FLIGHT MANUAL

SPACE SHUTTLE — A JOURNEY INTO SPACE™

IMPORTANT NOTE ABOUT YOUR FLIGHT DECK CONSOLE

The terminology in this instruction manual corresponds to that of the Flight Deck Console overlay provided. The overlay should be used when operating Space Shuttle. However, if the overlay cannot be used with your particular game system, the following list should be used as a guide:

TERMINOLOGY

GAME SYSTEM	FLIGHT DECK CONSOLE
Power On/Off	Internal Power
Color/B&W	Primary Engines
Left Difficulty	Backup Engines
Right Difficulty	Cargo Doors/Landing Gear
Game Select	Status
Game Reset	Activate Countdown

If the Color/B&W Switch (Primary Engines) on your game system is inaccessible, the Left Difficulty Switch (Backup Engines) should be used.

Also, on the Atari® 2800™ and Sears Video Arcade II™, put the Color/B&W Switch in the B&W mode, then use the Left Difficulty Switch.

Otherwise, shutdown Backup Engines (Left Difficulty) and ***do not touch!***

Sears Video Arcade II™ game systems:
Difficulty is called skill, and *A* is Expert, *B* is novice.

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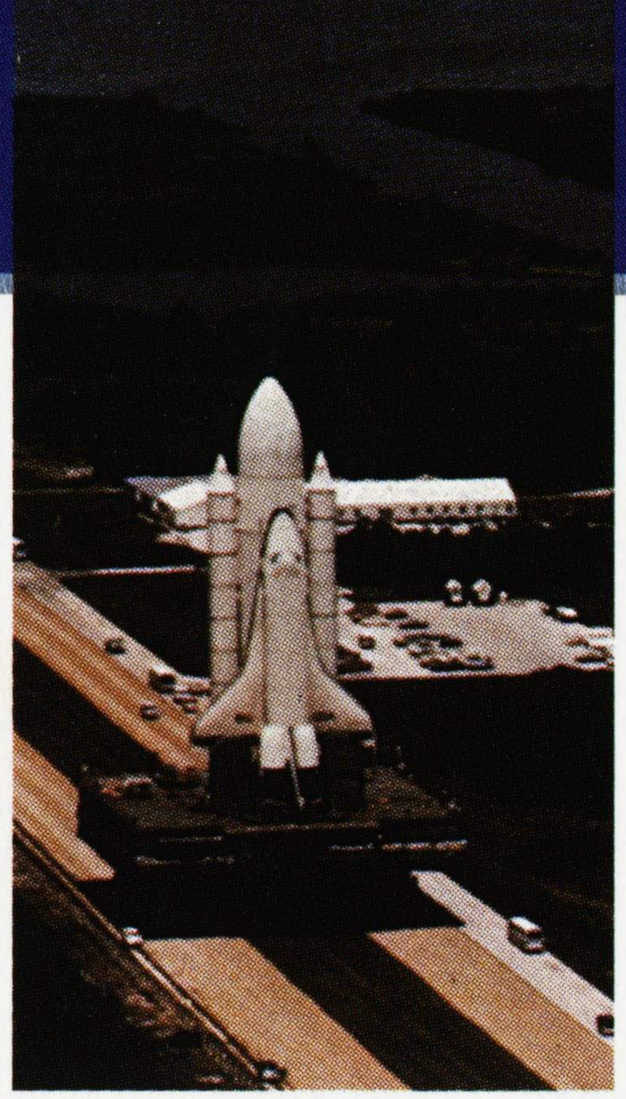
***Space Shuttle–A Journey Into Space*™ is dedicated to the men and women of the National Aeronautics and Space Administration (NASA), without whose kind assistance this cartridge would not have been possible.**



FLIGHT PREPARATIONS

MISSION PROFILE

It is the 101st Shuttle mission of the Space Transportation System. You are at the helm of the Space Shuttle Discovery. Approximately 210 nautical miles above the Earth is your target: an orbiting satellite with intentionally programmed gyroscope problems.

Your mission is to launch, rendezvous, and dock with the satellite as many times as you can, using the minimum of fuel, then return safely to Earth. A word of caution: Each time you successfully dock, the satellite has been programmed to become even more erratic.

This is a total test of your piloting capabilities. You will be evaluated at the end of your flight.

EQUIPMENT CHECK

Status Switch Your Flight Indicator. Hold it down to make your Flight Selection and to check the following important information: speed, altitude, fuel, MET (mission elapsed time) and stats (see "Stat Messages" for descriptions). Also, hold down for two seconds during flight to re-start flight.

Primary Engines Your access switch to all Shuttle engines: Main Engines, Orbital Maneuvering System, and Reaction Control System.

Backup Engines Used only on game systems where Primary Engines (Color/B&W Switch) is inaccessible. Otherwise *always* keep in shutdown mode.

Cargo Doors/Landing Gear A dual function switch used to open and close your Cargo Bay Doors, and to lower your Landing Gear. More on this in later sections.

Joystick Controller A realistic directional hand controller. Forward and back moves Shuttle forward or back (X axis). Left and right controls your "plane" (left/right) movement (Y axis). With red button depressed, forward or back stick movement moves shuttle up or down (Z axis). See "Maneuvering in Space" for further explanation. Also, the red button has other uses in launch, orbit, and entry phases as described in those sections.

FLIGHT SELECTION

There are three separate flight modes. Spend time with training flights #1 and #2 before taking on all the challenge of a real, unassisted Shuttle mission (flt. #3). Flight mode can only be selected before countdown is activated.

Flight #1 Autosimulator Flight mode #1 is a combination demonstration flight and autosimulator. The Shuttle flies an abbreviated mission. You do not use any of the console controls. In this flight mode, most aborts (see "Abort indicator") are ignored. Whenever you touch your Joystick, you take control from that point on. However, you will only need to use your Joystick Controller to correct your Y axis, and land.

Flight #2 Simulator All astronauts spend thousands of hours practicing in ground-based simulators before flying an actual Shuttle mission. In this mode, experience the challenge and demands of a real mission with a couple of important exceptions: You will never use any fuel units, so take your time to complete a mission. Also, your onboard computers will greatly assist you during flight by compensating for less than perfect piloting skills. Most aborts are overriden, but your flight indicator (stat message) will alert you when you've erred.

Flight #3 STS 101 A full-fledged Shuttle Flight. All aborts are operative and flight conditions are quite realistic. Good luck!

FLIGHT EVALUATION

Abort Indicator If critical problems occur anytime during a flight, you may receive a "Launch Scrub" or "Mission Abort" signal. If this happens, your flight has ended, and you must check your Status to find out what went wrong.

