aerospace design
ABOUT AEROSPACE DESIGN

The images on the front of this poster are artifacts from an exhibition called "Aerospace Design: The Art of Engineering from NASA's Aeronautical Research." The exhibition was organized by the Aeronautics Research Mission Directorate at NASA to commemorate the centennial of the Wright brothers’ first powered flight in December 1903. Artifacts include architectural and engineering designs for wind tunnels, wind tunnel models, and designs for conceptual airplanes, past and present.

For detailed descriptions of each artifact, exhibit photographs, and information about how to schedule the exhibit, visit:
http://aeronautics.nasa.gov/exhibits/aerospace/

ABOUT AERONAUTICS RESEARCH AT NASA

NASA research helps make aircraft quieter, safer, more efficient, and less expensive. For decades, our researchers have created revolutionary vehicle improvements that are used today on nearly every aircraft—from wings that maximize air flow and improve fuel efficiency; to wing designing systems that save time on the ground and improve safety in the air.

NASA’s Aeronautics Research Mission Directorate continues to focus on improving aircraft, but we also focus on improving the airspace in which those aircraft fly. Dramatic changes are needed to turn our current airspace system into one that can soon handle three times as many aircraft safely and efficiently. Together with the FAA and other partners, we are developing the tools and technologies needed for the next generation transportation system.

We also use our unique expertise to help discover how to send vehicles safely through the atmosphere of Earth and other planets—a critical component of NASA’s Vision for Space Exploration.

NASA is committed to the pursuit of technical truth that benefits the entire aeronautics community and beyond.

http://aeronautics.nasa.gov/

ABOUT CAREERS IN AEROSPACE DESIGN

Designing an aircraft’s components and how they come together is primarily the job of the aerospace engineer.

Aerospace (aeronautics) engineers work on the design and performance of everything from transport and military aircraft to helicopters and spacecraft. To do this, they have knowledge of aerodynamics (how an aircraft lifts and flies), aircraft structures and materials (how to build the aircraft), propulsion (how to build engines to propel vehicles into the atmosphere), flight dynamics and control (how to control the aircraft), and several other disciplines such as computer science.

Engineers often use their most creative skills when it comes to design. They determine the size, shape, structure, arrangement, and function of components of aircraft to meet the specifications set by the customer, and by safety or cost constraints.

Aerospace engineers are often aviation enthusiasts, curious about those “famous flying machines” and the science behind them.

Characteristics of a good aerospace engineer include:
- Good grasp of engineering science fundamentals
- Good understanding of the design and manufacturing process
- Basic understanding of the socioeconomic/political context in which engineering is practiced
- Good communication skills
- Ability to think both critically and creatively, independently and cooperatively
- Ability and the self-confidence to adapt to rapid/major changes—flexibility
- Curiosity and a life-long desire to learn
- Understanding of the importance of team work.

Samples of types of aerospace engineering degrees include:
- Aerodynamics
- Flight Dynamics and Control
- Aerospace Propulsion
- Aerospace Structures
- Aerospace Design

Visit the Education pages at the ARMd Web site:
http://aeronautics.nasa.gov/education.htm

NASA AERONAUTICS SCHOLARSHIP PROGRAM

NASA is committed to supporting a future workforce that helps us continue to reach our goals in science and exploration. In 2006, ARMd started the Aeronautics Scholarship Program for graduate and undergraduate students. The program expects to annually award ten, two-year scholarships plus summer internships to undergraduate students; and five, two- to three-year scholarships plus summer internships to graduate students.

Apply online at:
http://www.asp.nas.edu/programs/scholarships/

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Aerodynamics Design (8 Volume Series), Dr. Jan Rossak (Design Analysis and Research) 1989-2002

At the Edge of Space: The X-15 Flight Program, Milton O. Thompson, Washington, DC (Smithsonian Institution Press) 1992

Building for Air Travel: Architecture and Design for Commercial Aviation, John Zukowsky (ed.), Munich ( Prestel) 1996

Building for Space Travel, John Zukowsky (ed.), New York, NY (Harry N. Abrams) 2001

Concept to Reality: Contributions of the Langley Research Center to U.S. Civil Aircraft of the 1990s, Joseph P. Chambers, NASA History Series (NASA SP-2003-4529) 2002

