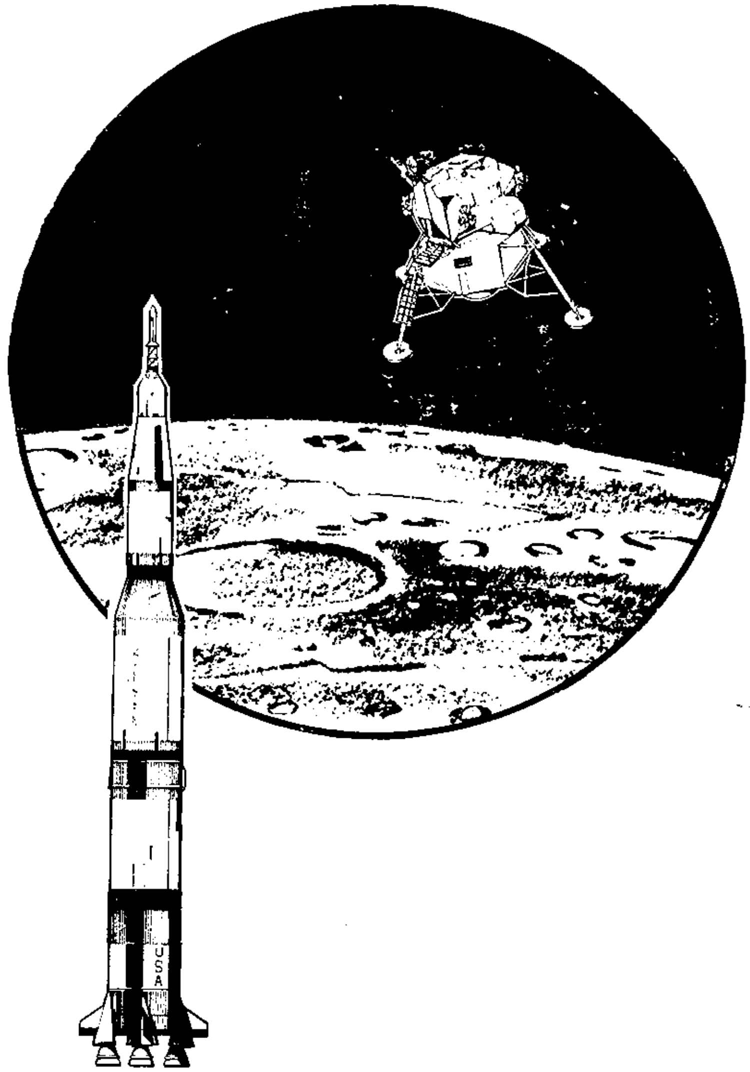
80-24

PRESS KIT



APOLLO 11
LUNAR LANDING MISSION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

TELS. WO 2-4155
WO 3-6925

FOR RELEASE: SUNDAY
July 6, 1969

RELEASE NO: 69-83K

PROJECT: APOLLO 11
(To be launched no earlier than July 16)

contents

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6/26/69

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NEWS
NASA
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WASHINGTON, D.C. 20546
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WO 3-6925

FOR RELEASE: SUNDAY
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APOLLO 11

The United States will launch a three-man spacecraft toward the Moon on July 16 with the goal of landing two astronaut-explorers on the lunar surface four days later.

If the mission--called Apollo 11--is successful, man will accomplish his long-time dream of walking on another celestial body.

The first astronaut on the Moon's surface will be 38-year-old Neil A. Armstrong of Wapakoneta, Ohio, and his initial act will be to unveil a plaque whose message symbolizes the nature of the journey.

Affixed to the leg of the lunar landing vehicle, the plaque is signed by President Nixon, Armstrong and his Apollo 11 companions, Michael Collins and Edwin E. Aldrin, Jr.

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It bears a map of the Earth and this inscription:

HERE MEN FROM THE PLANET EARTH

FIRST SET FOOT UPON THE MOON

JULY 1969 A.D.

WE CAME IN PEACE FOR ALL MANKIND

The plaque is fastened to the descent stage of the lunar module and thus becomes a permanent artifact on the lunar surface.

Later Armstrong and Aldrin will emplant an American flag on the surface of the Moon.

The Apollo 11 crew will also carry to the Moon and return two large American flags, flags of the 50 states, District of Columbia and U.S. Territories, flags of other nations and that of the United Nations Organization.

During their 22-hour stay on the lunar surface, Armstrong and Aldrin will spend up to 2 hours and 40 minutes outside the lunar module, also gathering samples of lunar surface material and deploying scientific experiments which will transmit back to Earth valuable data on the lunar environment.

Apollo 11 is scheduled for launch at 9:32 a.m. EDT July 16 from the National Aeronautics and Space Administration's Kennedy Space Center Launch Complex 39-A. The mission will be the fifth manned Apollo flight and the third to the Moon.

The prime mission objective of Apollo 11 is stated simply: "Perform a manned lunar landing and return". Successful fulfillment of this objective will meet a national goal of this decade, as set by President Kennedy May 25, 1961.

Apollo 11 Commander Armstrong and Command Module Pilot Collins 38, and Lunar Module Pilot Aldrin, 39, will each be making his second space flight. Armstrong was Gemini 8 commander, and backup Apollo 8 commander; Collins was Gemini 10 pilot and was command module pilot on the Apollo 8 crew until spinal surgery forced him to leave the crew for recuperation; and Aldrin was Gemini 12 pilot and Apollo 8 backup lunar module pilot. Armstrong is a civilian, Collins a USAF lieutenant colonel and Aldrin a USAF colonel.

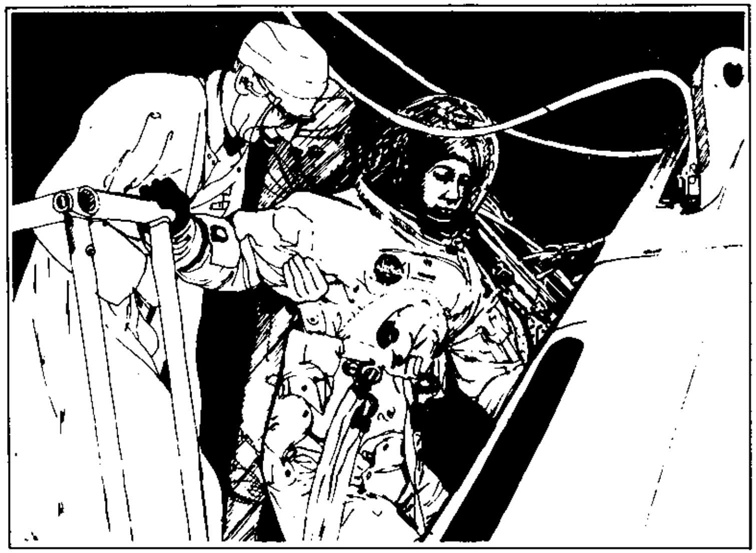
Apollo 11 backup crewmen are Commander James A. Lovell, Command Module Pilot William A. Anders, both of whom were on the Apollo 8 first lunar orbit mission crew, and Lunar Module Pilot Fred W. Haise.

The backup crew functions in three significant categories. They help the prime crew with mission preparation and hardware checkout activities. They receive nearly complete mission training which becomes a valuable foundation for later assignment as a prime crew and finally, should the prime crew become unavailable, they are prepared to fly as prime crew on schedule up until the last few weeks at which time full duplicate training becomes too costly and time consuming to be practical.

Apollo 11, after launch from Launch Complex 39-A, will begin the three-day voyage to the Moon about two and a half hours after the spacecraft is inserted into a 100-nautical mile circular Earth parking orbit. The Saturn V launch vehicle third stage will restart to inject Apollo 11 into a translunar trajectory as the vehicle passes over the Pacific midway through the second Earth parking orbit.

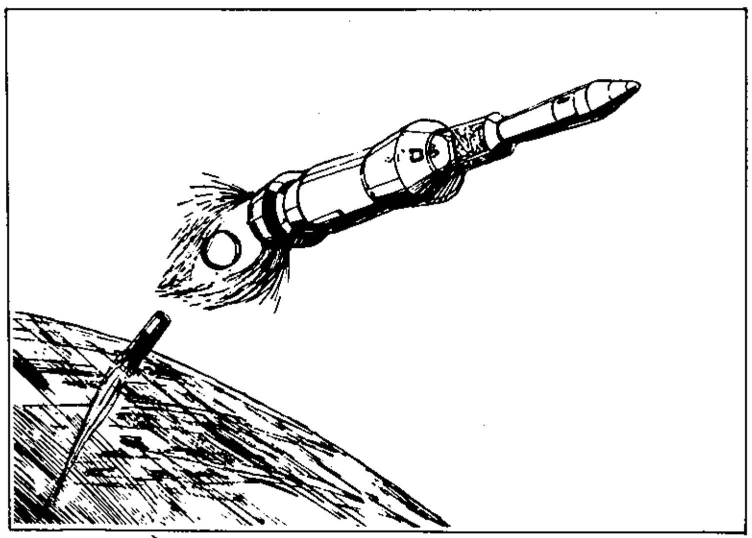
The "go" for translunar injection will follow a complete checkout of the space vehicle's readiness to be committed for injection. About a half hour after translunar injection (TLI), the command/service module will separate from the Saturn third stage, turn around and dock with the lunar module nested in the spacecraft LM adapter. Spring-loaded lunar module holddowns will be released to eject the docked spacecraft from the adapter.