Ranking If you safely land your Shuttle at Edwards Air Force Base, in flight #3, your performance will be computer-evaluated. Your ranking will be determined by the number of successful dockings and the exact number of fuel units you have remaining at the end of your flight:

RANKING	DESCRIPTION	QUALIFICATIONS (Dockings)	QUALIFICATIONS (Minimum fuel units)
Commander	Responsible for overall crew safety and flight execution.	6 or greater	7500
Pilot	Second in command, assists in all flight functions.	4,5	4500
Mission Specialist	Qualified to coordinate mission scientific objectives.	2,3	3500
Payload Specialist	Qualified to operate specific payloads and coordinate Shuttle housekeeping.	1	1

See "Earning Your Wings" for important club information.

LAUNCH: DAWN, CAPE CANAVERAL

OBJECTIVE

Launch your Space Shuttle and attain an altitude and orbit as close to the satellite's orbit as possible.

LAUNCH CHECKLIST

Launch Phases As you fire your enormous main engines and liftoff from the pad, you'll be going through 3 separate phases. The numbers 1, 2, 3 on your initial computer screen refer to: (1), firing of the SRB's (solid rocket boosters), which really shakes the shuttle, (2), maximum acceleration, and (3), approaching engine shut down. The X indicates MECO, (Main Engine Cut-Off).

Thrust Notice the two, long horizontal bars on the control panel on your screen. "T" stands for thrust. "C" stands for computer. The "C" arrow represents a signal from the onboard computer indicating the proper thrust needed during each phase of liftoff. You control "T" (thrust) using the red button on your Joystick. Always keep both "T" and "C" arrows aligned. Whenever the "T" arrow flashes, you are wasting fuel and should immediately increase or decrease thrust.

Hold Down Bolts Though your engines are firing, you won't leave the ground until MET +3. The "Hold Down Bolts" will keep your Shuttle on the ground until MET +3 to compensate for the mechanical strain on the Shuttle from firing your engines.

Trajectory/Plane In addition to regulating thrust, you'll need to also follow the proper trajectory (forward-back on Joystick), and constantly correct your "plane" (left-right on Joystick).

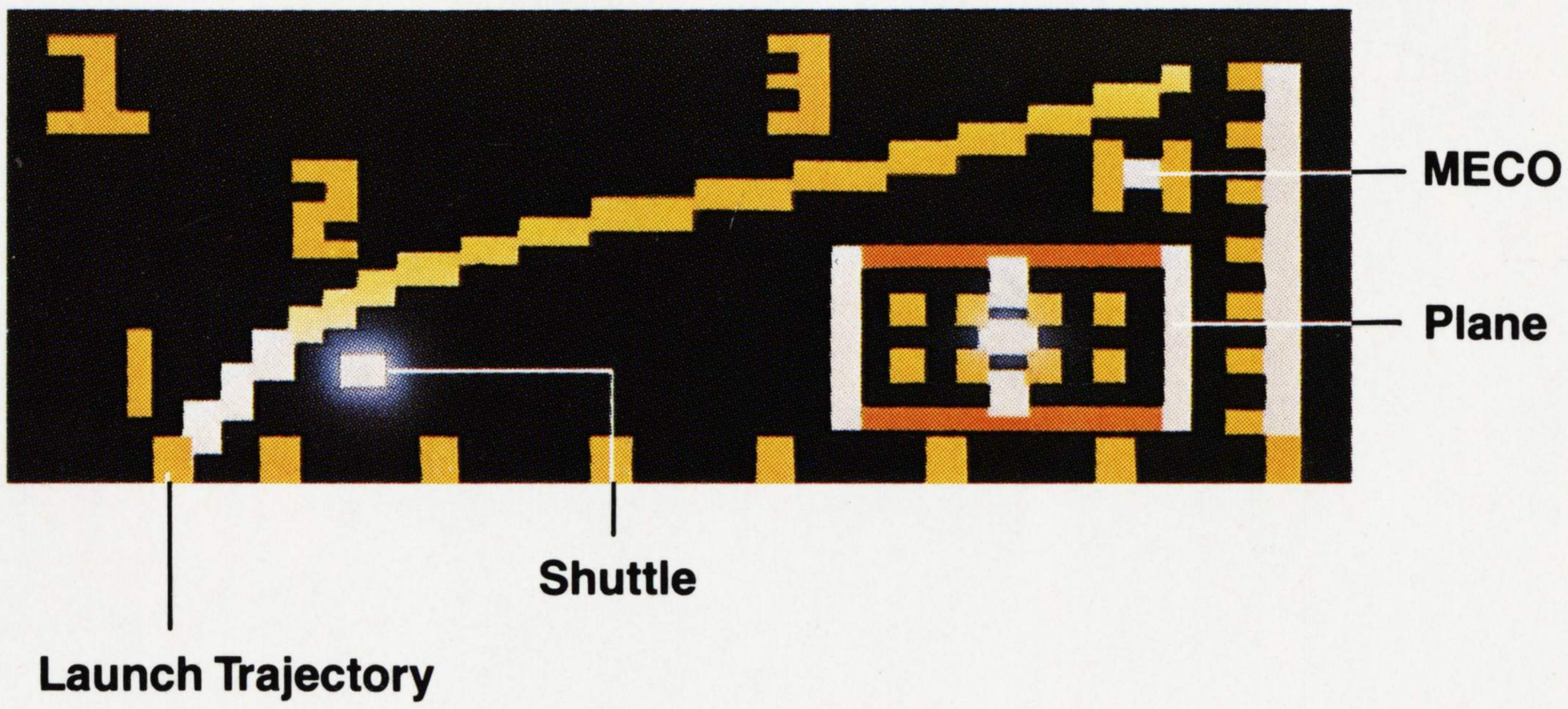
Line Horn If you stray from the correct launch trajectory, you will waste fuel. To alert you when this is happening, a warning horn will sound. You'll find this feature helpful in avoiding an abort situation.

Separation A yellow flash at about 26 nautical miles will indicate Solid Rocket Booster separation (SRB SEP). Another flash shortly after MECO, (Main Engine Cut-Off), will alert you that the main External Tank has fallen away into the Indian Ocean (ET SEP).

