

10/12

865 Cloverleaf La., Apt. 27
Newport News, Va. 23601
September 26, 1983

E1-3
A206-1
E34-3

L. Johnson
Joe

Attached is the material I prepared to nominate the Full-Scale Tunnel for designation as a National Historic Mechanical Engineering Landmark.

Please review this material for accuracy and completeness. Clyde McLemore provided the initial inputs. I have talked briefly with Abe Silverstein and Cabell Messick. Johnny Knemeyer provided the sketch of the tunnel and Ben Hood's letter. I am sending a copy of this material to both Abe and Cabell for their review. I have also talked to Jim Henson, and will send him a copy, too.

Should the nomination be accepted, a brochure will have to be prepared which will provide additional information on the tunnel and its history. The local Eastern Virginia Section of ASME will organize a committee to prepare for the "landmark ceremony" which is structured by ASME and regarded as a high priority item of business. The end result is a sizeable plaque affixed to the building.

Please call me if I have gone astray in this documentation. I will need a letter from you on the accuracy, appropriateness and completeness of this material as the resident expert on the facility.

Best regards.

Sincerely,

Peter Korycinski
Peter F. Korycinski

Enclosure: Draft

Charlie Schilling

DIR	108
DEP DIR	103A
CS	100
OEA	115
OEOP	178
SA	108
UA	105A
PROJ DIR	119
ACES	188
ESMPO	153
LDEF	208
LSST	188
SCOUT	188A
DIR AGRO	116
MSAD	202
LSAD	200A
YAU	285
DIR PAGE	107
ASD	201
SSA	207
DIR STR	110
ANRO	202
LAD	208
NO	201M
SDU	244
DIR LEC	117
AGU	207
CH HO	212
FLSD	213
PSA	208
IRC	213
TLVPO	206
DIR GEO	111
FD	112
FENGD	112
OSD	112
SEI	207
DIR AO	111
ASO O	204
CH O	204
FMD	106
IR O	106
MSO	123
OSCO	203
PAT O	203
PSS	120
PHO	104
RIAD	100A
TUARO	109A

FOR ACTION OF LSAD (Johnson) as required

FOR INFO OF LSAD / BO / Aero

FOR SIGNATURE OF LSAD

DUE DATE 10/6 ASSIGNED BY Lj

NASA-LANGLEY OCT 5 1983



NOMINATION FOR DESIGNATION
OF
HISTORIC MECHANICAL ENGINEERING LANDMARK

- STATE
- NATIONAL
- INTERNATIONAL

TO: Public Information Department
 Attention: History & Heritage
 Committee Liaison
 The American Society of Mechanical Engineers
 345 East 47th Street
 New York, New York 10017

FROM: Eastern Virginia Section

CC: Field Service Director
 Regional Vice President

(Local Section/Technical Division)

NOTE: This form is intended as a cover sheet for submitting nominations. Fill in only lines (a), (b), and (c). Items (d) through (j) should be presented on additional pages.

- a. Item Full-Scale Wind Tunnel
(Renamed 30 X 60 Foot Tunnel)
- b. Location NASA Langley Research Center
Hampton, Virginia 23665
- c. Date of construction (or other significant date)
Design started in 1929. Construction started in Spring of 1930; completed and operated in Spring of 1931.
- d. Persons involved in conception, design, construction, etc.
- e. Historical significance of this work. Include 100-word summary. Information will be used as a basis for plaque citation.
- f. What features or characteristics set this work apart from possibly similar landmarks?
- g. What contribution did this landmark make toward the development of the state/nation/world?
- h. Supporting evidence (documents, photos, and so on).
- i. Present condition, availability to public. Artifact must exist; vacant sites will not be considered.
- j. Mechanical specifications. Include technical data, such as size, capacity, etc., that you feel are significant to this landmark.

NOTE: ALL ITEMS MUST BE COMPLETE FOR TRANSMITTAL TO NATIONAL H&H COMMITTEE

APPROVED for transmittal by Executive Committee on

(Date)

.....
 Chairman, History & Heritage Committee

.....
 Chairman, Section/Division

d. Persons involved in conception, design, construction, etc.

