

RESUME
Norman L. Crabill

I. Professional Fields:

January 2012

- Transonic and Supersonic Aeronautical Research
- Rocket-Boosted Test Vehicles
- Space Craft Engineering, Development and Application
- Space Flight Trajectory Design and Navigation
- Space Flight Mission Design
- Space Flight Planetary Landing Site Selection
- Aircraft Lightning Interaction
- Aircraft Heavy Rain Effects
- Aircraft Wind Shear
- Aircraft Turbulence Measurement and Response
- Transport Aircraft Operational Profiles
- Air Traffic Control System Engineering
- Cockpit Display of Weather Information
- Aircraft Gust Alleviation
- Project Management

II. Education

- B.A.E. - Catholic University, Washington, DC 1949
- M.A.E. - University of Virginia (extension div.) 1958
- Seminar on Negotiating Skills and Conflict Management: Fed. Ex. Institute, U.S. Civil Service Commission 1972
- FAA Private Pilots License, 1967; Instrument Rating 1973: (2800 hours total time)
- Air Force Water Survival School, Homestead, AFB, 1980.
- Scuba Card, 1984

III. Patent

- No. 3,270,505: Control System for Rocket Vehicles: Crabill, N. L.; and Riebe, J. M., 1966.
- No. 5,265,024: Pilots Automated Weather Support System: Crabill, Dash, and Shipley, 1993.

IV. Awards

- NASA Group Achievement Award to Lunar Orbiter Spacecraft and Operations Team, October 23, 1967.
- NASA/LaRC Special Achievement Award for Sustained Superior Performance Leading to a Major Viking Cost Saving. February 1973.
- NASA/LaRC Special Achievement Award to Viking '75 Landing Site Working Group, October 26, 1973
- NASA Exceptional Service Medal for Viking Mission Design and Landing Site Selection, March 28, 1977.
- NASA Group Achievement Award to Viking Landing Site Staff, March 28, 1977.
- NASA Group Achievement Award to Viking Project Office Management, March 28, 1977.
- NASA/LaRC Special Achievement Award for Viking Mission Design and Landing Site Selection, May 9, 1977.
- NASA/LaRC Certificate of Outstanding Performance, October 31, 1978.
- NASA/LaRC Special Achievement Award for Outstanding Engineering Achievement and Direction of the NASA Severe Storms Research Program, July 21, 1983.
- NASA Group Achievement Award to Langley F106 Nuclear Electro Magnetic Pulse Test Team, November 13, 1985.
- Virginia Aeronautical Historical Society Judge Spain Leadership Award; April 2001.

- R&D Magazine 100 Award to ViGYAN, Inc. for its Pilot Weather Advisor System now being sold by WSI Corp. as WSI Inflight, September 2, 2003, as the inventor of the system.

Inducted into the Virginia Aviation Hall of Fame by the Virginia Aeronautical Historical Society on November 8, 2008.

V. Work Experience

- **Current Position** - Free lance consultant, trading as Aero Space Consultants, Newport News, VA - "... anything but helicopters." In 2000, initiated in-house studies with ViGYAN, Inc., on gust alleviation systems, and application to light aircraft; still in progress. "Consulted with several organizations on Cockpit Display of Weather-Graphics, including FAA, NASA and ViGYAN, Inc. on programs to develop a commercial Pilot Weather Advisor for general aviation. 1988-1990. Demonstrated the Pilot Automated Weather Support System using a satellite link to a small airplane on a moving map through a NASA SBIR to ViGYAN, Inc., and its acquisition by WSI. It is now used in many small aircraft through out the United States 1990-2002. Documented the NASA Digital VGH Program Methods and Results as a Consultant to Eagle Engineering, Inc., Hampton, Virginia and provide consulting services to the NASA/FAA's Flight Load Program. Consulted with Stoddard-Hamilton Aircraft and Lightning Technologies on successful lightning hardening the Glasair III composite aircraft. Completed contract with Alden Electronics to provide consulting on development of Meteorologists Weather Processor for FAA. Drafted major portions for Program Description Documents for NASA's Civil Space Technology Initiatives in Science Instruments, Data Systems, Robotic Systems, and Artificial Intelligence while under contract with the Bionetics Corporation. Consulted with SAIC on NASA's Return to Mars Program 1987-1988.
- **1986 - 1987** - Served as analyst to Chief Engineer, Martin Marietta Corporation, Air Traffic Control Division, Washington, DC in carrying out the Systems Engineering and Integration support for the FAA's National Air Space Plan Development. Was responsible for weather and navigation systems analyses and recommendations.
- **1949 - 1986** - Retired from NASA Langley Research Center on January 2, 1986 after 36 years experience in aeronautics research and space engineering, development and application. From 1949 through 1963 performed supersonic/transonic flights tests of aircraft configurations, and preorbital flight test of ECHO I and II satellites using rocket test vehicles. For the 3-year duration of the Lunar Orbiter Program, had responsibilities for mission design and site selection for sites to be photographed on the moon for early Apollo landings. For the next eight years, served as Mission Analysis and Design Manager, report to the Chief Engineer of the Viking Project, writing relevant section of the RFP, evaluating proposals and guiding Martin Marietta and JPL mission design efforts. Served on the Landing Site Selection Working Group pre-mission and during the mission, keeping the definitive minutes of the deliberations.