APOLLO 11 —— Launch And Translunar Injection

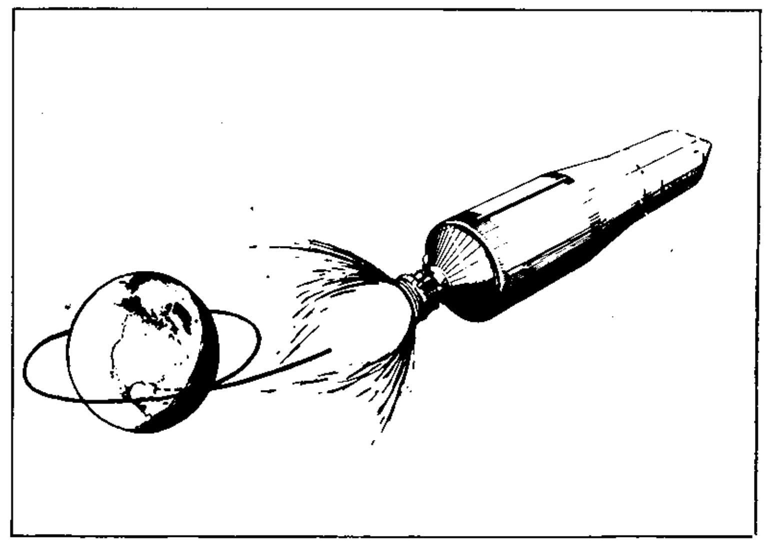


Astronaut Insertion

Check Of Systems



Saturn Staging



Translunar Injection

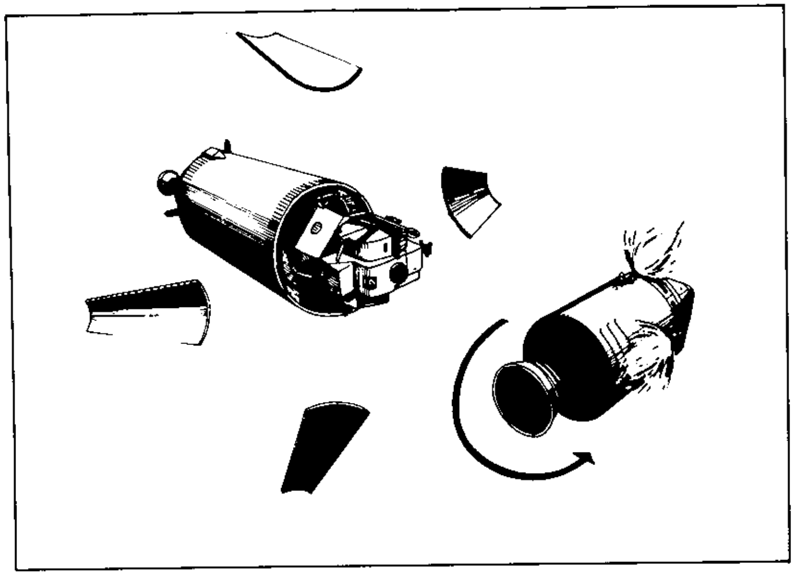
Later, leftover liquid propellant in the Saturn third stage will be vented through the engine bell to place the stage into a "slingshot" trajectory to miss the Moon and go into solar orbit.

During the translunar coast, Apollo 11 will be in the passive thermal control mode in which the spacecraft rotates slowly about one of its axes to stabilize thermal response to solar heating. Four midcourse correction maneuvers are possible during translunar coast and will be planned in real time to adjust the trajectory.

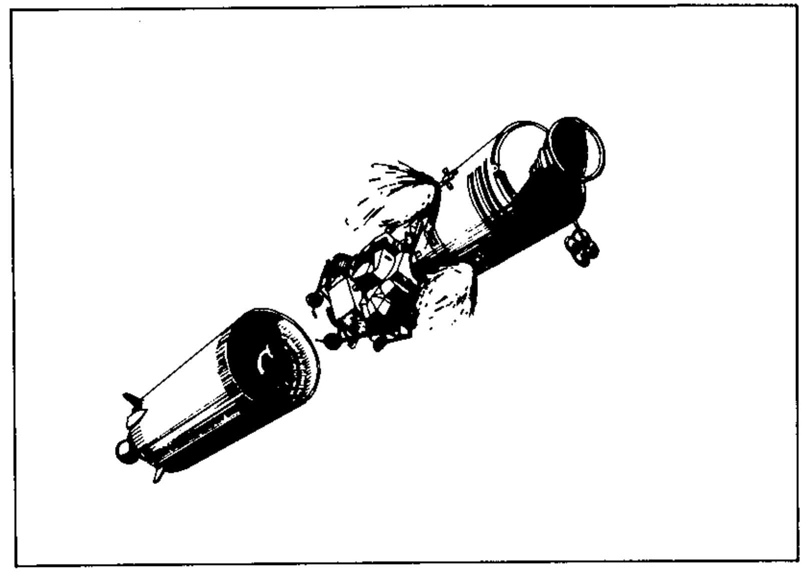
Apollo 11 will first be inserted into a 60-by-170-nautical mile elliptical lunar orbit, which two revolutions later will be adjusted to a near-circular 54 x 66 nm. Both lunar orbit insertion burns (LOI), using the spacecraft's 20,500-pound-thrust service propulsion system, will be made when Apollo 11 is behind the Moon and out of "sight" of Manned Space Flight Network stations.

Some 21 hours after entering lunar orbit, Armstrong and Aldrin will man and check out the lunar module for the descent to the surface. The LM descent propulsion system will place the LM in an elliptical orbit with a pericynthion, or low point above the Moon, of 50,000 feet, from which the actual descent and touchdown will be made.

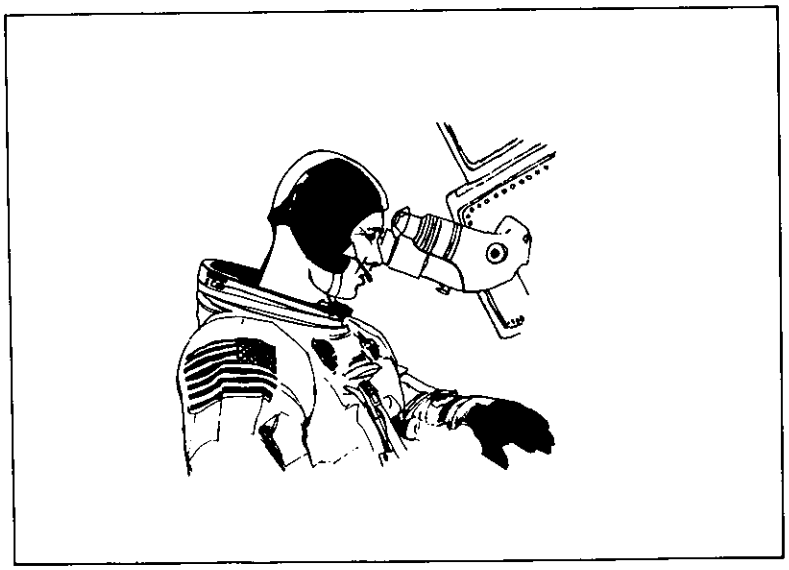
APOLLO 11 — Translunar Flight



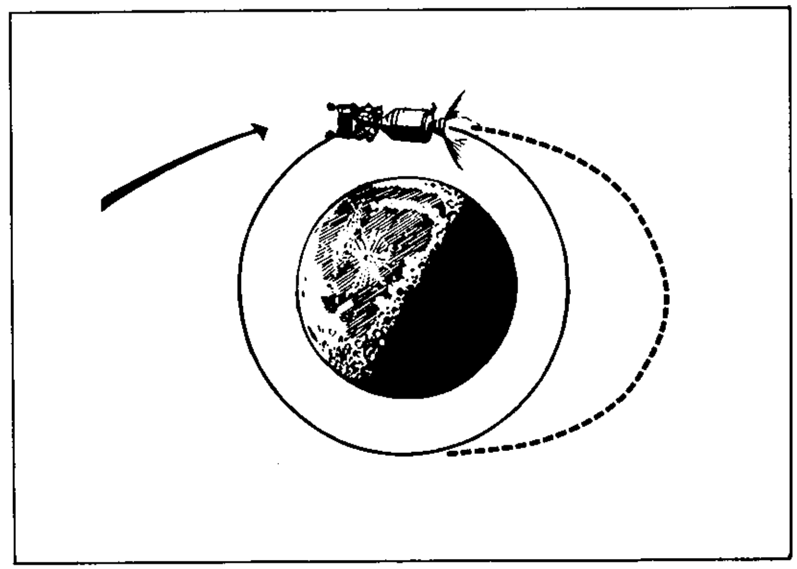
Transposition Maneuver



Extraction Of Lunar Module



Navigation Check



Lunar Orbit Insertion

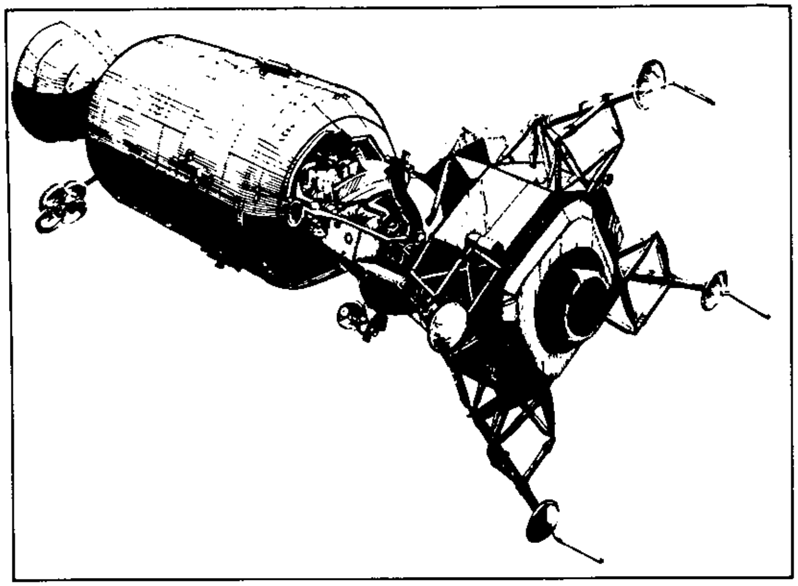
After touchdown, the landing crew will first ready the lunar module for immediate ascent and then take a brief rest before depressurizing the cabin for two-man EVA about 10 hours after touchdown. Armstrong will step onto the lunar surface first, followed by Aldrin some 40 minutes later.

