

Ohio History and Its Contributions to Flight

Students will learn about some of the significant Ohio contributions to aviation and space to include the Wright brothers and beyond.

LESSON PLAN

Learning Objectives:

The students will:

- Learn about significant milestones in Ohio's contributions to flight
- Create a time line of those significant events in the history of flight

Purpose:

Students will learn about some of the significant Ohio contributions to aviation and space to include the Wright brothers and beyond. Using adding machine paper tape, students will create a time line to represent the chronological order of these milestones of flight. Students will understand the importance of Ohio in aviation history.

Introduction:

The history of aviation and other forms of flying is a long list of events and inventors who pioneered the way for future technological advances. In the early years of flight, there were gliders, kites and balloons used to understand the early theories and inventions created. In the later years, more advanced flying objects began to arise with more scientific research and engineering studies. People from around the world began to invest in this new form of innovative technology. By the time of the 1900s, there were several advanced gliders and engines that were being tested to create the first human driven airplane. This was later achieved by Orville and Wilbur Wright, local Dayton, Ohio bike mechanics who saw a calling to invent the first flying airplane. In 1903, the Wright brothers and their local team of engineers and scientist created the first human driven airplane. This invention led to mass publicity, calling for major production and advancements in the science behind flying. Though a small piece in the long history of aviation technology and advancements, Orville and Wilbur Wright will forever be known as the fathers of aviation.

Grade Level: 4

Ohio Learning Standards/Social Studies (2018)

History:

1. Order or significant events in Ohio & the U.S. can be shown on a timeline

8. Technological innovations that originated in Ohio benefitted the U.S.

Economic:

21. Entrepreneurs in Ohio & U.S. organize

Materials Required:

- Machine paper tape
- Ruler
- Colored pencils/markers/crayons
- Laminating machine (optional)
- Double-sided tape

Procedure:**A. Warm-up**

1. Show a video on the Wright brothers' invention of the airplane (https://youtu.be/YDlk4Ky_ahs).
2. Have students review Ohio's Contributions to Flight (page 4 – 5) and the attached PowerPoint.
3. Have a class discussion about the historical importance of flight.
4. Allow the students to think of the milestones that they feel were most important to the history of aviation for their timelines.

B. Activity

1. Measure out a length of adding machine paper for the students to create their timelines (it will not be feasible to make the timeline to scale).
2. Record significant events in Ohio's contributions to flight on the adding machine paper tape.
3. Label and illustrate the time line.

C. Wrap-up

1. Laminate timelines if possible.
2. Display in hallway of school.

Assessment/Evaluation:

Students should be evaluated on class participation, their ability to follow directions and successful completion of project.

Resources/References:

History of Flight & Space:

<https://www.loc.gov/exhibits/dreamofflight/dream-timeline.html>

<https://www.aiaa.org/about/History-and-Heritage/History-of-Flight-Around-the-World>

<https://www.livescience.com/59185-key-milestones-in-aviation-history/2.html>

<https://www.airspacemag.com/history-of-flight/10-milestone-flights-4056259/?page=3>

<https://www.sciencelearn.org.nz/resources/1691-a-progression-of-flight-timeline>

<https://www.flyingboatmuseum.com/a-brief-timeline-history-of-manned-flight/#:~:text=Here's%20a%20timeline%20showing%20some,in%20The%20Spirit%20of%20St>

<https://www.space.com/22391-reusable-rocket-nasa-dc-x-anniversary.html>

<https://www.jpl.nasa.gov/missions/mars-science-laboratory-curiosity-rover-msl/#:~:text=ABOUT%20THE%20MISSION,landing%20maneuvers%20never%20before%20attempted.>

Ohio Flight & Space:

<https://www.copama.org/ohiohistory.htm#:~:text=Ohio%20became%20a%20State%20on,104%20years%20old%20this%20December>

<https://www.ohiohistory.org/learn/collections/history/history-blog/2015/august-2015/first-air-cargo-shipment>

<https://www.space.com/nasa-glenn-research-center.html>

[http://www.wright-brothers.org/Information_Desk/Just the Facts/Kites & Gliders/Wright Kites & Gliders.htm](http://www.wright-brothers.org/Information_Desk/Just_the_Facts/Kites_&_Gliders/Wright_Kites_&_Gliders.htm)

<https://airandspace.si.edu/exhibitions/wright-brothers/online/index.cfm>

Ohio's Contributions to Flight

The following is a list of just some of Ohio's contributions to aviation and space!