After Viking, initiated the Digital Flight Data Recorder Program in the Langley Low Speed Aero Division, utilizing airliner flight recorder magnetic tapes to derive statistical measures of how B-747, B-727 and L-1011, and later DC 10 aircraft were actually being operated. (five years)

In response to NASA Headquarters call, developed and managed the successful Langley Storm Hazards Program for research into the prediction, detection, operating procedures and design criteria involved in operating aircraft in heavy precipitation, wind shear, turbulence, and lightning.

VI. Committees

- NASA GSFC WFC: Echo I Test Program, 1958-1959
- NASA GSFC KSC Echo II Test Program, 1961
- NASA GSFC: Nike Asp Sounding Rocket Failures, E. Sorgnit, 1960

- NASA Italian Space Commission San Marco Test Program, 1962
- NASA HQ: Lunar Orbiter Surveyor Utilization Committee, E. M. Cortwright, 1965-1967
- Viking Site Selection Committee: U.S. Geological Survey, H. Masursky et al
- Radio Technical Commission for Aeronautics on Navigation SC-159: MMC Working Member, 1987.
- Mars Rover Sample Return Landing Site Criteria Working Group. M. Drake: UAZ at Tucson. 1991
- Virginia Aeronautical Historical Society: Board of Directors; 1997-2006.

VII. Personal Data

- Date of Birth: October 28, 1926
- Place: Washington, DC
- Health: Excellent
- Martial Status: Divorced
- Address: 105 Inland View Drive, Newport News, VA 23603-1431
- Telephone: (804) 887-9339
- Social Security No.: Supplied on request

VIII. References

- Joseph W. Stickle
4 Stickle Lane
Hampton, VA 23669
(757) 851-1477
- Albert Orgain,
Virginia Aeronautical
Historical Society
Richmond, VA
(804) 648-1636
- Edward J. Rupke
Lightning Technologies, Inc
Pittsfield MA
(413) 499 2135
- Michael Carr
U.S. Geological Survey
345 Middlefield Road
Menlo Park, CA 94025
(650) 329-5174

IX. Publications

43 publications from 1951 through present.

1. Crabill, N.L., Vigyan Inc., Hampton VA., and Ken W. Hyde, The Wright Experience, Warrenton VA. Unstable at All Speeds: Flight Testing 1903 Wright Flyer Reproduction in 2003 : AIAA-2010-040.
2. Crabill, Norman; and E.A. Morelli: "Engineering Test Results of the Three Flights of the 1903 Wright Flyer Reproduction at Kitty Hawk NC. January 2006. Proprietary
3. Rollo, Vera, Foster, PhD and Norman L. Crabill: Virginia Airports-A Historical Survey of Airports and Aviation from the Earliest Days: Virginia Aeronautical Historical Society. 2003
4. Seth, S.; and Crabill, N.L.: "Pilot Weather Advisor" SBIR Phase II Final Report. NASA Contract No. NAS1-19595, Dec 1994, Revised Jan 1996.
5. Seth, S.; and Crabill, N.L.: "Pilot Weather Advisor System," *J. Aircraft*, Vol. 31, No. 6, December 1994, pp. 1240-1243.
6. Kilgore, W. Allen; Crabill, N.L.; Shipley, S.T.; O'Neill, J.; Stauffacher, D.; Graffman, I.; and Seth, S.: "Pilot Weather Advisor," 2nd Joint Symposium on General Aviation Systems, Wichita, KS, March 16-17, 1992.
7. Kilgore, W.A.; Crabill, N.L.; Shipley, S.T.; O'Neill, J.; Stauffacher, D.; Graffman, I.; and Seth, S.: "Pilot Weather Advisor," Final Report for SBIR Phase I, NASA Contract No. NAS1-19250, September 1991.

