

University of Houston Clear Lake

Archives and Special Collections

HSF-64 George Strouhal Papers

[Human Space Flight Collection]

Collection Number: HSF-64

Title: George Strouhal Papers

Dates: 1952-1953, 1956, 1958, 1960-1975, 1978-1979, undated

Creator: George Strouhal; NASA; and various creators

Abstract

The George Strouhal Papers is composed of NASA corporate contractor records and reports, reports, white papers and papers, manuals, research binders, memorandums, brochures, booklets, a poster, college course lecture notes, course assignment records, and miscellaneous materials, created and used by George Strouhal during his career working at NASA's Manned Spacecraft Center (later Johnson Space Center) between the 1960s and 1970s. Strouhal was a mechanical engineer known for his work focusing on thermal protection systems for the Apollo Program and Space Shuttle Program. The bulk of the collection is composed of Strouhal's copies of official NASA corporation contractors' reports, papers, records, and other materials, from the 1950 through 1970s. There are miscellaneous NASA, contractors, and various organizations' aerospace research materials that he retained while working at NASA. The collection includes course notes kept by Strouhal during his undergraduate and other educational course work in the 1950s and 1960s.

Extent: Approximately 2.2 linear feet

Language(s): English

Repository

University of Houston-Clear Lake Archives and Special Collections, Alfred R. Neumann Library, 2700 Bay Area Blvd., Houston, TX 77058-1002

Restrictions on Access: There are no restrictions on accessing this collection.

Restrictions on Use

Much of the material in this collection was produced for NASA by contractors on work for-hire contracts. Many of the contractors copyrighted or patented the information or designs or content

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Preferred Citation

[Item name or title], [Box Numbers], [Folder Numbers], George Strouhal Papers, HSF-64, University of Houston-Clear Lake Archives and Special Collections, Alfred R. Neumann Library, 2700 Bay Area Blvd., Houston, TX 77058-1002

Acquisition

The collection was donated to the University of Houston-Clear Lake Alfred R. Neumann Library by Harold E. Benson of Friendswood, Texas (a neighbor of Dr. George Strouhal) in September 2019 on behalf of Strouhal family. The collection was turned over for preservation and long-term storage by the Neumann Library to the care of the University of Houston-Clear Lake Archives and Special Collections, a unit within the Library.

Separated Material

The oversized Moon poster in this collection has been separated from the rest of the collection due to its size, numbered as "Oversized Item 1," and relocated to a larger oversized folder bearing the collection number and item numbers for the posters stored with this folder. The folder has been labeled as "HSF-64 George Strouhal Papers Oversized Folder 1." This oversized folder was relocated to the appropriately-marked drawer in a UHCL Archives map case in the Archives' storage areas.

Processing Information

A few very thick binders had the contents removed from their bindings or three-ring binders, and divided between two or more folders since the manuals or handbooks were too wide to fit if stored in a single archival folder. The folders were labeled in the folder titles as "Part 1" and "Part 2" in parentheses after the manual or handbook title. The order of materials in the manuals

or handbooks were not changed when they were divided to fit in two separate folders for long-term storage. A number of materials were removed from the collection in keeping with the UHCL Archives' collection policy by the processing archivist while the collection was being arranged and described.

Processed by: Matthew M. Peek, December 2022-January 2023

Arrangement

The collection is arranged based on creator and purpose of the materials in folders in the collection. The collection is organized into the following series: Series I: George Strouhal Personal Materials; Series II: NASA Contractor Materials; Series III: Miscellaneous NASA and Research Materials; Series IV: NASA Programs Promotional Materials; and Oversized Folder 1.

Biographical Note

George Strouhal was born on March 15, 1930, to John Otto and Libbie Truksa Strouhal. Strouhal attended and graduated from Alvin High School in Alvin, Texas, in the late 1940s. He attended and graduated from the University of Houston College of Engineering in 1952 with a B.S. in mechanical engineering. In the mid-1950s, Strouhal served in the U.S. Army for two years after the Korean War. In 1955, Strouhal married his wife Carol Jean Millican in Bend, Texas, in 1955. The timeline for much of the rest of his educational and professional career is unclear. He would receive a master's degree from the University of Texas-Austin, and later a doctorate in 1970 from Rice University in Houston, Texas.

