

# NASA AERONAUTICS: SOLVING DECADES OF AVIATION CHALLENGES

1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008																																																																																																																								
<b>Advanced Turboprop Project 1976-1987</b>			<b>The Aircraft Energy Efficiency Program 1975-1986</b>			<b>Storm Hazards Program 1978-1986</b>			<b>Center/TRACON Automation System (CTAS) 1986-1990: NASA foundational papers on trajectory optimization led to development of a system of software tools to improve traffic flow and fuel efficiency.</b>			<b>Forward Swept Wing Research 1981-1990</b>			<b>Airborne Wind Shear Detection Program 1986-1993: This program developed the first onboard sensor system that can give pilots advance warning of dangerous wind shear conditions.</b>			<b>Mission Adaptive Wing (MAW) 1985-1989: The MAW, built by the Boeing Company, had a flexible outer skin that could be adjusted in-flight using an internal mechanism to attain ideal aerodynamic shapes for supersonic transport speeds. It was tested by NASA and the U.S. Air Force through the Advanced Fighter Technology Integration Program.</b>			<b>October 18, 1985</b> The MAW was first tested on an F-111.			<b>Laminar Flow Control Project 1986-1994: Research on active flow control over all speed regimes was developed to produce laminar flow over 65 percent of the wing of the aircraft, generating less drag and promoting better fuel efficiency.</b>			<b>X-30 National AeroSpace Plane (NASP) Program 1986-1994: Conceived to develop operational space planes, this program never advanced beyond its technology development period, but produced advanced technologies in materials, propulsion and other fields.</b>			<b>F-18 High Alpha Research Vehicle (HARV) 1987-1996: The HARV was developed to validate computer codes and wind tunnel test results relating to high angle of attack aerodynamics, flight controls and airflow phenomena.</b>			<b>January 28, 1986</b> During the 25th launch of the space shuttle, an explosion occurred 73 seconds into the flight of Space Shuttle Challenger. All seven crew members died.			<b>May 4, 1989</b> The Magellan mission to Venus was launched. It arrived at Venus in September 1990 and, using radar, mapped 99 percent of the planet's surface.			<b>April 24, 1990</b> Launch of the Hubble Space Telescope from the Space Shuttle Columbia (STS-31).			<b>January 28, 1986</b> During the 25th launch of the space shuttle, an explosion occurred 73 seconds into the flight of Space Shuttle Challenger. All seven crew members died.			<b>May 4, 1989</b> The Magellan mission to Venus was launched. It arrived at Venus in September 1990 and, using radar, mapped 99 percent of the planet's surface.			<b>April 24, 1990</b> Launch of the Hubble Space Telescope from the Space Shuttle Columbia (STS-31).																																																																																															
<b>Propulsion Controlled Aircraft (PCA) 1989-1998</b> NASA developed a computer-assisted engine control system to allow pilots to land aircraft even after losing primary flight controls. By adjusting the thrust from each engine to go up, down, left or right, engines-only landings were flown on NASA research aircraft and on actual transport aircraft.				<b>High Speed Research (HSR) Program 1990-1999: Interest in a supersonic transport had been renewed, and Phase II of HSR focused on the three key challenges to a High-Speed Civil Transport (HSCT): the sonic boom, airport and community noise, and ozone depletion.</b>				<b>Low Visibility Landing and Surface Operations Project 1993-2000</b> Research created early concepts for GPS-based airport map displays now on the Airbus A380 and for head-up guidance cockpit displays to improve safety.				<b>Environmental Research Aircraft and Sensor Technology (ERAST) Project 1994-2003: Pioneering research on high-altitude, long-endurance unmanned aircraft.</b>				<b>April 24, 1996</b> The F-15 ACTIVE achieved its supersonic yaw vectoring flight at Dryden Flight Research Center, Edwards, CA.				<b>September 11, 1995</b> Pathfinder Unmanned Aerial Vehicle (UAV) set a new altitude record of 50,567 feet for a solar-powered aircraft.				<b>July 7, 1997</b> Pathfinder UAV set an unofficial altitude record of 71,500 feet for a solar-powered aircraft.				<b>August 6, 1998</b> The modified, extended-wing Pathfinder Plus flew to a record altitude for propeller-driven aircraft of 80,201 feet.				<b>October 2000</b> NASA and the FAA tested an early version of the Runway Incursion Prevention System, which alerts pilots and air traffic controllers to planes or other vehicles about to encroach on runways.				<b>August 13, 2001</b> The Helios uncrewed solar-powered UAV flew to world record altitude of 96,863 feet.				