



WHITE EAGLE  
AEROSPACE



Aerospace History Series

MAKE YOUR CAREER SOAR

# Welcome

From the windy shores of Kitty Hawk, North Carolina to the magnificent desolation of Tranquility Base, America's aerospace history is a priceless national treasure. It is a history filled with people, events and accomplishments far more interesting and astounding than any fiction. Driven by wonder and fueled by freedom, this unparalleled history is truly part of our national character.

My personal love affair with flight has been a life-long enchantment. Neither vocation nor avocation has escaped the allure of flight. I am in my fourth decade as an aerospace engineer, my third as an aerospace educator and third as an aerospace historian. And the best is yet to come!

As one whose life has been profoundly influenced by the things of flight, I hold an abiding sense of responsibility to tell all who will hear it the story of America's incredible aerospace achievements. The Aerospace History Series (AHS) represents a tangible means for relating the many facets of that story. For more than twenty-five years, I have had the privilege of giving these presentations to countless audiences. The response has been most gratifying.

Thank you very much for your interest in White Eagle Aerospace. Please take a moment to review the AHS presentations listed in this pamphlet. Choose from our current selection of exciting audio-visual presentations or request a customized presentation that meets your organization's requirements. I sincerely relish the opportunity to speak to your group or organization on an aerospace history topic of interest to you.

Should you have any questions about our Aerospace History Series (AHS) or desire more information on how we can help MAKE YOUR ORGANIZATION SOAR, please contact us today.

Best Regards,



John Terry White  
President/CEO  
White Eagle Aerospace



## About Our Presentations

**The Aerospace History Series (AHS) is a unique collection of audio-visual presentations focusing on significant events in aerospace history.**

**Our presentations are designed to help preserve America's aerospace heritage so current and succeeding generations may be inspired and guided. We aim to help aerospace professionals effectively learn from the past, that they may continue to have success now and in the future.**

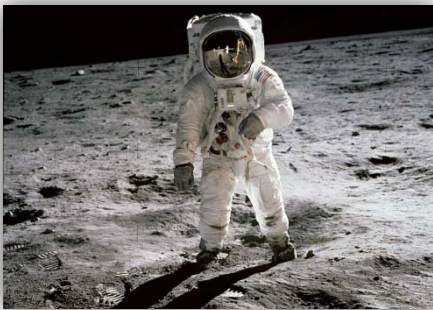
**These presentations are ideal as keynote addresses or inspirational talks for aerospace conferences, symposia, special-interest groups, and business meetings. We also develop and deliver custom presentations to meet your organizations needs.**

# Presentations

**In July 1969, man first landed at Tranquility Base on the lunar surface and returned safely to the Earth. In June 1959, the fabled X-15 hypersonic research aircraft first took to the air in the skies over Edwards Air Force Base, California. In December 1903, the first heavier-than-air flight took place at Kill Devil Hills, North Carolina.**

These and countless events like them have marked the history of flight in the United States of America. Indeed, as guardians of liberty, we are greatly blessed to be inheritors of a priceless heritage in the realm of flight. However, the uncommon achievements and technical progress that fostered that heritage did not come easily or without sacrifice of national treasure or human life. As an American, do you know and appreciate the significance of that history? As a current or aspiring aerospace professional, are you aware of and can you effectively apply the hard-earned lessons-learned garnered by past generations?

White Eagle Aerospace addresses these needs through exciting aerospace history lectures. The presentations included in our Aerospace History Series (AHS) cover a wide variety of fascinating topics. Delivered by a nationally-respected industry expert, the events and lessons discussed in each lecture are directly applicable to aerospace professionals, students or anyone interested in the legacy of flight.



## Aerospace History Series of Presentations

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# Zoom Flight

## The Story of the NF-104A

The zoom mission is one in which an aircraft trades kinetic energy for potential energy to achieve a maximum altitude far above its absolute ceiling. Military pilots employ the zoom maneuver to intercept adversary aircraft at extreme altitude. The zoom flight profile also serves as a means to impart high-energy initial kinematic conditions to propulsive stages carried aloft by a zoom aircraft. Pertinent examples include the USAF F-15 ASAT Project of the 1980's and DARPA's current RASCAL Program. The epitome of zoom flight was realized with an aircraft known as the USAF/Lockheed NF-104A Aerospace Trainer (AST) which was flown out of the Aerospace Research Pilots School (ARPS) at Edwards Air Force Base (EAFB) in the 1960's. The purpose of this airplane was to provide top ARPS students with realistic X-15-like spaceflight training at low cost. As such, the NF-104A was unofficially dubbed "The Poor Man's X-15".