8. Dash, Ernie R.; and Crabill, Norman L.: The Pilot's Automated Weather Support System Concept: PAWSS. Presented at the AIAA/FAA Joint Symposium on General Aviation System, Ocean City, New Jersey, April 12, 1990.
9. Setzer, T.E., P.I., Stoddard-Hamilton Aircraft, Inc., J.A. Plumer, E.J. Rupke, Lightning Technologies, Inc.; S. Siddiqi, Analytical Sciences and Materials, Inc.; and N.L. Crabill, Aero Space Consultants. Lightning Protection Technology for Smaller General Aviation Aircraft, Phase II Final Report. SH-93-1001. NASA SBIR Contract NAS1-19316, NASA SBIR-89-1-11 03.02-8533. Dec 1993.
10. Crabill, N.L. Aero Space Consultants, J.A. Plumer, E.J. Rupke, Lightning Technologies, Inc. GLASAIR III Lightning Protection System Development Report for Stoddard Hamilton Aircraft. LT-92-782 March 24, 1992.
11. Setzer, T.E., President, Stoddard-Hamilton Aircraft, Inc. and J.A. Plumer, Principal Investigator, Lightning Technologies, Inc. with technical contributions by N.L. Crabill, Aero Space Consultants. Phase I Report NASA SBIR Contract NAS1-19010. July 1990.
12. Crabill, N.L., Aero Space Consultants. GLASAIR III Lightning Protection System Project Plan. ASC 91-035. Dec. 3, 1991.
13. Crabill, N. L.: The NASA Digital VGH Program - Explanation of Methods and Final Results, Volumes I through V. Eagle Engineering Contract NASW 4430, NASA CR 181909, October 1989.
14. Crabill, N. L.: NASA Civil Space Technology Initiative: Science Sensor Technology Program Plan. The Bionetics Corporation, May 1989.
15. Crabill, N. L.: NASA Civil Space Technology Initiative: Data Systems: High Rate/Capacity Program Plan. The Bionetics Corporation, May 1989.
16. Crabill, N. L.: NASA Civil Space Technology Initiative: Telerobotics Program Plan. The Bionetics Corporation, May 1989.
17. Crabill, N. L.: NASA Civil Space Technology Initiative: Artificial Intelligence Program Plan: The Bionetics Corporation, May 1989.
18. Crabill, N. L.: Lightning Research Recommendations. Aero Space Consultants 88-001 letter to Chief, LSAD, NASA/LaRC.
19. Crabill, N. L.: Microburst Warning Technology. Aero Space Consultants 88-005, Letter to R. L. Bowles, NASA/LaRC.
20. Crabill, N. L.: Thoughts on the Planetary Program. Aero Space Consultants 88-013, Letter to Carl Sagan, Planetary Society.
21. Crabill, N. L.: Lightning Strike Experience in the NASA F106B Storm Hazards Program. NASA/MSFC 6th Annual Workshop on Meteorological and Environmental Inputs to Aviation Systems, pp. 63-65.
22. Crabill, N. L.; and Morris, G. J.: The NASA Digital VHG Program, Early Results: NASA 1980 Aircraft Safety and Operating Problems Conference Report, Part 2, pp. 613-624.
23. Morris, G. J.; and Crabill, N. L.: Air Transport Flight Parameter Measurements Program--Concepts and Benefits: SAE Aerospace Congress and Exposition, October 1980.
24. Deal, P. L.; Keyser, G. L.; Fisher, B. D.; and Crabill, N. L.: Storm Hazards 1980 Overview. NASA TM-81974.