<b>June 26, 2003</b> Helios crashes after malfunction.				<b>March 27, 2004</b> X-43A set a new aeronautical speed record of Mach 6.83—nearly 5,000 mph.				<b>November 16, 2004</b> A second unpowered flight of the X-43A resulted in a second speed record of Mach 9.68—nearly 7,000 mph.				<b>June 5-7, 2005</b> The Future Air Traffic Transportation System project held a public demonstration to showcase future technologies like "Highway in the Sky" that could help small planes better utilize small airports in all kinds of weather.				<b>August 2006</b> The Future Air Traffic Management Concepts Evaluation Tool (FACET) won NASA Software of the Year. FACET simulates thousands of aircraft trajectories and assists air traffic control managers plan for efficient travel flow across the country.				<b>April 26, 2007</b> First test flight of the Stratospheric Observatory for Infrared Astronomy (SOFIA), a Boeing 747 carrying an infrared telescope to capture images and spectra not possible by the largest ground-based telescopes.				<b>March 2008</b> A NASA wind tunnel hosted tests of the Smart Material Actuated Rotor Technology (SMART)—new trailing edge control flaps and "smart" material actuators that can reduce helicopter vibrations and noise.																																																																															
<b>Advanced Composite Technology Program 1988-1997: This research program focused on how to use textile composite materials, from design through fabrication, on wing and fuselage primary structures for commercial or military aircraft. A key ACT contribution was the validation of braided or stitched composite structures as cost-effective, low-weight, high-durability options.</b>						<b>1991-1992</b> NASA flew 130 flights through dangerous weather to test the forward-looking Doppler radar.						<b>November 30, 1994</b> A Continental Airlines Boeing 737-300 was the first commercial flight to use the forward-looking Doppler radar to detect wind shear.						<b>July 1996</b> The Traffic Management Advisor, a NASA CTAS software tool for controlling arriving air traffic, was deployed at Dallas/Fort Worth International Airport and later at more FAA en-route facilities.						<b>May 17, 1997</b> The X-36 subscale prototype tailless fighter made the first of 31 test flights, showing a high-speed vehicle without a tail could fly normally.						<b>Ultra-Efficient Engine Technology (UEET) Program October 1, 1999-2004: In light of future aviation growth, NASA created UEET to research ways to reduce nitric oxide and carbon dioxide emissions from commercial and military jet engines while maintaining performance and fuel efficiency. Multiple engine demonstrations and new computer simulation tools were among the beneficial results from UEET.</b>						<b>Intelligent Flight Control Systems (IFCS) 1999-Ongoing: Neural network technology for aircraft control was invented to help aircraft recover from loss of control.</b>						<b>Capstone Program 1999-2006</b> This FAA-led installation was the proving ground for ADS-B technology and its ability to reduce accidents among the thousands of general aviation pilots in the Alaska region who fly remote routes. NASA supported installation of Global Positioning System (GPS)-based avionics and data link communications suites in commercial aircraft, along with ground systems, equipment and services.						<b>2005</b> ADS-B began deployment at air facilities from Florida to New York.						<b>2007</b> Over 300 aircraft in Alaska received ADS-B to help air traffic separation efforts.																																																																																									
<b>Sonic Boom Reduction 1994-2000: Improvements in the configuration of aircraft to reduce sonic boom intensity were formulated in a sonic boom study.</b>												<b>Advanced Subsonic Technology (AST) Program 1992-1999: Led research into areas most likely to improve U.S. civil transport aircraft, including aircraft aging, noise reduction, environmental impact, productivity of the airport terminal area, propulsion, wing design, use of composite materials and improved flight controls. This work continues to inform aeronautics research at NASA.</b>												<b>Automatic Dependent Surveillance-Broadcast (ADS-B) Technology 1995-2008: NASA supported a public/private partnership to test and deploy new airborne surveillance and cockpit avionics technology that complements radar, provides air-to-air, air-to-ground, and ground-to-air functionality; improves safety and increases airport capacity.</b>												<b>Capstone Program 1999-2006</b> This FAA-led installation was the proving ground for ADS-B technology and its ability to reduce accidents among the thousands of general aviation pilots in the Alaska region who fly remote routes. NASA supported installation of Global Positioning System (GPS)-based avionics and data link communications suites in commercial aircraft, along with ground systems, equipment and services.												<b>2005</b> ADS-B began deployment at air facilities from Florida to New York.												<b>2007</b> Over 300 aircraft in Alaska received ADS-B to help air traffic separation efforts.																																																																																			
