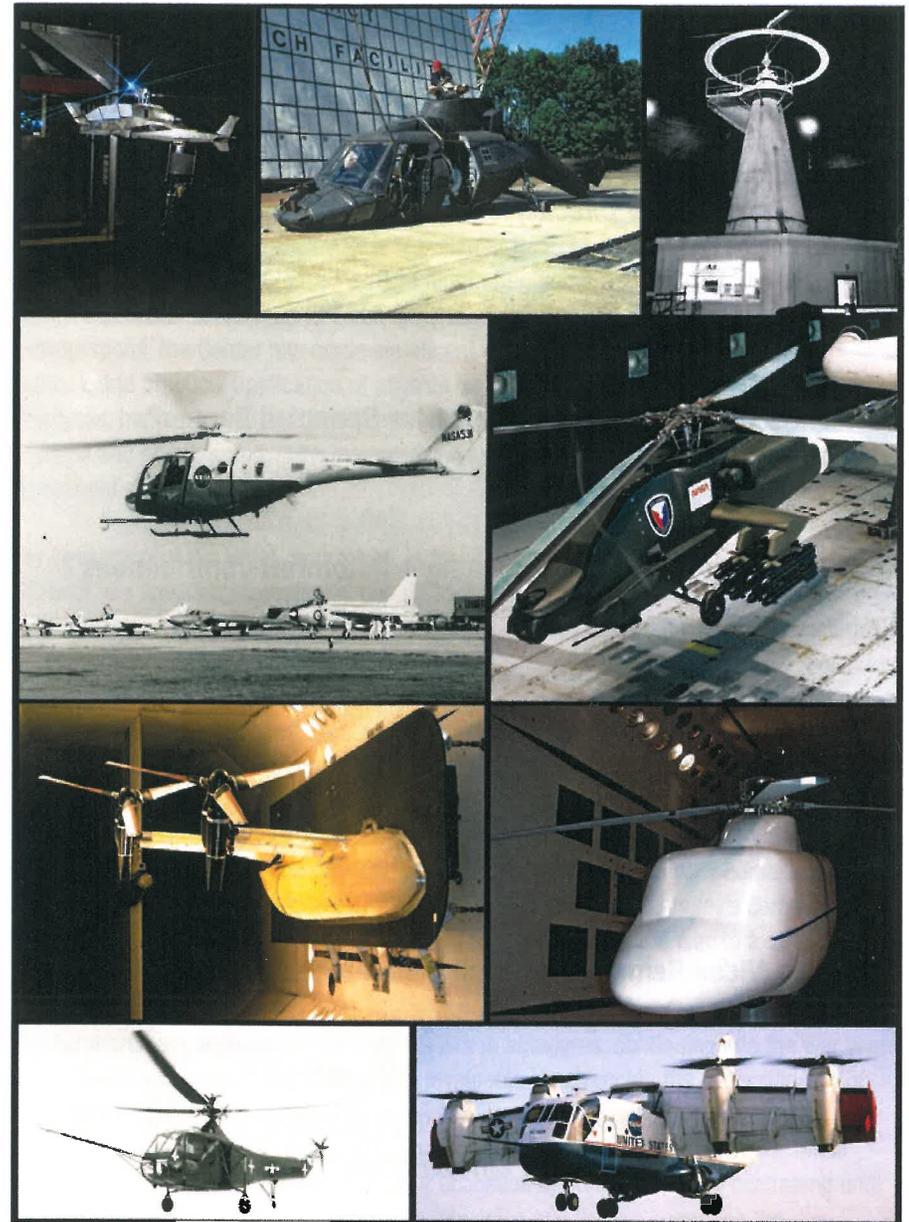




AHS International Vertical Flight Heritage Site Recognition Ceremony

NASA Langley Research Center
Hampton, Virginia



Special acknowledgment and thanks to W. Todd Hodges, Robert J. Huston, and Robert Tapscott for their contributions to the nomination package for this award.

Front Cover Photo Credit: Sikorsky YR-4 in the NACA Langley Full Scale Tunnel in 1944.

Program

Dave Bowles

Acting Center Director, NASA Langley Research Center

Presentation of Colors by Langley Air Force Honor Guard

Kerry Gough singing "The Star-Spangled Banner"

Systems Engineering & Engineering Methods Branch

Video of NACA and NASA Langley's Rotorcraft Contributions

The Honorable Charles Bolden

Administrator, NASA

Jaiwon Shin

Associate Administrator for Aeronautics, NASA

Video Remarks from the Honorable Scott Rigell

U.S. Congressman, Virginia, 2nd District

The Honorable George Wallace

Mayor, City of Hampton

Presentation of Plaque by Mike Hirschberg

Executive Director, AHS International

Refreshments

National Advisory Committee for Aeronautics and National Aeronautics and Space Administration

Langley Research Center

From the earliest days of Langley Research Center in 1920, researchers have been exploring the complex problem of vertical flight. Beginning with helicopters and autogyros and continuing with studies of vertical and short takeoff and landing (V/STOL) configurations, the Center has made significant contributions to the understanding, analysis, and practical application of physics for vertical flight. Aerodynamic, dynamic, structures, handling qualities, flight characteristics, and acoustic theories have been explored and documented, often leading the way for development and improvement of operational configurations.

