APOLLO 18

Mission to The Moon™

Flight Manual

IBM/Tandy

Designed By Artech Digital Entertainment, Inc.

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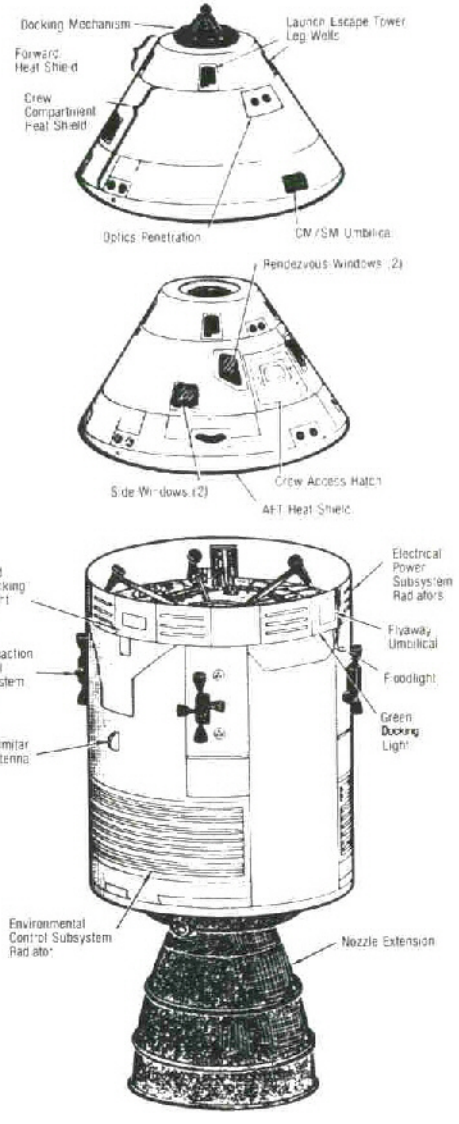
APOLLO 18

Apollo Command/ Service Modules



Congratulations! After an exhaustive selection process involving thousands of candidates, you have been selected to command the crew of Apollo 18, the final mission in the Apollo moon project. Within a few weeks, Mission Control will send your final orders to report to Houston. Upon your arrival, you will meet your fellow crew members, and begin training for your historic journey.

As you know, Apollo is one of the largest peacetime undertakings in history — the culmination of nearly a decade of effort, during which the United States has spent billions of dollars for new research and development. Hundreds of thousands of people have dedicated their talents to the success of these voyages. This tremendous commitment of human, material, and financial resources has resulted in untold advances in science and technology, and opened a new and endless frontier for our children and grandchildren.

More important, the Apollo project has captured and inspired the hearts and imaginations of people everywhere. Futurist Ray Bradbury called the Apollo 11 moon landing "the greatest single moment in human history."

You are now part of this history. Your Mission Control flight directors have prepared this briefing manual to familiarize you with the specific details of the mission. The information presented here is critical to your success, and we suggest that you review it thoroughly before reporting to Houston.

We here at Mission Control look forward to working with you to make the Apollo 18 mission a success.

APOLLO 18

YOUR APOLLO 18 GROUND CREW:

Project Design: Artech Digital Entertainments, Inc.
Programming: Ted and Diana Gruber, *Ted Gruber Software*
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APOLLO 18

I: PROJECT OBJECTIVES

The Apollo 18 mission has been assigned to:

- Retrieve portions of the Surveyor III photographic probe, which soft-landed on the moon in April, 1967
- Capture and repair three damaged satellites in Earth orbit

Apollo 18 will follow the same sequence of events our previous missions did. The entire voyage has been broken down into the following sub-missions:

- Successful launch into Earth orbit, using a Saturn IV-B rocket
- Lunar Module detachment and re-docking in space
- Course correction maneuvers
- Lunar landing
- Moonwalk mission to Surveyor site
- Lunar lift-off and redocking with the Command Module
- Spacewalk mission to repair satellites
- Re-entry and splashdown

II: SYSTEM IGNITION

1. Put your DOS disk into drive A and turn on the computer.
2. If you plan to use a joystick, plug it into the joystick port at the back of the computer.
3. When the A> prompt appears, remove the DOS disk from drive A. Replace it with your Apollo 18 game disk, label side up.

4 Type **APOLLO** and press **Enter**.

Apollo 18 is available in two versions besides the one on the enclosed disk:

- High-resolution on 5-1/4" disk (supports 640 x 350 x 16-color systems, 256K EGA cards, and IBM-compatible enhanced monitors)
- 3.5" disk containing both hi-res and lo-res versions

Your Apollo 18 package includes a postcard you can use to order these disks.

To boot your hi-res disk, type **APOLLOHI** and press **Enter**. If you are not using the high-resolution version, continue with Step 5:

5 After a short disk load, a prompt asks you to select the graphics adapter your system uses. Press the corresponding numeric key to choose:

1 CGA
2 TANDY (16 colors)
3 Hercules Graphics Adaptor
4 EGA (16 colors)
ESC Return to DOS

6 At the prompt, type either **J** for joystick, or **K** for keyboard. In a moment, the title screen appears, followed by the Launch Screen.

III: MISSION OVERVIEW (Quick Start)

The following section is a brief overview of the entire Apollo 18 mission, including objectives and basic instructions for each sub-mission. For more in-depth information on all phases of the project, please refer to the next chapter.

PROJECT OBJECTIVE

As the lead project astronaut, your objective is to successfully complete the entire sequence of sub-missions that comprise the Apollo 18 project. These sub-missions are outlined in the Project Objectives section. At the end of each sub-mission, you will be awarded performance points based on the efficiency with which the task was completed.

