE – IMAGE #4

For over 30 years the Space Shuttle orbiters *Columbia, Challenger, Discovery, Atlantis,* and *Endeavour* captivated millions of people with their thunderous climbs to orbit, their graceful orbital dances with satellites – Hubble, MIR, and the International Space Station – , and their tell-tale twin sonic booms that announced their landings back on Earth – landings that would not have been as smooth as they were if not for the help of their sister vehicle that never experienced space – the space shuttle, OV-101 Enterprise.

With NASA's new direction set, the Space Shuttle Program (SSP) was ready to begin a new era of focus on science and understanding in Low Earth Orbit (LEO). But before the first Space Shuttle mission could launch from the Kennedy Space Center in Florida, a great deal of ground testing was needed to understand fully the flight performance of this radical new design – a reusable space plane that would launch like a rocket and land as a glider with no propulsive force.

For this glider-landing method, a series of practice landings was drawn up to test thoroughly the proposed vehicle's low atmosphere, pre-landing handling. On July 26, 1972, NASA officially awarded the contract for construction for its very first Space Shuttle orbiter to Rockwell International (now Boeing). On June 4, 1974, structural assembly of OV-101's crew module was underway. On August 26, 1974, structural assembly of her aft fuselage began. The Grumman company, located near New York City, delivered the first set of Space Shuttle wings to the OV-101's construction facility in Palmdale, California, on May 23, 1975. By August 24th of that same year final assembly of OV-101 was underway. So was a massive debate with the public regarding the name of NASA' first Space Shuttle orbiter.

Honoring the bicentennial of the United States Constitution, NASA chose the name *Constitution* for OV-101 – much to the dissatisfaction of a large science fiction community. This community was anything but silent. Fans of the television series *Star Trek* had already succeeded eight years earlier in bombarding NBC with letters to renew and save their favorite television show – one that gained immense popularity after its eventual cancellation in 1969. These people wrote letters in droves to NASA and the American federal government urging them to rename Space Shuttle *Constitution* to Space Shuttle *Enterprise*. They contended that no space fleet of exploration would be complete without an Enterprise. Eventually, NASA and the federal government capitulated. OV-101 was officially, and permanently, named *Enterprise*.

Final assembly of Space Shuttle *Enterprise* was completed at Palmdale on March 12, 1976. She was revealed to the world on September 17th of that same year. Several cast members and the creator of *Star Trek* were present to witness her rollout from Palmdale. Final outfitting of *Enterprise* occurred between late September, 1976 and January, 1977. On January 31, 1977, *Enterprise* was transported 36 miles overland from her Palmdale construction facility to Edwards Air Force Base and NASA's Dryden Flight Research Center in California. Towed by the newly-built Mate-Demate Device (MDD), *Enterprise* was connected to a hoisting sling, lifted off the ground, her landing gear retracted, and placed atop of a newly acquired and newly modified 747 airliner – dubbed by NASA as the Shuttle Carrier Aircraft, or SCA.

On February 15, 1977, *Enterprise* and the SCA left the MDD and headed for the runway at Edwards Air Force Base to begin the Approach and Landing Test (ALT) Program. To begin, the SCA, with *Enterprise* mated on top, performed three runway taxi tests. The first taxi was achieved at the mild speed of 89 mph, while the second attained a speed of 140 mph and the third 157 mph. All three taxi tests demonstrated structural loads of the SCA-Shuttle mated pair as well as responses and ground handling and control characteristics of the combined vehicle through taxi and take-off speeds. The taxi tests also validated the SCA's steering and braking control while carrying a Shuttle orbiter.

On February 18th Space Shuttle *Enterprise* took to the skies for the first time for the first of five Captive-Inactive flights. *Enterprise* was attached to the SCA for the duration of each of these flights and configured in an unmanned, powered-down status. The succeeding four flights occurred on February 22nd, February 25th, February 28th, and March 2nd. They permitted the assessment of take-off, in-flight, and landing aerodynamics, structural integrity, and handling/performance characteristics of the mated SCA-Shuttle orbiter aircraft (with the tailcone assembly attached over *Enterprise's* aft engine area).

Following the final Captive-Inactive flight, *Enterprise* spent 3½ months on the ground as her flight systems were activated, tested, and prepared for the manned Captive-Active flights.

On June 18, 1977, a test-pilot crew boarded *Enterprise* at the MDD and rode in her crew module for the duration of the first Captive-Active flight of the Space Shuttle *Enterprise*/SCA mated pair. For this first Captive/Active flight, *Enterprise* remained firmly attached to the SCA as her test-pilot crew operated her flight control systems. Following this highly successful first crewed and powered flight of *Enterprise*, two more crewed Captive/Active flights were conducted on June 28th and July 26th, 1977. All three Captive/Active flights (with the tailcone assembly attached) exercised and evaluated *Enterprise's* systems in the flight environment for the upcoming major ALT evaluations. The three specific, major tests for the Captive/Active flights included flutter tests at low and high speeds, SCA-Orbiter separation trajectory tests, and a dress rehearsal for the first free flight test.