The investment of the NACA, now NASA, in facilities for experimental and computational research has provided a substantial benefit to vertical flight research. The Langley Full Scale Tunnel, later known as the 30 by 60-Foot Tunnel, was a workhorse for the exploration of helicopter and autogyro configurations. The Langley Low Turbulence Pressure Tunnel and the 6- by 28-Inch Transonic Tunnel were used to develop rotorcraft airfoil series. The Helicopter Test Tower research explored rotor stall. The Langley Transonic Dynamics Tunnel has provided understanding of aeroelasticity and vibratory loads. Work in the Langley V/STOL Tunnel, now the 14- by 22-Foot Subsonic Tunnel, has demonstrated the importance of interactional aerodynamics and configuration studies. Impact testing at the Landing and Impact Research (LandIR) facility is unique in the world for assessing the combined vertical and horizontal loads experienced by many vertical flight vehicles. Langley's computational research, conducted on clusters and supercomputers, is leading the way to a future of integrated modeling and simulation.

Flight research at Langley from the early 1930's in autogyros, continuing into the war years in the 1940's and through the 1950's, was invaluable in advancing the understanding of flight dynamics, handling qualities and ground resonance. Research for powered lift configurations in the 1960's and 1970's showed the benefits and challenges for these nonconventional vehicles. Research in flight acoustics through the 1980's continuing until the present has resulted in reduced community noise and had an impact on the development of civil and military configurations.

Langley research is embedded in the current fleet of helicopters and tiltrotors around the world and today's on-going research will provide new technology for future generations of vertical flight.

Dates of Significance

- 1915 Legislation creating the National Advisory Committee for Aeronautics, signed into law by President Woodrow Wilson.
- 1917 Construction begins on Langley Memorial Aeronautical Laboratory.
- 1920 Publication of NACA Technical Note 4, "The Problem of the Helicopter" by Edward P. Warner.
- 1929 Harold Pitcairn makes first cross-country flight of Cierva C-8 Autogiro in the U. S. from Philadelphia to Langley Field.
- 1931 Langley Full-Scale Tunnel (30 by 60-Foot Tunnel) in operation.
- 1939 Langley 19-Foot Pressure Tunnel (later modified into Langley Transonic Dynamics Tunnel) completed.
- 1935-1945 Rotorcraft technology evaluation for War Department.
- 1940 Langley Low Turbulence Pressure Tunnel built.
- 1946 Langley Helicopter Rotor Test Tower constructed.
- 1950 Flying-qualities portion of the Navy SR-189 specification developed.
- 1954 NACA conference on helicopters.
- 1958 NACA becomes NASA after legislation is signed by President Dwight Eisenhower.
- 1970 Langley V/STOL (later the Langley 14- by 22-Ft Subsonic Tunnel) construction complete.
- 1970 NASA-Army Collaborative Research Agreement at Langley initiated.
- 1972 Lunar Landing Research Facility is converted to Impact Dynamics Research Facility, now known as the Langley Landing and Impact Research (LandIR) facility.
- 1974 CH-47 crash test series begins, marking first rotorcraft impact test.
- 1975 Rotor Body Interference (ROBIN) testing begins at Langley.
- 1980 Landmark publication advancing noise prediction published. "A Review of Propeller Discrete Frequency Noise Prediction Technology with Emphasis on Two Current Methods for Time Domain Calculations" by F. Farassat and G.P. Succi in *Journal of Sound and Vibrations*.
- 1982 Rotorcraft series (RC-X-XX) airfoils designed and tested.
- 1985 All Composite Airframe Program series of crash tests begins.
- 1987 U.S. Patent 4,708,305 for "Helicopter Anti-Torque System using Fuselage Strakes" issued to H.L. Kelley and J.C. Wilson, Army employees at Langley.
- 1995 Comanche wind tunnel test series begins in 14-by 22-Foot Subsonic Tunnel.
- 1995 WRATS Tiltrotor aeroelastic evaluations begin in the Transonic Dynamics Tunnel.
- 1998 Short Haul (Civil Tiltrotor) Acoustic evaluations conducted.
- 2012 Kiowa Warrior testing begins in the 14- by 22-Foot Subsonic Tunnel.
- 2013 Received AHS International Grover Bell Award for Kiowa Warrior tests.
- 2013 First publication documenting formal optimization using computational fluid dynamics for rotorcraft. "Discrete Adjoint-Based Design for Unsteady Turbulent Flows on Dynamic Overset Unstructured Grids" by E.J. Nielsen and B. Diskin in *AIAA Journal*.
- 2013 Transport Rotorcraft Airframe Crash Testbed testing begins at Landing and Impact Research Facility.



Vertical Flight Heritage Site

NASA Langley Research Center

Since its establishment in 1917 as the Langley Memorial Aeronautical Laboratory, the Langley Research Center has performed groundbreaking research to advance the state of the art in vertical flight. The Center's research has contributed significantly to understanding vertical flight aerodynamic and dynamic principles, design requirements, and handling qualities through analysis, wind tunnel testing and experimental flight research.

Research at Langley has been key to the development and maturation of many novel configurations and has paved the way for the growth of today's global vertical flight industry.

May 2015