



Guide to the
George B. McCullough Papers, 1943-1965
PP16.04

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NASA Ames Research Center

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Descriptive Summary

Title:

George B. McCullough Papers, 1943-1965

Collection Number:

PP16.04

Creator:

McCullough, George B.

Dates:

Inclusive: 1943-1965

Bulk: 1949-1951

Extent:

Volume: 0.70 cubic feet

Repository:

NASA Ames History Office

Moffett Field, California 94035

Abstract:

The George B. McCullough Papers contain personal research materials and publications including data charts, equations, article drafts, NACA Technical Notes, and NASA Technical Notes. The collection as a whole documents McCullough's investigations into airfoils, helicopter rotors, and launch vehicles.

Administrative Information

Access:

Collection is open for research.

Publication Rights:

Copyright does not apply to United States government records. For non-governmental material, researcher must contact the original creator.

Languages and Scripts:

All records are in English.

Preferred Citation:

Expanded:

NASA Ames History Office, NASA Ames Research Center. Moffett Field, California. PP16.04, George B. McCullough Papers, [Container number] : [Folder number]. [Identification of item]. [Date, if available].

Abbreviated:

NASA ARC. PP16.04 [Container number] : [Folder number]. [Identification of item]. [Date, if available].

Acquisition Information:

Donated by History San Jose on March 28, 2016 (Accession 2016-004).

Custodial History

Formerly in the possession of History San Jose, all George B. McCullough materials related to NACA and NASA were transferred to the NASA Ames History Office. Records not related to aeronautics remain with History San Jose.

Biographical History

George B. McCullough came to work at NACA Ames as an aeronautical engineer in the early 1940s, soon after earning a degree from Stanford University. During the course of McCullough's employment, the NACA's theoretical research on wing design was extensive, driving the need for experimental work. McCullough started out conducting investigations on airfoil wing design and theory. Contributing to a number of NACA and NASA Technical Notes, McCullough's work on boundary layer profiles, stalling mechanics, leading edges and interpretation of test data helped advance aircraft wing design.

McCullough's research fell into three main research areas: NACA airfoils, helicopter rotors, and the effects of ground wind loads on launch vehicles. His investigations were mainly conducted in the 7-by-10-foot wind tunnel, 40-by-80-foot wind tunnel, and 12-foot pressure wind tunnel. McCullough authored and co-authored fifteen NACA and NASA technical publications related to this research.

The first research area focused primarily on airfoil sections. McCullough worked on the first set NACA airfoil designs. His investigations into wing sections were conducted in the 7- by-10-foot wind tunnels. Donald E. Gault and McCullough were the first to study new types of stalling mechanics for airfoil sections required for high-speed flight. The studies led to some of the first published technical notes on airfoils with boundary layer control and stall mechanics, which are still referenced by aeronautical engineers today. The breadth of this research can be found in his NACA Technical Notes from 1948 to 1955.

While studying airfoil sections, McCullough also began investigating helicopter rotors and their wing designs in the late 1950s. John McCloud and McCullough performed some of the first helicopter tests in the 40-by-80-foot wind tunnel. Together they calculated and measured stall boundaries based on rotor torque indications. As outlined in their NACA Technical Notes,

McCullough investigated the performance advances of delaying receding blade stall by the use of blade sections with increased maximum lift. McCullough published two technical notes related to helicopter rotors.

McCullough's third area of research involved models of various launch vehicles (rockets) for NASA, not long after the organization's transition from NACA. McCullough studied wind loads on rocket models in the 12-foot pressure wind tunnel for the purpose of preventing the rockets from blowing over on the launchpad. Studying wind loads involved calculating the desirable Reynolds Number, developing a model with conduits, and determining the velocity of the base bend. McCullough produced three NASA Technical Notes as a result of this research.

Although this was not a main focus of his research, McCullough supported one additional set of wing designs before his retirement in the late 1960s. A 7-by-10-foot wind tunnel group consisting of Robert Dannenberg, Wallace Davis, and McCullough mocked up wing designs of mounted jet-engine nacelles, intended for large multi-jet engine airplanes. The designs evolved into single- and twin-engine nacelles mounted on the lower surface of the wing. The group provided the base design of the nacelles of the first jet bombers built in this country. Unlike the other three research areas, McCullough did not author any publications related to this work.

Sources Consulted:

Gault, Donald E. and McCullough, George B. *Boundary-Layer and Stalling Characteristics of the NACA 64A066 Airfoil Section*. Ames Aeronautical Laboratory. Moffett Field, CA: NACA TN 1923, 1949.