INFORMATION SCREENS

Your IBM-compatible flight computer uses Telemetry Screens and Status Screens to convey information. From these screens, you can observe all mission variables, carry out tasks, and deal with any problems that may arise.

Telemetry Screens

Most sub-missions begin with a Telemetry Screen, from which you command Apollo's flight systems. To view the screen, type **T** when a **PROCEED** message appears on your console monitor. When the screen appears:

1 Adjust telemetry status settings until the status message at the bottom of the screen changes from **NO GO** to **GO**.

- Use the arrow keys or the joystick to move the arrow Up or Down.

- Use the **space bar** to change the settings. Correct settings appear in green.
- When the status line at the bottom of the screen say **GO**, press the **fire button** or **Enter** to exit the screen.

2 Execute the next program (operation) required by the onboard computers. The program numbers for the current mission appear at the top of the screen. At the **ENTER PROGRAM #** prompt, type the first program number, and press **Enter.** Enter the rest of the numbers the same way, in the given order.

Watch the status line for verification as the computer executes the program.

Status Screens

Status screens display your performance rating at the end of each sub-mission.

- Press the **space bar** to see the status screen for other submissions.
- Press the **fire button** or **Enter** to proceed with the mission.

ENDING THE MISSION

Your Apollo 18 mission ends when:

- You triumphantly splash down in the Atlantic.
- You encounter minor difficulties and the mission is aborted. In this event, the flight computer guides you through the appropriate sequences to return you to Earth unharmed.
- You encounter major difficulties, and become another piece of cosmic debris. This can happen at one of four places: during lunar landing, during the moonwalk, during the LM re-docking

with the CM, and during re-entry. If you don't survive any of these phases, Mission Control offers you one opportunity to practice the maneuver in the simulator before starting a new mission.

The final status screen displays your performance rating for each sub-mission, as well as your overall score for the entire mission.

SUB-MISSION BRIEFINGS

Sub-Mission 1: Lift-Off

GOAL: To achieve correct Earth orbit.

- When the flashing **PROCEED** light appears on your instrument console, press **T** to activate the Telemetry Screen and confirm that all systems are operational. (To find out more about Telemetry Screens, please turn to page **11**) Follow this procedure at the beginning of all sub-missions.
- Begin the mission by pressing the **fire button**, or any key.
- A red bar appears in the lower right of the screen, and begins to move. Try to press the **fire button** or Up arrow key when the bar is exactly at the mid-line. Your timing score is calculated in 1000ths of a second.
- Try to keep the total error average as close as possible to zero. For example, if the running error is -40 (that is, you reacted too early), then the next timing error should be late by +40 to reduce the error average to zero.
- Keep your total error on all events to a minimum. Mission Control/ Houston automatically aborts the launch if you allow an error in excess of 143.
- Launch events are divided into three groups. The accumulated error for the current group is displayed at the bottom of the screen in green.

- Move the joystick right and left or press the Right and Left arrow keys to keep the gyro bars balanced, and to maintain the needle of the horizontal gauge in the center position.
- An alarm sounds when the gyroscope becomes too imbalanced. If you don't correct this before the alarm sounds three times, Houston aborts the launch.
- Once you achieve Earth orbit, press **T** to go to the Telemetry Screen. Set **NO GO** to **GO** and enter the program numbers provided at the top of the screen.
- Performance is based on your final error average.

Sub-Mission 2: Docking

GOAL: To undock the Lunar Module (LM) from the Command Module (CM); turn the LM around 180 degrees, re-dock with the CM, and jettison the last rocket stage. This configures the CM and LM for the trip and lunar landing.

- Use the joystick or arrow keys to keep the crosshairs centered on the approaching vehicle.
- Your approach must be accurate, with a maximum velocity no greater than -003. Use the **fire button** or **space bar** to decelerate during docking. Be careful not to decelerate too much, or you could actually start backing away from the LM, wasting precious fuel.
- Performance is based on:
  - Total docking time
  - Docking accuracy
  - Number of attempts
  - CM velocity at time of contact

Sub-Mission 3: Course Corrections

GOAL: To correct your capsule's course by firing rockets. Several mid-course corrections will be required during the Apollo 18 mission.

- When a correction is needed, your onboard computer gives a countdown from 5 to 1. The instant the **FIRE** prompt appears:

  Joystick — Hold the **fire button**, and watch the Burn Panel closely. Release the button the instant the digit counter begins.

  Keyboard — Press the **space bar**, and watch the Burn Panel closely. Press the **space bar** again the instant the digit counter begins.
- The computer calculates the burn rate as the engines fire. If numbers appear in the Error Overflow window, it means you over-corrected — that is, you exceeded 300. Repeat the burn to get back on course.
- Performance is based on the number of corrections you make, and your reaction time during the burn.

Sub-Mission 4: Lunar Landing

GOAL: To land successfully on the lunar surface.

- There are three possible landing sites. You always begin with Site One.
- Use the following commands to control your descent:

Command	Keyboard	Joystick
Fire Left Thrusters	Left Arrow	Left
Fire Right Thrusters	Right Arrow	Right
Decrease Vertical Velocity	Down Arrow	Down

- Use the monitor at lower left to stay on course. Keep the white dot as close to the green line as you can.
- Watch your Altitude Indicator carefully, and try to land softly inside the small green target square, with the least velocity possible.
- If you stray outside the landing corridor (indicated by the red lines), the onboard computer takes over and aborts the current landing attempt, and guides your craft toward Site 2. If you fail to land at any of the three sites, this sub-mission is aborted.
- Performance is rated on:
  - Your ability to stay on course. To do this, stick closely to the green line between the red corridor lines.
  - The number of burns required
  - Your reaction time
  - Velocity at landing

Sub-Mission 5: Moonwalk

GOAL: To retrieve film and other parts from Surveyor III, an unmanned photographic probe that landed on the moon in 1967.