1899: Ohioans Orville and Wilbur Wright experiment with control surfaces by building and flying a box kite

1900: Wilbur and Orville built a small biplane glider and took it to Kitty Hawk, North Carolina to test it. The control system seemed to work, but the glider did not produce enough lift to carry a man aloft. They decided to try a larger glider.

1901: The Wrights try a larger glider but it didn't work well. So, they built their own wind tunnel and designed a pair of conceived balances that produced the bits of data required to make accurate performance calculations.

1902: The Wrights built and flew a much more successful glider.

December 17, 1903: The Wrights make the first sustained, controlled, powered flights in an airplane.

1905: The Wright brothers built and flew the world's first practical airplane in Dayton, Ohio. The Ohio field in which the Wright brothers flew became the world's first airport.

1909: the Wright brothers sell the US Government the first military aircraft.

October 26, 1909: Ohioan Frank P. Lahm became one of the first two military officers to become a pilot.

1917: Kettering "Bug" an aerial torpedo is created by Ohioan Charles Kettering.

1917: McCook Field, an airfield and aviation experimentation station, opened in Dayton, Ohio.

1918: Ohioan Eddie Rickenbacker became America's "Ace of Aces" during WW I.

1923: Origins of the National Museum of the United States Air Force opens near Dayton, OH and is now the world's oldest and largest military aviation museum.

1941: NASA Glenn Research Center, Cleveland, OH, began as an Aircraft Engine Research Laboratory and now designs and develops innovative technology to advance NASA's missions in aeronautics and space exploration. Glenn is also home to Plum Brook Station, which includes three world-class test facilities, which perform complex and innovative ground tests for the international aerospace community.

1942: Ohioan Mac Ross becomes one of the first five Tuskegee Airmen fighter pilots.

1944: Ohioan Don Gentile became America's "Ace of Aces" during WW II.

1948: Wright-Patterson Air Force Base near Dayton, OH is formed by combining three previously existing installations. Wright-Patterson Air Force Base has been a leader in military aviation development from the time of airplane inventors Wilbur and Orville Wright to today's aerospace age.

1961: Ohioan Curtis LeMay, famous USAF General, was selected as Chief of Staff of the USAF.

1962: Ohioan John Glenn became the first American to orbit the Earth.

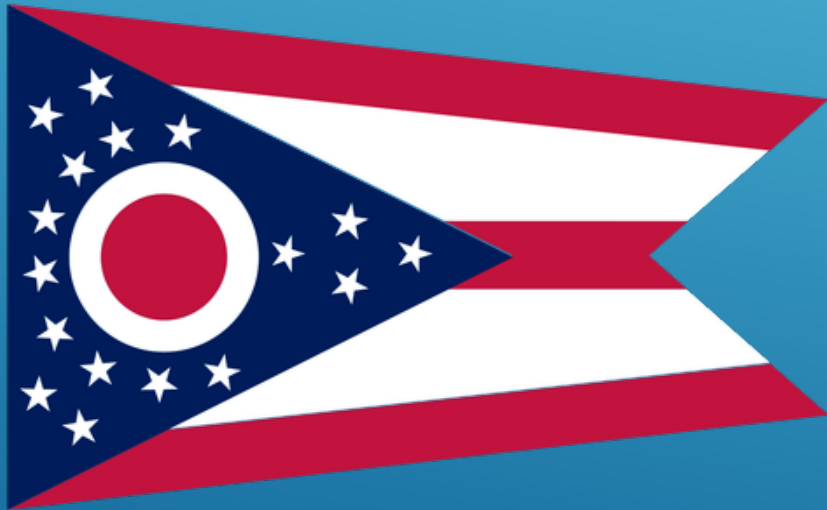
1964: Ohioan Jerrie Mock, became the first female pilot to fly solo around the world.

July 20, 1969: Ohioan Neil Armstrong becomes the first human to set foot on the moon.

1998: Ohioan John Glenn became the oldest astronaut when he flew on the Space Shuttle at age 77

2020 and beyond: Ohio continues to be a leader in both aviation and space innovations and milestones.