On the morning of August 12th, 1977, the first astronaut crew to board a Shuttle orbiter climbed into *Enterprise*. Fred Haise and Gordon Fullerton took their places in the respective seats of the commander and the pilot. Haise had flown as the Lunar Module Pilot on the aborted *Apollo* 13 lunar mission in 1970. At 8 a.m. PDT the SCA roared down Runway 22 at Edwards Air Force Base and lofted *Enterprise* to 20,000 feet for the ALT-1 flight. After climbing to 20,000 feet, all systems were go. In the seconds preceding the release, the SCA's engines revved to over 100% thrust to boost *Enterprise* to release altitude, and the SCA's nose pitched down into a shallow dive. This maneuver allowed *Enterprise* to generate as much lift over her wings as possible (aided by her 7-degree upward angle tilt on the back of the SCA). At 8:48 a.m. PDT Haise triggered *Enterprise's* release from the SCA, and the explosive bolts on the three attach struts between *Enterprise* and the SCA fired. *Enterprise* released from the SCA while the duo tracked north. The SCA/*Enterprise* duo were east of Edwards Air Force Base at that time. Haise pulled up the nose of *Enterprise* immediately following her release from the SCA to test her handling at relatively low air speeds. Haise then angled *Enterprise* into a dive and executed a 180-degree left-hand turn to align *Enterprise* with the dry lakebed runway. This maneuver was later referred to as "rolling around the HAC (Heading Alignment Circle)" for operational Space Shuttle missions. Four minutes after releasing from the SCA Fullerton lowered the landing gear of *Enterprise*. They touched down safely and successfully at 8:52 a.m. PDT. The first free flight and solo flight of a Space Shuttle orbiter had occurred.

Similarly, the next two free flight tests saw *Enterprise* lofted to 20,000 feet, released from the back of the SCA, rolled around the HAC, and landed on the dry lakebed runway at Edwards – all with her tailcone assembly attached. For AlT-2 Joe Engle and Richard Truly flew *Enterprise* on September 13th. Haise and Fullerton piloted *Enterprise* for ALT-3 on September 23rd.

On October 12th, 1977, Engle and Truly boarded a tailcone-less *Enterprise*. For the final two ALT flights *Enterprise* flew in "orbital" configuration with three mock Space Shuttle Main Engines and two mock Orbital Maneuvering (OMS) pods. Releasing from the back of the SCA at an altitude of 20,000 feet directly north of Edwards, Engle and Truly flew *Enterprise* on a steep, straight line approach to Edwards' dry lakebed runway. On ALT-4 no "roll around the HAC" maneuver occurred. ALT-4 lasted two minutes with an average descent rate of 10,000 feet per minute, or 166.6 feet per second.

Two weeks later, on October 26th, 1977, Haise and Fullerton boarded *Enterprise* for her final free flight that was under her control. For ALT-5, *Enterprise* did not aim for a dry lakebed runway. She aimed for the concrete runway at Edwards. While landing on concrete runway 04, as Haise flared *Enterprise* in preparation for touchdown, a pilot-induced oscillation occurred. This was later investigated by NASA's Fly-by-Wire F-8 Crusader. Nevertheless, *Enterprise* landed safely, performing the first concrete runway landing for the Space Shuttle Program.

With the completion of ALT-5, the flight career of *Enterprise* came to an end. Costs were mounting. NASA recognized that the reality of converting *Enterprise* from a ground and low atmosphere test article to a space-worthy Shuttle orbiter was not feasible. NASA quickly decided that *Enterprise* would not be converted to a space-worthy ship of exploration.
Instead, Structural Test Article - 099 (STA-099) would be converted into a flight-worthy orbiter in place of OV-101 *Enterprise*. STA-099 thus became OV-099 and was given the name *Challenger*.

But for *Enterprise* in 1977, the ALT was not yet complete. Over the next two months, *Enterprise* was prepared for four ferry flight tests with the SCA. After a series of these ferry flights, *Enterprise* was demated from the SCA and towed to a hanger at Dryden where she was modified for her next role – vertical ground vibration tests at the Marshall Space Flight Center (MSFC) in Huntsville, Alabama.

On October 30, 1979, she was transported back to Palmdale, where components of her flight systems were removed and refurbished for use on the space-worthy Shuttle orbiters that were still under construction at Palmdale. She was returned to Edwards Air Force Base on September 6, 1981.

On July 4, 1982, *Enterprise* served as the backdrop for President Ronald Reagan as he announced the successful completion of Space Shuttle *Columbia's* four Developmental Flight Tests earlier that day and the full operational capability of the Space Shuttle fleet.

***Enterprise* took her place as the centerpiece of the Smithsonian's Air and Space Museum on November 21st, 2003, where she remained until *Discovery* replaced her on April 19, 2012.**