The NF-104A was capable of attaining maximum altitudes in excess of 120 KFT from a ground take-off through the combination of a standard J79-GE-3B turbojet and a 6000-pound-thrust LR-121-NA-1 rocket motor. The aircraft was also configured with an X-15-type Reaction Control System (RCS) that allowed the pilot to maintain 3-axis control at dynamic pressures as low as 2 PSF. The pilot wore an AP 22S-2 full pressure suit and experienced roughly 70 seconds of zero-g flight near apogee. On the backside of the zoom profile, the pilot had to manage aircraft energy state to get back to the base and set-up for a dead-stick landing in the event that turbojet air-start could not be achieved. Mission elapsed time from brake release to wheels stop was approximately 25 minutes. Most who flew the NF-104A zoom mission consider it to be the most demanding and rewarding time that they ever spent in the cockpit. The view at the top of the zoom was spectacular. Here the pilot beheld a panorama that included the blue-purple-black of space above and the distinct curvature of the earth below. In the distance, the metropolises of San Francisco to the north and San Diego to the south were discernible. The purpose of this aerospace history presentation is to provide an overview of the previously untold story of the NF-104A; A story that is as much about the pilots and the era in which they flew as it is about the NF-104A itself. **Duration: 90 Minutes**



# Faster and Higher

## X-Aircraft from the XS-1 to the X-20A

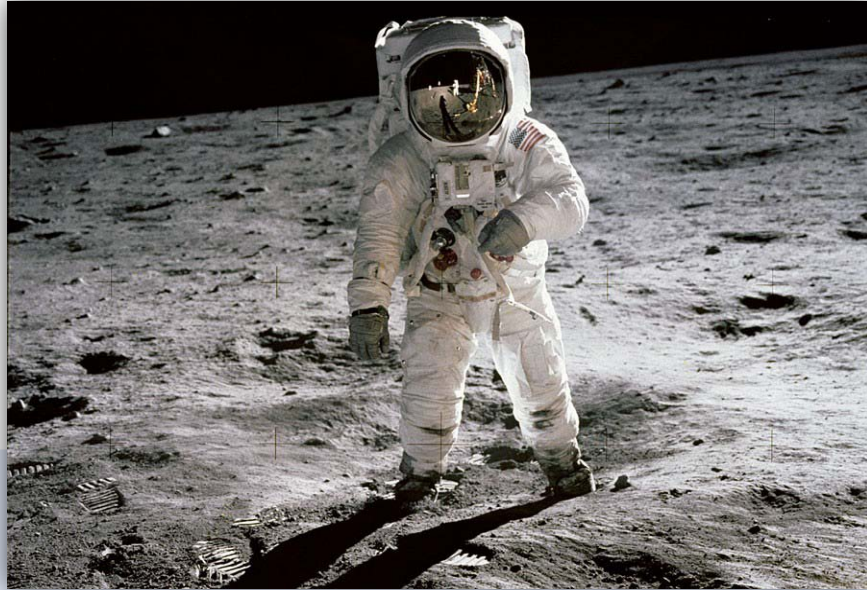


On the morning of 14 October 1947, USAF Captain Charles E. “Chuck” Yeager flew the Bell XS-1 rocket-powered aircraft to a maximum Mach number of 1.06 (700 MPH). Not only did this historic event establish the reality of manned supersonic flight, it ushered in the last true golden age of aviation in which speed and altitude records were routinely set and broken by America’s X-aircraft series. Indeed, Yeager’s inaugural supersonic experience initiated a 20-year assault on the limits of high performance flight which would culminate with aircraft reaching speeds in excess of 4500 MPH and altitudes beyond 350,000 feet.

This historical treatment considers the roles played by the Bell XS-1, Bell X-1A, Douglas D-558-II, Bell X-2, Douglas X-3, and the North American X-15 in the relentless push to fly faster and higher. Technical content addresses the design goals, flight test experiences, and technological frontiersmanship associated with the development of each aircraft. Pertinent discussion topics include consideration of airframe physical attributes, performance characteristics, and stability and control characteristics. Particular emphasis is placed on phenomena that greatly affected the design and performance of early X-aircraft including inertial coupling, control reversal, and lateral-directional instability. Perspectives are offered on the niche that each aircraft holds in aviation history as well as vital lessons-learned and applied to next-generation aircraft.