- The camera records your movements. The map at the lower left charts your progress toward the Surveyor site. Because of the low gravity, you can quickly "bunnywalk" to the site.
- To initiate your first hop, hold down the Right arrow key, or hold the joystick to the right.
- As you hold down the key, or move the joystick right, the speed bar turns green. If you lean too far forward, the speed bar turns red. Quickly press the Left arrow (joystick left) to recover.

- The moment you touch down from a hop, the speed bar flashes. At that instant, push the joystick right, or press the Right arrow key to keep going. This increases the astronaut's speed.
- Once you're off the ground again, ease off the joystick or arrow key to keep from falling. Watch the speed bar.
- Use the Up/Down arrow keys (or joystick up/down) to maintain course. These only work when you're off the ground.
- If the green dot on the map turns red, you're too far off course. While you're on the ground, press the **space bar** or **fire button** to turn around and go back. Your keyboard controls are now reversed: the Left arrow sends you forward. When the dot turns green again, press the **space bar** or **fire button** to resume your walk.
- You must reach the Surveyor and get back before your oxygen runs out. A **CONTACT** message appears when you've arrived.
- Performance is evaluated on total time taken, and on the number of falls.

Sub-Mission 6: Lunar Lift-Off and Redocking with CM

This procedure is similar to *Sub-Mission 2: Docking. (page 6)*

Sub-Mission 7: Space Walk

GOAL: To capture three damaged satellites for repair.

- Press the **fire button** or any arrow key to begin your walk to the first satellite. Once the clock starts, use the joystick or the keypad to accelerate in any direction. (Press keys **1, 3, 7,**and **9** to move diagonally.)
- On the graph at the lower left, the satellite is the yellow dot centered where the two lines cross. Your position is represented by two red

dots. When both dots turn green, you are in capture range.

- To capture a satellite, connect the end of your space hook with the rotating gaffing spot on the satellite:
  - Face the satellite by moving the joystick up and left, or by pressing keypad number **7**.
  - When you're in capture range, and facing the satellite at 11:00, press the **space bar** to turn your space hook off and on. This causes you to move at the same speed as the satellite.
  - Use the arrow keys (any direction) or joystick to line your space hook up with the rotating spot on the satellite.
  - When the end of the space hook touches the gaffing spot, press the **fire button** or **Enter** to capture the satellite.
- If you want to move around, press the **space bar** to put away the hook. You can't manipulate the stick and the jet pack at the same time.
- Performance points are based on how long it takes to complete the task, and how many attempts you made with the space hook.

Sub-Mission 8: Re-Entry and Splashdown

GOAL: To position your capsule for re-entry, survive the drop through Earth's atmosphere, and reach the splashdown target safely.

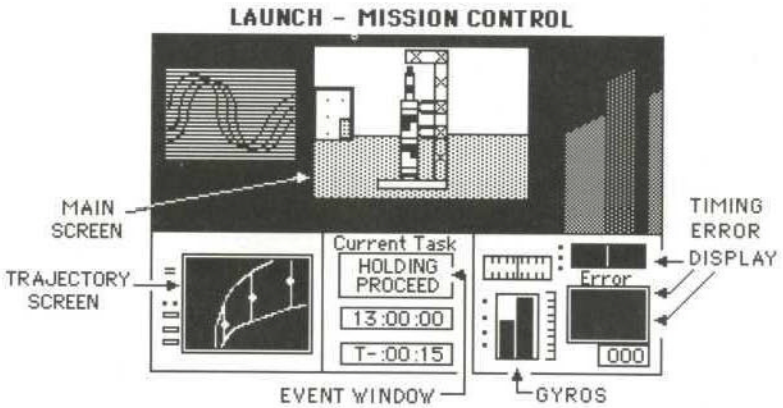
- The final course correction follows the same procedures you used in *Sub-Mission 3*.
- The "eight ball" shows the position of the heat shield under your capsule. Use the joystick or arrow keys (all directions) to keep it centered; the more off-center the target, the higher the temperature.
- Performance is based on your ability to maintain course. If the temperature rises above 2250 degrees F., you and your crew will perish.

IV: DETAILED MISSION MANUAL

This section contains in-depth instructions for all phases of the Apollo 18 mission. To improve your performance of mission tasks and increase your chance of success, we suggest that you thoroughly familiarize yourself with the following information before attempting to pilot your spacecraft.

Sub-Mission 1: Lift-Off Day 1 00:00:00

This part of the mission is presented as your flight control officers see it from Mission Control in Houston. Your control panel looks like this:



Telemetry Screen

Telemetry screens are your connection with Apollo's on-board computer. You will use them throughout the Apollo 18 mission to monitor and control both rocket and capsule systems.

- At T minus 15 and holding, the **PROCEED** prompt flashes in the status window. Type **T** to view the telemetry screen.
- Use the arrow keys or the joystick to move through the display. Press the space bar to cycle through the various options (the correct one for your current situation appears in green).
- When all pre-launch sequences are completed, the status line at the bottom of the screen changes from **NO GO** to **GO**. Press the **fire button** or **Enter** to leave the screen.

The systems controlled from your Launch Telemetry screen include:

Flight Control System —The Instruments Unit (IU) inertial guidance system guides and controls your craft during all phases of powered flight. At about T minus 17, the computer checks and re-sets the guidance reference system and gyroscope platform.