Flying without Wings: NASA Lifting Bodies and the Birth of the Space Shuttle, Sutton O. Thompson and Curtis Pfeil, Washington, DC (Smithsonian Institution Press) 1999


Quest for Performance: The Evolution of Modern Aircraft, Laurence K. Lottin, Jr., Washington, DC (Government Printing Office) 1986

The X-Planes: X-1 to X-45, Jay Miller, North Branch, MN (Special Press) 2001

Space Shuttle: The History of the National Space Transportation System The First 100 Missions, 3rd Edition, Dennis R. Jenkins (Dennis R. Jenkins) 2001

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ARTIFACT TITLES

1. Boeing F-2-2 Model, ca 1931-33
2. Streamlin 6S, Spin Tunnel Model, ca 1937
3. Douglas B-25-1 Destroyer Spin Tunnel Model, ca 1944
4. Northrop P-97 Black Widow Wind Tunnel Model, 1943
5. Wind Tunnel Fan Blade
6. Modified Bell X-1 Spin Tunnel Model, ca 1950
7. Bell X-2 Wind Tunnel Model, ca 1954
8. Early X-15 Concept Model, ca 1953
10. Advanced X-15 Configuration Model, ca 1966
14. OA Flight Patterns on Wedge Shapes, ca 1980
15. Nordtrom HL-10 Lifting Body Model, ca 1965
16. Monospar Model, ca 1960s
17. Hypersonic Skip-Glide Model, 1960s
18. Boeing X-2 Dyna-Soar Wind Tunnel Model, 1960-63
19. A Series of Delta Wing Wind Tunnel Models, 1960s
20. Proposed Shelves for the Mercury Capsule, 1957-60
21. Pilot Proto, 1970s
22. Douglas BT-1 Spin Tunnel Model, 1940
23. Early Hypersonic Wind Tunnel Model, ca 1980
24. Supersonic Commercial Air Transport Wind Tunnel Model, Late 1950s
25. High Speed Civil Transport, HSCT Model, ca 1990
26. Orbital Wing Model, ca 1960
27. Evolution of the Space Shuttle Configuration in Wind Tunnel Models, 1968-72
28. Early Hypersonic Wind Tunnel Models, ca 1985
29. Space Launcher II Wind Tunnel Model, ca 1972
30. Wendover Wind-Proof Model, ca 1970-75
31. Martin X-2-424 Lifting Body, Wind Tunnel Model, ca 1974
32. General Research Flying Wing Spin Tunnel Model, ca 1980
33. Space Shuttle Orbiter Wind Tunnel Model, ca 1979-70
34. HL-20 Lifting Body, Water Tunnel Model, ca 1980
35. Engine Exhaust Nozzle Model, 1960s
36. General Transport Aircraft, ca 1984
37. Rogallo Wing, Designed for Spacecraft Recovery, ca 1961
38. F-8-F Gunners Heat Shield Spin Tunnel Model, 1942
40. Advanced Wing Shapers, ca 2001
41. Wavy-Blade Helicopter Rotor Model, ca 1999
42. Bielastic Wing Body Model, ca 2001
43. Hypersonic Elliptic Contoured Spin Wing-Wing Model, ca 2001
44. Scallop Wing Wind Tunnel Model, ca 2001
45. Crew Transfer Vehicle Models, ca 1999
46. Microsail SR-1, Wind Tunnel Model, ca 1958
47. Lockheed SR-71 Blackbird, Wind Tunnel Model, 1963-60
48. Grammen X-29 Model (116 Scale), ca 1985-86
49. 1:10 Scale Mercury Space Capsule, Spin Tunnel Model, ca 1959
50. Vought F-8 Crusader Super Critical Wing Research Model, ca 1968
51. Twelve-Chute/Plug Nozzle, 1980s
52. Early Hypersonic Wind Tunnel Model, ca 1980
53. Model of a Mars Airliner Concept, ca 2002
54. HL-10 Lifting Body Wind Tunnel Model, ca 1960
55. Douglas F4 D-1 Ray Skin Spin Tunnel Model, 1955
56. Northrop P-97 Black Widow Wind Tunnel Model, 1943

* All artifact models are property of NASA.

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NASA Langley Research Center
http://www.nasa.gov/centers/langley