George Strouhal went to work for NASA sometime in the late 1950s or early 1960s, in time to work as an engineer on the Project Gemini program. At least by 1964, Strouhal served for the NASA Manned Spacecraft Center (later Johnson Space Center) in coastal Houston, Texas, as a NASA technical monitor on NASA corporate contractors' work. During the Apollo program as best as can be determined from available records, Strouhal worked on thermal protection systems for the Apollo modules. By 1974, George Strouhal had become the head of Johnson Space Center's Thermal Protection Section in the Structures and Mechanics Directorate. He worked at Johnson Space Center for over 30 years, including on the Space Shuttle program and the International Space Station development. Dr. George Strouhal died on July 12, 2000, in Friendswood, Texas. He was buried in Bend Cemetery in Bend, Texas.

Scope and Content

The collection is composed of NASA corporate contractor records and reports, reports, white papers and papers, manuals, research binders, memorandums, brochures, booklets, a poster, college course lecture notes, course assignment records, and miscellaneous materials, created and used by George Strouhal during his career working at NASA's Manned Spacecraft Center (later Johnson Space Center) between the 1960s and 1970s. Strouhal was a mechanical engineer known for his work focusing on thermal protection systems for the Apollo Program and Space Shuttle Program. The bulk of the collection is composed of Strouhal's copies of official NASA corporation contractors' reports, papers, records, and other materials, from the 1950 through

1970s. In his role in the early 1960s as a technical monitor on NASA corporate contractors' work, Strouhal was provided reports and papers on contractor work related to his mechanical engineering specialty of heat transfer and thermal protection for spacecraft.

There are miscellaneous NASA, contractors, and various organizations' aerospace research materials that he retained while working at NASA. The collection includes course notes kept by Strouhal during his undergraduate and other educational course work in the 1950s and 1960s. The collection also includes some NASA and contractor promotional materials for various Gemini and Apollo missions. The collection is arranged in the following series: Series I: George Strouhal Personal Materials; Series II: NASA Contractor Materials; Series III: Miscellaneous NASA and Research Materials; Series IV: NASA Programs Promotional Materials; and Oversized Folder 1.

Subject Terms

Personal/Family Name

Strouhal, George

Corporate Names

Avco Corporation

General Dynamics Corporation. Convair Division

Grumman Aerospace Corporation

Lockheed Martin

Lyndon B. Johnson Space Center

Martin Marietta Aerospace

North American Aviation

Rockwell International. Space Division

TRW Systems Group

United States. National Aeronautics and Space Administration

Geographic Name

Houston (Tex.)

Wright-Patterson Air Force Base (Ohio)

Topical Term

Manned space flight--History

Project Apollo (U.S.)

Space--Social aspects--History

United States. National Aeronautics and Space Administration--History

Genre/Physical Characteristic

Handbooks
 Memorandums
 Notes
 Photographs
 Publications
 Technical manuals
 Technical reports

Collection Inventory

Series I: George Strouhal Personal Materials

Series I consists of college course lecture notes, course assignment records, and miscellaneous research and scientific calculations notes, created and used by George Strouhal from his time as a college student in the early 1950s through his work with NASA in the 1960s. There are also records from a mechanical engineering course that Strouhal participated in in the fall of 1966 while working at NASA. The materials show the training and development he went through to become an engineer in the aerospace industry.

Box/Folder	Description	Date
1/1	Strouhal’s Class Notes on Dissociated Flow Heat Transfer and Mass Transfer Notes	1952, undated
1/2	Strouhal’s Aerodynamics Engineering 394 Notebook of Lectures	Spring 1953
1/3	Strouhal’s Mechanical Engineering 691a Course Papers and Tests: Advanced Gas Dynamics I (Part 1)	Fall 1966
1/4	Strouhal’s Mechanical Engineering 691a Course Papers and Tests: Advanced Gas Dynamics I (Part 2)	Fall 1966
1/5	Miscellaneous Strouhal Research and Calculations Notes	1960s
1/6	Miscellaneous Strouhal Calculations and Notes Binder	Undated
1/7	Miscellaneous Strouhal Calculations Notes	Undated
1/8	Strouhal’s Papers and Notes on Ablation	Undated

Series II: NASA Contractor Materials

Series II is composed of Strouhal’s copies of official NASA corporation contractors’ reports, papers, records, and other materials, from the 1950 through 1970s. In his role in the early 1960s as a technical monitor on NASA corporate contractors’ work, Strouhal was provided reports and

papers on contractor work related to his mechanical engineering specialty of heat transfer and thermal protection for spacecraft. The materials are organized in alphabetical order based on the name of the corporation or organization, including any subsections of larger corporations, that did contractor work with NASA Manned Spacecraft Center. Within each corporation's section of materials, the materials are arranged in chronological order.

