## HISTORIC AMERICAN ENGINEERING RECORD

## SPACE TRANSPORTATION SYSTEM, SHUTTLE CARRIER AIRCRAFT (Space Transportation System, N905NA and N911NA)

HAER No. TX-116-L

Location:	Lyndon B. Johnson Space Center 2101 NASA Parkway Houston Harris County Texas
	When not in active use, Shuttle Carrier Aircraft (SCA) N905NA and N911NA (hereinafter NASA 905 and NASA 911, respectively) were maintained at the National Aeronautics and Space Administration's (NASA) Dryden Flight Research Center (DFRC) at Edwards Air Force Base (AFB) in Edwards, California, located at latitude 34.949167, longitude: -117.885000. These coordinates represent Area A of DFRC, the location where the aircraft were parked; they were obtained on November 25, 2012 through Google Earth <sup>TM</sup> . The coordinates' datum are North American Datum 1983.
Dates of Construction:	NASA 905 was originally constructed in 1970; it was modified into a SCA in 1976. NASA 911 was originally built in 1973; it was modified into a SCA in 1988.
Builder:	NASA 905 and NASA 911 were built by The Boeing Company (Boeing) as 747-123 and 747-SR-46, respectively. Each was subsequently modified by Boeing for use as a SCA.
Original Owner and Use:	Before its purchase by NASA in July 1974, NASA 905 was owned and operated by American Airlines as a commercial jetliner. Prior to its purchase by NASA in April 1988, NASA 911 was owned and operated by Japan Air Lines as a commercial jetliner.
Present Owner:	Both NASA 905 and NASA 911 are owned by NASA's Lyndon B. Johnson Space Center (JSC) in Houston, Texas.
Significance:	NASA's Shuttle Carrier Aircraft, N905NA and N911NA, are significant in the context of the U.S. Space Shuttle Program (ca. 1969-2011). The two Boeing 747 "jumbo jets" were modified to transport the new Space Shuttle

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orbiters from California to the John F. Kennedy Space Center (KSC) in Florida. They also were used in post-mission transcontinental transport of the orbiters. The comprehensive period of significance for the two SCAs is from 1977, the date of the Approach and Landing Test (ALT) Program, through September 2009, when the final ferry flight of the operational phase of the Space Shuttle Program (SSP) occurred. Specifically, the period of significance for NASA 905 is from 1977 through July 2007; for NASA 911, the period of significance is 1988 through September 2009, when it made its final SSP ferry flight.

The two SCAs were modified specifically for the task of ferrying the orbiter prototype *Enterprise*, and the five orbiter vehicles, *Columbia*, *Challenger*, *Discovery*, *Atlantis*, and *Endeavour*. The aircraft transported the new Space Shuttle orbiters from California, to KSC in Florida.<sup>1</sup> The SCAs also were used for post-mission transcontinental transport when the orbiters landed at Edwards AFB in California (or White Sands Space Harbor, New Mexico, following STS-3); and for transport of the orbiters between California and Florida in support of major modifications, upgrades, and maintenance. In addition, NASA 905 was used for the ALT Program.

**Description:** The two SCAs are nearly identical; like most commercial airliners, the SCAs are primarily made of aluminum. Each aircraft has approximate overall dimensions of 231'-10" in length, with a wing span of 195'-8". With the landing gear lowered, each aircraft has a rough height of 32'-1" to the top of the cockpit area, and 63'-5" to the top of the vertical stabilizer. Each SCA has a maximum gross taxi weight of 713,000 pounds.<sup>2</sup> NASA 905 has a base weight of 318,053 pounds; NASA 911 weighs 323,034 pounds. The modifications to the aircraft in support of ferry operations increased the base weight of the aircraft by about 2,800 pounds.<sup>3</sup>

The modified aircraft was designed to fly at a maximum speed of 250 knots. The SCA is powered by four Pratt & Whitney JT9D-7J gas turbine

<sup>&</sup>lt;sup>1</sup> *Endeavour* was the only orbiter to be flown directly from the manufacturing/assembly site in Palmdale, California, to KSC; *Columbia, Challenger, Discovery*, and *Atlantis* were first transported overland from Palmdale to Edwards AFB prior to being flown to KSC.

<sup>&</sup>lt;sup>2</sup> Maximum gross taxi weight is the amount of weight an aircraft can carry during preflight ground maneuvers; it includes the weight of the plane, engines, fuel, and cargo. Aviation Glossary, http://aviationglossary.com/atog-allowable-takeoff-gross-weight-maximum-aircraft-weights/.

<sup>&</sup>lt;sup>3</sup> NASA DFRC, *Shuttle Carrier Aircraft*, NASA Fact Sheets (California: Dryden Flight Research Center, 2012), http://www.nasa.gov/centers/dryden/news/FactSheets/FS-013-DFRC.html.