The National Advisory Committee for Aeronautics in the year 1929
(appointed by the President of the United States):

Joseph S. Ames, Ph.D., Chairman
President Johns Hopkins University, Baltimore, Md.
David W. Taylor, D.Eng., Vice Chairman, Washington, D.C.
Charles G. Abbot, Sc.D.
Secretary Smithsonian Institution, Washington, D. C.
George K. Burgess, Sc.D.
Director Bureau of Standards, Washington, D. C.
William F. Durand, Ph.D.
Professor Emeritus of Mechanical Engineering, Stanford U., Calif.
James E. Fechet, Major General, United States Army
Chief of Air Corps, War Department, Washington, D. C.
Benjamin D. Foulois, Brigadier General, U. S. Army
Chief Materiel Division, Air Corps, Wright Field, Dayton, Ohio
Harry F. Guggenheim, M.A.
President Daniel Guggenheim Fund for Promotion of Aeronautics,
New York City
William P. MacCracken, Jr., Ph.B.
Chicago, Ill.
Charles F. Marvin, M.E.
Chief United States Weather Bureau, Washington, D. C.
William A. Moffett, Rear Admiral, United States Navy
Chief Bureau of Aeronautics, Navy Department, Washington, D.C.
S. W. Stratton, Sc.D.
President Massachusetts Institute of Technology, Cambridge, Mass.
John H. Towers, Commander, United States Navy
Assistant Chief Bureau of Aeronautics, Navy Dept., Washington, D.C.
Edward P. Warner, M. S.
Editor Aviation, New York City
Orville Wright, Sc.D.
Dayton, Ohio

NACA Headquarters, Washington, D. C.:

George E. Lewis, Director of Aeronautical Research
John F. Victory, Secretary, NACA

Key personnel, Langley Memorial Aeronautical Laboratory,
Langley Field, Va.:

Henry J. E. Reid, Engineer-in-Charge
Elton W. Miller, Chief of Aeronautical Research
Ray Sharp, Chief of Administration and Contracting Officer
Smith J. deFrance, Senior Aeronautical Research Engineer and
Project Engineer
Abe Silverstein, Aeronautical Research Engineer
Clinton H. Dearborn, Aeronautical Research Engineer
J. Cabell Messick, Mechanical Design Engineer
Gilbert Strailman, Electrical Engineer

d. (Continued)

Major contractors and personnel:

Structure: J. A. Jones Construction Company, Charlotte, N.C.
Edwin Jones, Project Engineer

Structural Design: Southern Engineering Co., Charlotte, N.C.
Ben O. Hood, Chief Engineer

Electrical Equipment: General Electric Company, Schenectady, N.Y.

Wind-Tunnel Scales: Toledo Scale Company, Toledo, Ohio

e. Historical significance of this work

World's first wind tunnel capable of testing airplanes under laboratory conditions at wind speeds equal to or greater than speeds encountered in flight.

In the mid-1920's it became evident to researchers in aeronautics that extrapolation of small-scale wind-tunnel model data was not sufficiently accurate for the design of airplanes. To remedy this deficiency, the National Advisory Committee for Aeronautics (NACA), an agency of the United States Government and the predecessor of the National Aeronautics and Space Administration, decided that progress in aeronautics required a wind tunnel large enough to test contemporary and future high-performance airplanes with engine and propeller operating.

Implementation of this decision was made in two steps. On June 25, 1925, the Committee authorized the construction of a facility at the Langley Memorial Aeronautical Laboratory, Hampton, Virginia, which would have a test chamber large enough to accommodate the fuselage of an airplane with engine to turn the propeller. With available resources, the Laboratory staff designed and had built an open-throat wind tunnel having a test section airstream 20 feet in diameter. Two 1000-horsepower diesel engines turned a 28-foot diameter propeller which generated a flow of air in excess of 100 miles per hour in the test section. This facility, designated the Propeller Research Tunnel, the largest wind tunnel in the world, began test operations in 1927.

The staff operating the Propeller Research Tunnel produced within 18 months spectacular research which led to such major breakthroughs in airplane design as the retractable landing gear and the NACA engine cowling.

Although the 20-foot test section diameter was not large enough to accommodate complete airplanes, the tunnel provided data which emphatically affirmed the value of aeronautical research using actual or large-scale components.