**Duration: 90 Minutes**

# Apollo Remembered



In July of 1969, America first landed men on the moon and returned them safely to the earth. This historic achievement was the culmination of a national commitment inspired by President John F. Kennedy in May of 1961. The president issued this challenge to go to the moon in spite of the fact that the United States had accumulated a scant 15 minutes of spaceflight up to that time! Appropriately, the responsibility for successful accomplishment of this daunting task fell under the aegis of the National Aeronautics and Space Administration (NASA). The specific program that NASA established to perform the lunar landing mission was known as Project Apollo.

At the inception of Project Apollo, there was no definitive concept for even getting to the moon, much less getting back to earth safely! However, in short order, the concept, hardware, and flight support infrastructure required to do so would be created by a national team that numbered in the hundreds of thousands. With the clock relentlessly ticking towards the end-of-decade goal, NASA and its contractors developed, tested, and flew the Apollo Command-Service Module, the Lunar Module, and the mighty Saturn V moon rocket. Critical spaceflight navigation techniques were developed and refined including rendezvous and docking, translunar and transearth injection, lunar descent and ascent, as well as superorbital earth entry. It was Project Apollo where Man first learned to live and work in deep space and conduct scientific research on another celestial body. **Duration: 90 Minutes**

# Hyper-X

## Hypersonic Scramjet Powered Flight



The central goal of NASA's recently-completed HYPER-X Program was to flight-demonstrate an airframe-integrated scramjet engine at Mach numbers between 7 and 10. After 8 years of intense effort by a government-contractor team, this goal was successfully realized in 2004 when the X-43A aircraft flew to Mach 7 and Mach 10 on 27 March and 16 November, respectively. On these historic occasions, the X-43A scramjet achieved and sustained supersonic combustion and produced thrust levels very close to prediction. These achievements represent true flight research frontiersmanship and stand as watershed events in aviation history

Mated to a modified Pegasus booster, the X-43A was propelled to hypersonic speeds following drop from the B-52B launch aircraft at Mach 0.8 and 40,000 feet. Upon separating from the booster at 95,000 to 110,000 feet, the X-43A's hydrogen-fueled scramjet engine was powered-up and the vehicle flew a sequence of pre-programmed flight maneuvers. These missions took place over the Pacific Ocean, lasted about 12-15 minutes, and terminated with the X-43A impacting in the ocean about 500-800 NM from the drop point.

Scramjet propulsion is the key to sustained, long range hypersonic flight. Successful development of scramjet technology is crucial to establishing capabilities ranging from long range, high speed strike operations to access-to-orbit. This aerospace history presentation will address this enabling technology, provide a summary of, and offer perspectives on the HYPER-X flight research project. **Duration: 90 Minutes**



# Lost Destiny

## Famous Aerospace Vehicles That Never Flew

For every aircraft or space vehicle program that actually flies a prototype, there are many more that never progress beyond the engineering or mock-up stage. Historically, the reasons for program cancellation are most often associated with technical, financial, and/or political issues. However, thoughtful examination of the historical record reveals much that can be applied to the successful conduct of current and future aerospace vehicle development programs.

The purpose of this aerospace history presentation is to briefly present and review the case histories of a representative cadre of aircraft and space vehicles that never made it to flight. Specifically, the programs to be addressed include the following

- Republic XF-103A Thunder Warrior
- North American XF-108A Rapier
- Bell XF-109A VTOL
- Boeing X-20A Dyna-Soar
- Douglas Manned Orbiting Laboratory
- NASA NOVA Launch Vehicle
- Lockheed X-33A Adv Technology Demonstrator
- Vought Supersonic Low Altitude Missile

Each program will be placed in its historical setting and perspectives will be offered regarding key techno-political lessons-learned. **Duration: 90 Minutes**





# High Jump

## Free Fall From 102,800 Feet

On 16 August 1960, USAF Captain Joseph W. Kittinger, Jr. jumped from an open balloon gondola at 102,800 feet (19.5 miles) and free fell nearly 85,000 feet (16 miles) prior to the opening of his main parachute. In so doing, Captain Kittinger set still-standing records for the highest parachute jump and longest free fall in aviation history. During his 4½ minute free fall, Kittinger reached a maximum inertial velocity of 614 miles per hour or approximately Mach 0.92. Total flight time from gondola exit to landing was 13½ minutes.

Joseph Kittinger's record high altitude parachute jump was part of a USAF flight research program called Project Excelsior. This program was initiated in 1958 in response to an urgent need to develop reliable means to ensure aircrew survival during high altitude ejections. Due to the lethally-low pressures and temperatures encountered in the stratosphere, the means devised to survive high altitude bailout was to free fall to lower altitudes prior to main parachute deployment. The most insidious aspect of free fall was the tendency for the human body to enter a flat spin that could produce spin rates in excess of 200 RPM. In response to this, the Beaupre Multi-Stage Parachute System was developed to help stabilize an aircrew member during free fall.