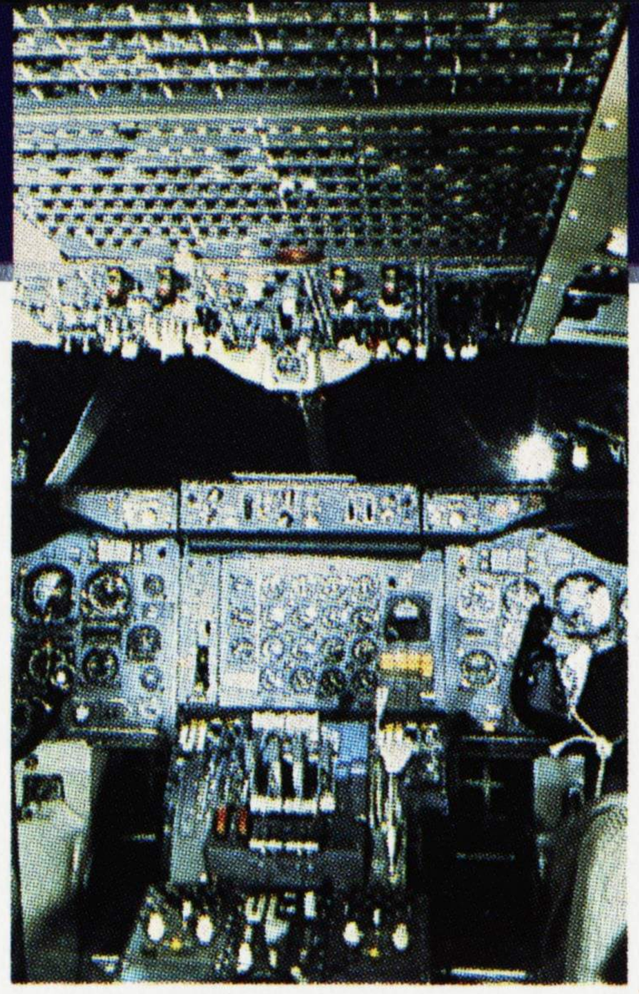
LAUNCH SEQUENCE

1. Internal Power On.
2. Primary and Backup Engines Shutdown.
3. Cargo Door closed/Landing Gear Up.
4. Activate Countdown.
5. At MET-015 activate Primary Engines.
6. At MET-004 ignite Engines by pressing red button on Joystick. Match "T" arrow with "C" arrow during launch.
7. As Shuttle rises, watch both dots on the computer screen. You must follow the indicated launch trajectory *and* continually correct your "plane" by keeping your Shuttle centered in the small box at right:
   - Move Joystick forward to move dot left, backward to move dot right.
   - Move Joystick left or right to correct plane.
8. At about 205 nautical miles, quickly shutdown engines. The closer you come to the 210 altitude, the closer you'll be to the satellite's orbit.

Launch & Ascent Summary Flying the Shuttle into orbit is an extremely challenging task. Following a roller coaster path, you must match your thrust with the computer indicator, stay on the proper trajectory as plotted on the altitude display, and correct your plane as indicated in the small green box. Each area is critical. Incorrect trajectory will cost precious fuel and may abort your mission. A great elevation in the plane setting at MECO will make satellite docking difficult.



TRACKING SCREEN



STABILIZING ORBIT

OBJECTIVE

Establish a stable orbit by adjusting Shuttle pitch to enable visual contact, and by opening Cargo Bay Doors for heat release.

STABLE ORBIT CHECKLIST

Nose Down Maneuver When the Shuttle first achieves orbit, the nose of the craft is pointed up out of the line of sight of the satellite. In order to dock, you must see the satellite. So it's necessary to bring the nose down, which is done by adjusting pitch (the up-down movement of the nose of the Shuttle).

Cargo Bay Doors One of your first tasks in orbit will be to open the Cargo Bay Doors. This is vital and must be accomplished within first orbit. The radiators that shed excess heat generated by the Shuttle are on the inner surfaces of these doors. If the doors remain closed, heat builds up within the vehicle, and a warning horn will sound. (You then have 30 seconds left to open Cargo Bay Doors.) If the doors aren't quickly opened, the mission will have to be aborted.

SEQUENCE TO STABILIZE ORBIT

1. Activate Primary Engines.
2. Push Joystick forward to set-28 pitch.
3. Shutdown Primary Engines.
4. Open Cargo Bay doors.

STABLE ORBIT SUMMARY

Nose pitch down and Cargo Bay Door events must be performed on the first orbit revolution before any on-orbit operations can be attempted.

DOCKING: 210 NAUTICAL MILES IN SPACE

OBJECTIVE

Properly correct the speed and position (Z, Y, X axes) of your Shuttle to successfully rendezvous with the satellite.