With aeronautical research results in hand to justify further expansion of the Langley Laboratory's capability to conduct full-scale tests, and with the experience gained in the design and operation of a large wind tunnel, the staff in 1929 began the second step toward a wind tunnel large enough to test complete airplanes. In 1929, during the Administration of President Herbert Hoover, the 70th Congress of the United States authorized the construction of a full-scale wind tunnel at an estimated cost of \$900,000. The final design called for an open-throat wind tunnel having a test section 60 feet wide, 30-feet high, and 56-feet long. In 1931, the Full-Scale Wind Tunnel was placed in operation.

f. Unique Features or Characteristics

1. The size of the tunnel. The test facility is integral with a structure 434 feet long, 222 feet wide and 96 feet high.
2. The ability to generate a precisely tailored airstream required for aerodynamic research in an open-throat test section 30 feet high, 60 feet wide, and 56 feet long at operating speeds from 25 to 110 miles per hour.
3. A capability to support on pylon struts complete contemporary (and future) high-performance airplanes with engine and propeller operating.
4. A capability to measure by means of scales the forces and moments acting on complete airplanes over the range of tunnel operating speeds and in the process simulating take-off, cruise, approach and landing conditions of flight.
5. A continual and expanding potential of the facility for aeronautical research by improvements in wind-tunnel design and in model support and data acquisition systems. These include the ability to test the following:
 - (a) Full-scale helicopters and rotor systems.
 - (b) Tilt-wing vertical take-off and landing airplane concepts.
 - (c) Advanced research airplanes such as the X-15 and the X-20 and manned lifting-body reentry vehicles such as the M-2 and the HL-10.
 - (d) Large-scale, jet-powered free-flying models of unique design, such as the advanced supersonic transports, to observe and measure their dynamic stability characteristics in low-speed flight.

g. Contributions

NACA contributions to aeronautical research, except where national security was involved, were published as open literature, available to all. The principal user of NACA research was the aviation industry of the United States which used the data to achieve and maintain pre-eminence of American aviation. The Langley Full-Scale Wind Tunnel, since its initial operation, was and continues to be a major contributor to aeronautical research. Some principal contributions are the following:

1. Development of procedures and equipment to survey the properties of large wind-tunnel test section airstreams; development of methods of altering the flow of large airstreams so as to assure quality, consistency and constancy of flow suitable for aerodynamic research; and development of analytical procedures to determine jet boundary correction factors to permit correlation of wind-tunnel results with flight results.
2. First demonstration, in 1933, of the ability to conduct full-scale aeronautical research in a wind tunnel using a Chance-Douglas Vought YO-31A military observation airplane.

g. (Continued)

3. First full-scale wind-tunnel investigations of wing-fuselage interference, effects of wing trailing-edge flaps, and the effects of wing design and wing placement with respect to fuselage.
4. The first full-scale wind-tunnel investigation to decrease the landing speed of a high-performance Boeing P-26A Pursuit through the use of trailing-edge flaps.
5. The first full-scale wind-tunnel tests of a Navy low-wing fighter equipped with an NACA cowling.
6. Development of technology for boundary-layer control and high-lift devices.
7. Drag cleanup tests of 30 critical military World War II airplanes to significantly increase performance.
8. Measurement of wind forces acting on large ground structures in Arctic regions such as the Distant Early Warning radar antenna installations.
9. Measurement of forces and moments on high-speed submarine configurations.

The success achieved with the Langley Full-Scale Wind Tunnel greatly assisted in the design and construction of an even larger wind tunnel, the 40- by 80-Foot Full-Scale Wind Tunnel at the Ames Research Center, Moffett Field, California. This tunnel went into operation in June 1944.

Post World War II research includes the following:

10. Development of upper-surface blowing and externally blown flap concepts for short take-off and landing (STOL) airplanes.
11. Analysis of high-angle-of-attack/stall characteristics of F-14, F-15, F-16, and F-17 configurations by means of free-flight tests and force tests.
12. Development of aerodynamic data base for theoretical stall-spin studies and piloted simulation of spin susceptibility.
13. Development of low-speed technology for advanced supersonic transports.
14. Identification and solution of stall problems of full-scale general aviation airplanes.
15. Aero-acoustic tests to determine noise of propulsion systems.
16. Evaluation of acoustics, loads, and temperatures for large-scale upper-surface blowing STOL model.

17. Tests of advanced fighter concepts such as Supercruiser and HIMAT at high angles of attack.
18. Ongoing studies of low-speed characteristics of advanced supersonic transport concepts.
19. Aero-acoustic tests of general aviation airplanes.
20. Evaluation of VTOL (Vertical Take-Off and Landing) fighter concepts.
21. Drag cleanup and cooling drag tests for general aviation airplanes.
22. Development of low-speed technology for advanced subsonic transports.

h. Supporting evidence

1. Sketch of tunnel.
2. Photo panel of exterior view of tunnel, of full-scale airplane in test section, and of an Advanced Supersonic Transport.
3. Ben O. Hood letter.

i. Present condition

The facility is fully operational and actively engaged in aeronautical research.