Hartman, Edwin P. *Adventures in Research: A History of Ames Research Center 1940-1965*. Washington D.C.: NASA SP-4314, 1970.

McCloud, John L. and McCullough, George B. *Wind-tunnel Tests of a Full-Scale Helicopter Rotor with Symmetrical and with Cambered Blade Sections at Advance Ratio from 0.3 to 0.4*. Ames Aeronautical Laboratory. Moffett Field, CA: NACA TN 4367, 1958.

Scope and Content

The George B. McCullough collection contains documentation of McCullough's investigations into airfoils, helicopter rotors, and launch vehicles. Included are test data and engineering reference materials, and the associated NACA and NASA technical publications.

Series one consists of McCullough's research into boundary-layer profiles, static orifices, stall mechanics, and airfoil section stalling. Included are wind tunnel test booklets, data charts and graphs, handwritten mathematical equations, technical publication drafts, and other material related to his research.

Series two consists of McCullough's research results in the form of thirteen NACA and NASA Technical Notes. The publications include experiment summaries, test descriptions, results, and data charts. Each publication presents detailed technical studies conducted in several wind tunnels.

System of Arrangement

The George B. McCullough collection was received with no apparent order. The records are arranged in two series, each one organized chronologically.

The materials are arranged in two series:

- I. Research Materials, 1943-1960
- II. Publications, 1948-1965

Series Descriptions

Series I: Research Materials, 1943-1960, 18 folders.

This series contains documentation of McCullough's research into NACA airfoil design and helicopter rotor design, as well as on wind loads on launch vehicles.

As part of his research process, McCullough conducted wind tunnel tests, often working out and re-working data analyses by hand. The series includes data tables plotted onto oversized charts to illustrate wing curvature or wing speed and calculations pertaining to orifice meter flow measurements, leading-edge suction slot calculations, and boundary layer profiles. Handwritten drafts of articles and papers contain details differing from what is found in the published versions.

Series II: Publications, 1948-1965, 13 folders.

This series contains some of the NACA and NASA Technical Notes authored by McCullough. They detail his investigations into boundary layer, stalling, and leading-edge characteristics of airfoils and helicopter rotors, as well as aerodynamic loads on launch vehicles. These technical notes include summaries, results, visual observations, notes on anomalies, photographs of the models, and corresponding data charts. While series one contains the supportive work necessary to develop these investigations, this second series presents the results and conclusions of McCullough's research.

Included in this series are reports describing two-dimensional airfoil tests McCullough performed in the 7-by-10-foot wind tunnel, tests on helicopter rotors in the 40-by-80-foot wind tunnel, and wind load tests performed in the 12-foot pressure wind tunnel on models of various launch vehicles. The purpose of the launch vehicle tests was to examine wind loads to determine a tipping point. McCullough worked extensively on all aspects of wing design and the publications showcase the progression of those investigations.

Indexing Terms

The following terms may be used to index this collection.

Corporate Name

United States. National Advisory Committee for Aeronautics
United States. National Aeronautics and Space Administration

Geographic Name

Moffett Field (Calif.)

Personal Name

Buell, Donald A.
Dannenberg, Robert
Gault, Donald E.
McCloud, John L.
McCullough, George B.
Wallace, Davis

Subjects

Aerodynamic Research
Aerofoils -- Research
Boundary layer control
Launch vehicles (Astronautics) -- Design and construction
Leading edges (Aerodynamics)
Reynolds number
Rotors (Helicopters)
Stalling (Aerodynamics)
Wind tunnel testing

Separated Material

A 1952 photograph of NACA personnel of Ames Aeronautical Laboratory was separated from the collection and relocated into the Archives Reference Collection, AFS1070.8A.

Related Collections

NACA Ames Aeronautical Laboratory and NASA Ames Research Center Records at the National Archives and Records Administration (Record Group 255).

Container List

Series I: Research Materials

Box 1, Folder 1	Charts for Computations, 1943-1946
Box 1, Folder 2	A Survey of Existing Data on Boundary-Layer Control, 1944
Box 1, Folder 3	Lift and Drag of Wings with Small Span, 1947
Box 1, Folder 4	Computer Instructions S*, O, and H Boundary-Layer Profiles, 1949
Box 1, Folder 5	Hayter and Delany: Calibration of #2 and #10 Pitots + #2 Wind Tunnel, 1949
Box 1, Folder 6	Method for Integrating Pressure Distribution, 1949
Box 1, Folder 7	Reynolds Number vs. q for various chords, 1950
Box 1, Folder 8	George B. McCullough General Information, Ames Lab N.A.C.A, 1951
Box 1, Folder 9	George B. McCullough General Information, Ames Lab N.A.C.A, 1951
Box 1, Folder 10	George B. McCullough General Information, Ames Lab N.A.C.A, 1951
Box 1, Folder 11	Test 126, 64A010-Leading Edge Slat, 1951
Box 1, Folder 12	Helicopter Charts, 1955-1956
Box 1, Folder 13	Missile Vibrations, 1956
Box 1, Folder 14	Buell's Paper, 1960
Box 1, Folder 15	Geometric Correlation of Airfoil Section Stalling, undated
Box 1, Folder 16	Helicopter Notes for Future Binding, undated
Box 1, Folder 17	Harmonic Analysis, undated
Box 1, Folder 18	Orifice Meter, undated