Propellant System — Ninety percent of your rocket's weight is fuel: 534,000 gallons of it, burning away at 3,500 gallons per second. Press the **fire button** to begin the complex sequence of purging and flushing out the tanks, pre-pressurizing, and making the final pressurization of the rocket propellant.

Engines — Set your engines from **OFF** to **SYNC**hronized, to **READY** for ignition.

Propulsion System — Your liquid oxygen (LOX) and liquid helium (LOH) tanks are stored under low pressure, then pressurized for flight. The Sequencing command turns on the Propellant Utilization (PU) system and the Auxiliary Propulsion System (APS), and displays the current status of the tanks.

- PU: The system is designed so that both tanks run dry at the same time. Residual amounts of either impair the stability and accuracy of your trajectory and orbit. The PU system continuously monitors propellant levels and controls the mixture ratio.

- APS: The APS controls the roll, pitch, and yaw of your rocket during powered flight.

Hydraulics — An electrical engine drives the various pressure pumps in the capsule and rocket. In the event of pump failure, your craft is also equipped with auxiliary backup pumps.

Electrical System — This consists of several 26-volt DC cells. From the Launch Telemetry screen, you can turn on the **MAIN** system, switch to **BACKUP** batteries, or **RESTORE POWER.**

Accelerometers — This is the system that keeps your rocket from shaking to pieces. It measures acceleration, stress on the rocket structure, engine thrust, vibration levels, turbulence, and fuel imbalances.

Status Line — If **NO GO** appears here, either you've forgotten to take care of one of the pre-launch details, or the telemetry system has detected a fault somewhere in your craft.

Lift-Off!

At T minus 15 and holding, the **GO** message flashes in the status window. Press the **fire button** or any arrow key to initiate the launch sequence and resume countdown.

At precisely 8.9 seconds after ignition, the five F-1 engines generate 7.5 million pounds of thrust — the equivalent of 180 million horsepower — at temperatures of 6,000 degrees F. When the rocket rises a mere 3/4" off the ground, the umbilical cables are retracted. From here on, the mission can't be scrubbed. You're on your way!

During launch, you control the critical sequence of firing and jettisoning the rocket's stages. And you have to maintain gyro control of the rocket.

- The launch sequence involves three groups of four events that require you to respond. The red bar at the top of the timing error

display tells you when to respond to each event. Try to hit the **fire button** or up arrow key when the bar reaches the center line.

- Your running error rate is shown in green at the bottom of the timing error display. Try to keep the total error as close to zero as you can. For example, if your running error is -40, it means you were early on some events. Compensate for this by trying for +40 on your next event, thus reducing your average to zero. Mission Control automatically aborts the launch if you allow an error in excess of 143.

If your error rate is low, the rocket stays on course and on schedule. Check your position on the trajectory screen: the center line shows the ideal flight path at each stage. If your timing error average is large, the rocket's course becomes dangerously steep, or low. The rocket strays off course, or you may run out of fuel before you reach orbit. In any of these events, the mission is aborted. The computer automatically takes you to the re-entry sequence (see *Sub-Mission 8*).

Gyros

After the rocket clears the tower and you've done the roll maneuver, the first stage is shut down and jettisoned. With the path adaptive guidance system on manual override, you're in control of the analog flight computer:

- Use the joystick or arrow keys to keep the gyro bars balanced and to maintain the needle of the horizontal gauge in the center position. Move Left to raise the left balance bar, or Right to raise the right bar.
- At Max Q, the period of most intense atmospheric buffeting, the craft feels very unstable.
- An alarm sounds if the rocket strays dangerously off course. If you don't act before the third alarm, the mission is aborted.

Earth Orbit

Once you achieve a stable parking orbit, you'll make a few revolutions around the Earth while you check the system for launch damage, and get ready for the next phase. If there's enough fuel, and no significant damage, Mission Control examines your orbital characteristics to determine when you'll leave for the moon. They also compute the ignition time and duration for re-igniting and shutting down the third stage.

- On the Command Module (CM) screen, a **PROCEED** message warns that it's time for systems checkout and Trans-Lunar Injection (TLI) burn.
- Press **T** to go to the Telemetry Screen.

Your flight computer is equipped with scores of programs that run detailed sequences of the Apollo 18 mission. You'll load these programs throughout your journey. The first two programs are:

PROGRAM 1
- CM/SM/LM system checkout
- Prepare for TLI

PROGRAM 3
- Fire S-IV-1 B TLI maneuver
- Shutdown S-IV-1B

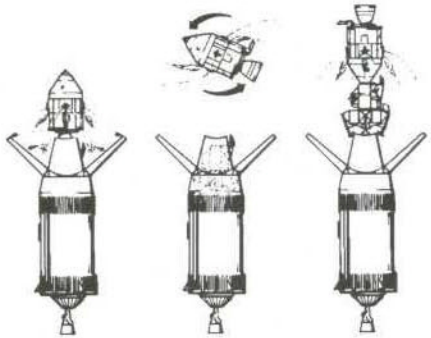
- Type **1** and press **Enter** to load the first program.
- If there are no problems or damage, the **GO** message appears. Type **3** and press **Enter** to load the second program.