The Langley Research Center shares occupancy of Langley Field with the United States Air Force. Normally the airbase is open to the public. Tour of the facility requires prior arrangement through the Office of External Affairs, Langley Research Center, Hampton, Virginia.

j. Specifications and technical data

Cited above.

TRANSCRIPT OF ORIGINAL MANUSCRIPT

Charlotte, N.C.
Jan. 1st, 1978

Mr. Donald P. Hearth
Director of Langley Research Center

My Dear Mr. Hearth

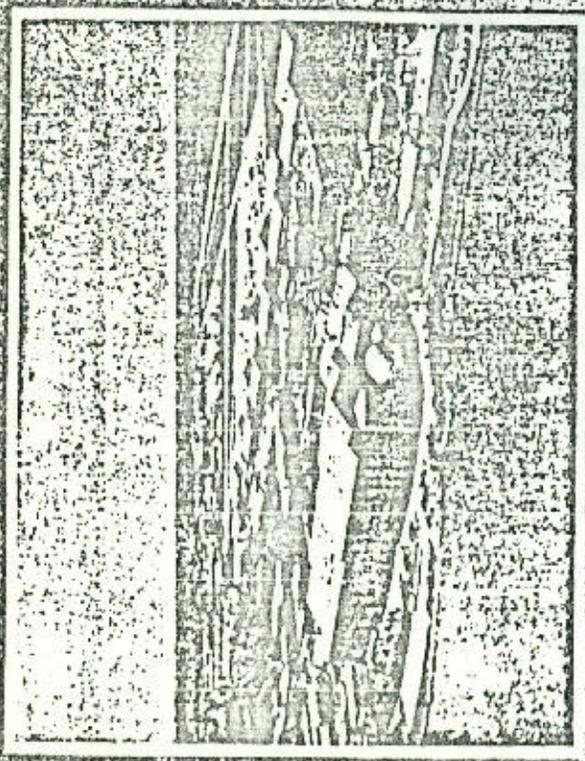
I was surprised and delighted to receive your nice letter of Nov. 1st and am very sorry it has taken me so long to answer. I want to thank you very much for the pictures and other material about Langley Research Center, especially the lapel pin which I am wearing on my best coat. The picture has a double meaning to me. 1st as Langley Field was started in 1917, and 2nd I went from NYC to Newark, N.J. to work for the Gov. on the construction of 150 steel freightboats and stayed 5 years. We detailed each piece in the ship with holes for the rivets and had the various pieces fabricated in shops east of Chicago and Milwaukee, Wis. We had 28 ways at Port Newark but only finished 50 ships when the war ended. I just celebrated my 98th birthday with three parties. It was Dec. 15, '77. I did not know I had so many friends. I am legally blind and am about deaf but I married again in 1972 after losing my 1st wife in Oct. 23, 1967, after having a 60th anniversary. I am from Asheville, N.C. and a graduate of N. C. State (Raleigh) in 1901 and am its oldest graduate. I have a BE + CE degree. I went to American Bridge Company in Pittsburgh, Pa. about 3 years and then to NYC for 15 and Newark 5 - came to Charlotte in 1922 as Ch. Eng. of a new steel company - Southern Eng. Co. We have 3 plants now. I retired March 1st 1953 after 52 years in steel work.

In 1929 I was asked by Edwin Jones of the J.R. Jones Const.Co. we would make a design and price on the Full Scale Wind Tunnel at Langley Field. Being a small Co. and not knowing much about this kind of Bldg. I said leave us the sketches and I would think it over. I went to the sight and met 4 nice men in charge - Messrs. Reid-Sharp-Miller and DeFrance. I was there 2 days and they showed me a model in the yard, and Pres. Hoover left them money and it was out of Politics. I came back and got in touch with Philip Cary about roofing and siding. So I told Edwin Jones I would make the design and price. Before taking bids I took my design to 4 men to show them what we were bidding on and if they had any critique. At the first letting the price was too high and Mr. Miller and DeFrance asked me to remain over and I did. They ask me how could we lower the price. I said change the conduits of the 2 large fans to the way they are now. So the 2nd letting Jones got the contract and we furnished the steel and did not have a misfit that I know of. We finished our work 1930 and I am glad to know it is still in use.