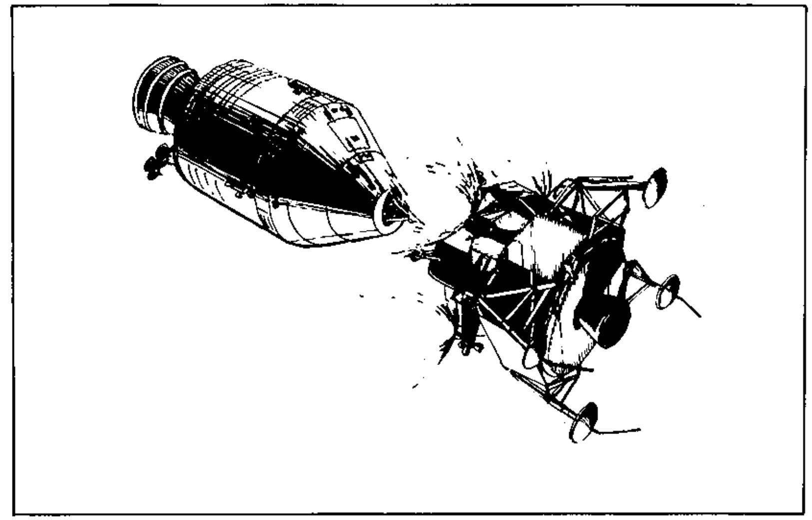
During their two hours and 40 minutes on the surface, Armstrong and Aldrin will gather geologic samples for return to Earth in sealed sample return containers and set up two scientific experiments for returning Moon data to Earth long after the mission is complete.

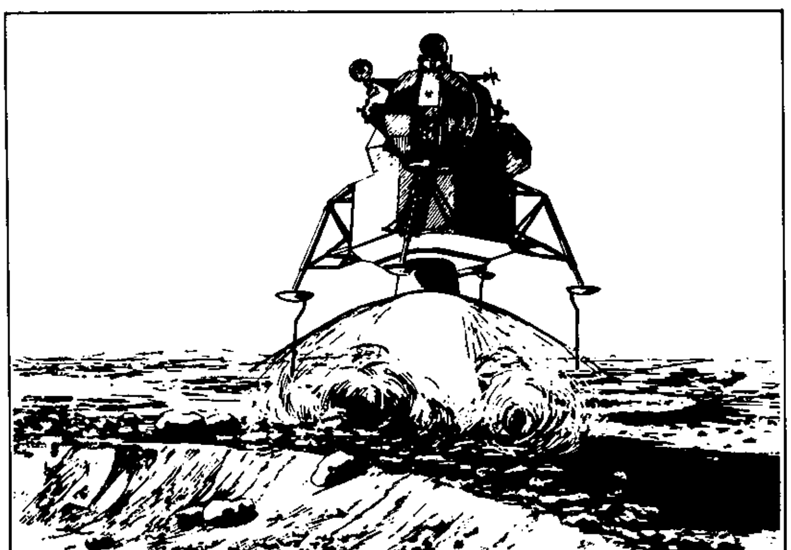
One experiment measures moonquakes and meteoroid impacts on the lunar surface, while the other experiment is a sophisticated reflector that will mirror laser beams back to points on Earth to aid in expanding scientific knowledge both of this planet and of the Moon.

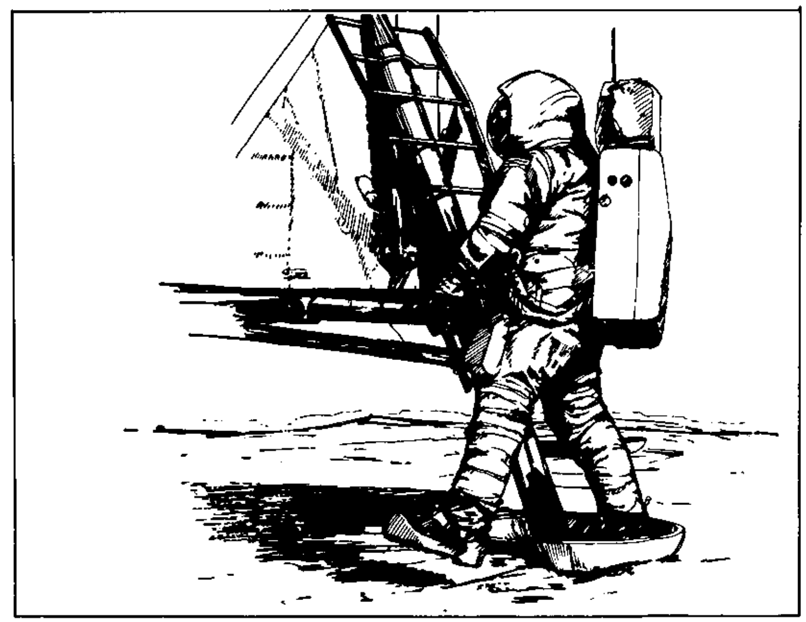
The lunar module's descent stage will serve as a launching pad for the crew cabin as the 3,500-pound-thrust ascent engine propels the LM ascent stage back into lunar orbit for rendezvous with Collins in the command/service module--orbiting 60 miles above the Moon.