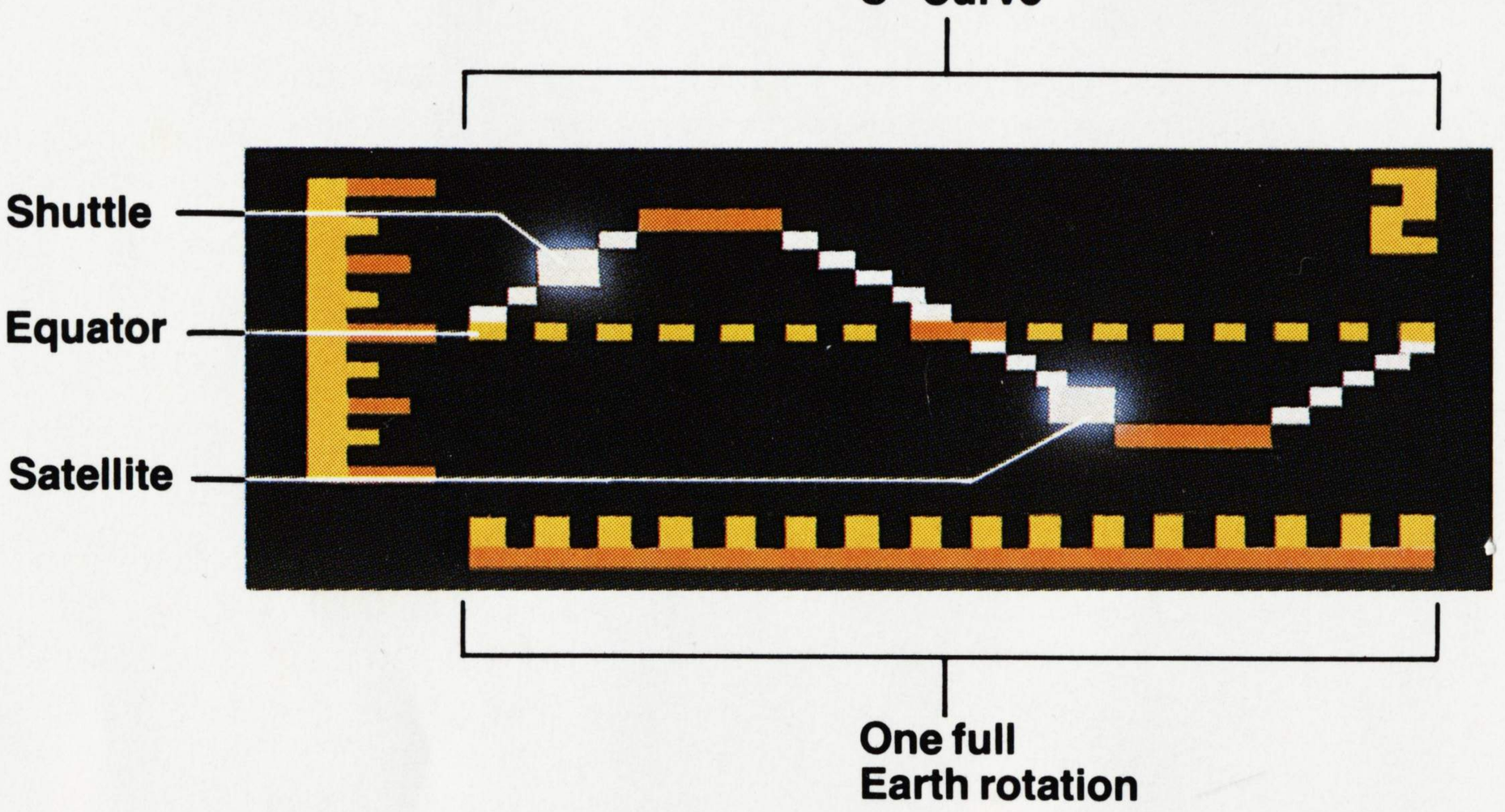
DOCKING CHECKLIST

Maneuvering in Space There are two separate ways to maneuver your Shuttle in space.For major maneuvers (30 nautical miles or more) the Orbital Maneuvering System (OMS) can be used. This system (explained in a later section) takes a good deal of understanding and experience to use effectively. So, when first starting out, use the Reaction Control System (RCS). These clusters of rocket engines in the Shuttle's nose and tail can move the Shuttle about its three major axes X, Y, Z (called transitional) or about its yaw or pitch (rotational).

Shuttle Speed and Position Speed is just as important as position. Never allow your speed to drop below mach 17.0, or your altitude to fall below 195 nautical miles, or you'll burn up in the atmosphere! Your X motion to satellite is dependent upon your speed, not the RCS engines. To move toward satellite you must increase speed to greater than mach 23.9 (the satellite's speed). When you make your final approach to satellite, keep your speed close to mach 23.9.

Drifting As you move closer to the satellite, constantly go back and forth to check all axes. Settings continually shift, and the satellite movement is erratic.

"S" Curve On computer screen #2, the "S" line indicates both the Shuttle's and the satellite's ground track around the Earth. The flashing dot is your Shuttle, the solid dot is the satellite. Notice as you track the satellite, your X axis will suddenly change significantly as the satellite "wraps around" the tracking line. This is because the orbital tracking line wraps around the display as a real orbit would wrap around the Earth.



GROUND TRACK SCREEN

Docking Screen You'll use the "S" curve screen until you get fairly close to the satellite. Then, two smaller radar screens will appear. The left screen shows your Z axis, (up-down), and a wide view of your Y axis, (left-right). The right screen, which you'll use more, shows the X axis (left-right), and micro (close in) Y axis (up-down).

Multiple Dockings Every time you dock, you receive a "Rendevous" sign and a certain number of fuel units. However, each docking becomes more and more difficult. So, for each successive docking, you receive more fuel. After each docking, the satellite has been programmed to sail a good distance away from your Shuttle. Wait until it settles ($x = +128$ or -128) before beginning another docking procedure.

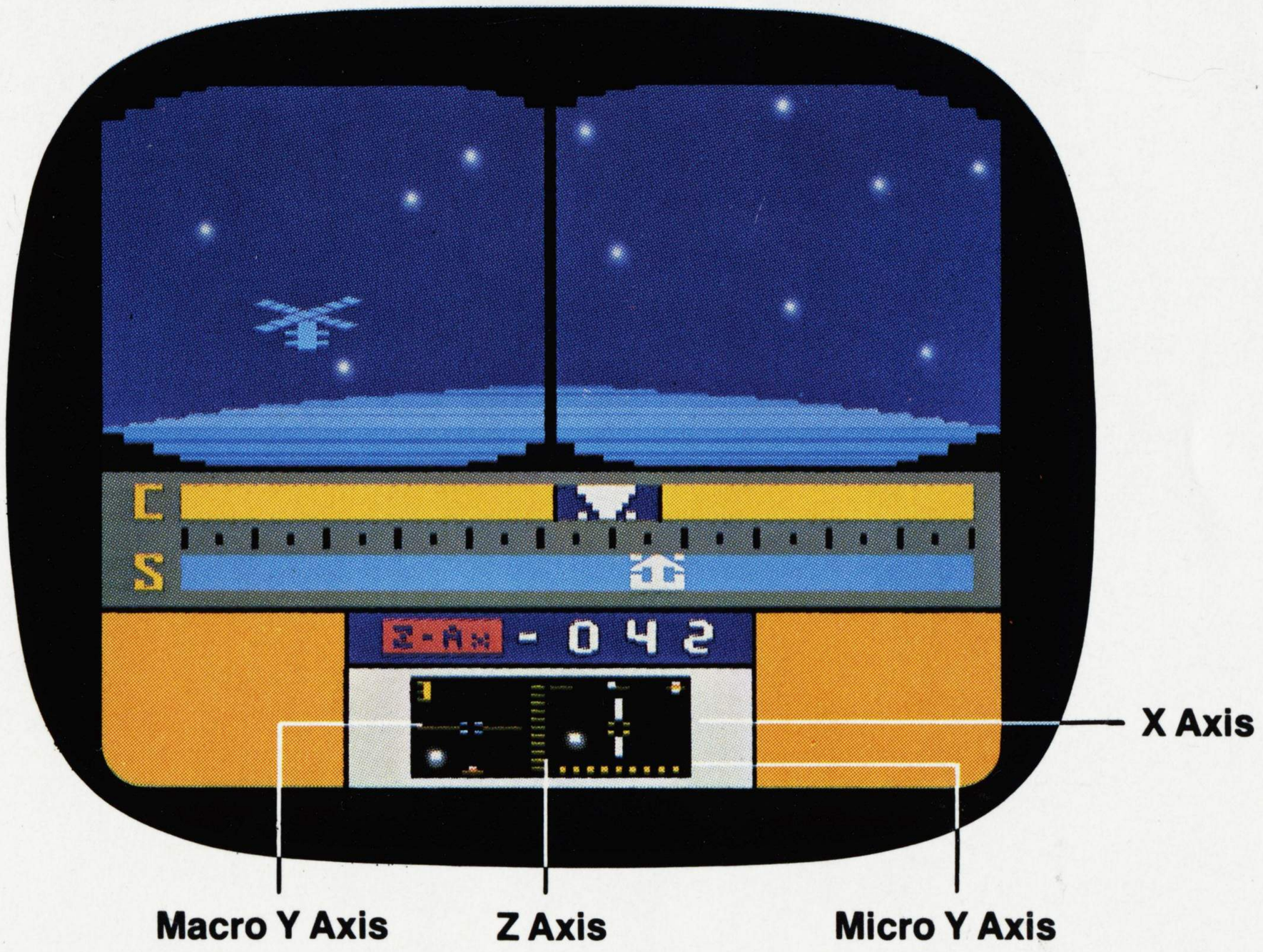
DOCKING SEQUENCE

Match the position of your Shuttle with that of the satellite's by correcting your Z, Y and X axes preferably *in that order*.