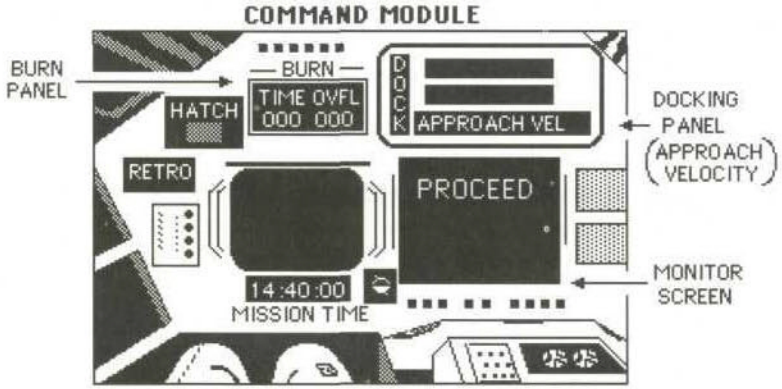
Program 1 performs checkout sequences for the Command Module, Lunar Module, and Service Module. Program 3 briefly fires the third stage of your Saturn IV-B rocket to send you to a higher orbit in preparation for TLI. When you reach escape velocity (25,000 mph), Apollo is free from Earth. Your communications link with Mission Control is blacked out during the burn. When the burn is completed, the third stage shuts down automatically.

Sub-Mission 2: Docking

Day 1 1:58:42

The Lunar Module is nested inside the nose cone of the third rocket stage. Once you're on a trajectory for the moon, your next sub-mission is to retrieve the LM, attach it to the CM, and jettison the now-obsolete third stage. This requires some very tricky docking maneuvers. Remember: use fuel sparingly!





The computer sends the Lunar Module (LM) adapter panels blossoming outward to 45 degrees. You then separate the CM from the third stage, pull away, turn 180 degrees, dock with the LM, and pull the LM away from the third stage.

PROGRAM 23 • Open adapter panels

- Fire Reaction Control System rockets (S-RCS) on the service module to initiate separation from third stage

PROGRAM 44 • Extend probe. The probe acts as a docking guide.

- Enter program 23. Watch the window as this program rotates the CM and lines it up for docking with the LM.
- A **PROCEED** message appears on your Telemetry Screen when the CM is lined up for docking. Press **T** to view the screen. Enter program 44 to extend the probe.
- The monitor lets you know when the probe is extended. It also gives you the X and Y velocity of the CM, and the distance of the approaching vehicle.
- Use the joystick or arrow keys to fire the CM's rocket thrusters as you dock. Left/Right controls yaw; Up/Down controls pitch. Press the **fire button** or **space bar** to slow your approach.

Keep the approach velocity below -004 so you don't damage the LM, or bump it away into an erratic spin. On the other hand, if you over-decelerate, you may actually start backing away from the LM. Above all, watch your fuel consumption: you're going to need it later on.

If the approach velocity is too great, the on-board computer may kick in and abort the docking. Should the computer abort more than three times, or should too much fuel be spent, the computer takes over and the remainder of the mission is altered to compensate for this failure.

When you've successfully docked the CM to the LM, a **PROCEED** message appears.

PROGRAM 87 • Lock the 12 latches and secure all systems

PROGRAM 54 • Pull LM out of the third stage and dump the stage

PROGRAM 56 • Burn S-RCS rockets to resume course

When these three programs are successfully executed, the CM and LM are properly positioned to make the journey to the moon.

Sub-Mission 3: Course Corrections Day 1 04:43:56

The Earth is a satellite, orbiting the sun at 67,000 mph. Similarly, the moon orbits Earth at a relative speed of 2,300 mph. You are in a spacecraft traveling at a minimum coasting speed of 3,000 mph. With all these moving targets, it's important to take very careful aim.

So, a few hours after leaving Earth's orbit, you need to fine-tune the spacecraft's course, aiming it at the place the moon will be three days from now. Later, as you approach the moon, a second correction positions you for lunar orbit.

PROGRAM 98 • Mid-Course Correction

- The Mid-Course Correction countdown appears on the CM monitor. Watch the screen closely. The instant the countdown goes to zero and a **FIRE** message appears:

  Joystick — Hold the **fire button** down, and watch the Burn Panel closely. Release the button the instant the digit counter begins.

  Keyboard — Press the **space bar**, and watch the Burn Panel closely. Press the **space bar** again the instant the digit counter begins.

- Now, quickly shift your attention to the Burn Panel near the top of the screen. The instant the digit counter begins, press the **space bar** again, or release the fire button. The digit counter stops. The resulting number is your timing response score.

If the error is insignificant (under 300), an **ON COURSE** message appears on your monitor. If the error exceeds 300, you must attempt the correction again. The overflow register on the burn panel shows how much you exceeded the correction range.

You are given three opportunities to make the correction. If you don't make it, Houston scrubs the mission.

Second Correction

The second correction puts you into lunar orbit. It's very similar to the previous one, though you use different programs:

PROGRAM 99 • Fire S-RCS for lunar correction

PROGRAM 12 • Fire SM main propulsion system

PROGRAM 13 • LO deceleration; fire descent engine

- Activate program 99. The CM monitor announces the firing of the S-RCS. Once a successful correction is made, the computer checks fuel levels and determines if Lunar Orbit Insertion (LOI) is a **GO**.
- When you are approximately 200,000 miles from Earth, the **GO FOR LOI** message flashes. Enter program 12, which fires the main propulsion system. The gravitational force of the moon is now stronger than the distant Earth's, and Apollo plunges quickly toward the moon.
- At 80 miles above the moon, program 13 fires the braking descent engine, slowing down your craft and placing it in a neat low lunar orbit.

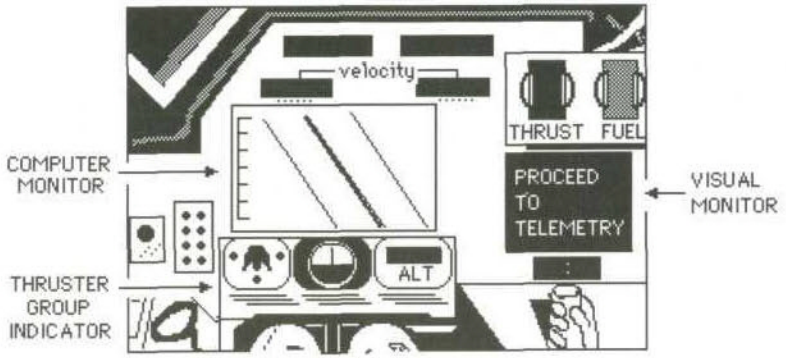
Apollo is now behind the moon, and radio contact with Earth is lost.

