

Apollo 11: Lunar Landing

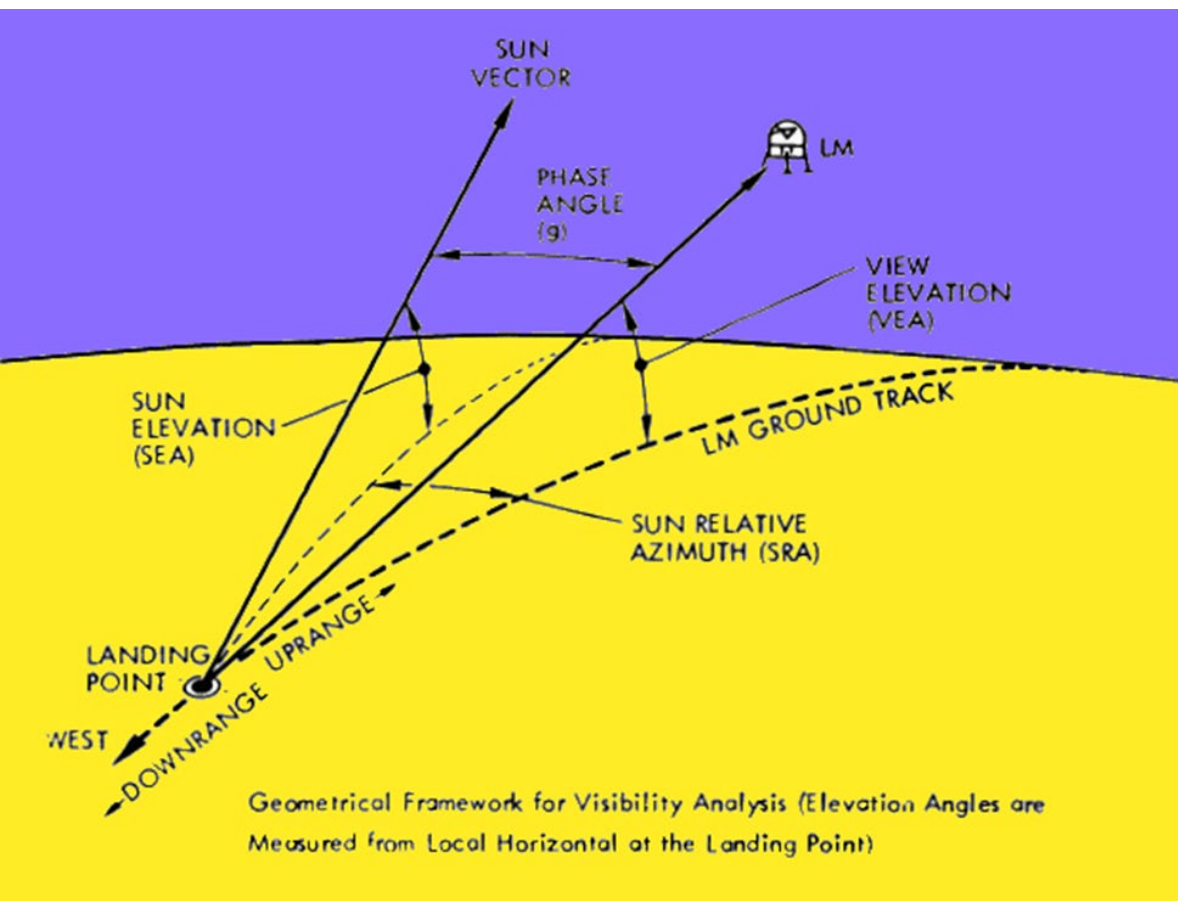
INST 154

Apollo at 50

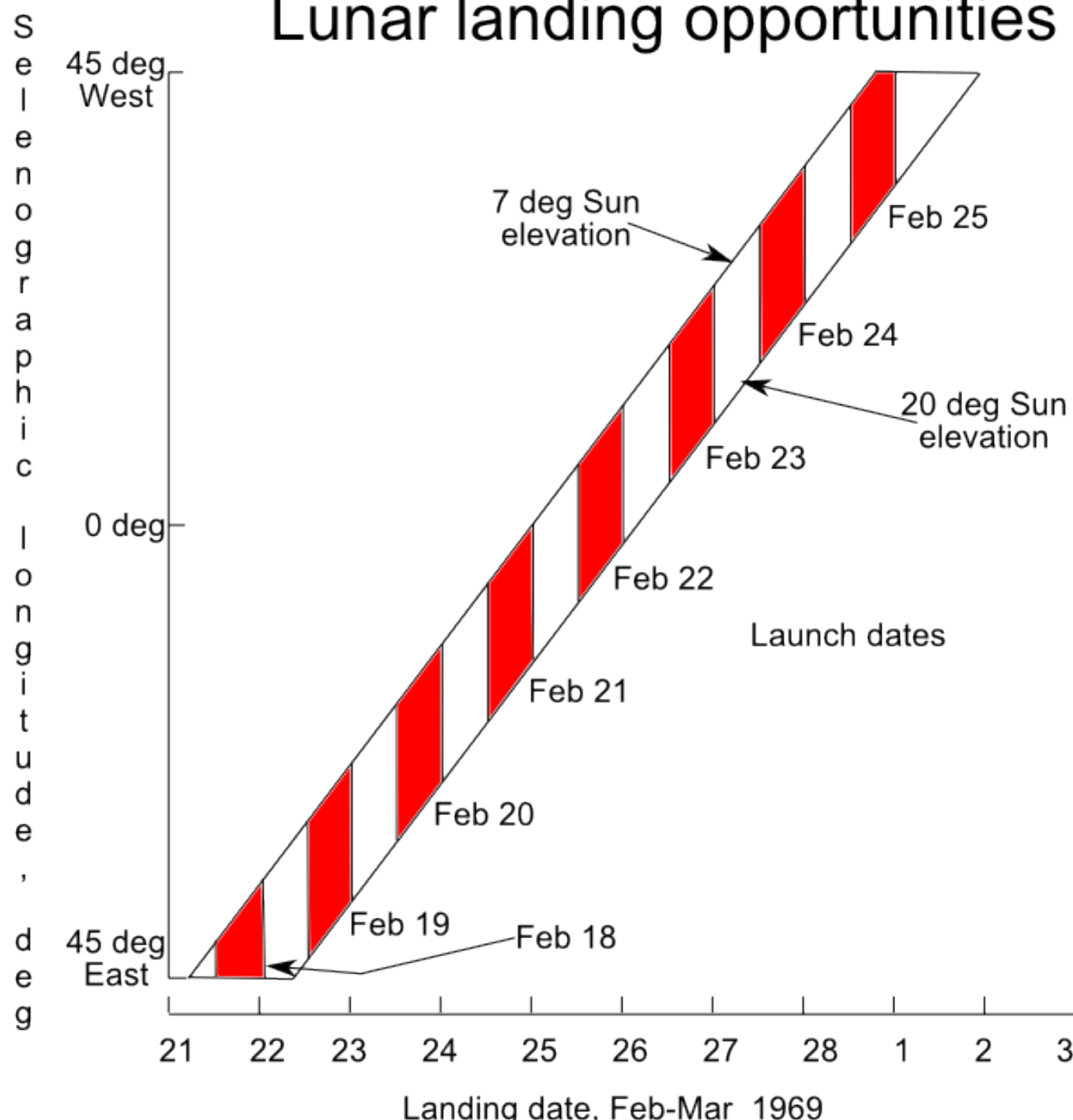
[Lunar Landing](#)