Two of the most unique items in this series are two of North American Aviation's original Apollo Program contractor training manuals from 1965. Another interesting set of materials are Strouhal's copies of NASA contractor Martin Marietta's Thermal Protection System research and systems reports in the 1970s that were for the future Space Shuttle orbiter. There are also a set of the original TRW Systems Group Apollo Missions 10-13 "Mission Information Display Cards," which were analog information display cards with movable parts to show the planned missions for Apollo 10-13.

Box/Folder	Description	Date
1/9	Aerospace Corporation Report: (U) Thermal Protection System for the SV-5 (Prime) Ablative Lifting Reentry Vehicle	October 22, 1965
1/10	AVCO Technical Memo: An Analytical Method for Separating Radiative and Convective Heat Transfer Rate Contributions from a Measurement of Stagnation Point Total Heat Transfer Rate	October 1962
1/11	AVCO Corporate Paper and Strouhal's Calculation Notes on Convect Heating with Mass Injection	circa 1963
1/12	AVCO Everett Research Laboratory: Transition and Strouhal Numbers for the Incompressible Wake of Various Bodies Report	August 1965
1/13	AVCO Memo: Formulation of Radiant Heat Transfer Equations for Heat Shield Materials [Copied Document]	January 21, 1966
2/1	Convair Heat Transfer Through the Laminar Boundary Layer with Pressure Gradient Report	December 2, 1958
2/2	Convair Generalized Study of the Flow of Rarefied Gases Report	March 30, 1961
2/3	General Dynamics Report: Hypersonic Flow Field and Heat Transfer Studies on a Lifting Entry Vehicle at Angles of Attack from 0° to 60°	September 1970
2/4	General Electric Thermal Protection System Repair Kit	November 28, 1979

Program: Final Program Presentation

2/5	General Electric Thermal Protection System Repair Kit Program (Final Report)	November 28, 1979
2/6	Grumman Aerospace Corporation Apollo 11 Brochure	1969
2/7	Grumman Aircraft Promotional Booklet: <i>The Lunar Excursion Module for Project Apollo</i> (with Strouhal's Doodles)	[1960s]
2/8	Grumman Aerospace Manual: Initial Development of An Ablative Leading Edge for the Space Shuttle Orbiter	March 1974
2/9	ILC Industries "Space Suits for Project Apollo" Brochure	1969
2/10	Lockheed Study: Heat Transfer By Radiation and Conduction in High Temperature Insulation Materials	October 1970
3/1	Lockheed Electronics Company Program HITEMP for Study of Heat Transfer by Conduction and Radiation Project 7204 Documentation	March 1971
3/2	Lockheed Engineering Memo: Effects of RSI Titles on Aerodynamics (Photocopy)	November 1972
3/3	Lockheed Technical Report: A Finite Difference Solution of Combined Conduction and Radiation Heat Transfer in Porous Insulation Materials	May 1973
3/4	Lockheed Technical Report Project Number 3212I: Property Estimates for LI900 and LI1500 Insulation Materials	December 1973
3/5	Douglas Corporate Paper: Ablative Materials Subject to Combustion and Thermal Radiation Phenomena [Copied Paper]	January 1964
3/6	McDonnell Douglas Report: Aft-Facing Ablating Step Analysis and Computer Program	October 1969
3/7	McDonnell Douglas: Design and Fabrication of a High Temperature Leading Edge Heating Array, Additional Investigations and Final Design	March 1, 1974
3/8	McDonnell Douglas Aerothermodynamic Assessment	January 31, 1978

of Corrugated Panel Thermal Protection Systems (Final Report)