APOLLO 11 — Descent To Lunar Surface

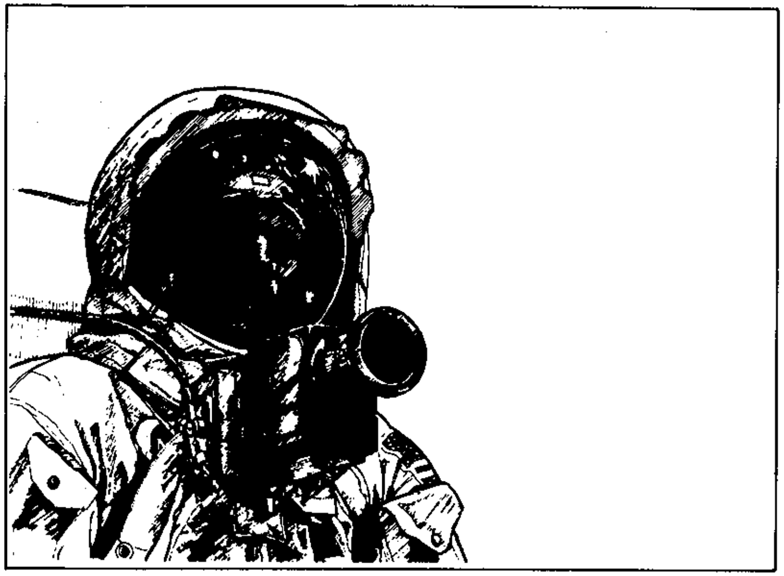

Transfer To LM


Separation Of LM From CSM

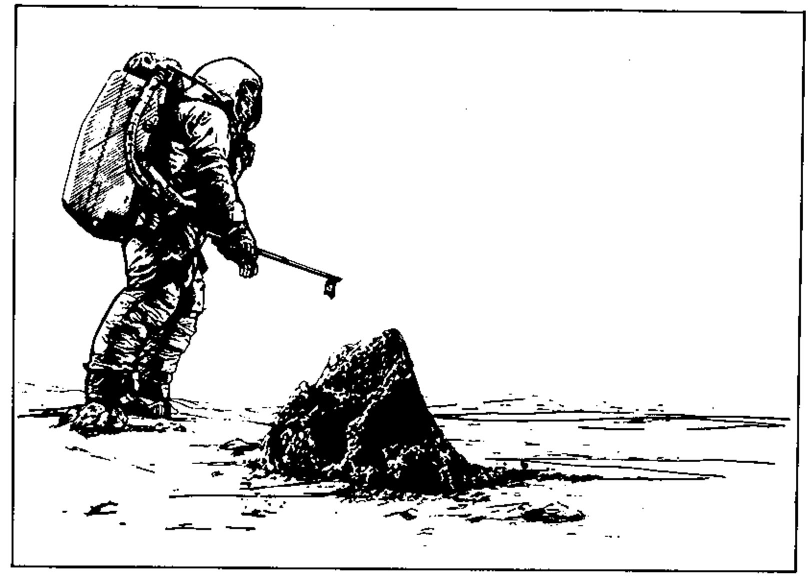

Landing On Moon


First Step On Moon

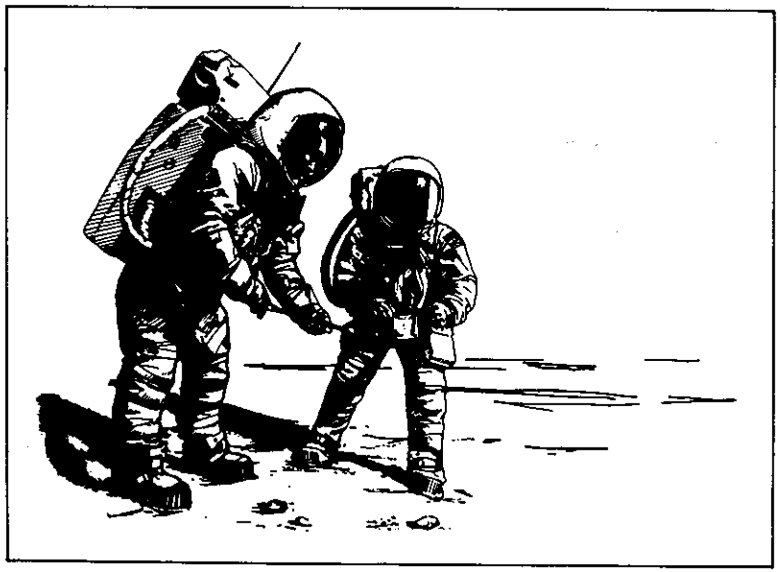
APOLLO 11 — Lunar Surface Activities



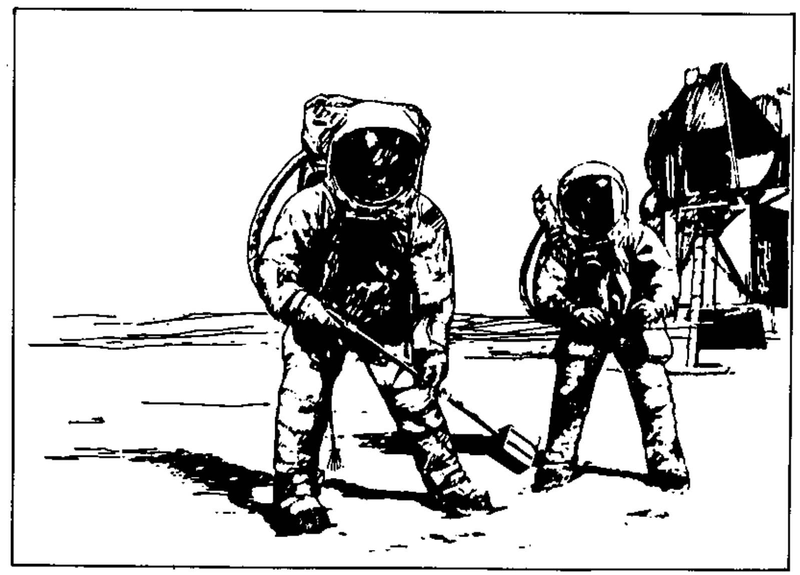
Commander On Moon



Contingency Sample

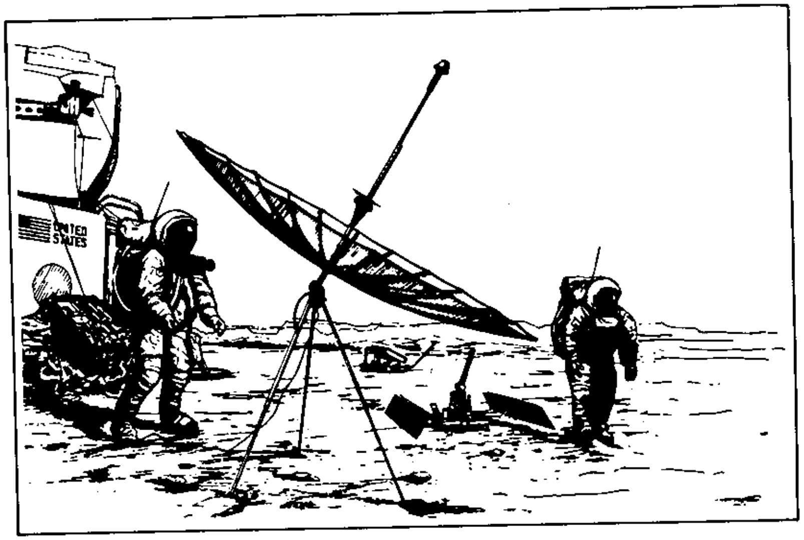


Documented Sample Collection



Sample Collecting

APOLLO 11 —— Lunar Surface Activities



Experiment Placements

TV Camera

Alignment Of Passive Seismometer

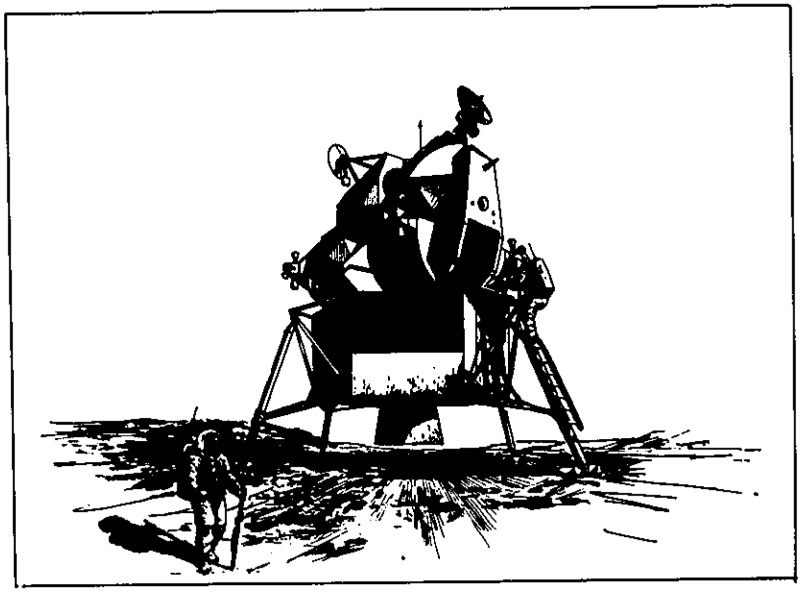
Bulk Sample Collection

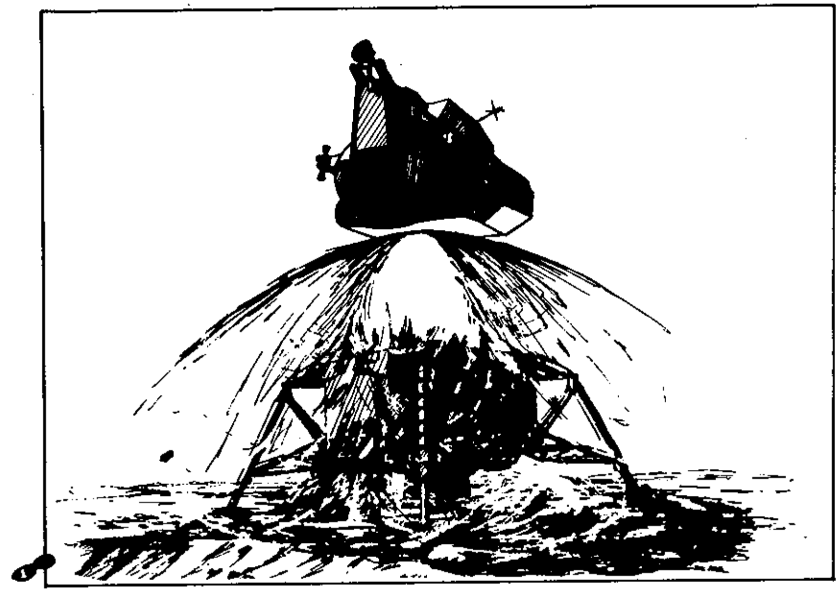
Four basic maneuvers, all performed by the LM crew using the spacecraft's small maneuvering and attitude thrusters, will bring the LM and the command module together for docking about three and a half hours after liftoff from the Moon.

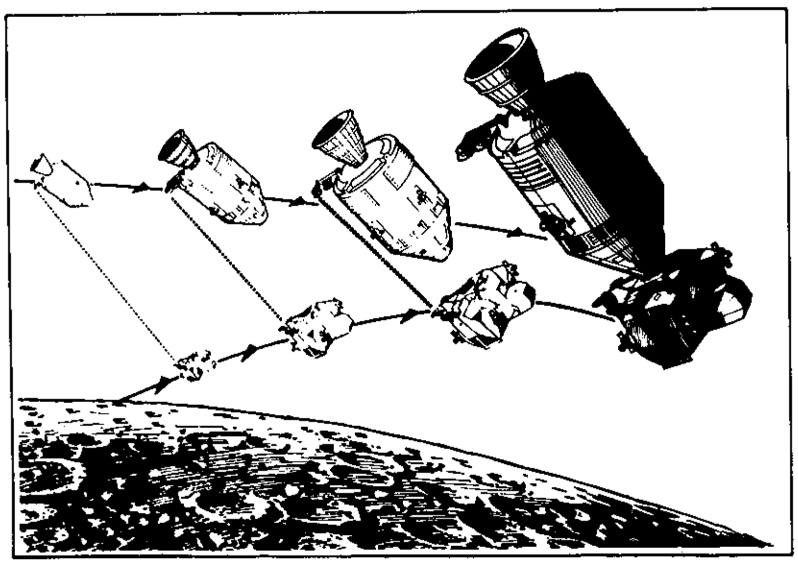
The boost out of lunar orbit for the return journey is planned for about 135 hours after Earth liftoff and after the LM ascent stage has been jettisoned and lunar samples and film stowed aboard the command module. An optional plan provides for a 12-hour delay in the transearth injection burn to allow the crew more rest after a long hard day's work on the lunar surface and flying the rendezvous. The total mission time to splashdown would remain about the same, since the transearth injection burn would impart a higher velocity to bring the spacecraft back to the mid-Pacific recovery line at about the same time.

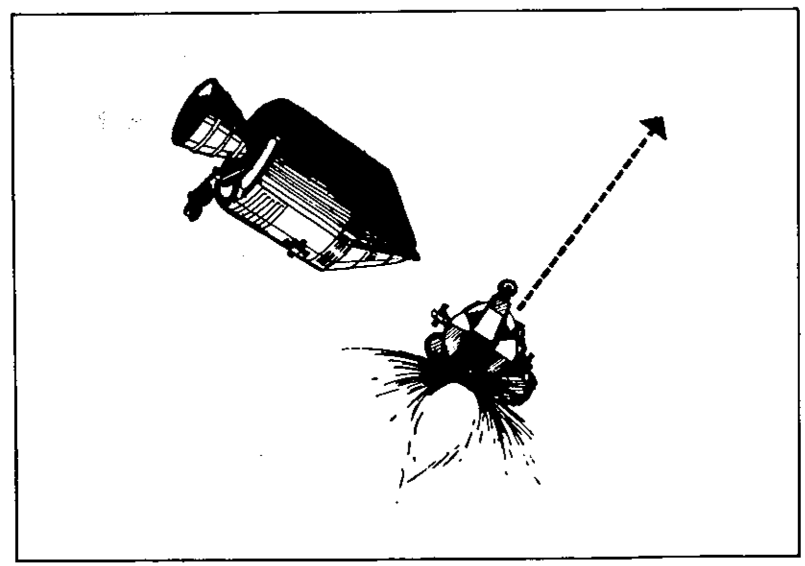
The rendezvous sequence to be flown on Apollo 11 has twice been flown with the Apollo spacecraft---once in Earth orbit on Apollo 9 and once in lunar orbit with Apollo 10. The Apollo 10 mission duplicated, except for the actual landing, all aspects of the Apollo 11 timeline.