Sub-Mission 4: Lunar Landing Day 3 69:28:00

Apollo makes three revolutions of the moon while Mission Control/Houston monitors the craft and its movements. After the third orbit, as you approach the first of three possible landing sites, the ground team sends a **GO** message, clearing you for lunar descent.

The lunar landing team enters the LM and runs the power-up and system checkout sequences. When everything is up and running, a **PROCEED** message on the LM monitor directs you to the Telemetry Screen.

LUNAR MODULE



PROGRAM 2 • LM power-up sequence

PROGRAM 4 • Close CM hatches

PROGRAM 34 • Deploy LM landing gear

PROGRAM 21 • Detach LM from CM. Inspect LM.

PROGRAM 11 • Final LM checkout before descent

Execute program 2. If the Power Up sequence is **GO**, enter Program 4 to close the hatches and secure the system before separation. The LM is now operational, and your control panel lights and dials are running. Program 34 extends the LM landing gear; program 21 detaches the LM from the CM's Firing Reaction Control System; and program 11 rotates the LM twice for inspection from the CM. If there are no problems, you are **GO** for descent.

PROGRAM 33 • Powered Descent Initiation (PDI). Fire descent engine and turn on landing radar.

PROGRAM 24 • Manual/Highgate

PROGRAM 97 • Check out LM for damage

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Program 24 gives you manual control of the LM. **HIGHGATE** is a maneuver that turns the LM into landing position and places it on the descent path. It is performed at a high point above the landing site.

The descent trajectory appears onscreen as a corridor defined by red lines on either side. The green line in the middle is your ideal course. Try to stay close to this line, and make as few corrections as possible to save fuel.

NOTE: Use the joystick or arrow keys to control your retro rockets. Pressing the Left key (or joystick left) fires the left rocket cluster, and moves you RIGHT. Steering to the right sends you LEFT. Pull the joystick down or hit the Down arrow key to fire the braking engine if you're dropping too fast. If you keep pulling the joystick or pressing the Down arrow key, your decent velocity drops below zero — that is, your craft starts to ascend.

Mission Control has selected three possible landing sites: 1) Littrow, 2) Tranquility, and 3) Descartes. If the Littrow landing attempt is unsuccessful, the onboard computer takes the LM to a safe height, while the ground team computes a new landing sequence. When the Tranquility site approaches, begin descent again.

Make contact at or near zero velocity in both the vertical and horizontal planes. The landing should be both gentle, and on target. A landing velocity below 40 is soft. Between 40 and 60, the LM may sustain damage. If your speed is over 60, the LM crashes.

The LM consists of two pieces: the descent stage and the ascent stage. The descent stage serves as a lift-off platform for the rest of the craft, and remains on the moon.

If you fail to land at any of the three sites, the landing mission is aborted. You are instructed to fire the ascent engine and begin tracking the CM on the rendezvous radar. The status screen displays your performance rating and landing status information.

Sub-Mission 5: Moonwalk Day 4 80:20:20

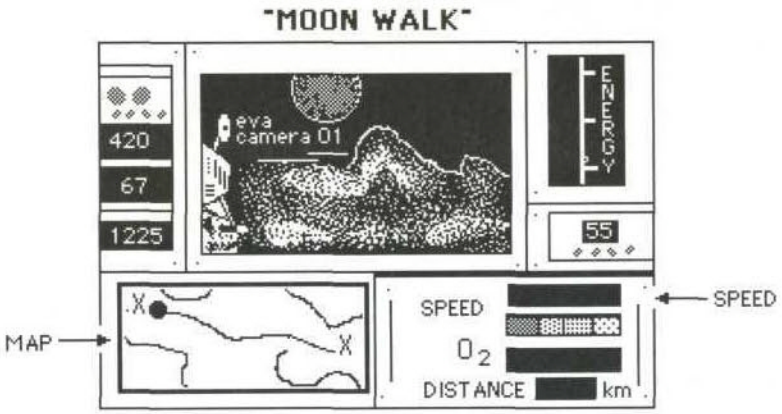
Extra-vehicular activity (EVA) missions enable NASA to perform a variety of scientific and medical experiments, and take care of some specific tasks. The real-life Apollo 12 mission located the unmanned picture-taking probe Surveyor III, which soft-landed on the moon in April, 1967. The LM *Intrepid* landed only 600 feet from Surveyor, and the crew took parts from the probe back to Earth, where inspection found that it had never been struck by a meteor during its 30-month lunar stay. Your task is to repeat this mission by reaching Surveyor III, and then returning to the LM.

Leaving the LM

Once you're safely on the moon, Mission Control sends you the **GO** for the moonwalk. As usual, the **PROCEED** message prompts you to go to the Telemetry Screen.

PROGRAM 22 • Exit Sequence: depressurize cabin, open hatch, erect antennae, and start cameras

Various cameras monitor your progress on the lunar surface:



The map at lower left displays your path and your progress. If the dot is green, you are on course. The dot turns red if you stray off course. Other instruments monitor distance covered, oxygen remaining, and how much energy you're using.

Bunnywalk

The moon's gravity is only one-sixth that of Earth. This means that a 150-pound person weighs only 25 pounds on the moon, and that you can get a lot more lift out of each step. The press called the astronauts' bouncing steps the "bunnywalk."