1. Correct Z axis to 0: Hold down red button and tap Joystick forward. A negative number means the satellite is below you, so push the Joystick forward to dive. A positive number means the satellite is above you, so pull the Joystick back to climb.
2. Correct Y axis to 0: Tap the Joystick to the right. A positive number means the satellite is right of you, so push your stick right to line up with it. A negative number means it is left of you. Push Joystick left to line up with satellite.
3. Correct X axis: Tap the Joystick back. A positive number means the Satellite is ahead of you. A negative number means it is behind you. To increase Shuttle speed, push Joystick forward. To decrease speed, pull Joystick back. Use Status switch to check Shuttle speed.
4. Dock: All axes must be adjusted to 0, and stabilized for 2 seconds, then you will receive a "Rendevous" signal, indicating you've docked.

DOCKING SUMMARY

You are attempting to dock with a satellite that is travelling at Mach 23.9 and 210 nautical miles above the Earth. You will either need to slow down or speed up to rendezvous (X axis). Also, you will need to be at the same altitude (Z axis), and position (Y axis). All of these maneuvers are interrelated—changing one can affect the others. And, in flight #3, the longer you take to dock, the more fuel you'll use! It is also better to tap the Joystick than hold it down (saves fuel).



DOCKING SCREEN

DEORBIT BURN

OBJECTIVE

To turn the Shuttle around, fire the engines, and decelerate to the proper speed.

DEORBIT CHECKLIST

Deorbit Burn Maneuver You must first turn the Shuttle around so that it is traveling tail-first. Then, in order to maintain the proper altitude, set your Z axis and pitch. Once completed, fire the engines to decelerate. (If the Z axis and pitch are not set properly, firing the engines will make your Shuttle climb or dive.) After the deorbit burn, the Shuttle must then be reoriented nose-forward to the proper attitude for reentry. Entering the atmosphere backwards will cause the Shuttle to burn-up.

Yaw Left-right rotation of the nose of the craft.

Satellite Interference Before attempting a deorbit burn, you *must* allow the satellite to pull a safe 128 nautical miles away from the shuttle. If you don't, your deorbit burn will be unsuccessful, and you'll never leave orbit!

SEQUENCE FOR DEORBIT BURN

1. Check x axis by tapping Joystick back. Wait until x = 128 miles *before* proceeding (x = + 128 or − 128).
2. Using Status switch, check your speed. Pull Joystick back or push Joystick forward to set speed at Mach 23.9.
3. Correct Z axis to 0.
4. Activate Primary Engines.
5. Turn Shuttle around by pushing Joystick left to set yaw at − 128.
6. Pull back or push Joystick forward to set pitch at − 004.
7. Display speed (SP/m), speed in Mach, using Status switch.
8. Ignite engines by pressing red fire button. Hold down button until speed = 19.0.
9. Reset yaw to exactly 0.

DEORBIT SUMMARY

Deorbit is one of the most critical phases of your flight.

Following completion of orbital operations, the Shuttle is oriented to a tail-first attitude, then decelerated to a necessary speed for reentry.

The orientation of the Shuttle is established by the RCS engines, and deceleration is provided by the larger OMS engines.

You begin to lose altitude once you've slowed the Shuttle down below the actual velocity needed to sustain your 210 mile orbit.

REENTRY

OBJECTIVE

To establish and maintain the correct pitch, yaw and speed; follow the correct trajectory; and properly manage heat build-up during reentry.

REENTRY CHECKLIST

Entry Interface This is the point in your flight where atmospheric entry officially begins. As the Shuttle descends, atmospheric drag dissipates tremendous energy, generating a great deal of heat. This heat quickly builds up (portions of the vehicle's exterior reach 1,540°C). Pitch and speed must be correct to properly utilize the Shuttle's Thermal Protection System.

Terminal Area Energy Management After entry interface, you must closely follow the proper descent trajectory in order to maintain enough altitude and speed to reach the final touchdown point. This process of conserving your energy by maintaining the correct position, altitude, velocity and heading is called Terminal Area Energy Management (TAEM).

Loss of Signal During reentry, the Shuttle superheats the gas of the upper atmosphere, creating flashes of color outside your window. Heat strips electrons from the air around the Shuttle, enveloping it in a sheath of ionized air that blocks all communication with the ground. So, at 160 miles, you will experience a temporary partial loss of signal (LOS). Keep a close eye on your radar at this point. You will receive intermittent signals which you need to use to correct your course and plane.

Descent Screens On your reentry screen, "X" indicates cut-off of your OMS engines (deorbit burn). "T" indicates the Terminal Area Energy Management Phase. "L" indicates your transition to final landing approach. The small box at left is your plane indicator.