OHIO'S HERITAGE IN AVIATION



OHIO



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ORVILLE & WILBUR WRIGHT



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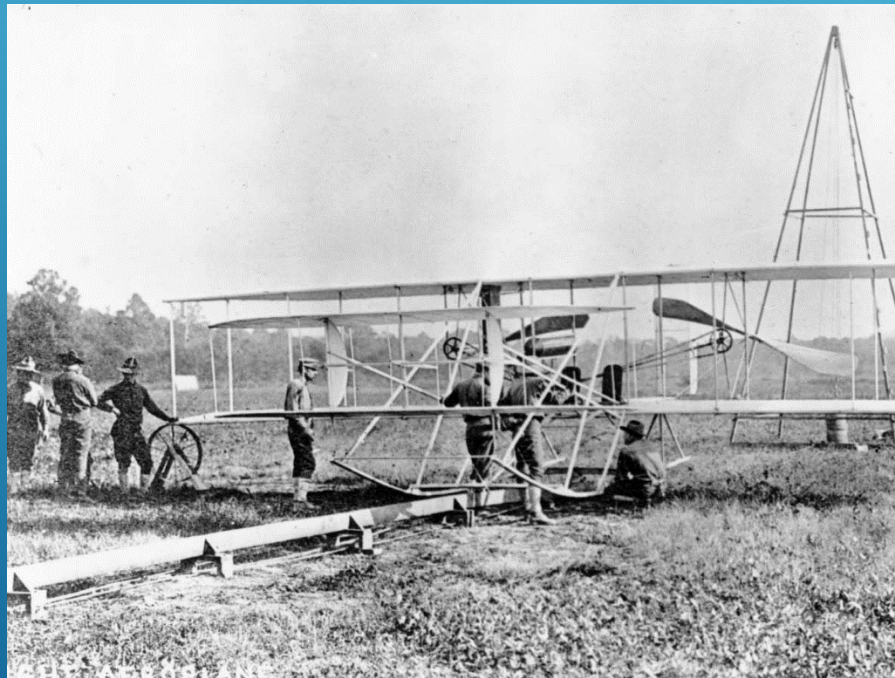
ORVILLE & WILBUR WRIGHT

- ▶ Begin pursuit of powered flight in 1899
 - ▶ 5 Foot biplane kite to test wing warping
 - ▶ 1900 thru 1902 they progress to 32 foot gliders with a pilot at the controls
 - ▶ 1903 The first to conquer powered flight of an aircraft at Kitty Hawk, North Carolina
 - ▶ 1905 they build the first practical aircraft with flights exceeding one hour
 - ▶ Huffman Prairie, near Dayton OH became the world's first airport!



ORVILLE & WILBUR WRIGHT

- ▶ 1909 the Wright brothers sell the US Government the first military aircraft (Signal Corps Airplane No. 1)



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FRANK P. LAHM – FROM OHIO



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FRANK P. LAHM – FROM OHIO

- ▶ 1901- Graduated from the US Military Academy
- ▶ Rated as a balloon pilot while stationed in France
 - ▶ Won the International Balloon Race from Paris to England
- ▶ First military officer to fly in a powered aircraft
 - ▶ Taught how to fly by the Wright brothers
 - ▶ Became the Army's 2nd qualified "pilot"
 - ▶ Rated as both a balloon and airplane pilot
- ▶ Commanded balloon outfits in WW1



CHARLES KETTERING – FROM OHIO

- ▶ Holder of 186 patents
 - ▶ Electrical starter for car
 - ▶ Leaded gasoline
 - ▶ Freon refrigerant
 - ▶ Electric cash register (NCR)
- ▶ Founder of DELCO (Dayton Engineering Laboratories Company)
- ▶ Vice President of GM Research Division



KETTERING “BUG”

- ▶ Aerial Torpedo”
- ▶ Invented by Charles Kettering in 1917
- ▶ 75 mile range / 180 lb bomb



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EDDIE RICKENBACKER



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EDDIE RICKENBACKER – FROM OHIO

- ▶ Initially assigned as a staff driver in WW1
- ▶ Attended Aviation Training School in France
- ▶ Assigned to the 94th Aero Squadron famed “Hat-in-the-Ring Squadron”
 - ▶ Selected to command squadron in September 1918
 - ▶ Top US “Ace” with 26 victories
 - ▶ Advisor in WW2 to Secretary of War
 - ▶ Spent 24 days lost at sea in a raft when his aircraft ditched



DON GENTILE – FROM OHIO



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DON GENTILE

- ▶ Learned how to fly in high school
 - ▶ Earned military pilot rating from the Royal Air Force (RAF) in 1941
- ▶ Assigned to No. 133 “Eagle Squadron” in 1942
 - ▶ Commissioned 2nd Lt when Eagle Squadrons transferred to US Army Air Forces
- ▶ Shot down 22 German aircraft in combat*
 - ▶ Destroyed 6 aircraft on ground
 - ▶ 182 Total combat missions