3/9	Martin Marietta Space Shuttle Thermal Protection System: Martin Surface Insulation (MAR-SI) Status Report	August 1972
3/10	Martin Marietta Status Report: Low Temperature Reusable Surface Insulation (LRSI) for the Space Shuttle Orbiter	February 1973
3/11	Martin Marietta TILE Protective System Flight Repair Kit—Final Review	November 1979
3/12	Martin Marietta: Thermal Protection System Flight Repair Kit (Final Report)	December 1979
4/1	North American Aviation Apollo Training Contractor Manual: Structures and Mechanical Systems	August 1, 1965
4/2	North American Aviation Apollo Contractor Training Manual, Revised	October 1, 1965
4/3	Rockwell International: Space Shuttle Acoustic Fatigue Development Test Program	April 1975
4/4	Rockwell International: Thermal Protection System Test Plan Volume 1, Materials Characterization Test Program	June 1, 1975
4/5	TRW Systems Group Apollo Missions 10-13 Mission Information Display Cards	1960s-1970s
4/6	Wright-Patterson Air Force Base Technical Report: Transient Temperature in a Semi-Infinite, Porous Solid with Phase Change and Transpiration Effects	January 1960
4/7	Wright-Patterson Air Force Base Technical Report: Turbulent Transpiration Cooling Including Downstream Effects	June 1965

Series III: Miscellaneous NASA and Research Materials

Series III consists of miscellaneous research binders, conference papers, research papers, NASA technical notes and memorandums, and other materials, used and kept by George Strouhal during his research and work with NASA Manned Spacecraft Center. Most of the materials date from

1964 through 1973. The materials largely relate to Strouhal's professional specialty in heat transfer and thermal protection systems for aerospace travel.

Box/Folder	Description	Date
4/8	American Rocket Society Annual Meeting: Heat Transfer to Satellite Vehicles Re-Entering the Atmosphere Paper	November 1956
4/9	Manned Spacecraft Center Robert Harris Research in Transparent Installations Compiled Binder (Part 1)	March 1964
5/1	Manned Spacecraft Center Robert Harris Research in Transparent Installations Compiled Binder (Part 2)	March 1964
5/2	Thermal Radiation Transfer in a Gas: Fundamental Relations (Manned Spacecraft Center Internal Note) (Fax Copy)	September 21, 1964
5/3	Miscellaneous Apollo and Ablator Thermal Protection NASA Presentation Slide Photographs	1964, 1966
5/4	The Effect of Protuberance, Cavities, and Angle of Attack on the Wind-Tunnel Pressure and Heat-Transfer Distribution for the Apollo Command Module (U) Paper	January 1966
5/5	NASA Technical Note: The Stagnation-Point Boundary Layer with Suction and Injection in Equilibrium Dissociating Air	March 1967
5/6	Water Safety Guide (Manned Spacecraft Center)	June 1968
5/7	Boundary Layer Transition: A Review of Theory, Experiment and Related Phenomena Technical Report	February 1971
5/8	NASA Space Shuttle Program Working Paper: The Importance of Boundary Layer Transition to the Space Shuttle Design	December 1971
5/9	Structures Branch Report: Thermoelastic Stress Distribution in the Transversely Isotropic Thermal Protection System (TPS) for the Space Shuttle	January 1973
5/10	NASA Technical Memo: Wall Boundary Equations with Slip and Catalysis for Multicomponent, Nonequilibrium Gas Flows	December 1973

5/11	Hot Structure Thermal Model and Composite Body Flap Materials	1978-1979
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Series IV: NASA Programs Promotional Materials

Series IV consists of booklets and a souvenir program from NASA and NASA contractors for various missions or aspects of the Mercury, Gemini, and Apollo programs in the 1960s and early 1970s. This includes an original Apollo Extravaganza souvenir program for the event held in the Houston Astrodome in August 1969 to celebrate the Apollo 11 lunar landing. There is also an original Apollo 16 mission contractor’s booklet.

Box/Folder	Description	Date
5/12	<i>One-Two-Three and the Moon: Projects Mercury, Gemini, and Apollo of America’s Manned Space Flight Program</i> Booklet	June 1, 1963
5/13	<i>The Six Orbits of Sigma 7: Walter M. Schirra’s Space Flight, October 3, 1962</i> Booklet	1963
5/14	Original Apollo Extravaganza Souvenir Program	August 16, 1969
5/15	Apollo 16 Mission Promotional Booklet	1972
Oversized Folder 1	General Electric “The Moon” Poster	1966

Oversized Item 1: An original poster entitled “The Moon,” produced by the General Electric Company in 1966, provides lunar data, a projection, photographs, and description of major NASA lunar programs planned through 1970. This poster provides a view of the Project Apollo mission to land on the Moon several years before the Apollo 11 lunar landing.