LIGHTING

QUICK REFERENCE DATA

Exterior tracking light	
Type	High-intensity, flashing
Intensity	9,000 beam candlepower (minimum)
Visibility	Cone centered on LM +Z-axis, with semivertex angle of 30°
	Visual: 10 to 130 nautical miles
	CSM sextant: 30 to 400 nautical miles
Docking lights	
Type	Incandescent
Intensity	Fixed
Visibility	1,000 feet
Interior	
Control panels and pushbuttons	White
Circuit breakers	White
Numeric readouts	Green
Lunar contact lights	Blue
Caution annunciators	Yellow
Warning annunciators	Red
Master alarm pushbutton/lights	Red
Component caution lights	Yellow
Engine start and stop pushbutton/lights	Red
Computer status condition indicators	White
Self-luminous devices	Green
Talkbacks (two- and three-position)	White background
Displays	
Characters and indicia	White
Labels and multipliers	Green
Range markings	Green
Immediate-action or emergency controls	Yellow
Indicator power failure lights	Red
Floodlights	White

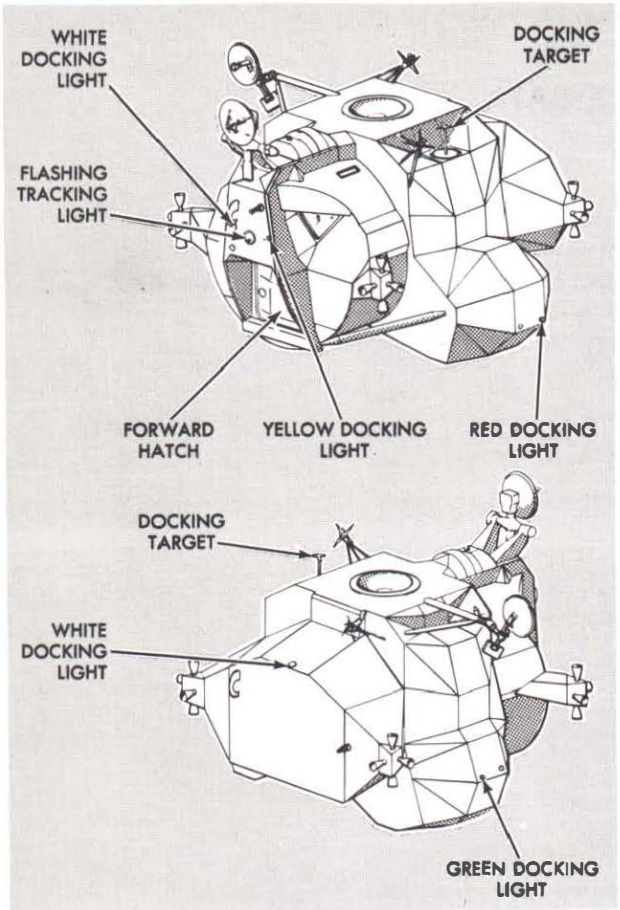
Exterior and interior lighting aids in the performance of crew visual tasks and lessens astronaut fatigue and interior-exterior glare effects. Exterior lighting is used for LM and CSM tracking and docking maneuvers. Interior lighting illuminates the cabin and the controls and displays on the Commander's and LM Pilot's panels.

FUNCTIONAL DESCRIPTION

LM lighting is provided by exterior and interior lights and lighting control equipment. The exterior lighting enables the astronauts to guide and orient the LM visually to the CSM visually to achieve successful tracking and docking. Interior lighting is divided into seven categories: incandescent annunciators, component caution lights, floodlights, computer condition lights, integral electroluminescent lighting, numeric electroluminescent lighting, and incandescently illuminated pushbuttons.

EXTERIOR LIGHTING

Exterior lighting includes five docking lights, and a high-intensity tracking light.



R-105

Ascent Stage Exterior Lighting

DOCKING LIGHTS

Five docking lights mounted on the exterior of the LM provide visual orientation and permit gross attitude determination relative to a line of sight through the CSM windows during rendezvous and docking. For transposition and docking, the docking lights are turned on by a switch located at spacecraft Lunar Module adapter attachment points. This switch is automatically closed upon deployment of the adapter panels. At completion of the docking maneuver, LM power is turned off and the docking lights go off. The lights are visible, and their color recognizable, at a maximum distance of 1,000 feet.

TRACKING LIGHT

The tracking light permits visual tracking of the LM by the CSM. A flash tube in the tracking light electronics assembly causes the light, which has a 60° beam spread, to flash at a rate of 60 flashes per minute.

INTERIOR LIGHTING

Interior lighting consists of integral panel and display lighting, backup floodlighting, and electroluminescent lighting. Electroluminescence is light emitted from a crystalline phosphor (Z_NS) placed as a thin layer between two closely spaced electrodes of an electrical capacitor; one of the electrodes must be transparent. The light output varies with voltage. Advantageous characteristics are an "afterglow" of less than 1 second, low power consumption, and negligible heat dissipation.

INTEGRALLY LIGHTED COMPONENTS

There are three types of integrally lighted components: panel areas, displays, and caution and warning annunciators. The integrally lighted components use electroluminescent or incandescent devices that are controlled by on-off switches and potentiometer-type dimming controls. All panel placards are integrally lighted by white electroluminescent lamps with overlays. The displays have electroluminescent lamps within their enclosures. The numeric displays show green or white illuminated digits on a nonilluminated background; displays with pointers have a nonilluminated pointer travelling over an illuminated background. The brightness of the electroluminescent displays is varied with dimming controls which can be bypassed by a related override switch, so that full brightness will be maintained should a dimming control fail.

LUNAR CONTACT LIGHTS

Two Lunar Contact lights go on when one or more of the four lunar-surface sensing probes contact the lunar surface. A probe is mounted beneath each of the landing gear footpads.

FLOODLIGHTING

Floodlighting is used for general cabin illumination and as a secondary source of illumination for

the control and display panels. Floodlighting is provided by the Commander's overhead and forward floodlights, the LM Pilot's overhead and forward floodlights, and recessed floodlights in the bottom of extending side panels. These floodlight fixtures provide an even distribution of light with minimum reflection. Every panel area has more than one lamp.

PORTABLE UTILITY LIGHTS

Two portable utility lights are used, when necessary, to supplement the cabin interior lighting. The lights, when removed from the flight data file container, connect to the overhead utility light panel. Switches provide one-step dimming for light-intensity control.

OPTICAL SIGHT RETICLE LIGHT

The crewman's optical alignment sight, used to sight the docking target on the CSM, has a reticle that is illuminated by a 28-volt d-c lamp.

ALIGNMENT OPTICAL TELESCOPE LIGHTS

A thumbwheel on the computer control and reticle dimmer assembly controls the brightness of the telescope reticle. The lamps edge-light the reticle with incandescent red light.