APOLLO 11 —— Lunar Ascent And Rendezvous

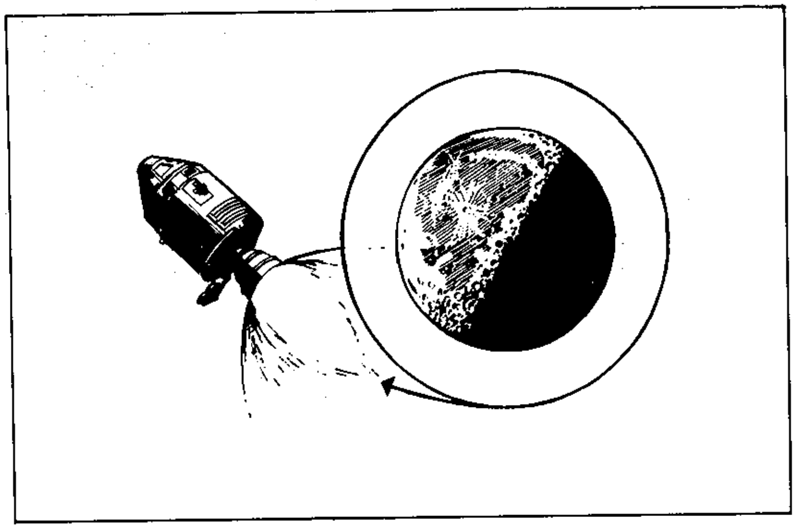

Return To Spacecraft


Ascent Stage Launch

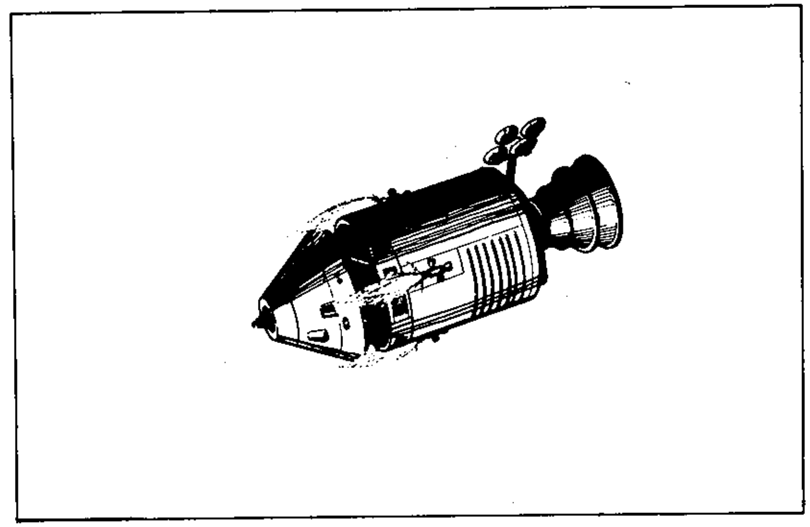

Rendezvous And Docking


LM Jettison

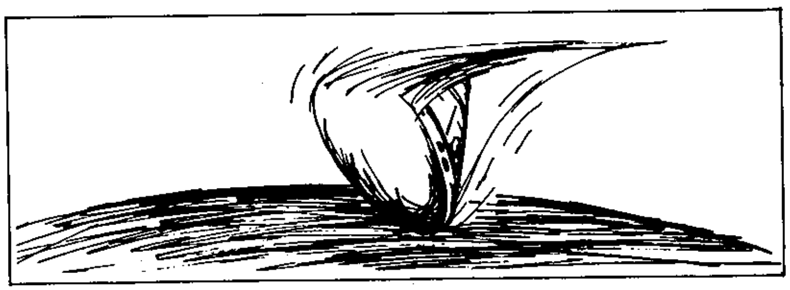
APOLLO 11 —— Transearth Injection And Recovery



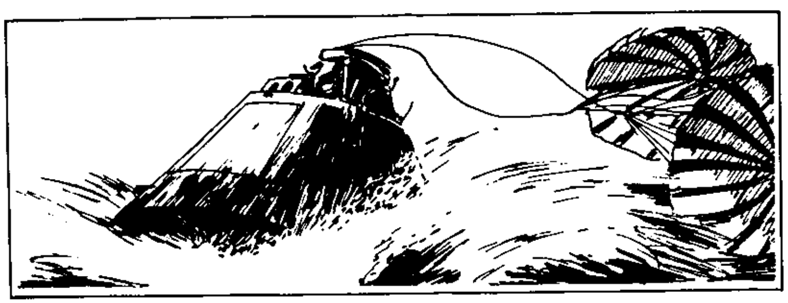
Transearth Injection



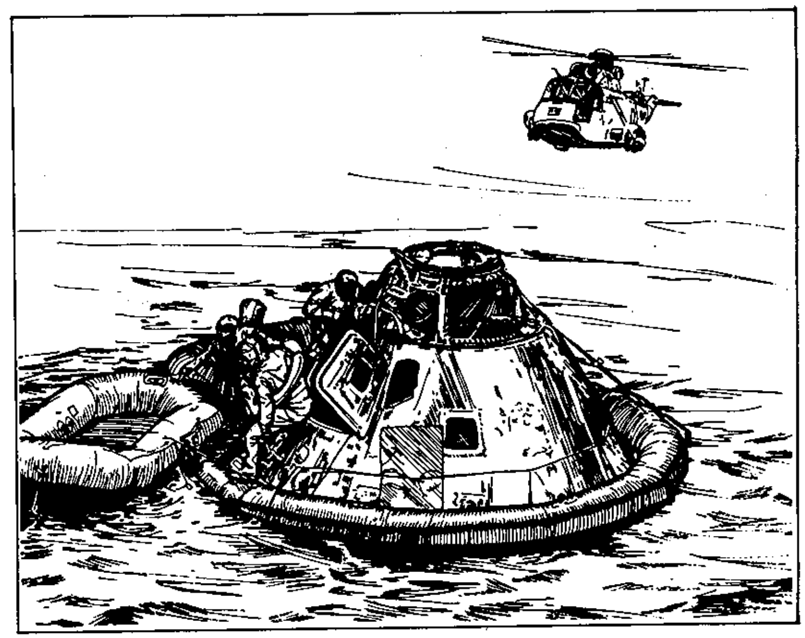
CM/SM Separation



Reentry



Splashdown



Recovery

During the transearth coast period, Apollo 11 will again control solar heat loads by using the passive thermal control "barbeque" technique. Three transearth midcourse corrections are possible and will be planned in real time to adjust the Earth entry corridor.

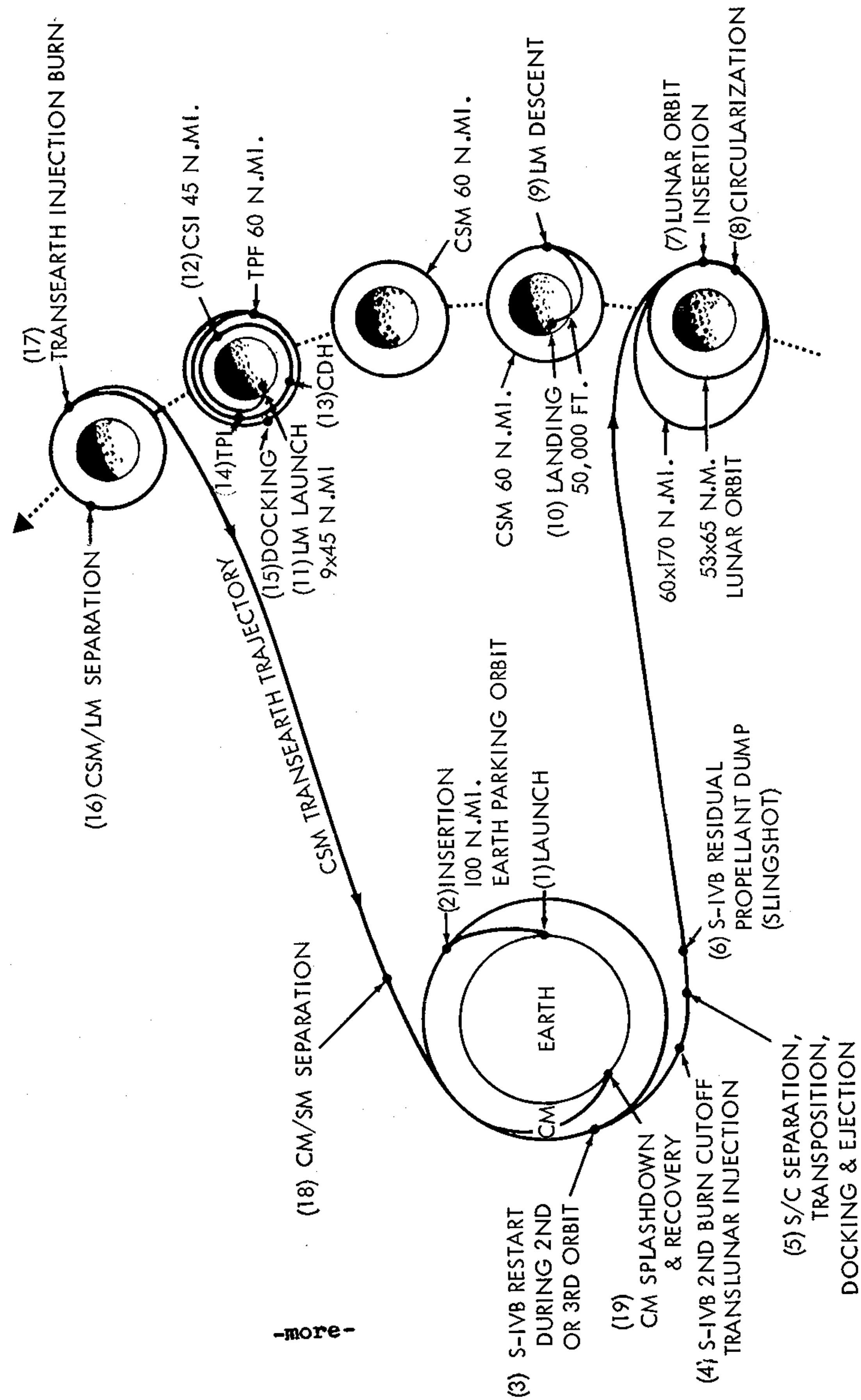
Apollo 11 will enter the Earth's atmosphere (400,000 feet) at 195 hours and five minutes after launch at 36,194 feet per second. Command module touchdown will be 1285 nautical miles downrange from entry at 10.6 degrees north latitude by 172.4 west longitude at 195 hours, 19 minutes after Earth launch 12:46 p.m. EDT July 24. The touchdown point is about 1040 nautical miles southwest of Honolulu, Hawaii.