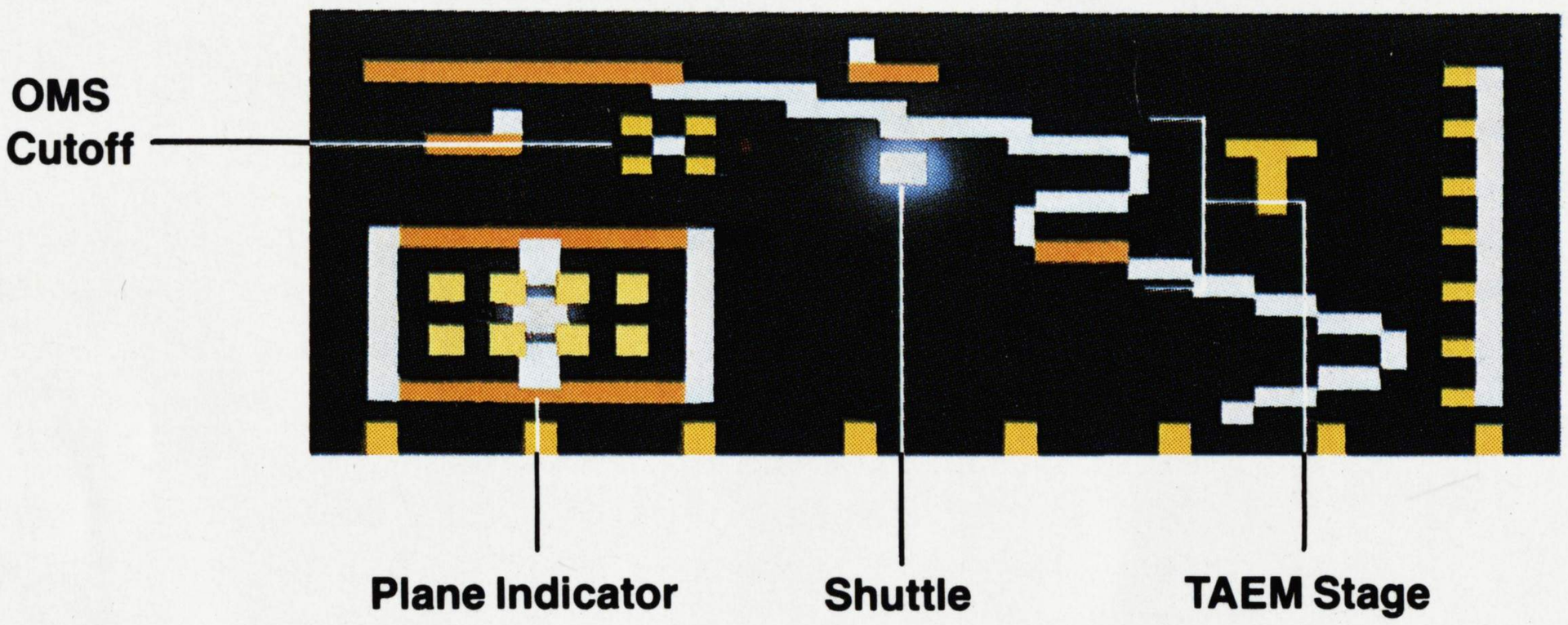
REENTRY

REENTRY SEQUENCE

1. Pull back Joystick to set +24 pitch for proper reentry attitude.
2. Close Cargo Bay Doors.
3. Follow reentry course on computer screen. Pull stick back to go right; push forward to go left. Left and right on stick centers plane.

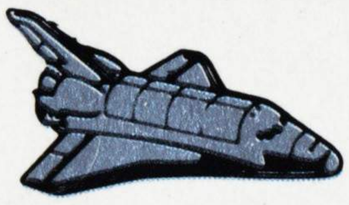
REENTRY SUMMARY

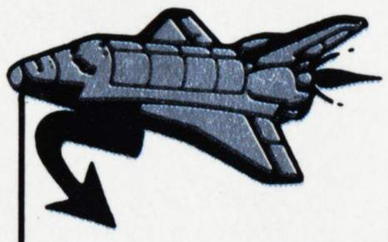
There are three important stages to Reentry: Entry Interface, TAEM and LOS. Position, altitude, velocity and heading must all be exact to both properly manage the tremendous heat buildup and correctly position your shuttle for the Final Approach.



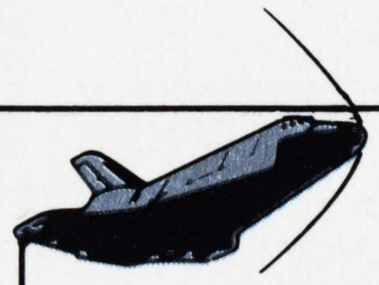
REENTRY SCREEN

RETURNING TO EARTH

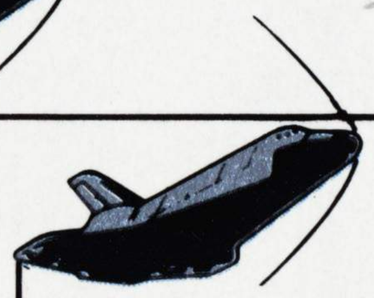




DEORBIT BURN TO SLOW SPEED

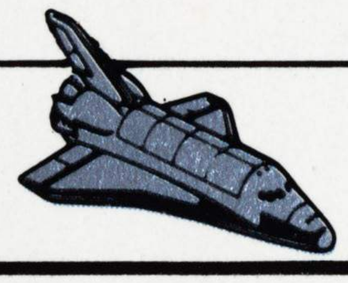


BEGIN DESCENT

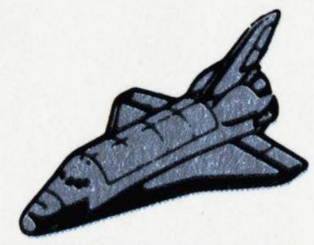


MAXIMUM HEATING

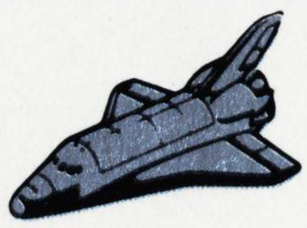
FOLLOW GLIDEPATH



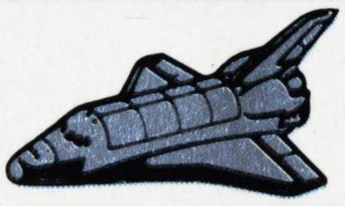
TERMINAL AREA ENERGY MANAGEMENT



TURN TO BEGIN FINAL APPROACH



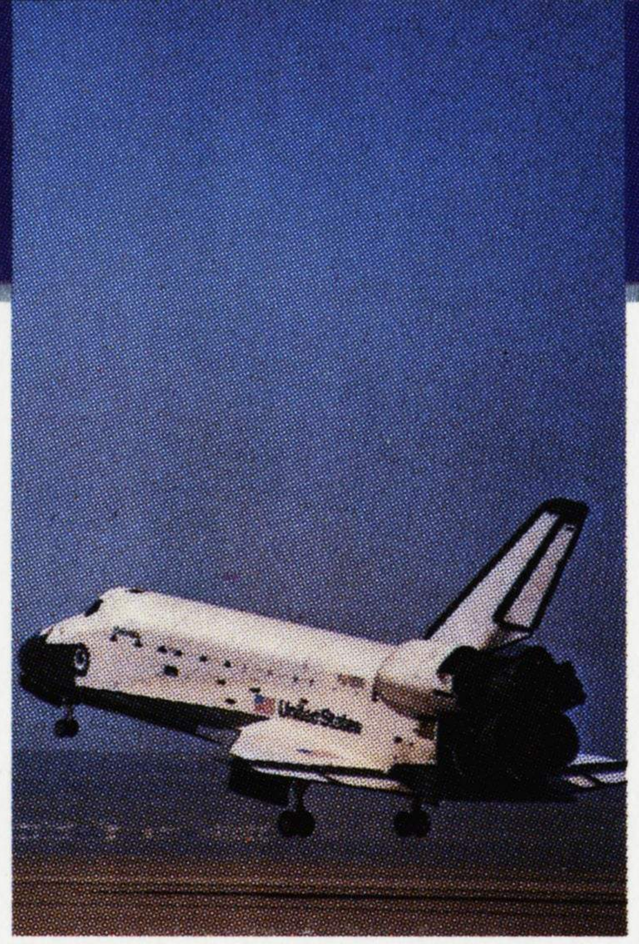
BEGIN TO PULL NOSE UP



PREPARE TO DROP GEAR

WHEELS DOWN

TOUCHDOWN



LANDING: EDWARDS AIR FORCE BASE, CALIFORNIA

OBJECTIVE

Properly following the final approach course, maintain the correct pitch and descent rate to safely land.