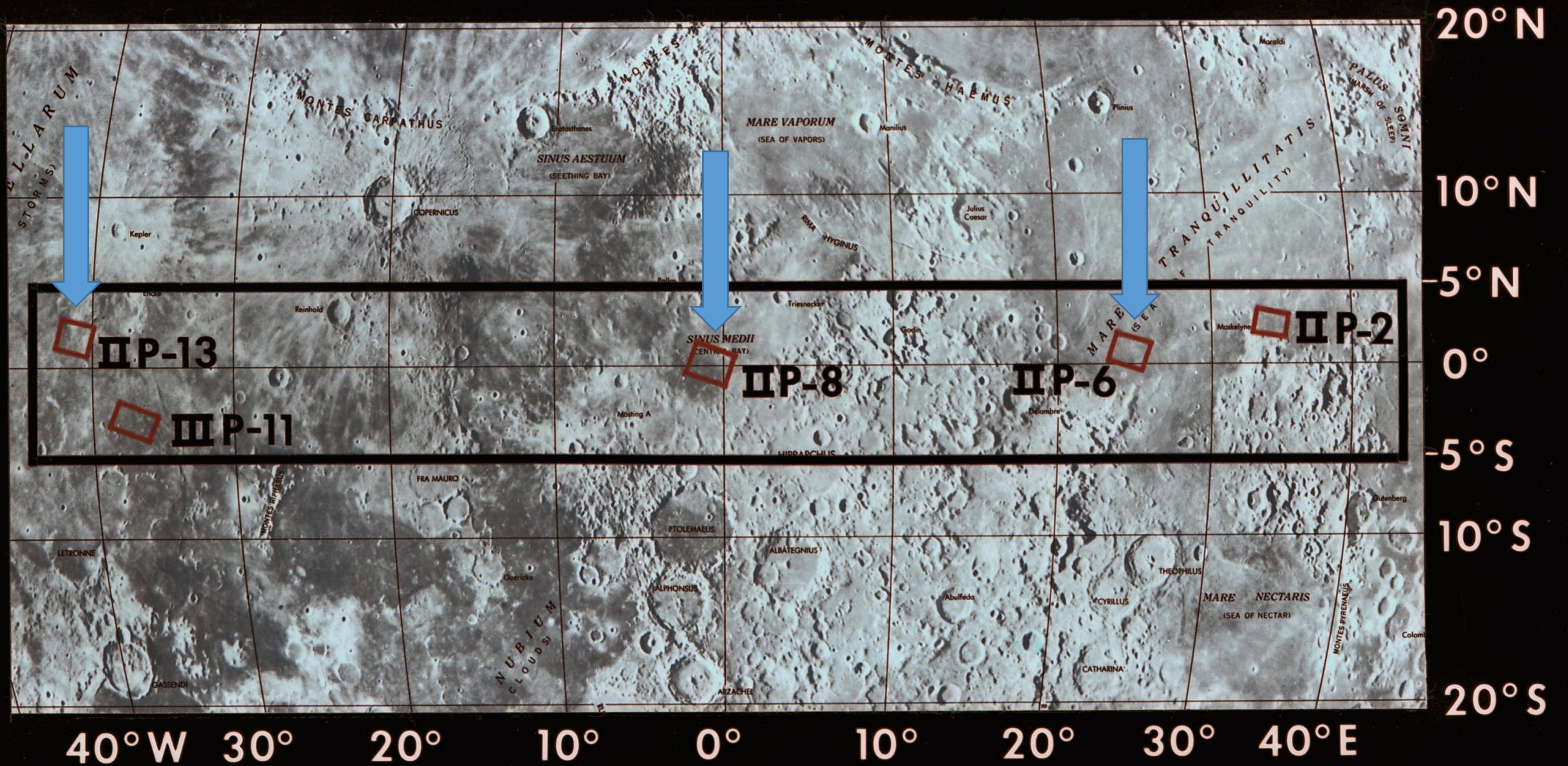
Apollo 11 Landing Site Selection Criteria

- **Smoothness:** The sites should have relatively few craters
- **Slope:** The general slope of the landing area must be less than 2 degrees
- **Approach path:** There should be no large hills, tall cliffs or deep craters which could cause incorrect altitude signals to the landing radar
- **Free-return:** The sites must be within reach of the Apollo spacecraft in the free-return trajectory
- **Fuel:** Sites near the lunar equator were selected to allow for minimizing the need for plane change maneuvers by the CSM
- **Launch delays:** Three sites were selected to allow for launch delays of up to 5 days



Lunar landing opportunities





Possible Apollo 11 Launch Dates

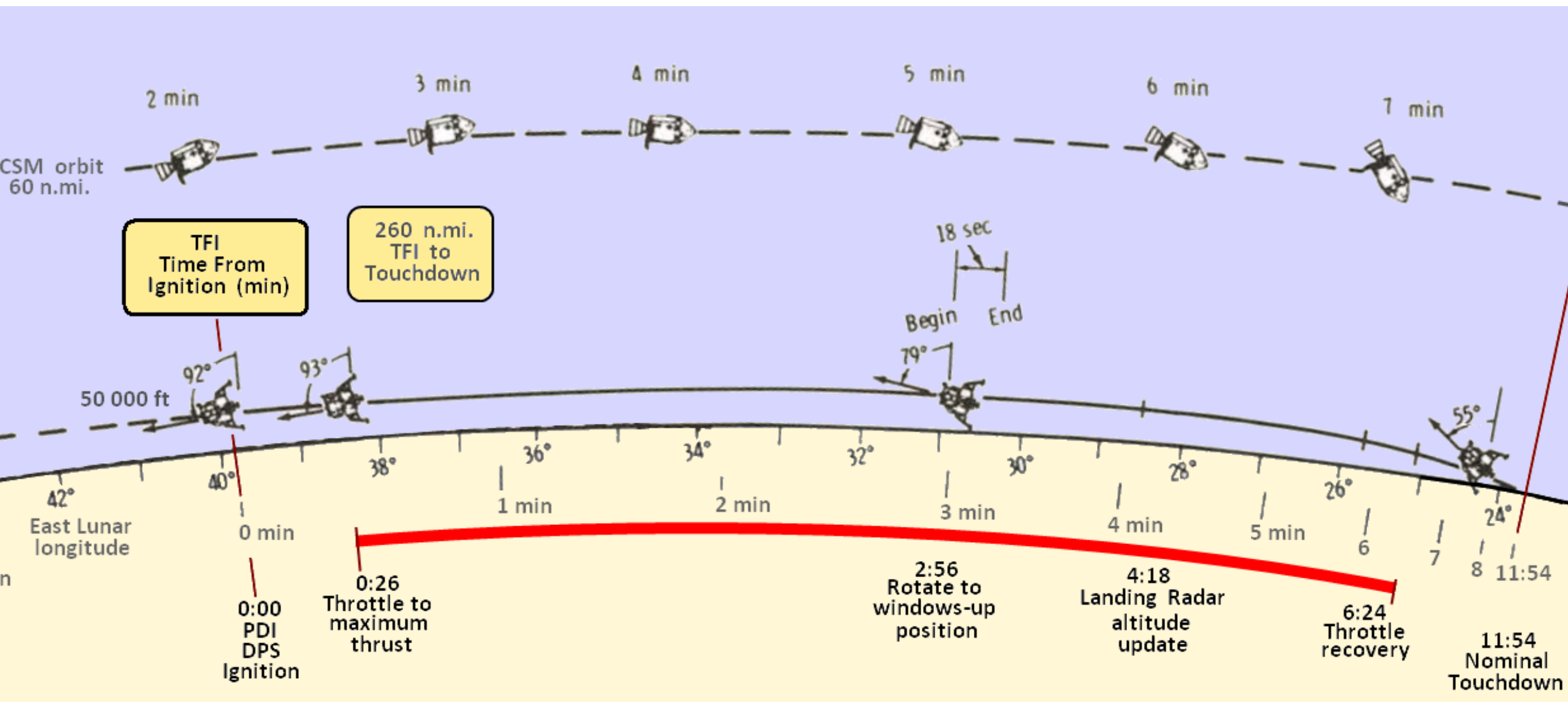
<p>JULY 16-21</p> <p>LAUNCH DATE</p> <p>LAUNCH WINDOW, E.D.T.</p> <p>SITE/PROFILE</p> <p>SUN ELEVATION ANGLE</p> <p>MISSION TIME, DAYS:HOURS</p> <p>SPS RESERVES, FPS</p>	<p>16</p> <p>9:32-13:54</p> <p>2/FR</p> <p>9.9-12.6</p> <p>8:3</p> <p>1700</p>		<p>18</p> <p>9:38-14:02</p> <p>3/FR</p> <p>8.3-11.0</p> <p>8:5</p> <p>1550</p>			<p>21</p> <p>10:09-14:39</p> <p>5/HYB</p> <p>6.3-9.0</p> <p>8:8</p> <p>1750</p>	
<p>AUGUST 14-20</p> <p>LAUNCH DATE</p> <p>LAUNCH WINDOW, E.D.T.</p> <p>SITE/PROFILE</p> <p>SUN ELEVATION ANGLE</p> <p>MISSION TIME, DAYS:HOURS</p> <p>SPS RESERVES, FPS</p>	<p>14</p> <p>7:51-12:15</p> <p>2/HYB</p> <p>6.2-8.9</p> <p>8:5</p> <p>1600</p>		<p>16</p> <p>8:04-12:31</p> <p>3/HYB</p> <p>6.2-8.9</p> <p>8:7</p> <p>1750</p>				<p>20</p> <p>10:05-14:47</p> <p>5/HYB</p> <p>9.0-12.0</p> <p>8:8</p> <p>1300</p>
<p>SEP 13-18</p> <p>LAUNCH DATE</p> <p>LAUNCH WINDOW, E.D.T.</p> <p>SITE/PROFILE</p> <p>SUN ELEVATION ANGLE</p> <p>MISSION TIME, DAYS:HOURS</p> <p>SPS RESERVES, FPS</p>	<p>13</p> <p>6:17-10:45</p> <p>2/HYB</p> <p>6.8-9.6</p> <p>8:7</p> <p>1600</p>		<p>15</p> <p>7:04-11:39</p> <p>3/HYB</p> <p>6.3-9.2</p> <p>8:8</p> <p>1500</p>			<p>18</p> <p>11:31-16:14</p> <p>5/HYB</p> <p>6.8-9.7</p> <p>8:6</p> <p>1050</p>	

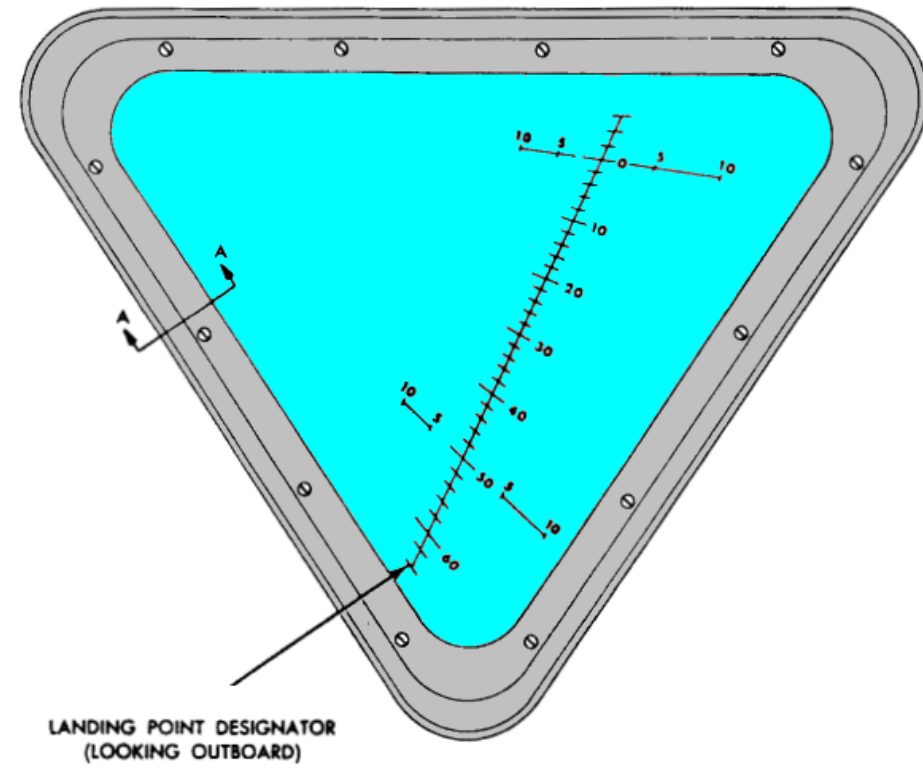
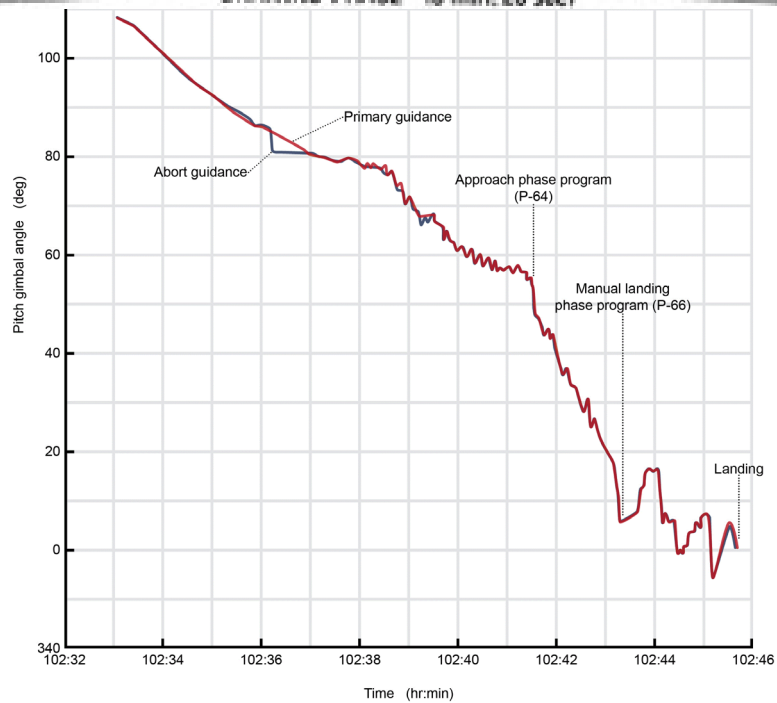
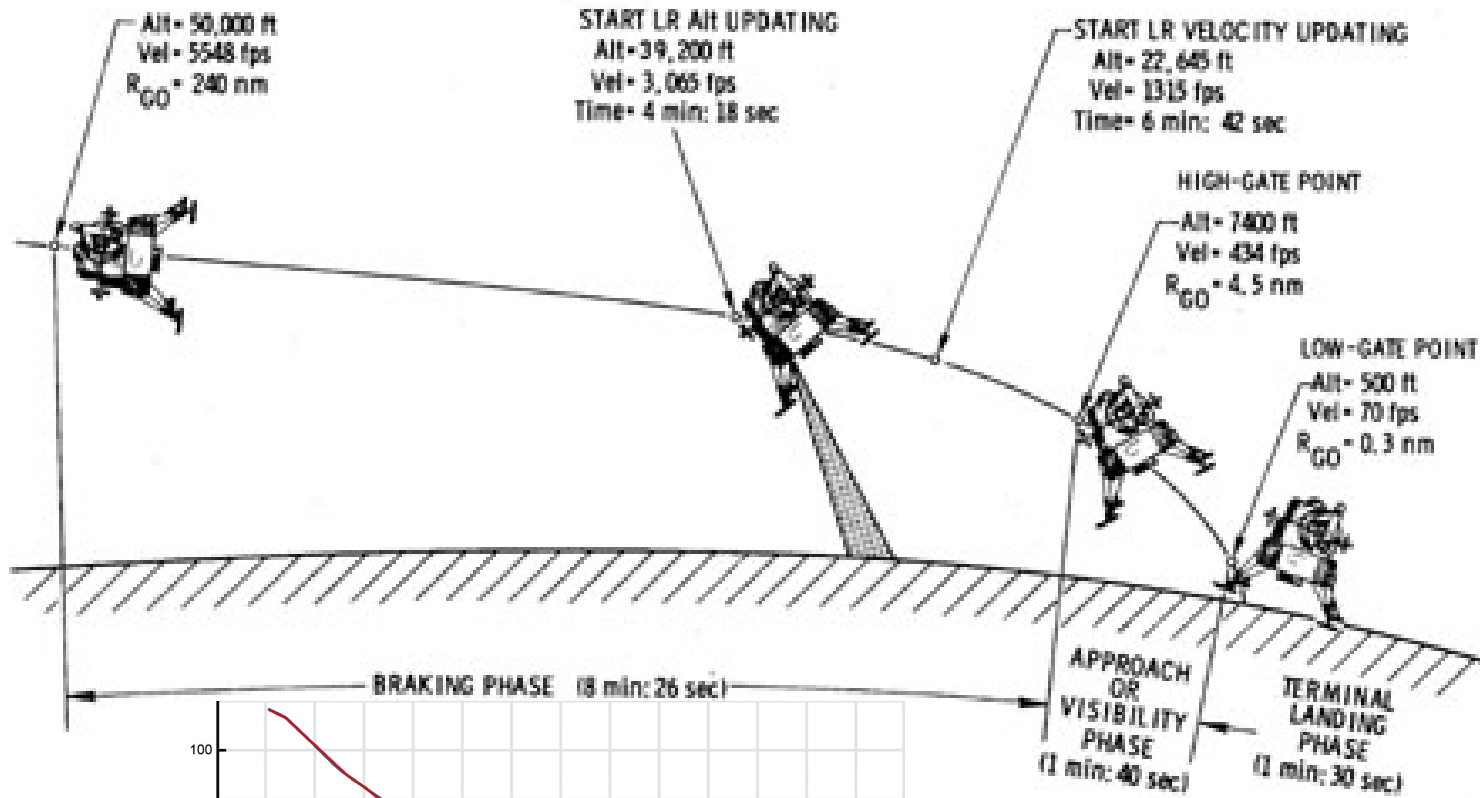


Name	Role	LLRV Flights	Required	LLTV Flights
Armstrong (Launched 7/16/69)	Apollo 11 Commander	21	All available	6
Lovell	Apollo 11 Backup Commander	None	All available	None
Borman	Unassigned	1	[Too early]	None
Anders	Unassigned	11	[Too early]	None
Conrad (Launched 11/14/69)	Apollo 12 Commander	13	11	10
Scott	Apollo 12 Backup Commander	None	22	22
Lovell (Launched 4/11/70)	Apollo 13 Commander	None	22	22
Young	Apollo 13 Backup Commander	None	22	22
Shepard (Launched 1/31/71)	Apollo 14 Commander	None	22	22
Cernan	Apollo 14 Backup Commander	None	22	22
Scott (Launched 7/26/71)	Apollo 15 Commander	None	11 or fewer	11 or fewer
Gordon	Apollo 15 Backup Commander	None	22	22
Young (Launched 4/16/72)	Apollo 16 Commander	None	11 or fewer	11 or fewer
Haise	Apollo 16 Backup Commander	None	22	22
Cernan (Launched 12/7/72)	Apollo 17 Commander	None	11 or fewer	11 or fewer
Young	Apollo 17 Backup Commander	None	11 or fewer	11 or fewer

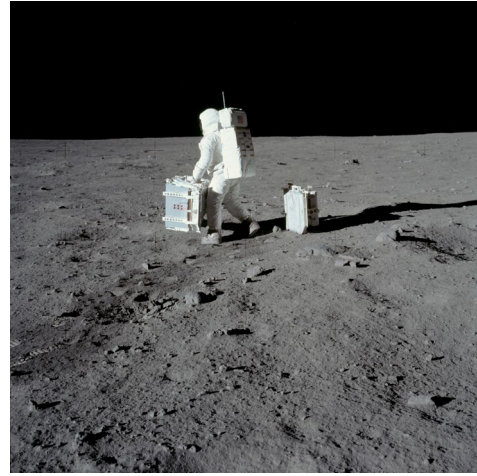
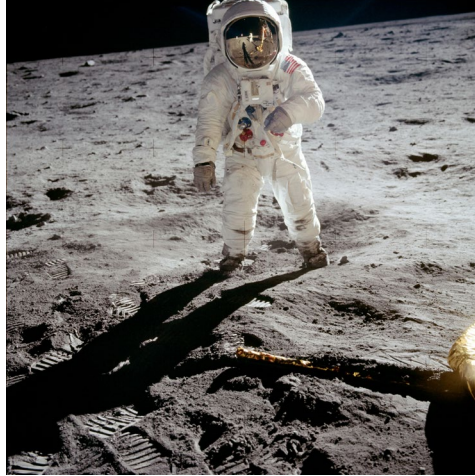
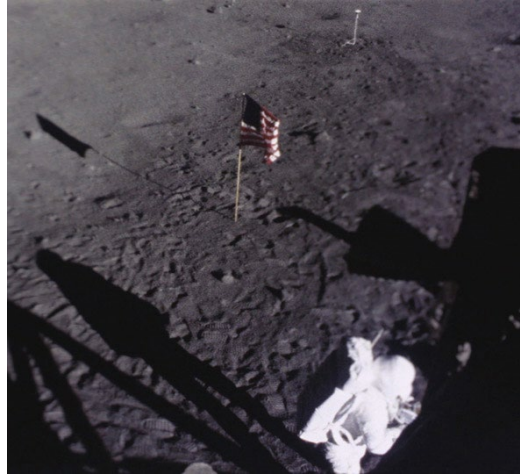
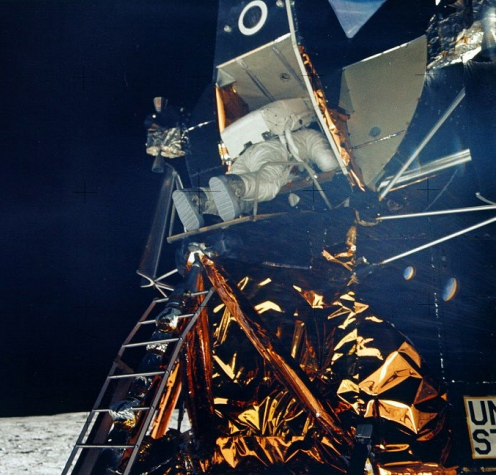
Decision Points

- Launch
- Translunar Injection
- Lunar Orbit Insertion
- Lunar orbit circularization (LOI-2)
- Descent Orbit Insertion
- Powered Descent Initiation
- Post-landing lunar stay
- EVA
- Continued lunar orbit operations after docking

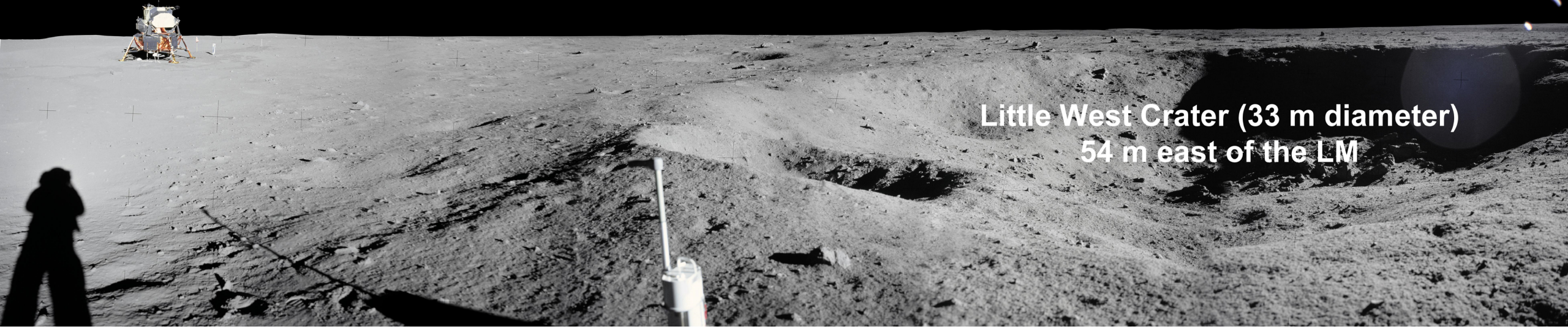




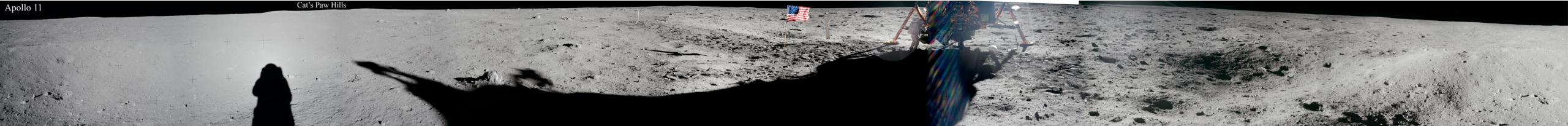
[3D Visualization](#)

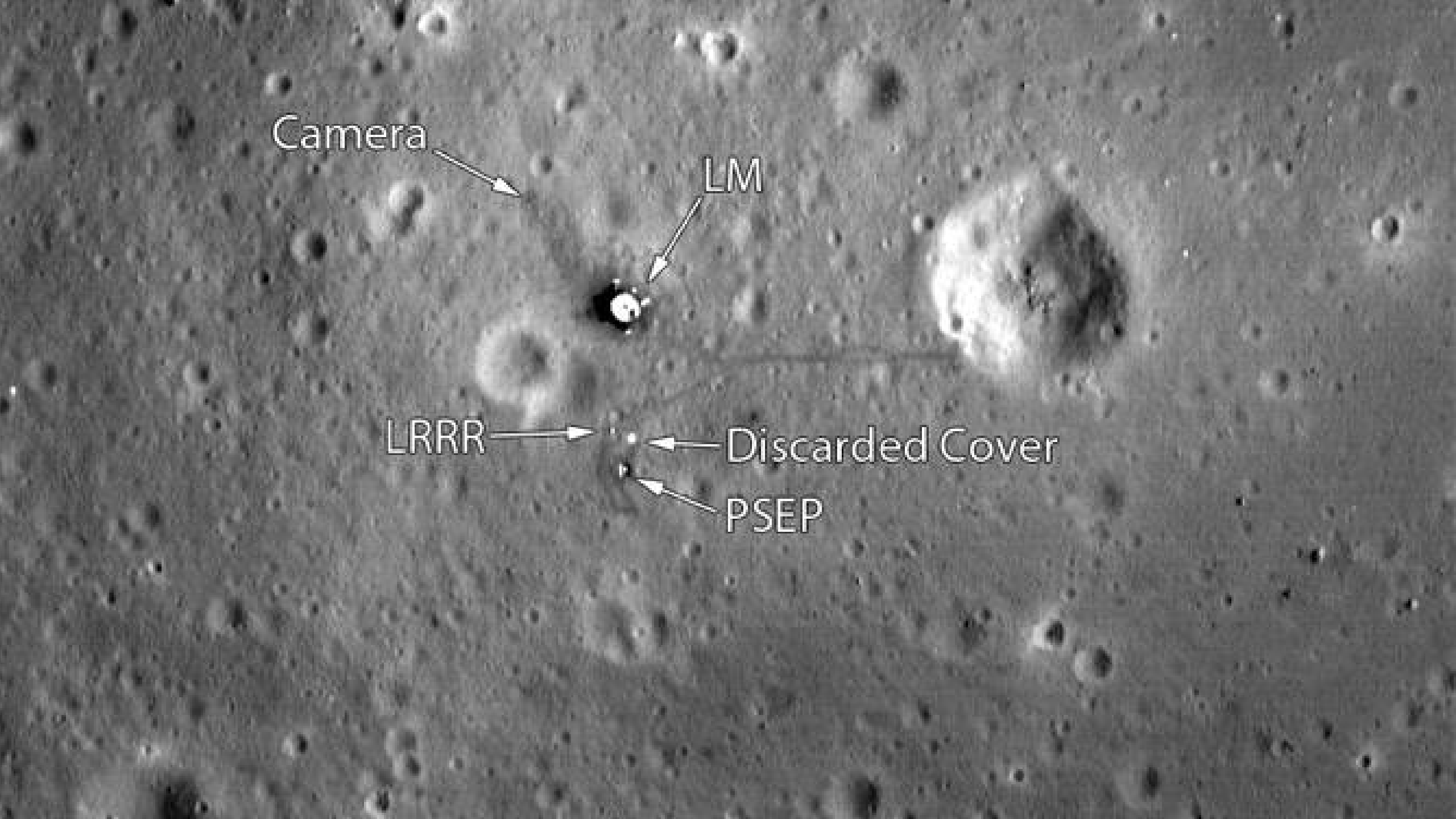


Apollo 11 Station 5



Little West Crater (33 m diameter)
54 m east of the LM





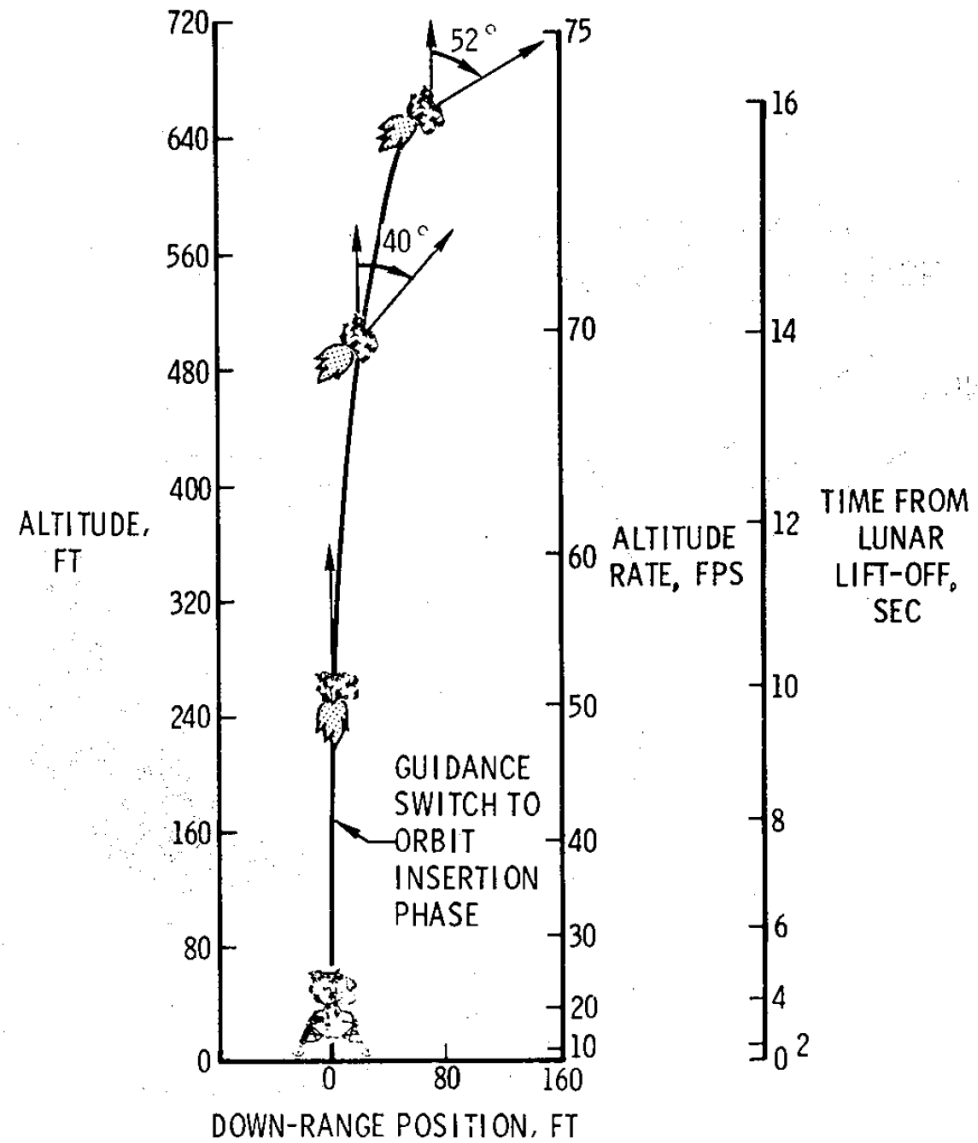
Camera

LM

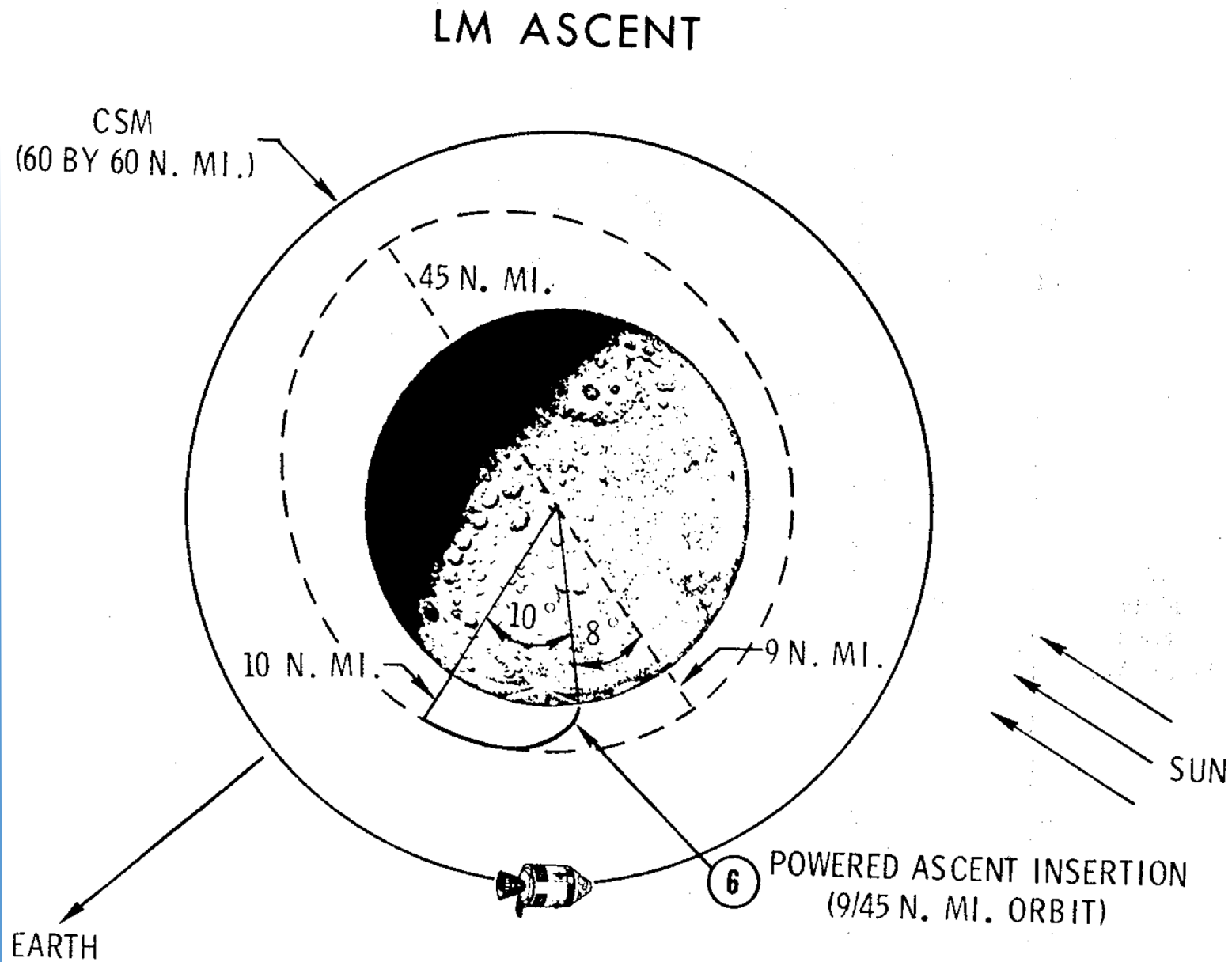
LRRR

Discarded Cover

PSEP



VERTICAL RISE PHASE





Discussion Groups

- **Chaikin Chapter 5 (“The First Lunar Landing”)**
 - **The astronauts’ view of Apollo 11**
- Cox Chapter 24 (“We ... We’re Go on That Flight!”)
 - Mission control’s view of Apollo 11
- Harland Chapter 2 (“Magnificent Desolation”)
 - The first moonwalk
- Glenn lecture video (“40th Anniversary of Apollo 11”)
 - The three Apollo 11 astronauts tell their story 40 years later

Apollo 12 Readings

- **Chaikin Chapter 6 (“Sailors on the Ocean of Storms”)**
 - A telling of the astronaut’s view of Apollo 12
- Apollo 12 Mission Report Chapter 9 (“Pilots’ Report”)
 - The astronaut’s actual view of Apollo 12
- Cox Chapter 26 (“I Think We Need to do a Little More All-Weather Testing”)
 - A view of Apollo 12 from mission control
- From the Earth to the Moon Episode 7 (“That’s All There Is”)
 - An dramatization of a mission that largely lacked video