(END OF GENERAL RELEASE; BACKGROUND INFORMATION FOLLOWS)

Official Apollo 11 Insignia

This photograph not for release
before Saturday, July 5, 1969

FLIGHT PROFILE



APOLLO 11 COUNTDOWN

The clock for the Apollo 11 countdown will start at T-28 hours, with a six-hour built-in-hold planned at T-9 hours, prior to launch vehicle propellant loading.

The countdown is preceded by a pre-count operation that begins some 5 days before launch. During this period the tasks include mechanical buildup of both the command/service module and LM, fuel cell activation and servicing and loading of the super critical helium aboard the LM descent stage.

Following are some of the highlights of the final count:

T-28 hrs.	Official countdown starts
T-27 hrs. 30 mins.	Install launch vehicle flight batteries (to 23 hrs. 30 mins.) LM stowage and cabin closeout (to 15 hrs.)
T-21 hrs.	Top off LM super critical helium (to 19 hrs.)
T-16 hrs.	Launch vehicle range safety checks (to 15 hrs.)
T-11 hrs. 30 mins.	Install launch vehicle destruct devices (to 10 hrs. 45 mins.) Command/service module pre-ingress operations
T-10 hrs.	Start mobile service structure move to park site
T-9 hrs.	Start six hour built-in-hold
T-9 hrs. counting	Clear blast area for propellant loading
T-8 hrs. 30 mins.	Astronaut backup crew to spacecraft for prelaunch checks
T-8 hrs. 15 mins.	Launch Vehicle propellant loading, three stages (liquid oxygen in first stage) liquid oxygen and liquid hydrogen in second, third stages. Continues thru T-3 hrs. 38 mins.

T-5 hrs. 17 mins.	Flight crew alerted
T-5 hrs. 02 mins.	Medical examination
T-4 hrs. 32 mins.	Breakfast
T-3 hrs. 57 mins.	Don space suits
T-3 hrs. 07 mins.	Depart Manned Spacecraft Operations Building for LC-39 via crew transfer van
T-2 hrs. 55 mins.	Arrive at LC-39
T-2 hrs. 40 mins.	Start flight crew ingress
T-1 hr. 55 mins.	Mission Control Center-Houston/spacecraft command checks
T-1 hr. 50 mins.	Abort advisory system checks
T-1 hr. 46 mins.	Space vehicle Emergency Detection System (EDS) test
T-43 mins.	Retrack Apollo access arm to standby position (12 degrees)
T-42 mins.	Arm launch escape system
T-40 mins.	Final launch vehicle range safety checks (to 35 mins.)
T-30 mins.	Launch vehicle power transfer test
	LM switch over to internal power
T-20 mins. to T-10 mins.	Shutdown LM operational instrumentation
T-15 mins.	Spacecraft to internal power
T-6 mins.	Space vehicle final status checks
T-5 mins. 30 sec.	Arm destruct system
T-5 mins.	Apollo access arm fully retracted
T-3 mins. 10 sec.	Initiate firing command (automatic sequencer)
T-50 sec.	Launch vehicle transfer to internal power

T-8.9 sec.	Ignition sequence start
T-2 sec.	All engines running
T-0	Liftoff

*Note: Some changes in the above countdown are possible as a result of experience gained in the Countdown Demonstration Test (CDDT) which occurs about 10 days before launch.

-more-

LAUNCH EVENTS

Time			Event	Altitude	Velocity	Range
Hrs	Min	Sec		Feet	Ft/Sec	Nau Mi
00	00	00	First Motion	182.7	1,340.67	0.0
00	01	21.0	Maximum Dynamic Pressure	43,365	2,636.7	2.7
00	02	15	S-IC Center Engine Cutoff	145,600	6,504.5	24.9
00	02	40.8	S-IC Outboard Engines Cutoff	217,655	9,030.6	49.6
00	02	41.6	S-IC/S-II Separation	219,984	9,064.5	50.2
00	02	43.2	S-II Ignition	221,881	9,059.1	51.3
00	03	11.5	S-II Aft Interstage Jettison	301,266	9,469.0	87.0
00	03	17.2	LET Jettison	315,001	9,777.6	94.3
00	07	39.8	S-II Center Engine Cutoff	588,152	18,761.7	600.0
00	09	11.4	S-II Outboard Engines Cutoff	609,759	22,746.8	885.0
00	09	12.3	S-II/S-IVB Separation	609,982	22,756.7	887.99
00	09	15.4	S-IVB Ignition	610,014	22,756.7	888.42
00	11	40.1	S-IVB First Cutoff	617,957	25,562.4	1425.2
00	11	50.1	Parking Orbit Insertion	617,735	25,567.9	1463.9
02	44	14.8	S-IVB Reignition	650,558	25,554.0	3481.9
02	50	03.1	S-IVB Second Cutoff	1058,809	35,562.9	2633.6
02	50	13.1	Translunar Injection	1103,215	35,538.5	2605.0

-more-

APOLLO 11 MISSION EVENTS

Event	GET hrs:min:sec	Date/EDT	Vel.Change feet/sec	Purpose and resultant orbit
Lunar orbit insertion No. 1	75:54:28	19th 1:26 p	-2924	Inserts Apollo 11 into 60 x 170 nm elliptical lunar orbit
Lunar orbit insertion No. 2	80:09:30	19th 5:42 p	-157.8	Changes lunar parking orbit to 54 x 66 nm
CSM-LM undocking, separation (SM RCS)	100:09:50 100:39:50	20th 1:42 p 20th 2:12 p	-- 2.5	Establishes equiperiod orbit for 2.2 nm separation for DOI maneuver
Descent orbit insertion (DPS)	101:38:48	20th 3:12 p	-74.2	Lowers LM pericynthion to 8 nm (8 x 60)
LM powered descent initiation (DPS)	102:35:13	20th 4:08 p	-6761	Three-phase maneuver to brake LM out of transfer orbit, vertical descent and touchdown on lunar surface
LM touchdown on lunar surface	102:47:11	20th 4:19 p		Lunar exploration
Depressurization for lunar surface EVA	112:30	21st 2:02 a		
Repressurize LM after EVA	115:10	21st 4:42 a		

APOLLO 11 MISSION EVENTS

Event	GET hrs:min:sec	Date/EDT	Vel.Change feet/sec	Purpose and resultant orbit
Earth orbit insertion	00:11:50	16th 9:44 a	25,567	Insertion into 100 nm circular earth parking orbit
Translunar injection (S-IVB engine ignition)	02:44:15	16th 12:16 p	9,965	Injection into free-return trans-lunar trajectory with 60 nm pericynthion
CSM separation, docking	03:20:00	16th 12:52 p	--	Hard-mating of CSM and LM
Ejection from SLA	04:10:00	16th 1:42 p	1	Separates CSM-LM from S-IVB-SLA
SPS Evasive maneuver	04:39:37	16th 2:12 p	19.7	Provides separation prior to S-IVB propellant dump and "slingshot" maneuver
Midcourse correction #1	TLI+9 hrs	16th 9:16 p	*0	*These midcourse corrections have a nominal velocity change of 0 fps, but will be calculated in real time to correct TLI dispersions.
Midcourse correction #2	TLI+24 hrs	17th 12:16 p	0	
Midcourse correction #3	LOI-22 hrs	18th 3:26 p	0	
Midcourse correction #4	LOI-5 hrs	19th 8:26 a	0	

APOLLO 11 MISSION EVENTS

Event	GET hrs:min:sec	DATE/EDT	Vel.Change feet/sec	Purpose and resultant orbit
LM ascent and orbit insertion	124:23:21	21st 1:55 p	6055	Boosts ascent stage into 9 x 45 lunar orbit for rendezvous with CSM
LM RCS concentric sequence initiate (CSI) burn	125:21:20	21st 2:53 p	49.4	Raises LM perilune to 44.7 nm, adjusts orbital shape for rendezvous sequence (45.5 x 44.2)
LM RCS constant delta height (CDH) burn	126:19:40	21st 3:52 p	4.5	Radially downward burn adjusts LM orbit to constant 15 nm below CSM
LM RCS terminal phase initiate (TPI) burn	126:58:26	21st 4:30 p	24.6	LM thrusts along line of sight toward CSM, midcourse and braking maneuvers as necessary
Rendezvous (TPF)	127:43:54	21st 5:15 p	-4.7	Completes rendezvous sequence (59.5 x 59.0)
Docking	128:00:00	21st 5:32 p	--	Commander and LM pilot transfer back to CSM
LM jettison, separation (SM RCS)	131:53:05	21st 9:25 p	-1	Prevents recontact of CSM with LM ascent stage during remainder of lunar orbit
Transearth injection (TEI) SPS	135:24:34	22nd 00:57 a	3293	Inject CSM into 59.6-hour transearth trajectory

APOLLO 11 MISSION EVENTS

Event	GET hrs:min:sec	DATE/EDT	Vel.Change feet/sec	Purpose and resultant orbit
Midcourse correction No. 5	TEI+15 hrs	22nd 3:57 p	0	Transearth midcourse corrections will be computed in real time for entry corridor control and recovery area weather avoidance.
Midcourse correction No. 6	EI -15 hrs	23rd 9:37 p	0	
Midcourse correction No. 7	EI -3 hrs	24th 9:37 a	0	
CM/SM separation	194:50:04	24th 12:22 p	--	Command module oriented for entry
Entry interface (400,000 feet)	195:05:04	24th 12:37 p	--	Command module enters earth's sensible atmosphere at 36,194 fps
Touchdown	195:19:05	24th 12:51 p	--	Landing 1285 nm downrange from entry, 10.6 north latitude by 172.4 west longitude.

MISSION TRAJECTORY AND MANEUVER DESCRIPTION

Information presented herein is based upon a July 16 launch and is subject to change prior to the mission or in real time during the mission to meet changing conditions.

Launch

Apollo 11 will be launched from Kennedy Space Center Launch Complex 39A on a launch azimuth that can vary from 72 degrees to 106 degrees, depending upon the time of day of launch. The azimuth changes with time of day to permit a fuel-optimum injection from Earth parking orbit into a free-return circumlunar trajectory. Other factors influencing the launch windows are a daylight launch and proper Sun angles on the lunar landing sites.