LANDING CHECKLIST

Final Approach As you leave the reentry phase and enter your final approach, the first thing you'll see are the mountains around Edwards Air Force Base. You'll hear two sonic booms caused by your craft and the chase planes. At this point, your Shuttle is a glider.

In order to maintain enough altitude and speed to reach the touchdown point, you'll need to make an extreme right turn which will leave you lined up with the runway entry point.

Landing Screens Now, closely watch all your flight instruments on the front control panel. At this point events happen quickly. You will need to keep your nose pulled up to slow descent while constantly watching altitude and range. Lines on the left screen box, (Altitude Direction Indicator) indicate the ideal trajectory or path and your upper and lower safe limits. The right box is your Horizontal Situation Indicator. It shows your position relative to the runway.

Range Range is the distance from the edge of the runway to your shuttle. So, when range is negative you're above the runway.

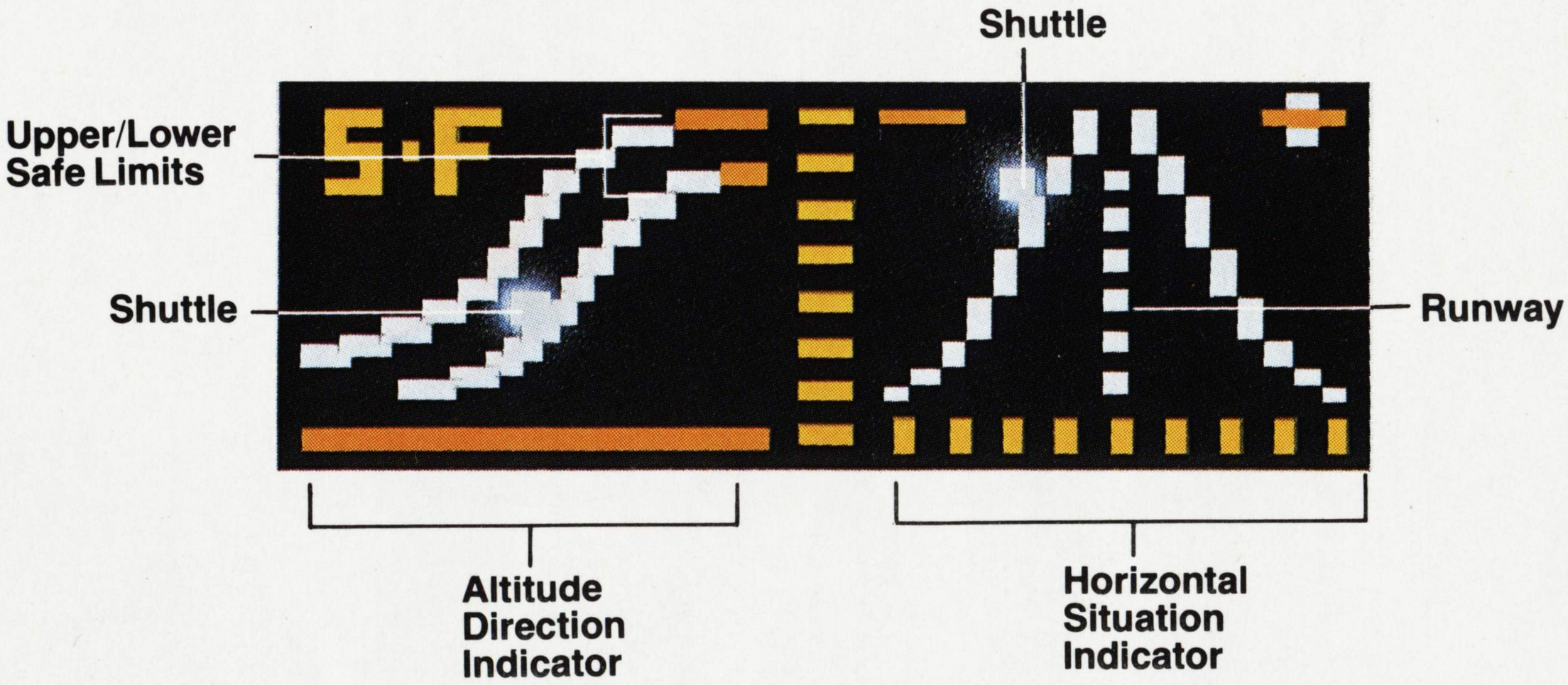
Surface Conditions Since you're in the desert, crosswinds can become a real problem. Compensate by constantly moving Joystick left-right and forward-back to maintain the proper trajectory and descent rate until touchdown. Just because you're close to home—don't let up on your concentration.

LANDING SEQUENCE

1. As soon as you see the mountains, make a right turn. Line up Shuttle on runway using radar screen.
2. Follow final approach course on both computer screens. Left screen: Keep dot centered between the two arched lines. Right screen: Keep dot centered on straight runway approach line. Push Joystick forward to lower nose (quicken descent). Pull Joystick back to raise nose (slow descent). Push Joystick left or right to keep dot centered.
3. Press red button to display altitude. Release button to display range.
4. When range goes negative, you're over the runway, just seconds from touchdown, so drop landing gear *now*.
5. Push Joystick forward to lower nose.
6. When Shuttle hits runway, your nose will pop up, so keep Joystick pushed forward to keep nose down until you hear the thud of the front landing gear.

LANDING SUMMARY

During the final approach, descent speed is critical. You will be conducting a series of "flares" (nose-up maneuvers) that reduce speed which is necessary for landing. So, not only will you need to center the Shuttle on the runway, but also you must maintain the proper pitch at the same time. Sounds are important during this phase. Use them to monitor your progress. In addition to the sonic boom as you break through the atmosphere, you'll hear a constant beeping effect which will increase in speed the closer you get to the runway, a high-pitched warning horn after you've passed over the runway (a signal to put your landing gear down), landing gear lowered, and (main gear) tires screech when you've touched down.