The purpose of this aerospace history presentation is to recount the epic story of Project Excelsior and highlight the many technical lessons-learned during conduct of this epic research effort. **Duration: 90 Minutes**



# Valkyrie

## North American XB-70A



In Norse mythology, a Valkyrie was one of the maidens of Odin who brooded over the scene of battle and had authority to choose those who would live and those who would die in the conflict. The imagery evoked therein is symbolic of the intended mission of the North American XB-70A Valkyrie strategic bomber. At 185 feet in length and weighing over a half million pounds, the Valkyrie was the largest and heaviest Mach 3-capable manned aircraft ever flown. Its mission was to deliver nuclear ordnance over intercontinental ranges flying at 70,000 feet and 2,000 mph. This level of performance was made possible through advances in aerodynamics, structures, propulsion, and flight controls. Key developments included a propulsion system consisting of six YJ93-GE-3 turbojet engines, each supplying 30,000 pounds of thrust, the use of stainless-steel honeycomb sandwich and titanium construction, and exploitation of the so-called “Compression-Lift” theory.

For all of its performance and promise, only a pair of Valkyries was ever built and flown. At that, these aircraft were relegated to the role of supersonic research test-beds before they ever flew. The primary reasons for this turn of events were the coming of age of the Intercontinental Ballistic Missile (ICBM) and the perception within certain military circles that the manned bomber could not survive penetration into the denied airspace of modern strategic targets. This presentation tells the story of the Valkyrie from the perspectives of technology, politics, and history. Both the triumphs and the heartaches of the program will be highlighted including the attainment of Mach 3 flight on 14 October 1965 by Air Vehicle (AV) No. 1 as well as the tragic loss of AV No. 2 on 08 June 1966. **Duration: 90 Minutes**



## X-15

# Rocket, Aircraft And Spacecraft

The most successful flight research aircraft in the 60-year history of the X-aircraft series was arguably the North American X-15. The world's first hypersonic manned aircraft, the X-15 was designed and built in the 1950's and flew 199 research flights from 1959 through 1968. NASA's Joe Walker flew the type to an altitude of 354,000 feet in August 1963, receiving astronaut wings in the process. In October 1967, USAF Major Pete Knight flew the X-15 to 4,520 mph (Mach 6.7). Throughout its legendary history, the X-15 was used as a hypersonic test-bed to obtain vital flight research data in the realms of propulsion, aerodynamics, aerothermodynamics, flight controls, and bioastronautics. Twelve men flew the X-15 including one contractor, one USN, five USAF, and five NASA pilots.

The X-15 was unique in that it was a combination rocket, aircraft, and spacecraft. Propulsion was provided by the diminutive, but mighty XLR-99 throttled rocket engine which generated a maximum thrust of 57,000-lbs. The X-15 was configured with both aerodynamic control surfaces and a reaction control system to provide roll, pitch, and yaw control throughout the flight envelope. The basic airframe was made of a difficult-to-manufacture temperature-resistant steel called Inconel-X in order to withstand surface temperatures up to 1,200°F. Later, the X-15A-2 (a higher performance version of the original vehicle) was equipped with two external propellant tanks and employed a high temperature ablator material which allowed it to withstand surface temperatures as high as 1,800°F.

The purpose of this presentation is to tell the remarkable story of the X-15 from the triple perspectives of aerospace technology, frontiersmanship, and history. Key elements of this story include the people who flew and tested it as well as those halcyon days in which the X-15 graced our skies. **Duration: 90 Minutes**



# Legends of Flight

## Century Series Aircraft



The decade of the 1950's saw the introduction of the first operational supersonic-capable aircraft into the flying inventories of the United States military services. Significant among these was a diverse family of mission-specific aircraft known as the Century Series. Flown by the United States Air Force, Century Series aircraft ranged from the first production airplane capable of supersonic speeds in level flight (i.e., F-100 Super Sabre) to the "Ultimate Interceptor" (i.e., F-106 Delta Dart). In its entirety, the Century Series included the following:

- North American F-100 Super Sabre
- McDonnell F-101 Voodoo
- Convair F-102 Delta Dagger
- Lockheed F-104 Starfighter
- Republic F-105 Thunderchief
- Convair F-106 Delta Dart

