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THE NASA/GRUMMAN APOLLO LUNAR MODULE

GENERAL DESCRIPTION

A two-stage vehicle, with an earth weight of about 32,000 lbs., the Apollo Lunar Module (LM) will function as a ferry, transporting two astronauts from lunar-orbiting Apollo Command and Service Modules (CSM) to the Lunar surface and back.

Basically, the ascent (upper) stage consists of a pressurized crew compartment, equipment areas, and an ascent rocket engine. The descent (lower) stage, to which the landing gear is attached, contains a gimbaled, throttleable descent rocket engine, and the Scientific Experiment Package. The LM is a completely self-sufficient spacecraft; it is equipped with the systems necessary for life support, guidance and navigation, attitude control, communications, and instrumentation in a manned vehicle. The two crewmen stand side-by-side, facing two triangular windows that afford forward and downward lines of sight. A support and restraint harness provides the crew with the stability they require to accomplish their tasks throughout varying gravity environments, and helps them withstand the lunar landing impact. A large center panel permits them to share the displays and controls.

LM will be coupled to the CSM in a turnaround docking maneuver during the earth-to-moon passage. Shortly after the combined CSM-LM has entered a lunar orbit, two of the three astronauts in the

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Command Module (CM) will enter LM through a connecting tunnel. After vehicle checkout, LM will be separated from the CSM and, under the control of its crew, descend and land at a preselected site.

During their planned stay on the lunar surface, the astronauts will perform such scientific tasks as gathering soil samples; measuring temperature, gravity, and magnetic-field strength; and conducting communications experiments. Local explorations in the vicinity of the LM landing site are also planned.

To start their return journey, the astronauts will sever communications between the ascent and descent stage, ignite the ascent engine and liftoff in LM's ascent stage. The descent stage, serving as a launch platform for the ascent stage, will remain on the moon. The launch profile will bring LM to an orbit providing a rendezvous point with the CSM. After docking, the LM crewmen will rejoin the third astronaut in the CM. The ascent stage will then be left in lunar orbit as the CSM starts back to earth. (Simply stated, this is the role which LM will play in the Apollo mission.)

Before earth launch, the LM spacecraft will be subjected to rigorous tests to achieve maximum mission reliability. System acceptance and functional tests, integrated equipment tests, assembly tests, launch pad tests, and countdown operational tests permit constant system monitoring. A general-purpose spacecraft-checkout system, the Acceptance Checkout Equipment-Spacecraft (ACE-S/C) is used for computer-controlled or manually-controlled acceptance tests and pre-launch tests of the LM systems.