Series II: Publications

Box 2, Folder 1	Gault, Donald E. and McCullough, George B. <i>An Experimental Investigation of an NACA 631-012 Airfoil Section with Leading-Edge Suction Slots</i> . Ames Aeronautical Laboratory. Moffett Field, CA: NACA TN 1683, 1948.
Box 2, Folder 2	Gault, Donald E. and McCullough, George B. <i>Boundary-Layer and Stalling Characteristics of the NACA 64A066 Airfoil Section</i> . Ames Aeronautical Laboratory. Moffett Field, CA: NACA TN 1923, 1949.
Box 2, Folder 3	Gault, Donald E. and McCullough, George B. <i>An Experimental Investigation of the NACA 631-012 Airfoil Section with Leading-Edge and Midchord Suction Slots</i> . Ames Aeronautical Laboratory. Moffett Field, CA: NACA TN 2041, 1950.
Box 2, Folder 4	Haire, William M. and McCullough, George B. <i>Low-Speed Characteristics of Four Cambered, 10 Percent Thick NACA Airfoil Sections</i> . Ames Aeronautical Laboratory. Moffett Field, CA: TN 2177, 1950.
Box 2, Folder 5	Gault, Donald E. and McCullough, George B. <i>Examples of Three Representative Types of Airfoil-Section Stall at Low Speed</i> . Ames Aeronautical Laboratory. Moffett Filed, CA: NACA TN 2502, 1951.
Box 2, Folder 6	McCullough, George B. and Weiberg, James A. <i>Wind-Tunnel Investigation at Low Speed of a Twisted and Cambered Wing Swept Back</i>

- 63° with Vortex Generators and Fences. Ames Aeronautical Laboratory. Moffett Field, CA: NACA RM-A52A17, 1952.
- Box 2, Folder 7 Kelly, John and McCullough, George B. *Aerodynamic Loads on a Leading-Edge Flap and a Leading-Edge Slat on the NACA 64A010 Airfoil Section*. Ames Aeronautical Laboratory. Moffett Field, CA: NACA TN 3220, 1954.
- Box 2, Folder 8 McCullough, George B. *The Effect of Reynolds Number on the Stalling Characteristics and Pressure Distributions of Four Moderately Thin Airfoil Sections*. Ames Aeronautical Laboratory. Moffett Field, CA: NACA TN 3524, 1955.
- Box 2, Folder 9 McCloud, John L. and McCullough, George B. *Wind-Tunnel Tests of a Full-Scale Helicopter Rotor with Symmetrical and with Cambered Blade Sections at Advance Ratio from 0.3 to 0.4*. Ames Aeronautical Laboratory. Moffett Field, CA: NACA TN 4367, 1958.
- Box 2, Folder 10 McCloud, John L. and McCullough George B. *Comparison of Calculated and Measured Stall Boundaries of a Helicopter Rotor at Advance Ratios from 0.3 to 0.4*. Ames Research Center. Moffett Field, CA: NASA TN D-73, 1959.
- Box 2, Folder 11 Buell, Donald A., McCullough, George B. and Steinmetz, William J. *A Wind-Tunnel Investigation of Ground-Wind Loads on Axisymmetric Launch Vehicles*. Ames Research Center. Moffett Field CA: NASA TN D-1893, 1963.
- Box 2, Folder 12 Buell, Donald A. *Some Sources of Ground-Wind Loads in Launch Vehicles*. Ames Research Center. Moffett Field, CA: NASA TM X-54, 024, 1964.
- Box 2, Folder 13 McCullough, George B. and Steinmetz, William J. *A Wind-Tunnel Study of Ground-Wind Loads on Launch Vehicles including the Effects of Conduits and Adjacent Structures*. Ames Research Center. Moffett Field, CA: NASA TN D-2889, 1965.

Acronyms

NACA	National Advisory Committee for Aeronautics
NASA	National Aeronautics and Space Administration
q	Dynamic Pressure
RN	Reynolds Number
TN	Technical Notes