- To do the bunnywalk, press and hold the arrow keys or joystick in the direction you want to move. Hold the Right key down to initiate your first jump.
- As you hold down the key (or move the joystick to the right), the speed bar turns green. If you lean too far forward, the speed bar turns red. Quickly press the Left arrow (joystick left) to recover.
- The moment you touch down from a hop, the speed bar flashes. At that instant, hold the joystick right, or press the Right arrow key to keep going. This increases your speed — and decreases the amount of oxygen used.
- Once you're off the ground again, ease off the joystick or arrow key to prevent falling. Watch the speed bar: you'll have to react quickly.
- Use the Up/Down arrow keys (or joystick up/down) to steer yourself along the path. Steering only works while you're off the ground, so be quick.
- If the green dot on the map turns red, you're too far off course. While you're on the ground, press the **space bar** or **fire button** to turn around and go back. Your keyboard controls are now reversed:

the Left arrow sends you forward. When you're back on course, the dot turns green. Press the **space bar** again to reverse and resume your walk.

Solar flare activity or other problems may force Mission Control into aborting your walk at some point. In this case, return to the LM as quickly as possible.

To re-enter the Lunar Module after your moonwalk:

PROGRAM 25 • Depressurize LM. Open hatch. Repressurize.

A status screen at the end of your EVA mission gives your performance rating.

Sub-Mission 6: Lift-Off & Re-Dock Day 5 105:21:59

The redundancy safety factor (two of everything) built into most Apollo systems doesn't apply to your ascent engines. There are no backups. Everything MUST fire perfectly the first time, or you will be marooned on the moon.

PROGRAM 34 • Prepare LM for lift-off, and leave moon

PROGRAM 45 • Fire main engines

Set the Ascent stage to **ON** to turn on the LM Ascent Stage telemetry. Once the Telemetry Screen displays the GO message, **PROCEED** to program 34, which runs the LM lift-off sequence. When the countdown approaches zero, press the **space bar** or **fire button** to activate program 45, which fires the ascent engines. Watch the monitor view as the moon falls away underneath you. The **ALIGNED** message on your console indicates that the CM is in rendezvous position above you. In addition, various phases of the launch pitch appear on screen as the blast progresses.

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PROGRAM 56 • CM co-elliptic sequence initiation
- Rendezvous radar on, tracking CM
- Align CM and LM; radar lock
- Differential height maneuver

Once you're in orbit, program 56 tracks the CM on rendezvous radar. The CM is about 350 miles away. Both craft are tracked by Earth stations.

PROGRAM 66 • Manual dock with CM

PROGRAM 78 • Open the 12 CM latches
- Deactivate LM
- Execute LM power-down sequence

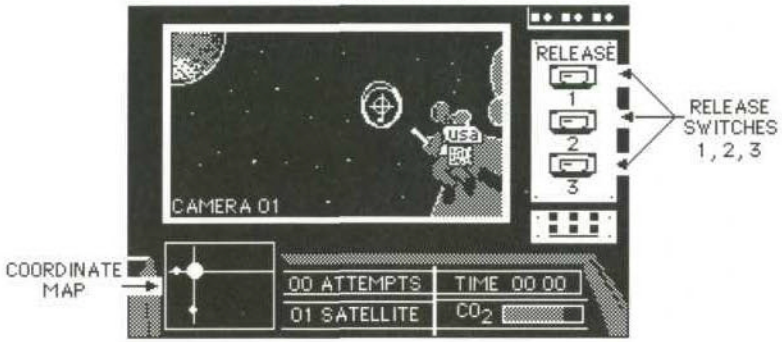
When the **ALIGNED** message reappears, dock with the CM the same way you did before. When **DOCKED** appears, enter program 78 to deactivate the LM.

When you're back inside the CM, and the Lunar Module is completely shut down, the "return home" sequence begins automatically. In the darkness behind the moon, the Service Module's main propulsion system fires, eating four tons of propellant. Apollo breaks free of the moon, and enters Earth Orbit Insertion (EOI) phase.

Sub-Mission 7: Space Walk Day 7 136:01:00

Spacewalks are performed as a routine function of Apollo missions. Outside the capsule, astronauts can place satellites in orbit around the Earth or moon, retrieve the film canisters mounted on the outside of the craft, or launch or retrieve satellites for repositioning or repair. Your mission on this flight is to capture three damaged satellites for maintenance work.

"SPACE WALK"



The control panel includes satellite release switches, a mission timing clock, a jet pack fuel gauge, the current satellite number, and the number of capture attempts you have made with the space hook. The map at lower left shows the coordinates of the satellite, which appears as a yellow dot where the two lines cross. To leave the craft, activate:

PROGRAM 34 • Depressurize cabin. Open hatch. Repressurize.

The red flashing light below the satellite release switch tells you when the first satellite is ready. Hit the **fire button** or any arrow key, and the light turns green. The timing clock is set to zero, and the satellite appears. Control your movement with the joystick or arrow keys. You can move in all eight directions.

When you get close to a satellite, move your astronaut into an 11 o'clock position — that is, a three-quarters view facing left and away. To do this, press the joystick up and left, or hit arrow key **7**.

Watch the radar map at lower left. The satellite is the yellow dot centered at the intersection of the two lines. When you're in capture range, the two red dots representing your position turn green.

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The instant you're in range of the satellite and facing the proper direction, hit the **space bar.** This gets the space hook out, and automatically propels you in the same direction as the satellite, at the same speed. Your goal is to touch the end of the space hook to the red, rotating gaffing spot on the satellite. Use the joystick or arrow keys to control arm movements, and press the **fire button** or **Enter** to capture the satellite.