MCCOOK FIELD



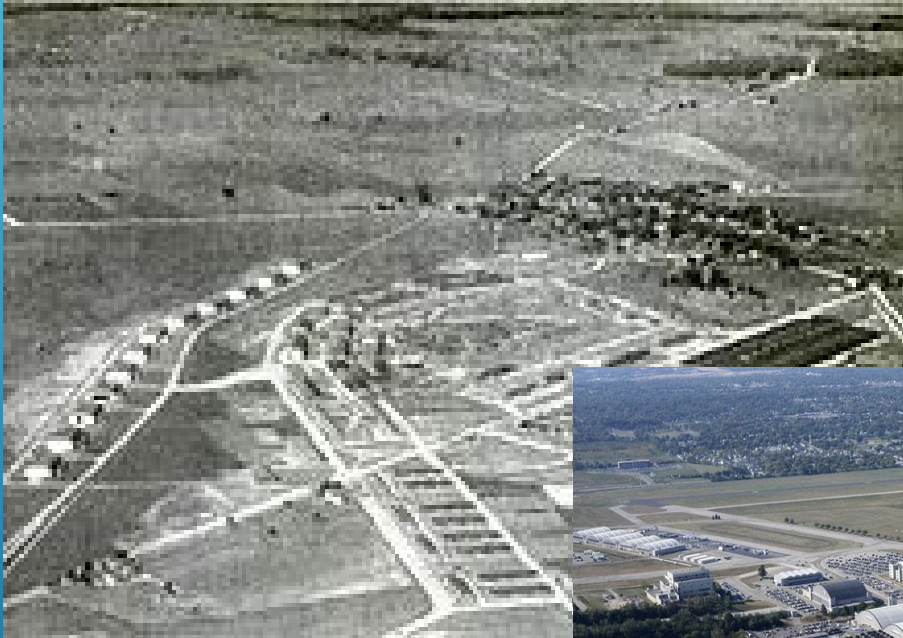
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MCCOOK FIELD

- ▶ 1917 - Military airfield located in what is now downtown Dayton opened in late 1917
- ▶ 1919 became home of Engineering Division to study and design versions of foreign aircraft
- ▶ 1927 - McCook Field closed when operations transferred to Wright Field



WRIGHT-PATTERSON AFB



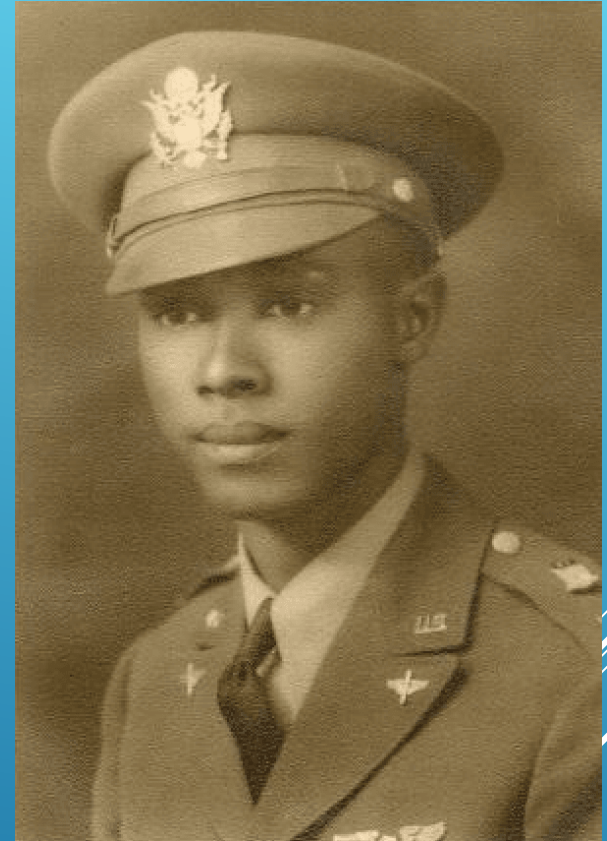
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WRIGHT-PATTERSON AFB