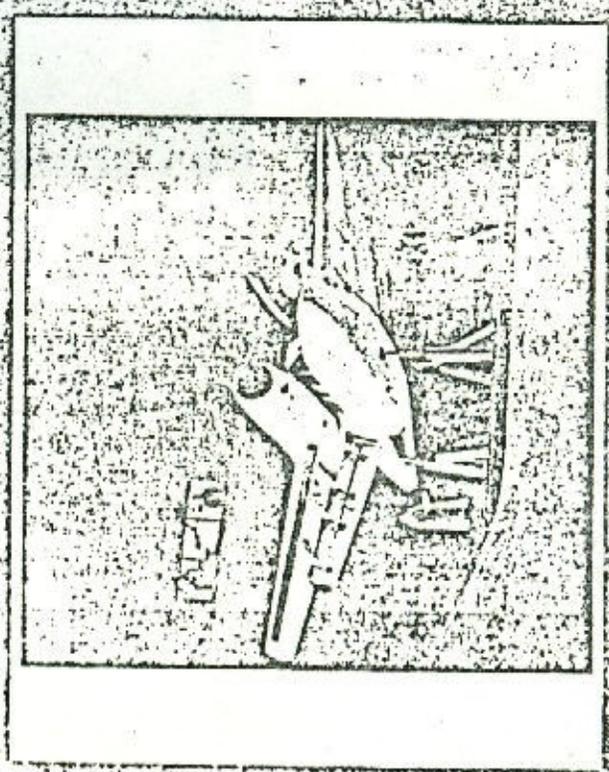
DeFrance told me I took more interest in the wind tunnel than any bidder. I went back to see them 6 years later and I certainly would like to go now. I have no chance. I would like to meet you and those 30 wind tunnel employees who sent me a Christmas card. I do appreciate this attention. I know you have the records. I repowered the Propeller Research Tunnel - furnished steel for NACA Tank - steel house to support airplanes and the repair shop between W.T. and Propeller Research. Excuse everything especially the delay.

Sincerely,

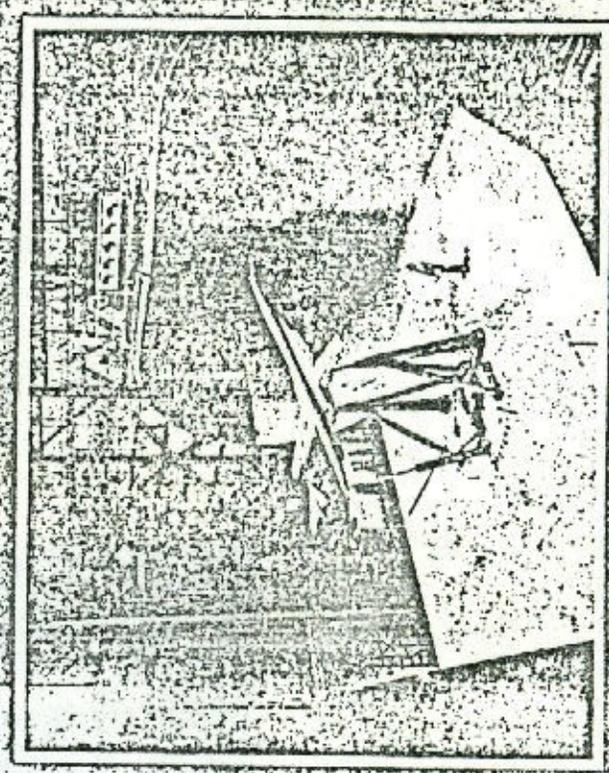
(signed) Ben O. Hood



- TEST SECTION - 30 ft x 60 ft x 56 ft
- SPEED - 25 TO 110 mph
- REYNOLDS NUMBER - 0 TO 1×10^6 per ft
- CONTINUOUS FLOW, ATMOSPHERIC PRESSURE
- GENERAL AERODYNAMIC INVESTIGATIONS AND MODEL TESTS AND AERO-ACOUSTIC UNIQUE TEST CAPABILITIES (FREE-FLIGHT TESTS)



UPPER-SURFACE BLOWING



SUPERSONIC AIRCRAFT AT LOW SPEED