The planned Apollo 11 launch date of July 16 will call for liftoff at 9:32 a.m. EDT on a launch azimuth of 72 degrees. The 7.6-million-pound thrust Saturn V first stage boosts the space vehicle to an altitude of 36.3 nm at 50.6 nm downrange and increases the vehicle's velocity to 9030.6 fps in 2 minutes 40.8 seconds of powered flight. First stage thrust builds to 9,088,419 pounds before center engine shutdown. Following out-board engine shutdown, the first stage separates and falls into the Atlantic Ocean about 340 nm downrange (30.3 degrees North latitude and 73.5 degrees West longitude) some 9 minutes after liftoff.

The 1-million-pound thrust second stage (S-II) carries the space vehicle to an altitude of 101.4 nm and a distance of 885 nm downrange. Before engine burnout, the vehicle will be moving at a speed of 22,746.8 fps. The outer J-2 engines will burn 6 minutes 29 seconds during this powered phase, but the center engine will be cut off at 4 minutes 56 seconds after S-II ignition.

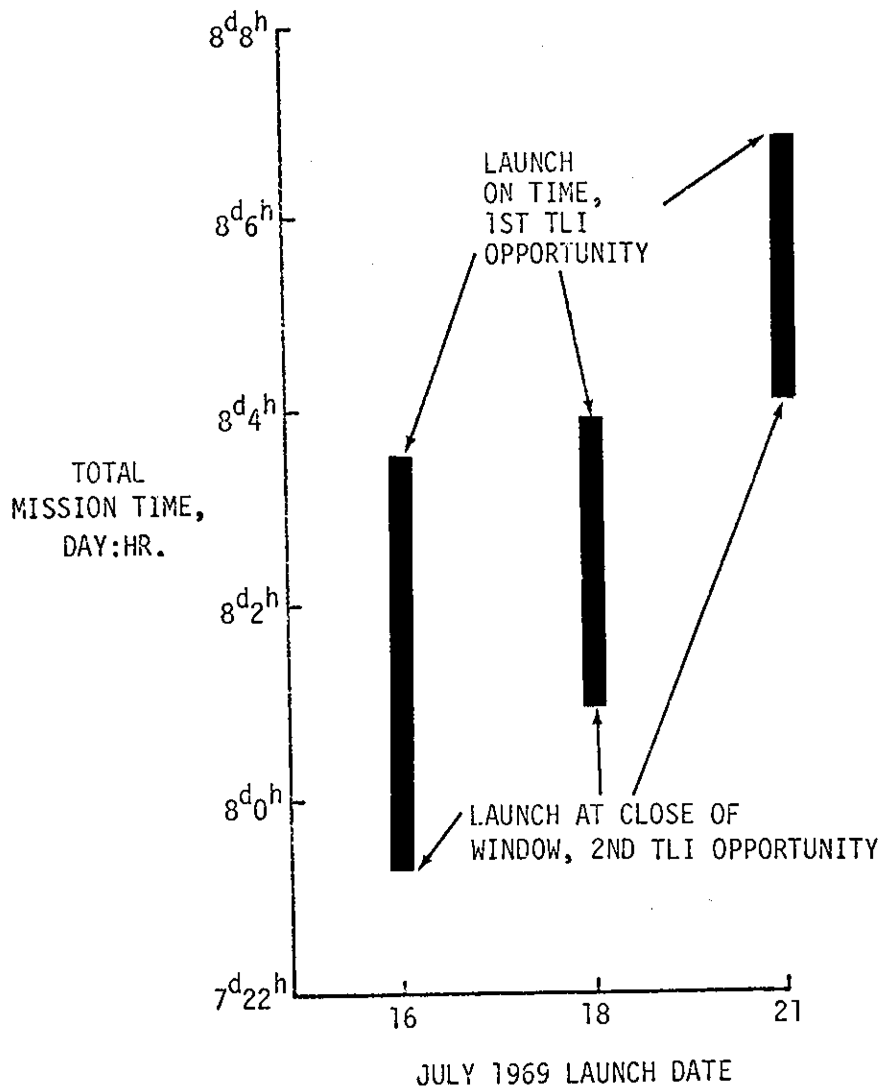
At outboard engine cutoff, the S-II separates and, following a ballistic trajectory, plunges into the Atlantic Ocean about 2,300 nm downrange from the Kennedy Space Center (31 degrees North latitude and 33.6 degrees West longitude) some 20 minutes after liftoff.

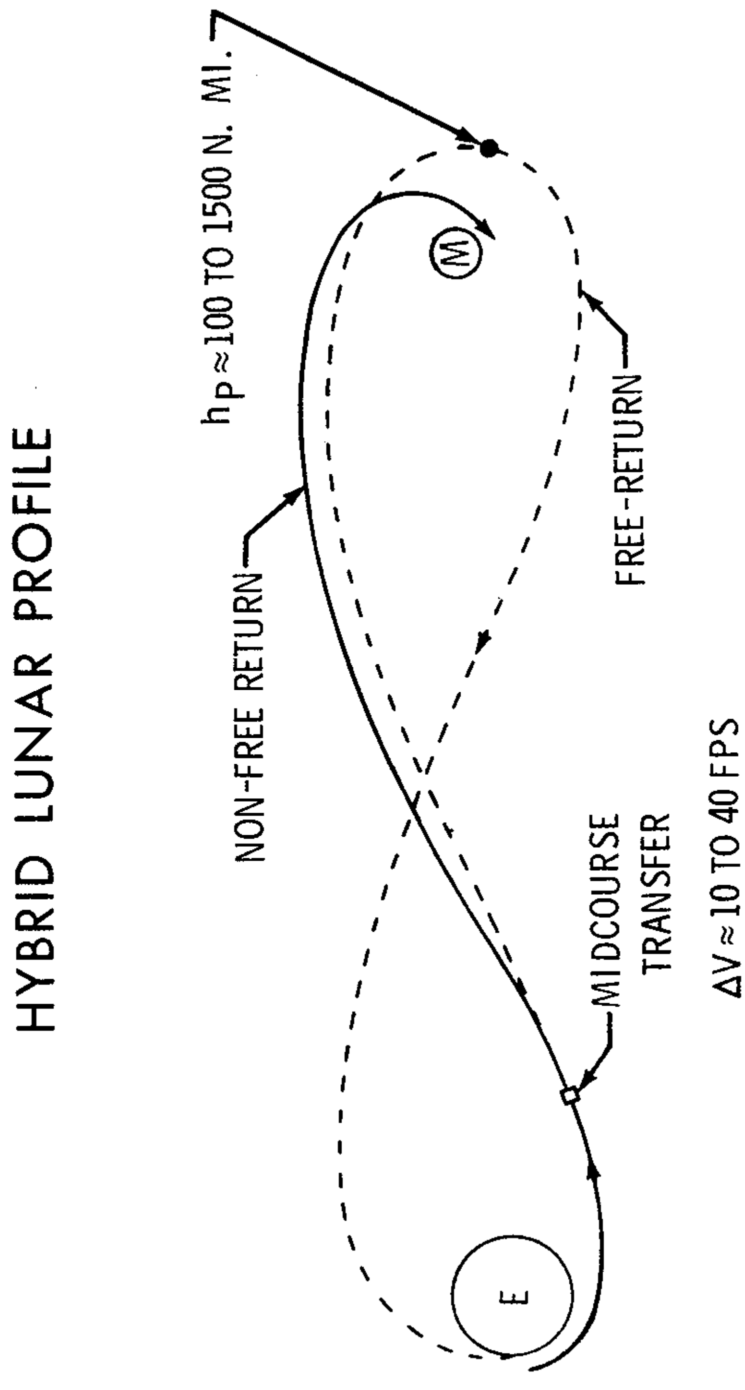
The first burn of the Saturn V third stage (S-IVB) occurs immediately after S-II stage separation. It will last long enough (145 seconds) to insert the space vehicle into a circular Earth parking orbit beginning at about 4,818 nm downrange. Velocity at Earth orbital insertion will be 25,567 fps at 11 minutes 50 seconds ground elapsed time (GET). Inclination will be 32.6 degrees.

LAUNCH WINDOW SUMMARY

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

MISSION DURATIONS




HYBRID LUNAR PROFILE
$h_p \approx 100$ TO 1500 N. MI.
M
NON-FREE RETURN
FREE-RETURN
MIDCOURSE
TRANSFER
$\Delta V \approx 10$ TO 40 FPS
E

The crew will have a backup to launch vehicle guidance during powered flight. If the Saturn instrument unit inertial platform fails, the crew can switch guidance to the command module systems for first-stage powered flight automatic control. Second and third stage backup guidance is through manual takeover in which crew hand controller inputs are fed through the command module computer to the Saturn instrument unit.

Earth Parking Orbit (EPO)