- ▶ 1903 - first Huffman Prairie flying Field, the testing location of the Wright Brothers for years
- ▶ 1917 - after the declaration of war, three installations were created: McCook Field, Wilbur Wright Field and the Fairfield Aviation General Supply Depot.
- ▶ 1919 - Wilbur Wright field merged to become known as the Wilbur Wright Air Service Depot
- ▶ 1931- the War Department predesignated a portion of Wright Field as "Patterson Field", the Patterson family who were influential in engineering research
- ▶ 1941-1944 – During WWII, the buildings and HQs count went from 40 to over 300
- ▶ January 13, 1948 – Wright and Patterson Field were merged into a single installation
- ▶ 1948 – Assigned the Air Materiel Command
- ▶ 1961 – Air Force Transferred Air Materiel Command's procurement and production for new systems to Air Force Systems Command (AFSC)
- ▶ 1992 – Air Force inactivated AFSC and established the Air Force Materiel Command HQ

MAC ROSS – FROM OHIO

- ▶ 1940s - He was one of the first of the Tuskegee Airmen fighter pilots
- ▶ March 7, 1942 - Mac Ross and four others received silver wings
- ▶ 1943 – became the youngest Squadron Commander in the field
- ▶ Late 1940s – Ross lost his life while in transition to fly the P-51 Mustang
- ▶ Received Distinguished Flying Cross and Legion of Merit



CURTIS LEMAY – FROM OHIO



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CURTIS LEMAY

- ▶ 1937 - Specialized in aerial navigation to improve effectiveness of heavy bombers defending the US
- ▶ 1945 - Directed strategic bombing campaign in Pacific against Japan
- ▶ 1948-1957 Commander of the Strategic Air Command
 - ▶ Directed transition to all jet aircraft
- ▶ 1961-1965 selected as Chief of Staff of the USAF
- ▶ 1968 – Vice Presidential candidate for the American Independent Party





NASA GLENN RESEARCH CENTER



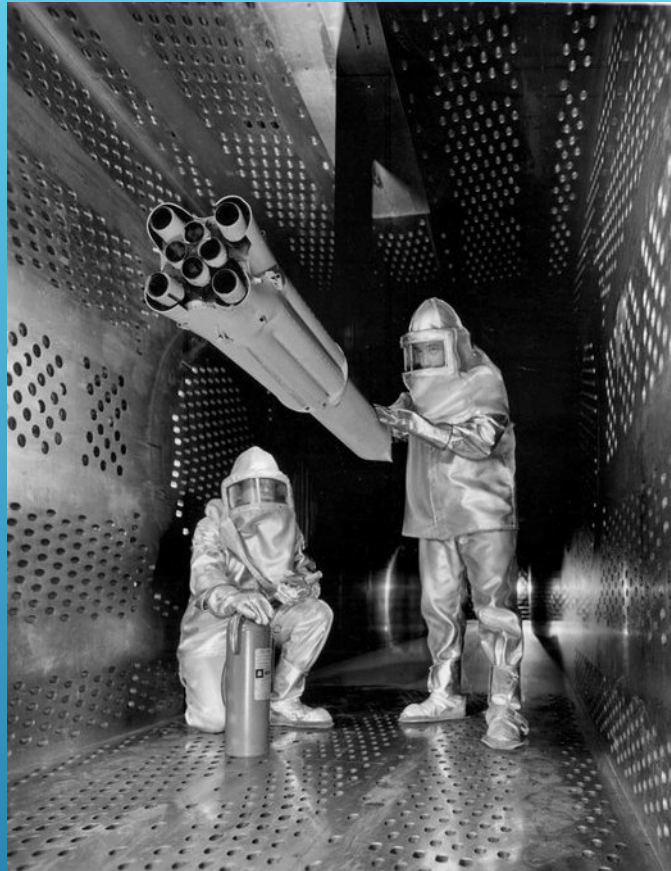
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NASA GLENN RESEARCH CENTER

- ▶ Located near Cleveland, it designs and develops new technology to advance NASA's missions in aeronautics and space exploration
 - ▶ Began in 1941 as an Aircraft Engine Research Laboratory
 - ▶ Responsible for jet engine advancements in WW2
 - ▶ Using wind tunnels, developed airfoil shapes for wings and propellers, which lead to the development of the P-51 Mustang (best American WW2 fighter)
 - ▶ 1966 – develops Centaur upper stage rocket which sends the Surveyor spacecraft to land on the moon
 - ▶ March 1, 1999 renamed Lewis Research Center to NASA Glenn Research Center at Lewis field



