



News From

## Space Division North American Rockwell

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S-24-B

DOWNEY, Calif.--Technicians began assembling the Apollo 13 spacecraft command module (CM) and service module (SM) for NASA more than 3 years ago at North American Rockwell's Space Division in Downey, Calif. Here is a biography of the spacecraft, recorded as Serial No. 109:

Began manufacturing CM	Nov. 4, 1966
Began assembling crew compartment heat shield	Feb. 17, 1967
Began assembling service module structure at Tulsa, Okla.	April 25, 1967
Completed closeout weld of CM crew compartment	July 13, 1967
Began manufacturing the spacecraft lunar module adapter (SLA 16) at Tulsa Division	Aug. 11, 1967
Service module structure shipped from Tulsa to Downey	Sept. 19, 1967
Began assembling launch escape tower	Sept. 22, 1967
Shipped crew compartment heat shield to AVCO for application of ablative material	Oct. 12, 1967
Completed installing secondary structure in SM	March 1, 1968
Finished installing CM's secondary structure	March 5, 1968
AVCO returned heat shield with ablator applied	March 13, 1968
Launch escape tower shipped to Downey	July 19, 1968
Heat shield was installed on CM crew compartment	Aug. 2, 1968

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## Apollo 13 Biography--2

Completed initial systems installation in CM	Aug. 30, 1968
SLA panels mated	Nov. 1, 1968
Finished initial systems installation in SM	Nov. 3, 1968
Completed final systems installation in CM	Nov. 22, 1968
Completed final systems installation in the SM	Dec. 11, 1968
Passed individual & combined (CM & SM) systems checkout tests	Feb. 20, 1969
Completed integrated systems checkout and demated spacecraft CSM	May 1, 1969
Shipped CM, SM and launch escape system tower to KSC	June 25, 1969
Shipped spacecraft lunar module adapter to KSC	July 18, 1969
Prime crew completed manned altitude run	Sept. 10, 1969
Spacecraft moved to VAB to be mated to booster	Dec. 10, 1969
Apollo 13 space vehicle rolled out to launch complete 39A	Dec. 15, 1969
Apollo 13 completed flight readiness testing	Feb. 26, 1970
Apollo 13 scheduled launch	April 11, 1970

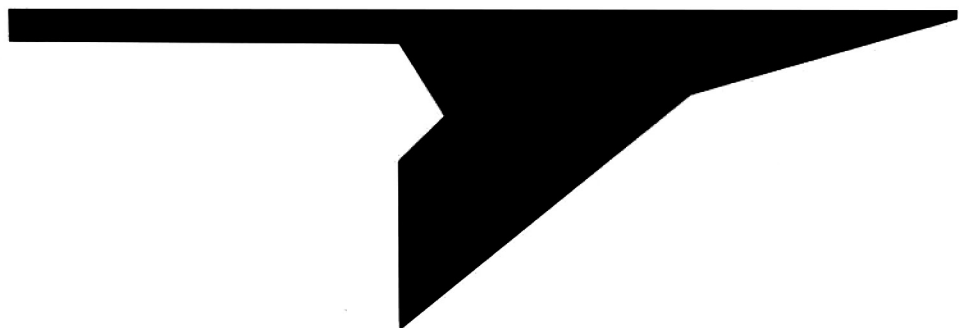
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**GRUMMAN**



**APOLLO 13**

## MANUFACTURING HISTORY - LM-7 "Aquarius"

The Lunar Module (LM-7), scheduled to land on the moon on 15 April 1970, began its manufacturing life at Grumman Aerospace Corporation, Bethpage, New York, in January 1967 when work was started on the ascent stage structure.

Other milestones in the construction of the ascent stage include:

**ASSEMBLY** - The ascent stage moved into assembly (Plant 2) in December 1967 where the following installations were made: helium pressurization module, helium tanks, propellant tanks and feed lines, RCS tanks, manifold lines, water tanks (ECS), oxygen tank, cabin pressure relief and dump valve, suit circuit assembly and water control module, avionics, electrical harnesses and cable assemblies, relay junction box, power failure relay and ECS relay box, and tracking light. The RCS engines were one of the last installations performed at Plant 2.

**COLD FLOW TESTING** - LM-7 ascent stage underwent tests at Grumman's High Pressure Test Facility where substitute gases and liquids were used to test propulsion systems, environment control systems and the cabin proof pressure and leak rate. The checkouts began in mid-October 1968 and were conducted periodically during final assembly and testing.

**FINAL ASSEMBLY AND TEST** - In November 1968, the ascent stage was moved into the final assembly area "clean room" located in Plant 5 at Grumman's main Bethpage facility. The ascent stage was fitted onto the Rotate and Clean fixture where it was prepared for final assembly. Final Assembly installations include: controls and displays, rendezvous radar, attitude and translation control assembly, stowage compartments, thermal blankets and skins. Electronic and communications tests were conducted during this phase of buildup.

The Ascent Propulsion System was completed with the installation of the engine on December 9, 1968 followed by engine leak tests and engine functional tests.

CLEAN AND INSPECT - The ascent stage was again rotated and cleaned at the end of June 1969 and pre-ship inspections were performed.

DESCENT STAGE

The descent stage for LM-7 began taking shape in January 1968 in the main fixture at Grumman's Plant 2. During descent stage manufacture, the separate spacecraft stages came together, or were "mated" several times.

Milestones in buildup of the descent stage for LM-7 are:

ASSEMBLY - The descent stage moved into Plant 2 Final Assembly in May 1968 where the following installations were made: helium pressurization module, helium tanks, propellant tanks, fluid lines, heat exchanger, electrical harness and cable assembly, explosive devices relay box and electrical control assembly.

COLD FLOW TESTING - LM-7 descent stage was moved to the High Pressure Test facility in early December 1968 and underwent a series of tests which included interconnecting water main valve assembly verification, harness and propellant pressure test, tank and flow-proof pressure, and descent stage propellant feed section dry and sample tests. The descent stage then arrived in the Plant 5 final assembly and test area in late December 1968. The installations performed in Plant 5 included gimbal drive actuator, descent engine control assembly, landing radar antenna assembly and base thermal shield and blanket and skin assembly.

Tests performed included electrical circuit interpreter operation, landing radar interface check, ECI pin depth check, and descent stage HTS Structure integrity.

The descent engine was installed in late December 1968 and a descent stage engine interface leak check was performed.

The landing gear was installed in early June 1969 and removed for shipping.

CLEAN AND INSPECT - The descent stage was then rotated and cleaned in end of June 1969 and pre-ship inspection began.

DELIVERY - The ascent and descent stages crated in pressurized containers were flown to NASA KSC aboard a Super Guppy aircraft on June 27 and 28, 1969 respectively. After months of testing LM-7, was hoisted into position on the Apollo 13 stack in mid-December for final checkout prior to the scheduled 11 April launch. At lift-off LM-7 "Aquarius" will weigh roughly 32,000 pounds plus - 15,000 for the ascent stage and 17,500 or more for the descent.