<b>Advanced General Aviation Transport Experiments (AGATE) Program 1994-2001: Under the AST, AGATE revitalized the general aviation industry through an alliance of government agencies, industry and universities that dramatically updated flight deck and propulsion technologies, certification methods and airspace infrastructure for small aircraft.</b>												<b>June 2003</b> NASA's Performance Data Analysis and Reporting System was recognized for helping air traffic control centers improve safety and efficiency through customized reports.												<b>August 27, 2003</b> The F-5 Shaped Sonic Boom Demonstration research aircraft proved its modified forward section reduced the intensity of sonic booms.												<b>September 2003</b> NASA's Surface Management System software, which helps manage air traffic from gate to gate, was demonstrated at Memphis International Airport.												<b>February 1, 2003</b> All crew members died after the Space Shuttle Columbia broke up 15 minutes before landing.												<b>January 3 and 24, 2004</b> NASA landed two Mars Exploration Rovers, Spirit and Opportunity, on the surface of Mars.												<b>August 10, 2006</b> NASA and Gulfstream Aerospace tested a telescopic "Quiet Spike" sonic boom mitigator on a NASA F-15B aircraft and proved it reduced the intensity of sonic booms caused by supersonic aircraft.												<b>December 2006-April 2007</b> NASA's 8-Foot High-Temperature tunnel hosted testing of Pratt & Whitney Rocketdyne's X-1 scramjet engine, a major technology step toward making hypersonic flight (> Mach 5.0) a reality.												<b>July 26, 2005</b> The Space Shuttle Discovery lifted off into orbit, marking NASA's return to human spaceflight after the Columbia disaster.												<b>January 19, 2006</b> The New Horizons spacecraft lifted off from Cape Canaveral, beginning its nine-year trip toward Pluto and the Kuiper Belt.												<b>July 2007</b> NASA's 8-Foot High-Temperature tunnel hosted testing of Pratt & Whitney Rocketdyne's X-1 scramjet engine, a major technology step toward making hypersonic flight (> Mach 5.0) a reality.												<b>May 25, 2008</b> After deploying a parachute system developed in collaboration with NASA researchers, the Phoenix Mars Lander touched down in the northern polar region of Mars to analyze soil and water ice samples.											
<b>October 29, 1998</b> John Glenn returned to space on the Space Shuttle Discovery (STS-95). He was a test subject for specific investigations on the similarities between space flight and aging.												<b>July 22-27, 1999</b> The Space Shuttle Columbia's 26th flight was led by Air Force Col. Eileen Collins, the first woman to command a shuttle mission (STS-93).												<b>October 31, 2000</b> Expedition One of the International Space Station launched from Baikonur Cosmodrome in Kazakhstan. Astronaut William M. Shepherd and cosmonauts Yuri Pavlovich Gidzenko and Sergi K. Krikalev became the first residents of the ISS.												<b>June 27-July 7, 1995</b> Space Shuttle Atlantis docked to the Mir space station. It was the first of nine shuttle-Mir link-ups between 1995 and 1998.												<b>July 4, 1997</b> The Mars Pathfinder landed on Mars and deployed the Sojourner rover. This mission marked the first return of the U.S. to Mars after nearly twenty years.												<b>November 15, 2002</b> The Active Aeroelastic Wing F-18A was first flown to explore how aerodynamically twisting flexible wings could improve maneuverability of high-performance aircraft at transonic and supersonic speeds.												<b>February 1, 2003</b> All crew members died after the Space Shuttle Columbia broke up 15 minutes before landing.												<b>January 3 and 24, 2004</b> NASA landed two Mars Exploration Rovers, Spirit and Opportunity, on the surface of Mars.																																																											
<b>Ronald Reagan</b> January 20, 1981 - January 19, 1989				<b>George H.W. Bush</b> January 20, 1989 - January 19, 1993				<b>William J. Clinton</b> January 20, 1993 - January 19, 2001				<b>George W. Bush</b> January 20, 2001 -				<b>Sean O'Keefe</b> December 21, 2001 - February 11, 2005				<b>Dr. Michael Griffin</b> April 14, 2005 -				<b>U.S. President</b>																																																																																																																							