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SUPERSONIC WIND TUNNEL



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PLUM BROOK STATION

- ▶ Plum Brook Station is a remote test facility for the NASA Glenn Research Center in Cleveland, Ohio. Located on 6,400 acres in the Lake Erie community of Sandusky, Plum Brook is home to four world-class test facilities, which perform complex and innovative ground tests for the international space community.
- ▶ The Space Environments Complex (SEC) houses the world's largest and most powerful space environment simulation facilities including the Space Simulation Vacuum Chamber measuring 100 ft. in diameter by 122 ft. high. The Reverberant Acoustic Test Facility is the world's most powerful spacecraft acoustic test chamber, which can simulate the noise of a spacecraft launch up to 163 decibels or as loud as the thrust of 20 jet engines. The Mechanical Vibration Facility is the world's highest capacity and most powerful spacecraft shaker system, subjecting test articles to the rigorous conditions of launch. Take a virtual tour of the Space Environments Complex.
- ▶ In-Space Propulsion Facility (ISP) is the world's only facility capable of testing full-scale, upper-stage launch vehicles and rocket engines under simulated high-altitude conditions. The engine or vehicle can be exposed for indefinite periods to low ambient pressures, low-background temperatures and dynamic solar heating to simulate the environment of orbital or interplanetary travel.



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JERRIE MOCK - FROM OHIO



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JERRIE MOCK

- ▶ First female pilot to fly solo around the world in 1964 at age 37
- ▶ Flew a single-engine plane dubbed “The Spirit of Columbus” for 29 days straight.
- ▶ The trip began and ended in Columbus, Ohio
- ▶ Accomplished what Amelia Earhart was unable to do



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JOHN GLENN



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JOHN GLENN – FROM OHIO

- ▶ Marine Corps fighter pilot in WWII and Korean War
 - ▶ Shot down 3 MiG fighters in Korea
 - ▶ Flew first supersonic transcontinental flight across the US
- ▶ 1962 – First American to orbit the Earth (three orbits)
- ▶ 1998 – Flew on the Space Shuttle at age 77
 - ▶ 9 days as Payload Specialist on the Discovery Space Shuttle
- ▶ 1974-1999 Ohio Democratic Senator in Congress





NEIL ARMSTRONG – FROM OHIO



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NEIL ARMSTRONG

- ▶ Navy Fighter pilot in the Korean War
 - ▶ Bailed out after his aircraft was damaged on a bombing run
- ▶ Test Pilot for the National Advisory Committee for Aeronautics (NACA)
 - ▶ Piloted the X-15 experimental rocket plane 7X
- ▶ Became NASA astronaut in 1962
 - ▶ Commanded Gemini 8, performing first docking of two spacecraft
 - ▶ July 20, 1969 – First human to walk on the Moon (Apollo 11)



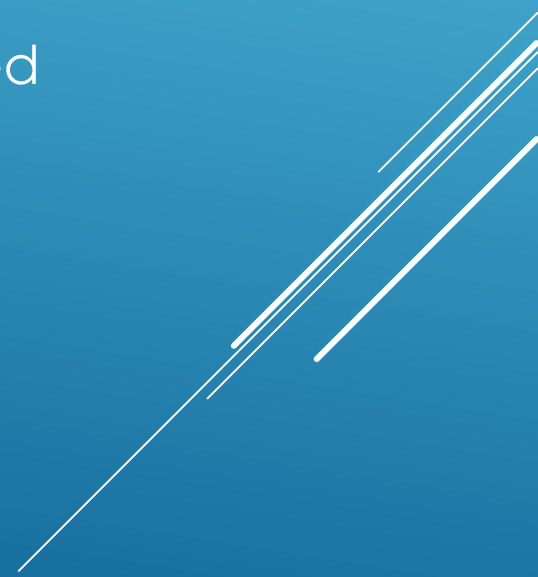
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NATIONAL MUSEUM OF THE UNITED STATES AIR FORCE (NMUSAF)

- ▶ Origins date back to 1923, when it opened to the public in an aircraft hangar at the edge of McCook Field
- ▶ After 1955 - the museum moved to a new building funded by the Air Force Museum Foundation
- ▶ September 3, 1971 - President Nixon dedicated the new free public access museum



EXTRA FACTS: OHIO ASTRONAUTS

- ▶ 25 astronauts are from Ohio
 - ▶ 16 are from Northeast Ohio
 - ▶ 2 are from Northwest Ohio
 - ▶ 7 are from Southern Ohio
 - ▶ Three have been to the moon
- ▶ Ohio astronauts participated in a total of 78 space flights
 - ▶ One third of these astronauts have flown on the Shuttle 4X



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