This aerospace history presentation will trace the technological development and operational life of these remarkable airplanes, each of which holds a hallowed place in the aviation hall of fame. The historical setting and mission of each aircraft will be examined in addition to the key technology innovations required to produce a viable weapon system. Finally, the aborted lives of would-be Century Series aircraft will be considered including the Republic XF-103A Thunder Warrior, North American YF-107 Ultra Sabre, North American XF-108A Rapier, and Bell XF-109A VTOL. **Duration: 90 Minutes**



# America in Space

## The First 50 Years

The United States of America entered the manned-flight portion of the Space Race on 05 May 1961 when Navy Commander Alan B. Shepherd, Jr. was launched on a sub-orbital mission from Cape Canaveral, Florida. Though flying to a maximum altitude of only 116 nautical miles and landing a mere 302 nautical miles from the launch point, Shepherd's historic 15 minute flight aboard Freedom 7 rekindled the fire of patriotism in his fellow countrymen. Twenty days later, before a special session of Congress, an emboldened President John F. Kennedy proposed a national goal of landing a man on the moon and returning him safely to earth before the end of the decade.

Though not without difficulty and tragedy along the way, history records that America did indeed meet their late-president's goal when Apollo 11 successfully completed the first lunar landing in July 1969. Five Apollo lunar landing missions followed in the next 41 months concluding with Apollo 17 in December 1972. America continued manned space exploration with the Sky Lab missions of the 1970's, the introduction of the Space Shuttle era in the 1980's, and the building of the International Space Station (ISS) in the 1990's.

The purpose of this aerospace history presentation is to tell the incredible story of America's human spaceflight program from the first Mercury sub-orbital flights in 1961 to the Space Shuttle Discovery Return-to-Flight missions of 2005 and 2006. Major US spaceflight programs addressed include Projects Mercury, Gemini, and Apollo as well as Sky Lab, Shuttle, and the ISS. Key launch vehicles and spacecraft will be highlighted as well as historically-significant missions flown by these vehicles. However, all of this is simply a backdrop to that most enduring aspect of America in Space – the triumph of the human spirit in a noble cause. A triumph made possible by the spirit of freedom and the blessings of personal liberty.

**Duration: 90 Minutes**





# J. Terry White

## Aerosciences Instructor

**John Terry White is president and CEO of White Eagle Aerospace. With headquarters in Oro Valley, Arizona, White Eagle Aerospace is a leading provider of engineering consulting, professional training, history of flight lectures and technical publication services to the aerospace community.**

White's over 50 years of professional aerospace experience includes the NASA Space Shuttle Program, NASA X-43A Flight Project, and United States Navy STANDARD Missile Program. During his extensive career, he has served on the engineering technical staff of Rockwell International, General Dynamics Corporation, Hughes Missile Systems Company, NASA Dryden Flight Research Center and Raytheon Missile Systems.

In 2009, White completed a 2-year assignment as manager of the Aerodynamics Department in the Guidance, Navigation, and Control Center at Raytheon Missile Systems in Tucson, Arizona. In this capacity, he was responsible for all aerodynamics work performed at the world's largest tactical missile producer. White resigned from Raytheon in 2010 as an Engineering Senior Fellow in Aerodynamics.

White has authored more than 180 technical papers on a wide variety of aerospace and aerospace subjects. His teaching credentials include 15 years as an instructor in the Aerospace Engineering Department of the California State Polytechnic University, Pomona, 10 years as an instructor in the professional development program at Raytheon and 6 years developing and teaching courses at White Eagle Aerospace. Those who have taken his courses say that White brings an uncommon passion and extensive technical knowledge to the training environment.

White is particularly well known for his inspiring aerospace history lectures and presentations. These "techno-histories" are intense, fast-paced reviews of historically-significant events in United States aerospace history. He has lectured extensively on aerospace history topics at the USAF Test Pilot School, the Society of Experimental Test Pilots, the National Aeronautics and Space Administration, the American Institute of Aeronautics and Astronautics, academia, and industry. White also serves as a motivational keynote speaker for aerospace conferences, business functions, commemorative events, public service organizations, special interest groups, and private business.

### Courses Offered

- **Aerodynamics for Engineers**
- **Aerospace Lessons-Learned**
- **Advanced Missile Aerodynamics**
- **Aerospace Vehicle Performance**
- **Basic Missile Aerodynamics**
- **Basic Rocket Science**
- **Fundamentals of Earth Reentry**
- **Fundamentals of Gas Dynamics**
- **Fundamentals of Hypersonics**
- **Fundamentals of 6-DOF Aerodynamics Models**

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