25. Fisher, B. D.; and Crabill, N. L.: Summary of Flight Tests of an Airborne Lightning Locator System and Comparison with Ground-Based Measurements of Precipitation and Turbulence. NASA 1980 Aircraft Safety and Operating Problems Conference Report, pp. 251-277.
26. Masursky, H.; and Crabill, N. L.: Viking Site Selection and Certification. NASA SP-429.
27. Masursky, H.; and Crabill, N. L.: Search for the Viking 2 Landing Site. Science, Vol. 194, pp. 62-68, October 1, 1976.
28. Masursky, H.; and Crabill, N. L.: The Viking Landing Sites-Selection and Certification. Science, Vol. 193, pp. 809-812, August 27, 1976.
28. Bowen, F. W., Jr.; Brummer, E. A.; Crabill, N. L.; Kingsland, L., Jr.; Martin, J.S., Jr.; Newcomb, J. F.; Soffen, G. A.; Taback, I.; Young, A. T.; and Wolfe, A. E.: 1973 Viking Voyage to Mars. Astronautics and Aeronautics, Vol. 7, pp. 30-59.
30. Young A. T.; and Crabill, N. L.: NASA Lunar Orbiter Project: LOTD 102-1 Mission A Description June 1, 1966.

LOTD 107-1 Mission II	Description October 26, 1966
LOTD 113-0 Mission III	Description January 25, 1967
LOTD 118-0 Mission IV	Description April 26, 1967
LOTD 120-1 Mission V	Description July 9, 1967
31. Crabill, N. L.: Ascent Problems of Sounding Rockets. AGARD-391, July 1961.
32. James, R. L., Jr.; and Crabill, N. L.: A Three-Dimensional Trajectory Simulation Using Six Degrees of Freedom with Arbitrary Wind. Appendix B: Damping in Pitch and Yaw for Radial Burning Solid-Propellant Rockets. NASA TN D-641.
33. Curry, T. B.; and Crabill, N. L.: Rocket-Model Investigation of Lateral Stability Characteristics and Power Effects of a Jet-Engine Airplane Configuration with Tail Boom at Mach Number from 1.15 to 1.37. NASA TN D-638.
34. Jackson, Bruce G.; and Crabill, Norman L.: Free-Flight Investigation of Jet Effects at Low Supersonic Mach Numbers on a Fighter-Type Configuration Employing a Tail-Boom Assembly: Longitudinal Stability, and Trim. NACA RM L57F19, 1957.
35. Swihart, John M.; and Crabill, Norman L.: Steady Loads Due to Jet Interference on Wings, Tail, and Fuselages at Transonic Speeds. NACA RM L57F19, 1957.
36. Crabill, Norman L.: An Analytical Investigation of the Gust Alleviating Properties of a Simple Pitch Damper. NACA TN 4173. 1957
37. Crabill, N. L.: Thesis to University of Virginia for Degree of Masters of Aeronautical Engineering: Theoretical Investigation of a Simple Gust Alleviator, 1956.
38. Crabill, Norman L.; and Jackson, B. G.: Some Transonic Aerodynamic Characteristics of a Model Similar to the McDonnell F3H-2N Airplane. NACA RM SL56E15, 1956.
39. Crabill, Norman L.: Lift, Drag, Static Stability, and Buffet Boundaries of a Model of the McDonnell F3H-1N Airplane from $M = .40$ to 1.27. NACA RM SL56A13, 1956.
40. Crabill, Norman L.; and McFall, J. C., Jr.: Summary of the Lift, Drag, and Stability of 1/10-Scale Rocket-Boosted Models of the McDonnell XF3H-1 Airplane for a Mach Number Range of 0.6 to 1.4 as Affected by the Operation of Extensible Rocket Racks. NACA RM SL54A18, 1954.

41. Crabill, Norman L.: The Effects of Extensible Rocket Racks on Lift, Drag, and Stability of a 1/10 Scale Rocket-Boosted Model of the McDonnell XF3H-1 Airplane for a Mach Number of 0.60 to 1.34. NACA RM SL53F15, 1953.
42. Mitcham, Grady L.; Crabill, Norman L.; and Stevens, Joseph E.: Flight Determination of the Drag and Longitudinal Stability and Control Characteristics of a Rocket-Powered Model of a 60 degree Delta-Wing Airplane from Mach Number of 0.75 to 1.70. NACA RM L511O4, 1951.
43. Mitcham, G. L.; Stevens, J. E.; Crabill, Norman L.; and Hinners, Arthur H.: Low-Lift Drag and Duct Pressure Recovery of a 1/8.25-Scale Model of the Consolidated-Vultee XF92 Airplane at Mach Numbers from 0.7 to 1.4. NACA RM SL 51E23, 1951.