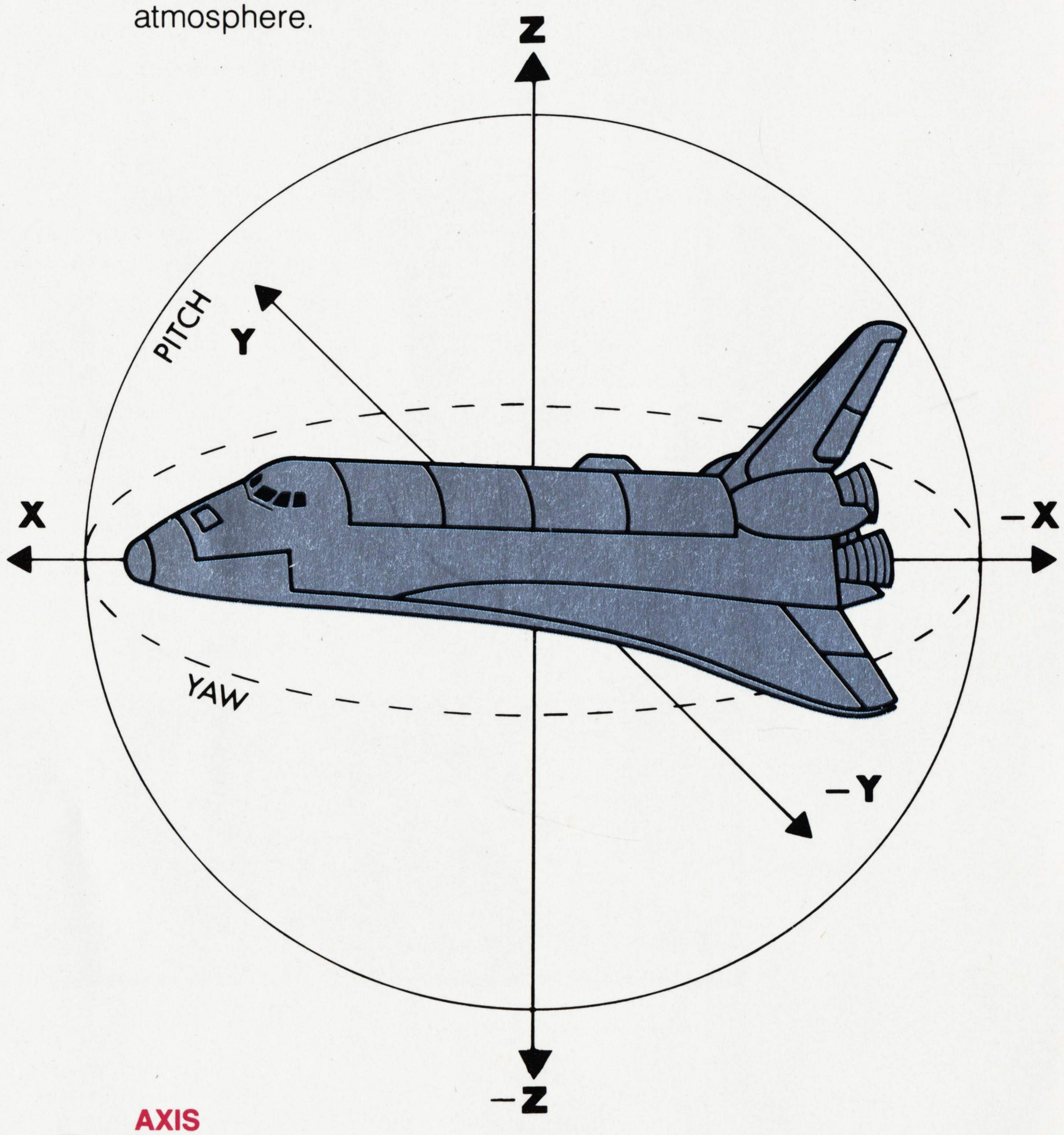


FINAL APPROACH SCREEN

ORBITAL MECHANICS

You've successfully launched your Shuttle into orbit. Now, it's time to dock with the satellite. Whether you're making position corrections using the OMS or RCS engines, remember that every action you take may affect your axis (X, Y, Z) or altitude. For example, if your pitch is −028 (nose-down) and you perform an OMS burn to correct your X axis, your altitude will drop because you're actually pointed towards Earth.

Try and picture the position of the Shuttle in your mind as you're orbiting. Use the diagram below (also on your Flight Deck Console) to help you visualize Shuttle positioning. And remember: minimum speed is Mach 17.0 and minimum altitude is 195 nautical miles, or your orbit will destabilize and the vehicle will burn up in the atmosphere.



AXIS

Z = Vertical distance to earth
Y = Left and right distance to satellite
X = Forward and back distance to satellite
PITCH = Up-down of the nose of the craft
YAW = Left-right rotation of the nose of the craft

ORBITAL MANEUVERING SYSTEM

For smaller, precise adjustments, you'll want to achieve orbital maneuvers with your Reaction Control System (RCS) engines. They're easier to use. However, time means fuel. Housekeeping fuel—used to keep the various electrical equipment and life support systems of the Shuttle operating—is constantly being expended. So, it's imperative you make your orbital corrections as efficiently and quickly as possible. This is where your OMS engines can be a great aid. When making major maneuvers (30 nautical miles or more) use your 12,000-pound-thrust OMS engines. However, since using the powerful OMS engines can dramatically affect altitude, *read the following instructions carefully.*

X AXIS CORRECTIONS USING OMS ENGINES

When flying forward on X (0 Yaw) using your OMS engines, your altitude will drop faster if your pitch is zero or negative. When flying backwards on X (– 128 Yaw) using your OMS engines, your altitude will rise if your pitch is positive or zero, and your altitude will not be affected by the OMS burn if your pitch is negative.

Sequence

- Set pitch to correct value.
- Set display to "X" axis, speed, or altitude
- Set yaw to – or + 128.
- Push red button to fire engines.
- Restore yaw and pitch to correct values.

Y AXIS CORRECTIONS USING OMS ENGINES

As you perform a Y OMS burn, you'll see your Y indicator change. If you forgot to change your pitch to 0, your altitude will change. A positive pitch will make you fall. A negative pitch will force you to rise. A non-zero pitch also burns extra fuel.

Sequence

- Set pitch to correct value.
- Set yaw to – or + 64.
- Push red button to fire engines.
- Restore yaw and pitch to correct value.

OMS Summary In other words, when correcting either X or Y axis using your OMS engines, *altitude may be affected.* Taking this into account, it is possible to make both Z (vertical) *and* X or Y corrections, all in the same maneuver—if very skillfully done.

LAUNCH: PROBLEMS

PROBLEM: MET-15 does not appear. Screen only comes up STAT.

SOLUTION: Check switches. Primary and Backup Engines must be shut down. Cargo Doors must be closed. Try again.

PROBLEM: "Launch Scrub."

SOLUTION: You're igniting your engines prior to or too long after MET-004 . Wait for launch systems to recycle and concentrate on firing as close to (but not before) MET-004 as possible.

PROBLEM: Line horn continually sounds during launch.

SOLUTION: Keep dot (your Shuttle) slightly on the low side of the trajectory line to maintain proper course.

STABILIZING ORBIT: PROBLEMS

PROBLEM: Initial orbit position too low, or speed too slow.

SOLUTION: You're shutting off your engines before proper altitude is achieved. Cut-off your main engines as close to 205 miles as possible.

PROBLEM: "Mission Abort" signal as soon as you shut down engines.

SOLUTION: Dependent upon your Abort number, either: speed/altitude were too low to sustain orbit; you were far off the trajectory line at MECO; you shut down your engines too early, or your orbit insertion angle was incorrect. