

CAPE CANAVERAL AIR FORCE STATION,  
LAUNCH COMPLEX 39,

HAER NO. FL-8-11-S-2

SOLID ROCKET BOOSTER DISASSEMBLY & REFURBISHMENT COMPLEX

SOLID ROCKET BOOSTER RECOVERY SLIP

(Hangar AF Complex-Recovery Slip)

(John F. Kennedy Space Center)

Cape Canaveral

Brevard County

Florida

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD

National Park Service  
Department of Interior  
100 Alabama St., SW  
Atlanta, Georgia 30303

HISTORIC AMERICAN ENGINEERING RECORD

CAPE CANAVERAL AIR FORCE STATION, LAUNCH COMPLEX 39,  
SOLID ROCKET BOOSTER DISASSEMBLY & REFURBISHMENT COMPLEX  
SOLID ROCKET BOOSTER RECOVERY SLIP  
(Hangar AF Complex - SRB Recovery Slip)

HAER No. FL-8-11-S-2

Location: Cape Canaveral Air Force Station, Cape Canaveral,  
Brevard County, Florida.

USGS Orsino, Florida, Quadrangle, Universal  
Transverse Mercator Coordinates: E 540465.24 N  
3151325.46 Zone 17, NAD 1983.

Date of Construction: 1979

Present Owner: National Aeronautics and Space Administration (NASA)

Present Use: Solid Rocket Booster Disassembly & Refurbishment

Significance: The Solid Rocket Booster (SRB) Disassembly & Refurbishment Complex contains the SRB Recovery Slip and eight other facilities that played an essential role in the re-usability of the SRBs in the Space Shuttle Program (SSP). The complex is considered eligible as a historic district in the National Register of Historic Places (NRHP) in the context of the SSP (1969-2011) under Criterion A for Space Exploration. The SRB Recovery Slip has achieved exceptional significance within the past 50 years, so NRHP Criterion Consideration G applies. The complex was originally designed or modified to process SRBs, from pre-launch manufacture and assembly to post-launch recovery, disassembly, cleaning, and refurbishment. The complex maintains a high level of integrity.

Report Prepared by: New South Associates, Stone Mountain, Georgia

Date: October 16, 2012

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PART I. HISTORICAL INFORMATION

A. INTRODUCTION

Located on the Banana River, the SRB Recovery Slip (Facility 66244) lies at the western edge of SRB Disassembly and Refurbishment Complex, in the Industrial Area of the Cape Canaveral Air Force Station (CCAFS). The complex's boundaries are defined as the edges of the concrete hardscape that surrounds Hangar AF. The complex contains nine contributing resources, including the SRB Recovery Slip (8BR2005). The remaining eight contributing resources are Hangar AF (8BR2001), the High Pressure Gas Building (8BR2002), the High Pressure Wash Building (8BR2003), the First Wash Building (8BR2004), the SRB Paint Building (8BR2006), the Robot Wash Building (8BR2007), the Thrust Vector Control Deservicing Building (8BR2008), and the Multi-Media Blast Facility (8BR2009).

The complex is a significant historic property for its association with the Space Transportation System (STS), commonly known as the "Space Shuttle." The STS was a unique breakthrough in the history of the U.S. Space Program because it was based on a design that made most of its major components re-usable. This model decreased program costs and helped make orbital space flight a routine endeavor. Along with the orbiter spacecraft, the SRBs were two of the Space Shuttle's primary reusable elements, while the external tank (ET) was not reused. The SRBs' reusability was made possible by a number of facilities at Kennedy Space Center (KSC) and CCAFS, including the SRB Disassembly and Refurbishment Complex, which is located in the Industrial Area of CCAFS. The complex is the first place the SRBs were brought after

their recovery from sea and where they were disassembled, cleaned, and processed before they were moved to other KSC facilities for buildup and assembly.

## B. HISTORICAL CONTEXT

A full historical context, as well as a summary of the entire disassembly and refurbishment process, for the SRB Disassembly and Refurbishment Complex can be found in HAER NO. FL-8-11-S (Hangar AF Complex). A detailed explanation for the portions of that process that occurred in this resource is located in Section III of this document.

## C. PHYSICAL HISTORY

### 1. Date of Construction:

1979

### 2. Architects/Engineers:

Sverdrup & Parcel and Associates, Inc., Jacksonville, Florida.

Sverdrup & Parcel was the engineering, architectural, and planning services branch of the larger Sverdrup Corporation, a broad-based engineering firm that worked throughout the United States and internationally.<sup>1</sup>

The company was founded as Sverdrup and Parcel in 1928 by Norwegian engineer Leif J. Sverdrup and John Ira Parcel, a professor at the University of Minnesota. Together, the

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<sup>1</sup> Sverdrup Corporation: Company History, <http://www.fundinguniverse.com/company-histories/Sverdrup-Corporation-Company-History.html>. Accessed November 17, 2011.

men specialized in bridge design and construction and became one of the most respected bridge firms in the country by the 1940s. During World War II, the firm broadened its scope of services to include work for the U.S. Corps of Engineers in the Pacific theater, including a chain of airfields in the South Pacific leading to the Philippines.<sup>2</sup>

Domestically, Sverdrup and Parcel continued to concentrate on somewhat routine bridge, railroad, and highway construction. In the late 1940s, however, the firm expanded into the design of military and aviation test facilities for the U.S. Government, including architectural and engineering services at the new Arnold Engineering Development Center (AEDC) in Tullahoma, Tennessee, and the Air Force's Joint Long-Range Proving Ground at Cape Canaveral, Florida. The work at Cape Canaveral opened the door for the firm to work in the 1960s with NASA and the Air Force, first in the development of rocket test stands, and then in 1977 with modifications to Hangar AF.<sup>3</sup>

### 3. Builder/Contractor/Supplier:

Holloway Construction

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<sup>2</sup> International Directory of Company Histories, *Sverdrup Corporation: Company History* (Farmington Hills, MI: St. James Press, 1996), <http://www.fundinguniverse.com/company-histories/Sverdrup-Corporation-Company-History.html>. Accessed November 17, 2011.

<sup>3</sup> International Directory of Company Histories, *Sverdrup Corporation: Company History* <http://www.fundinguniverse.com/company-histories/Sverdrup-Corporation-Company-History.html>. Accessed November 17, 2011.

#### 4. Original Plans and Construction:

The SRB Recovery Slip was designed in 1977 by Sverdrup & Parcel. The original plans reveal that the slip retains its original appearance.

#### 5. Alterations and Additions:

The SRB Recovery Slip received repairs and improvements in 1995 to stabilize the structure's seawall and bulkhead to improve drainage capabilities. Improper drainage had caused spalling and cracks in the structure's concrete. The design work for this improvement was done by Reynolds, Smith and Hills, an architecture-engineering firm with an office in Merritt Island, Florida. The work included removing a 10-inch thick concrete slab from around the slip to expose the structure's subsurface expansion joints and drainage system for repairs. Once completed, the excavated areas were backfilled and new concrete was installed.

## PART II. STRUCTURAL/DESIGN/EQUIPMENT INFORMATION

### A. GENERAL STATEMENT:

#### 1. Character:

The SRB Recovery Slip is a T-shaped, reinforced concrete receiving dock on the west end of the Hangar AF Complex. It was designed to provide a docking area for the SRB recovery ships and to receive and remove the SRBs from the water.

2. Condition of fabric:

The condition of the SRB Recovery Slip fabric is excellent. The SRB Recovery Slip has been regularly maintained throughout its lifespan and does not exhibit any major signs of neglect or deterioration.

B. BUILDING DESCRIPTION:

SRB Recovery Slip

The SRB Recovery Slip is located on the Banana River at the far western edge of the Hangar AF Complex. The T-shaped slip is the used to lift the SRBs out of the water after they are recovered and towed in from sea by the *Freedom Star* and *Liberty Star* ships. It is located immediately north of Hangar AF's original concrete pad, which was used to receive Saturn rocket components.

The slip consists of a concrete bulkhead facing the water and a perpendicular slip opening, into which the SRBs are floated for recovery. Once inside the slip, a 200-ton capacity gantry crane straddles the slip and lifts the SRBs out of the water. The SRBs weigh approximately 190,000 pounds at this point. The bulkhead is approximately 100 feet long from north to south and is faced with marine rubber fenders. Marine cleats positioned at regular intervals along the top of the bulkhead allow the retrieval ships to tie up once they are in port.

The slip's opening is 25'-0" wide, 96'-0" long, and 12'-0" deep. There are marine rubber fenders at the mouth and terminal end of the slip, but the majority of its length is lined with 4" x 8" timber fenders. The eastern end of the slip features a pair of circular or cylinder-shaped marine

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rubber fenders. There is a 1'-0" concrete curb extending around the top perimeter of the bulkhead and slip. The ground surface surrounding the slip is concrete pavement. There are capstans (hydraulic machines used to tighten ship lines and cables) mounted on either side of the slip mouth and one at its terminal end.

### PART III: OPERATIONS AND PROCESS

The primary operations at Hangar AF involved receiving the SRBs from the recovery ships, separating all of the SRB segments, removing their electronic and mechanical components, removing their protective TPS finishes, and preparing them for buildup and assembly at the ARF. The buildings and structures at the Hangar AF Complex processed the aft skirts, forward skirts, frustums, TVC systems, MPSS, ETA Ring, and a variety of small metal parts contained in each of the segments. The boosters' four SRMs were separated and cleaned at Hangar AF, but then shipped to their manufacturer for full refurbishment. Typically, the number of people working at Hangar AF during the Space Shuttle era was approximately 150 people. It typically took these workers from two to three weeks to fully process the SRB components from the time of their arrival.

The Hangar AF refurbishment process began at the SRB Recovery Slip on the west end of the complex, where the SRBs were towed by the *Freedom Star* and *Liberty Star* ships. The SRBs were then floated, one at a time, into the slip. A mobile 200-ton capacity gantry crane then lifted the SRBs out of the slip and placed them onto specially-designed rail cars, or dollies, which moved along tracks embedded in the paved surface of the complex. The dollies resemble flatbed rail cars, each of which is equipped with a series of eight semi-circle "cradles" that hold the SRBs. The

cradles all have belts and rollers along their inside surface that allow workers to rotate the SRBs into correct position using control panels mounted on the sides of the dollies.

The two sets of dolly rail tracks extend all the way from the slip area through the wash bays of the First Wash Building and then into Hangar AF where both SRBs were processed at the same time. The SRBs weighed approximately 190,000 pounds at the beginning of the refurbishment process.

After the SRBs were removed from the slip, the booster frustums and parachutes were offloaded from the ships, placed on transport trailers, and taken to Hangar AF for processing.

#### PART IV. SOURCES OF INFORMATION

##### A. ENGINEERING DRAWINGS AND PLANS

Sverdrup & Parcel and Associates. "Solid Rocket Booster Recovery & Disassembly Facility, Hangar AF, CCAFS, Industrial Area." Kennedy Space Center, Florida. Construction drawings, 1977.

##### B. EARLY VIEWS

Kennedy Space Center.

Photograph negative number 116-KSC-373C-548/16. 1973. On file at Kennedy Space Center Archives.

Photograph negative number 108-KSC-378C-203/3. 1978. On file at Kennedy Space Center Archives.

Photograph negative number 108-KSC-81PC-459. 1983. On file at Kennedy Space Center Archives.

Photograph negative number 116-KSC-383C-1256. 1983. On file at Kennedy Space Center Archives.

Photograph negative number 108-KSC-378C-759. 1978. On file at Kennedy Space Center Archives.

Photograph negative number 108-KSC-379C-1060/1. 1979. On file at Kennedy Space Center Archives.

#### C. INTERVIEWS

Christy, Howard, RPSF Manager, Personal Communication, February 24, 2010.

Morales, Art. George C. Marshall Space Flight Center Office of the Director Shuttle - ARES Transition Office. Interview with author. September 27, 2011.

Price, David. Hangar AF Facility Manager, United Space Alliance. Interview with the author. September 27, 2011.

#### D. PRIMARY SOURCES

Brown, Joseph Andrew. *Bid Cost of Shuttle Facilities, Construction Bidding Cost of KSC's Space Shuttle Facilities*. Proceedings from the 23<sup>rd</sup> Annual American Association of Cost Engineers Meeting, Cincinnati, Ohio,

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July 15-18, 1979, 14. On file at Kennedy Space Center Archives.

Cape Canaveral Air Force Station Master Plan and Building Schedule. Department of the Air Force, Air Force Systems Command. Cape Canaveral, Florida, 1963.

Kennedy Space Center. *Technical Facilities Resume: Hangar AF*. Facility No. 10-00-22-00 (John F. Kennedy Space Center, Florida, 1966), 43-44. On file at Kennedy Space Center Archives.

#### E. SECONDARY SOURCES

Deming, Joan, and Patricia Slovinac. *NASA-Wide Survey and Evaluation of Historic Facilities in the Context of the U.S. Space Shuttle Program: Roll-Up Report*. Submitted to the National Aeronautics and Space Administration, Environmental Management Branch. Sarasota, Florida: Archaeological Consultants, Inc. February 2008, revised July 2008.

National Aeronautics and Space Administration (NASA)

*NASA Facts: Solid Rocket Boosters*. Kennedy Space Center, Florida. IS-2004-09-014-KSC, Revised 2006.

*NASA Facts: Solid Rocket Boosters and Post-Launch Processing*. Kennedy Space Center, Florida. FS-2004-07-012-KSC (Rev. 2006).

*Sverdrup Corporation: Company History*.

<http://www.fundinguniverse.com/company-histories/Sverdrup-Corporation-Company-History.html>.

Accessed November 17, 2011.

United Space Alliance

"Marine Operations, Revision J." (John F. Kennedy Space  
Center, n.d.), MO-1.

#### F. Likely Sources Not Yet Investigated

Research was conducted at KSC using primary and secondary sources. Sources that were not investigated that may contain secondary information include NASA Headquarters and at the offices of the various architects and contractors that constructed the buildings of the Hangar AF Complex.

Additional oral history interviews with other engineers and technicians could also prove useful.

#### V. PROJECT INFORMATION

NASA determined that the SRB Disassembly & Refurbishment Complex was eligible to the NRHP as a historic district under Criterion A in the area of Space Exploration. The SRB Recovery Slip is considered a contributing resource to the historic district. This determination was made by NASA's "Shuttle Transition Historic Preservation Working Group" or HPWG, which looked at 335 facilities at thirteen NASA Centers.<sup>4</sup> As a result of this work, seventy properties were identified as either listed, determined eligible, or were potentially eligible to the National Register. Out of twelve property types identified for NASA's SSP, the SRB Disassembly and Refurbishment Complex was identified as Type 2, which includes Resources Associated with Vehicle

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<sup>4</sup> Deming and Slovinac, *Evaluation of Historic Facilities, Space Shuttle Program*, 5.11.

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Processing Facilities.<sup>5</sup> NASA completed this evaluation as the SSP was scheduled for termination in 2011.

A Programmatic Agreement (PA) was developed to document the identified eligible resources and streamline the Section 106 consultation process. Per Section V.A of the PA between NASA, the Advisory Council on Historic Preservation (ACHP), and the Florida State Historic Preservation Officer (SHPO), dated May 2009, and the Statement of Work provided to New South Associates by KSC/InoMedic Health Applications (IHA), as part of the Task Order Contract, dated August 2011, the documentation package for the SRB Disassembly & Refurbishment Complex includes the following items: a written narrative; a series of photographs showing both exterior and interior views using large format negatives; and a selection of existing drawings, which were photographed with large format negatives. This HAER documentation fulfills the recordation requirements of the PA for the district.

New South Associates, under contract with IHA, a subcontractor to NASA, conducted the HAER documentation and historic research for this project in September and October 2011. Therefore, NASA is completing HAER documentation of the complex and other KSC properties to record these as they appear and as they existed during the SSP. David Diener served as the project photographer. Julie Coco served as Principal Investigator, while David L. Price served as Project Historian.

In order to complete the project, New South Associates personnel were allowed full access to the facility, under the supervision of Barbara Naylor, KSC Historic Preservation Officer, and Nancy English, Cultural Resources Specialist.

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<sup>5</sup> Deming and Slovinac, *Evaluation of Historic Facilities, Space Shuttle Program*, 5.11.

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Photographs were taken of each building's interior, exterior, and context. David Price conducted a limited number of oral interviews and otherwise compiled the historic documentation required for the project. The following people were interviewed for this project: David Price, Hangar AF Facility Manager, United Space Alliance; Art Morales, George C. Marshall Space Flight Center, Office of the Director Shuttle - ARES Transition Office; and Dave Pappalardo, United Space Alliance, TVC Technician. Elaine Liston, KSC Archivist, provided a wealth of information from her office in the KSC Headquarters Building.



Source: USGS 7.5 Minute Topographic Quadrangle Map, Orsino, FL (1976)

Figure 1. USGS Map Showing the Location of the SRB Recovery Slip.



Source: ESRI Resource Data, Imagery Layer

Figure 2. Aerial Photograph Showing the Location of the SRB Recovery Slip.

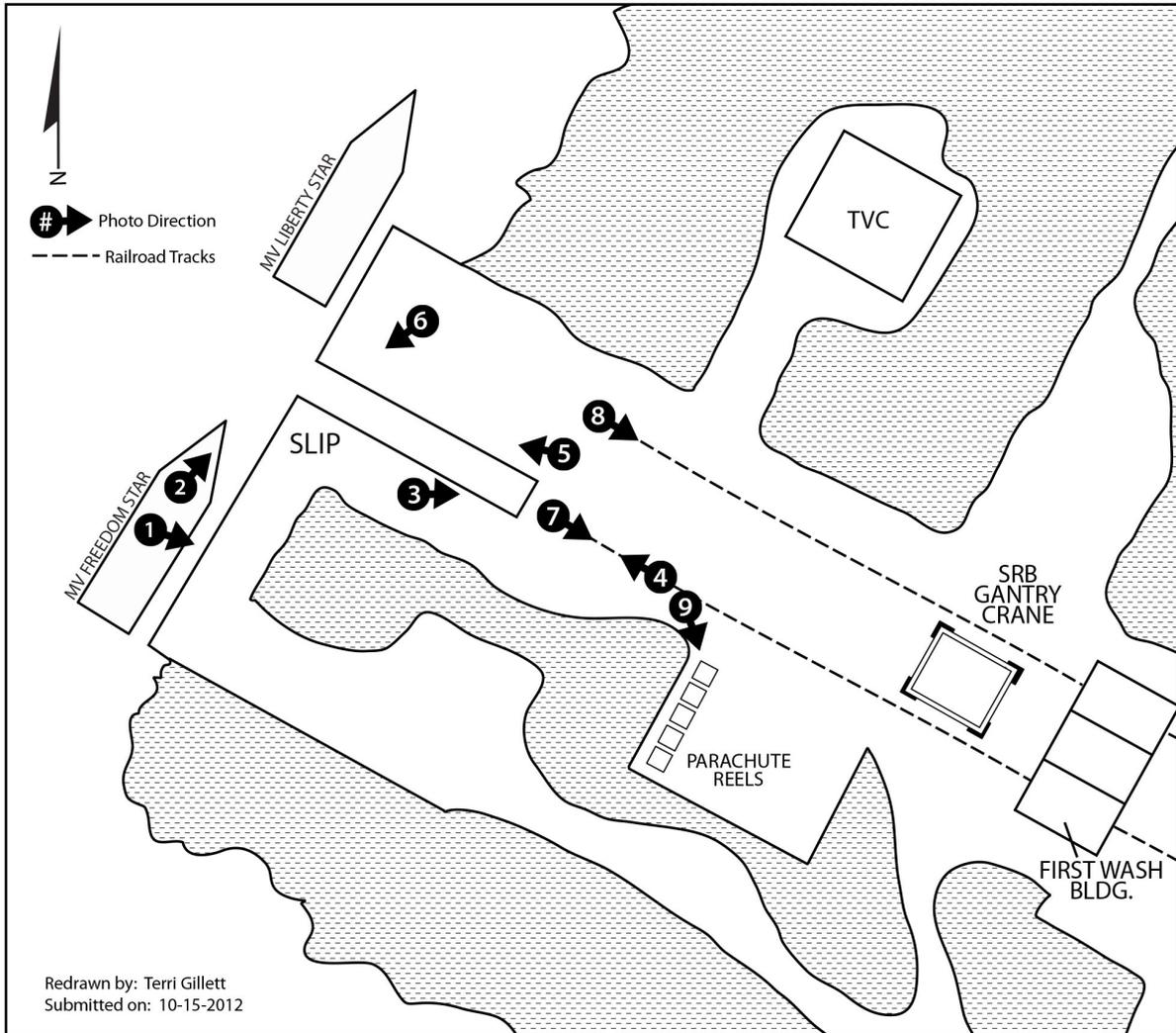


Figure 3. Photograph key for HAER NO. FL-8-11-S-2.