If you miss the satellite, or it moves out of reach, hit the **space bar** again to retract the space hook and activate the jet pack. (You cannot manipulate both hook and jet pack at the same time!) When you have captured all three satellites, activate:

PROGRAM 35 • Depressurize cabin. Open hatch. Repressurize.

The status screen at the end of the EVA sequence rates your performance. You're scored on the time it took to catch the satellites, and how many attempts you made with the space hook.

Sub-Mission 8: Course Correction & Re-Entry

On Day 7 (138:30:00), you will make a major course correction, aiming Apollo more precisely at Earth.

PROGRAM 37 • Mid-Course Correction

This correction uses exactly the same procedures you followed in *Sub-Mission 3.*

On Day 9 (199:00:00), at 2,500 miles from Earth, begin preparing Apollo 18 for re-entry.

PROGRAM 12 • Final course correction

PROGRAM 39 • Spin Up

PROGRAM 33 • Jettison Service Module

Program 12 executes the correction firing sequence. Spin Up is much like a bullet spiraling up from a gun barrel, and it increases the accuracy of the projectile's aim — in this case, ensuring that you'll land near the waiting rescue ship. The SM itself is now jettisoned, since you won't need its rockets any more.

The re-entry corridor is a narrow cone, 300 miles wide and 40 miles deep. If the approach angle is too steep, your abrupt deceleration into the ever-thickening air will crush your craft and incinerate it. If the angle is too low, you will skip off the atmosphere into a perpetual orbit around the sun.

Unlike the earlier, slower Mercury and Gemini craft, Apollo 18 doesn't make a direct re-entry. Instead, you will deliberately skip off the atmosphere several times to decelerate more slowly.

PROGRAM 89 • CM reaction control system — set re-entry angle
• Switch to manual control

Program 89 fires the Command Reaction Control System (C-RCS) to establish the re-entry angle. It then gives you control of the capsule.

If there are no problems, re-entry begins. Your job is to keep the CM on course, and maintain the re-entry angle at 5.5 degrees. Watch the "eight ball" gyro on your CM console. Use the joystick or arrow keys to keep it centered.

At seven miles per second, the CM's outside temperature can soar to 5,000 degrees F. The ionization creates a complete radio blackout for two minutes. Vibrations will increase and decrease as your tiny craft bounces in and out of the atmosphere, at an altitude of about 400,000 feet. When you reach the final re-entry phase, the heat shield is jettisoned automatically.

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PROGRAM 99 • Check out heat shield and chutes

When **PROCEED** appears, consult the Telemetry Screen for a re-entry check, and execute program 99 to check the shield and chutes.

At 24,000 feet, the monitor directs you to begin the final splashdown sequence.

PROGRAM 90	• Fire drogue chutes	24,000 feet
	• Pilot chutes	11,000 feet
	• Main chutes	10,000 feet
	• Turn on beacon	

After splashdown, the status screen gives an itemized total of your overall mission performance rating. If your mission was really outstanding, you may have the opportunity to enter your name in the Astronaut's Hall of Fame.

Welcome home!

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APOLLO MANNED MISSIONS

1967 JAN 27 APOLLO 1 Gus Grissom, Edward White, Roger Chaffee
Fire inside spacecraft during ground test resulted in death of astronauts

1968 OCT 11 APOLLO 7 Wally Schirra, Donn Eisele, Walt Cunningham
163 orbits/10 days, 20 hours
First Apollo Earth Orbit Mission

1968 DEC 21 APOLLO 8 Frank Borman, James Lovell, William Anders
10 lunar orbits/6 days, 3 hours
First Manned Orbit of Moon

1969 MAR 3 APOLLO 9 James McDivitt, David Scott, Russell Schweickart
151 orbits/10 days, 1 hour
First test of Lunar Module in Earth orbit

1969 MAY 18 APOLLO 10 Thomas Stafford, Eugene Cernan, John Young
31 lunar orbits/8 days
First test of Lunar Module in lunar orbit

1969 JUL 16 APOLLO 11 Neil Armstrong, Buzz Aldrin, Michael Collins
22 hours on the moon/2 hours, 35 minutes EVA
First manned lunar landing!

1969 NOV 14 APOLLO 12 Pete Conrad, Richard Gordon, Alan Bean
32 hours on the moon/7 hours, 45 minutes EVA
Second lunar landing; returned parts of Surveyor III

1970 APR 11 APOLLO 13 James Lovell, Fred Haise, Jack Swigert
5 days, 22 hours, 53 minutes
Aborted mission; safe return of crew

1971 JAN 31 APOLLO 14 Alan Shepard, Stuart Roosa, Edgar Mitchell
34 hours on the moon/24 minutes EVA
Collected 96 lbs. of lunar soil

1971 JUL 26 APOLLO 15 David Scott, Alfred Warden, James Irwin
67 hours on the moon/18 hours, 35 minutes EVA
First Use of Lunar Rover

1972 APR 16 APOLLO 16 Charles Duke, Ken Mattingly, John Young
71 hours on the moon/21 hours, 15 minutes EVA
Collected 213 lbs. of lunar rocks

1972 DEC 7 APOLLO 17 Eugene Cernan, Ronald Evans, Harrison Schmidt
76 hours on the moon/23 hours, 12 minutes EVA
Last manned trip to the moon;
collected 243 lbs. of lunar samples

1975 JUL 15 APOLLO 18 Vance Brand, Thomas Stafford, Donald Slayton
136 orbits/9 days, 1 hour, 30 minutes
U.S. - U.S.S.R. joint flight;
crews linked-up in space;
conducted experiments

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