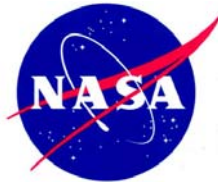




# STS RECORDATION BIBLIOGRAPHY

**National Aeronautics and Space Administration  
Johnson Space Center**



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## PREFACE

NASA's Space Shuttle Program (SSP) has served America's science and research programs for over 30 years. In the three decades since it became a reality, NASA's Space Transportation System (STS), first launched in April 1981, is the only reusable spacecraft capable of delivering and returning large payloads and scientific experiments to and from space. The space shuttle fleet, comprised of Discovery, Atlantis and Endeavour, is scheduled for retirement in 2010.

The removal of the Space Transportation System from active service will result in the ending of the SSP. With the support of the SSP and various NASA centers, recordation of the space shuttle "stack," including the orbiters, external fuel tank, space shuttle main engines, and reusable solid rocket motor/solid rocket boosters, is underway. NASA plans to document the STS in accordance with the Department of the Interior's standards for a Level II Historic American Engineering Record (HAER). NASA recordation activities will cover the historic phases for engineering of the stack from concept development to retirement, including design, test and operations; the unique features of the three active orbiters; the ferry operations for the Shuttle Carrier Aircraft; and major design modifications and mission operations post Challenger and Columbia.

The STS Recordation Bibliography was prepared as a companion to the STS Recordation HAER document. It is not intended to be an encyclopedic reference guide to the SSP. Rather, the references focus primarily on the technological evolution of the STS, including the orbiter vehicle and major propulsion elements. Since it is intended as a reference guide suitable for use by the general public, listings for highly technical materials are not included.

The STS Recordation Bibliography is organized topically into five major sections: General History; the Orbiter Vehicles; the Space Shuttle Main Engines; the Solid Rocket Boosters/Solid Rocket Motors/Reusable Solid Rocket Motors; and the External Tank. Within each section, references are grouped by the general information type, i.e., books, pamphlets, journals, and presentation materials; cultural resource inventories and historic contexts; internet sources; oral histories; and video, film, and DVD. As appropriate, reference materials also are grouped by the source repository, specifically the archives at the University of Houston – Clear Lake, the Kennedy Space Center Library, and the Marshall Space Flight Center History Office.

This bibliography is designed to capture the basics of the technological evolution of the shuttle stack. For additional information, a wealth of archival and current materials about the Space Shuttle Program and the Space Transportation System is available at NASA's World Wide Web site - <http://www.nasa.gov/>.

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## **Section 1. GENERAL HISTORY OF THE SPACE TRANSPORTATION SYSTEM**

*“I can’t think of any single program in our country that has done more, made more overall contributions to society, than the space program. It’s been the driver of technology for the last half of the century, it has been an important instrument of international relations, it has built the reputation of our nation among all the nations, and it has generated spin-offs that have made untold contributions to society. To consider that we, for less than 1 percent of the national budget, could have gotten that return on the investment to me is nothing short of miraculous. Looking back on things that I have done, I like to think that I’ve been a part of something that has benefited not only a small group of people but has benefited all of society.”*

William R. Lucas, Huntsville, Alabama – July 21, 2010

(Interview by Rebecca Wright,  
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## Section 2. THE ORBITER VEHICLES

*“I think for the average person looking at it, an orbiter is an orbiter is an orbiter – they all look the same. But it’s like a race car driver, he knows the difference between the cars and the way they handle.”*

Gerald Blackburn, Downey, California – August 24, 2010

(Interview by Rebecca Wright,  
NASA STS Recordation Oral History Project Oral History Transcript)

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## Section 3. THE SPACE SHUTTLE MAIN ENGINE (SSME)

*“One thing that surprises a lot of people about the SSME is that each of those engines burns 1,000 pounds of propellants a second. When you combust hydrogen and oxygen, the exhaust is water vapor. So when they run a test, there’ll be a big cloud of exhausted water vapor. If the wind conditions were right, and the cloud vapor floated over you, it would condense because it was cooler in the atmosphere than the exhaust, and it would pour down rain on you. We got wet once in a while.”*

George D. Hopson, Huntsville, Alabama – July 20, 2010

(Interview by Jennifer Ross-Nazzal,  
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## **Section 4. THE SOLID ROCKET BOOSTER/SOLID ROCKET MOTOR/REUSABLE SOLID ROCKET MOTOR (SRB/SRM/RSRM)**

*I got much involved in the decision of how we would prevent the components in the solid rocket booster from being destroyed on recovery. The parachutes of course brought it down but they were still moving pretty fast, and every time that thing splashed in the ocean it bugged up everything in the aft skirt. So we investigated several foams and we finally found one that was very good at cushioning and we sprayed the components with this cushioning foam and after that we could reuse the hardware.*

Robert J. Schwinghamer – Huntsville, Alabama – July 20, 2010

(Interview by Rebecca Wright,  
NASA STS Recordation Oral History Project Oral History Transcript)

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## Section 5. THE EXTERNAL TANK (ET)

*One thing that's unique—and I'm not sure the public ever really understood—was if you visualize the tank sitting on the pad, it's bolted down by the two solid rocket motors. You've got the tank in the middle, then you've got the orbiter hanging off to the side. So here you got 250,000 pounds hanging on the side of this fairly rigid tank and solid [rocket motors]. When you light the orbiter engines first, it actually pushes the tank over, it bends it about three or four feet. The top of the tank actually goes off vertical about three or four feet, then you light the solids. Once they pressurize, it wants to pop it back straight, and you time all of that such that it lifts off when it's vertical. I still love just watching, but for the casual observer you would never notice that detail. It literally launches when it comes back vertical.*

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*We painted the first two or three tanks because we didn't know how long it was going to be on the pad, and that foam is very susceptible to ultraviolet light so the longer it's on the pad, the foam will start to deteriorate, and little minute surfaces will start to shed off. To avoid that, we painted the first two white. It was like 1,500 pounds of paint we put on it, basically a flat latex paint. You wouldn't believe the ugly letters I got when we took the paint off. "That old ugly colored tank." Most of them were from ladies that just thought it really looked good before.*

James B. Odom – Huntsville, Alabama – July 20, 2010

(Interview by Rebecca Wright,  
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