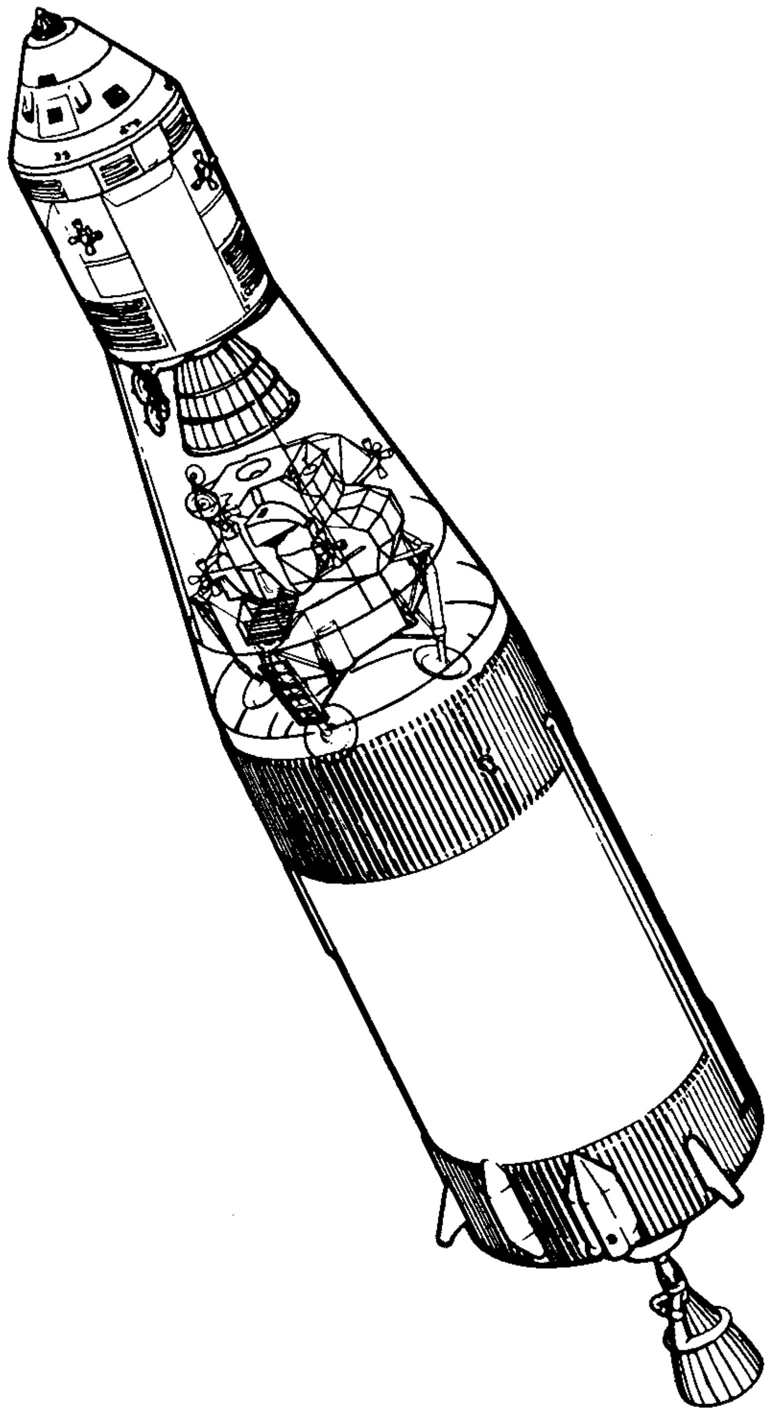
Apollo 11 will remain in Earth parking orbit for one-and-one-half revolutions after insertion and will hold a local horizontal attitude during the entire period. The crew will perform spacecraft systems checks in preparation for the translunar injection (TLI) burn. The final "go" for the TLI burn will be given to the crew through the Carnarvon, Australia, Manned Space Flight Network station.

Translunar Injection (TLI)

Midway through the second revolution in Earth parking orbit, the S-IVB third-stage engine will restart at 2:44:15 GET over the mid-Pacific just south of the equator to inject Apollo 11 toward the Moon. The velocity will increase from 25,567 fps to 35,533 fps at TLI cutoff--a velocity increase of 9971 fps. The TLI burn is targeted for about 6 fps overspeed to compensate for the later SPS evasive maneuver after LM extraction. TLI will place Apollo 11 on a free-return circumlunar trajectory from which midcourse corrections if necessary could be made with the SM RCS thrusters. Entry from a free-return trajectory would be at 10:37 a.m. EDT July 22 at 14.9 degrees south latitude by 174.9 east longitude after a flight time of 145 hrs 04 min.

Transposition, Docking and Ejection (TD&E)

At about three hours after liftoff and 25 minutes after the TLI burn, the Apollo 11 crew will separate the command/service module from the spacecraft lunar module adapter (SLA), thrust out away from the S-IVB, turn around and move back in for docking with the lunar module. Docking should take place at about three hours and 21 minutes GET, and after the crew confirms all docking latches solidly engaged, they will connect the CSM-to-LM umbilicals and pressurize the LM with the command module surge tank. At about 4:09 GET, the spacecraft will be ejected from the spacecraft LM adapter by spring devices at the four LM landing gear "knee" attach points. The ejection springs will impart about one fps velocity to the spacecraft. A 19.7 fps service propulsion system (SPS) evasive maneuver in plane at 4:39 GET will separate the spacecraft to a safe distance for the S-IVB "slingshot" maneuver in which residual launch vehicle liquid propellants will be dumped through the J-2 engine bell to propell the stage into a trajectory passing behind the Moon's trailing edge and on into solar orbit.

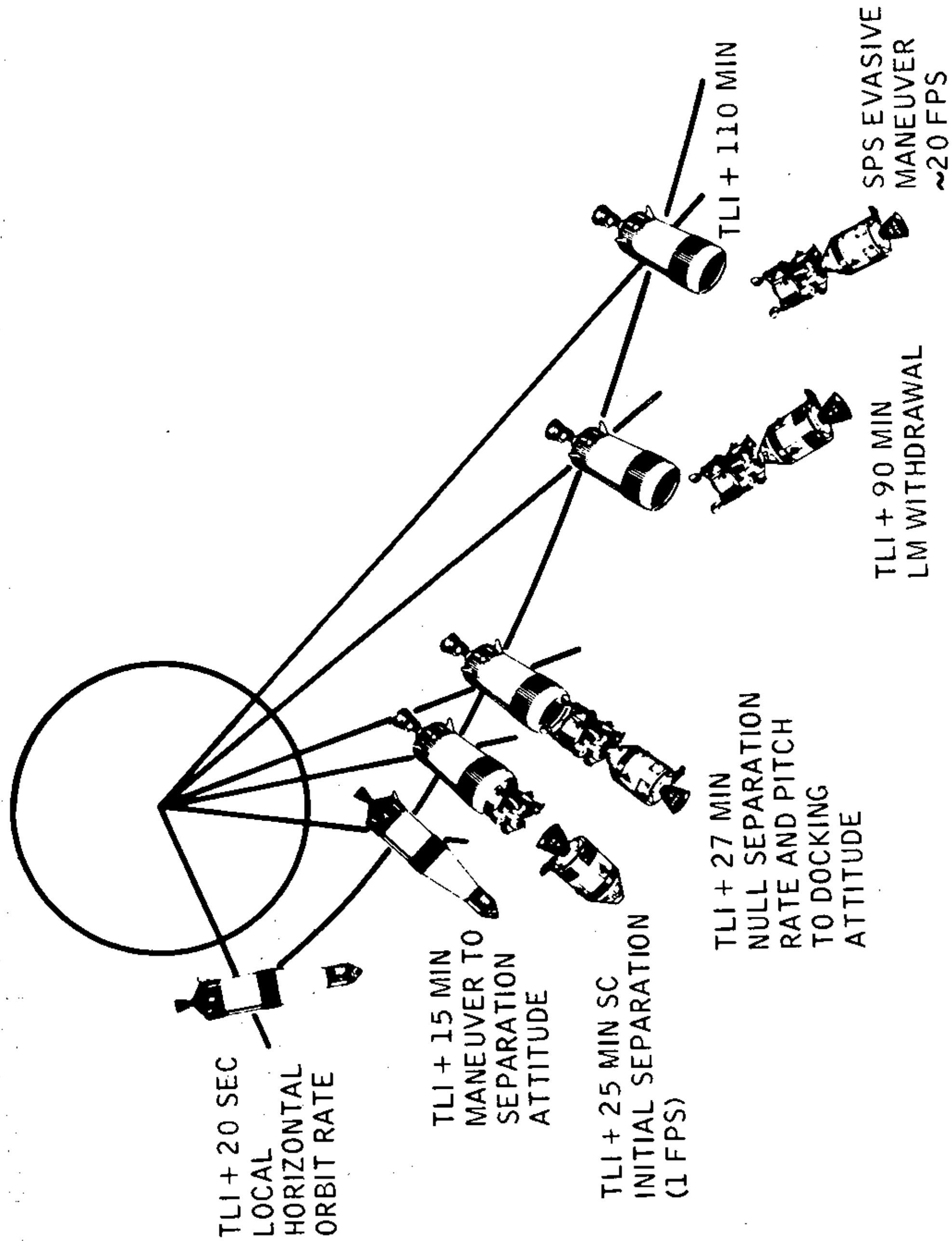


VEHICLE EARTH PARKING ORBIT CONFIGURATION

(SATURN V THIRD STAGE AND INSTRUMENT UNIT, APOLLO SPACECRAFT)

-more-

POST TLI TIMELINE



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Translunar Coast

Up to four midcourse correction burns are planned during the translunar coast phase, depending upon the accuracy of the trajectory resulting from the TLI maneuver. If required, the midcourse correction burns are planned at TLI +9 hours, TLI +24 hours, lunar orbit insertion (LOI) -22 hours and LOI -5 hours.

During coast periods between midcourse corrections, the spacecraft will be in the passive thermal control (PTC) or "barbecue" mode in which the spacecraft will rotate slowly about one axis to stabilize spacecraft thermal response to the continuous solar exposure.

Lunar Orbit Insertion (LOI)

The first of two lunar orbit insertion burns will be made at 75:54:28 GET at an altitude of about 80 nm above the Moon. LOI-1 will have a nominal retrograde velocity change of 2,924 fps and will insert Apollo 11 into a 60x170-nm elliptical lunar orbit. LOI-2 two orbits later at 80:09:30 GET will adjust the orbit to a 54x65-nm orbit, which because of perturbations of the lunar gravitational potential, will become circular at 60 nm at the time of rendezvous with the LM. The burn will be 157.8 fps retrograde. Both LOI maneuvers will be with the SPS engine near pericynthion when the spacecraft is behind the Moon and out of contact with MSFN stations. After LOI-2 (circularization), the lunar module pilot will enter the lunar module for a brief checkout and return to the command module.

Lunar ModuleDescent, Lunar Landing

The lunar module will be manned and checked out for undocking and subsequent landing on the lunar surface at Apollo site 2. Undocking will take place at 100:09:50 GET prior to the MSFN acquisition of signal. A readially downward service module RCS burn of 2.5 fps will place the CSM on an equiperiod orbit with a maximum separation of 2.2 nm one half revolution after the separation maneuver. At this point, on lunar farside, the descent orbit insertion burn (DOI) will be made with the lunar module descent engine firing retrograde 74.2 fps at 101:38:48 GET. The burn will start at 10 per cent throttle for 15 seconds and the remainder at 40 per cent throttle.

The DOI maneuver lowers LM pericynthion to 50,000 feet at a point about 14 degrees uprange of landing site 2.

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