<b>James M. Beggs</b> July 10, 1981 - December 4, 1985				<b>Dr. James C. Fletcher</b> May 12, 1989 - April 8, 1989				<b>Richard H. Truly</b> May 12, 1989 - March 31, 1992				<b>Daniel S. Goldin</b> April 1, 1992 - November 17, 2001				<b>Sean O'Keefe</b> December 21, 2001 - February 11, 2005				<b>Dr. Michael Griffin</b> April 14, 2005 -				<b>NASA Administrator</b>																																																																																																																							
<b>\$1.20</b>				<b>\$0.93</b>				<b>\$0.95</b>				<b>\$1.02</b>				<b>\$1.16</b>				<b>\$1.14</b>				<b>\$1.13</b>				<b>\$1.11</b>				<b>\$1.23</b>				<b>\$1.06</b>				<b>\$1.17</b>				<b>\$1.51</b>				<b>\$1.46</b>				<b>\$1.36</b>				<b>\$1.59</b>				<b>\$1.88</b>				<b>\$2.30</b>				<b>\$2.59</b>				<b>\$3.03</b>				<b>Price of Gas</b>																																																																			
Russell Meyer and Cessna Aircraft for the outstanding safety record of the Citation fleet				Jeana Yeager, Richard Rutan, Elbert Rutan, Bruce Evans and associates for the Voyager aircraft				NASA Lewis Research Center for design and development of advanced turboprop propulsion concepts				Rear Adm. Richard Truly for outstanding leadership rejuvenating the U.S. manned space program				Ben Rich and the Lockheed-Air Force team for production of the F-117A Stealth Nighthawk bomber				Bell-Boeing team for development of the V-22 Osprey tilt-rotor aircraft				USAF, Northrop and the Industry Team for B-2 design, development, production and flight testing				USAF, USNRL, the Aerospace Corp., Rockwell and IBM for Global Positioning System development				Hubbas Space Telescope (HST) Repair Team for successful HST orbital recovery and repair				Boeing Commercial Aircraft Co. for design, development and production of the Boeing 777				Cessna Aircraft Co. for design, development and production of the Citation X				Gulfstream Aerospace Corp. for design, development and production of the Gulfstream V				Lockheed Martin, General Electric, NASA, USAF and DARA for U-2S/ER-2 development and operation				Boeing Co. for development of the F/A-18E/F Super Hornet				Northrop Grumman, Rolls-Royce, Raytheon, L-3, USAF and DARPA for Global Hawk creation and operation				Sikorsky and industry team for development and introduction into service of the S-92 helicopter				Gulfstream for setting new safety standards with development of the innovative G550 aircraft				The Rutan SpaceShipOne Team for the first privately financed, built and flown space vehicle				Eclipse Aviation Corp. for development and operation of the very light jet the Eclipse 500				USAF and its industry partners for design, test and operation of the revolutionary F-22 Raptor				The Automatic Dependent Surveillance-Broadcast (ADS-B) team of public and private sector groups				<b>Collier Trophy</b>																																																											
Kareem Abdul-Jabbar				Joe Paterno				'Eight Athletes Who Care'				Orel Hershiser				Greg LeMond				Joe Montana				Michael Jordan				Arthur Ashe				Don Shula				Bonnie Blair / John Olav Koss				Cal Ripken, Jr.				Tiger Woods				Dean Smith				Mark McGwire / Sammy Sosa				U.S. Women's Soccer Team				Tiger Woods				Randy Johnson / Curt Schilling				Lance Armstrong				Tim Duncan / David Robinson				Boston Red Sox				Tom Brady				Dwayne Wade				Brett Favre				<b>Sports Illustrated Sportsman of the Year</b>																																																			
Deng Xiaoping				Corazon Aquino				Mikhail Gorbachev				Endangered Earth				Mikhail Gorbachev				George H. W. Bush				Ted Turner				Bill Clinton				The Peacemakers				Pope John Paul II				Newt Gingrich				David Ho				Andy Grove				Bill Clinton / Kenneth Starr				Jeffrey P. Bezos				George W. Bush				Rudolph Giuliani				The Whistleblowers				The American Soldier				George W. Bush				The Good Samaritans				You				Vladimir Putin				<b>Time Magazine Person of the Year</b>																																																			
Out of Africa				Platoon				The Last Emperor				Rain Man				Driving Miss Daisy				Dances with Wolves				The Silence of the Lambs				Unforgiven				Schindler's List				Forrest Gump				Braveheart				The English Patient				Titanic				Shakespeare in Love				American Beauty				Gladiator				A Beautiful Mind				Chicago				The Lord of the Rings: The Return of the King				Million Dollar Baby				Crash				The Departed				No Country for Old Men				<b>Academy Award for Best Picture</b>																																																			

National Aeronautics and Space Administration



NASA aeronautics research

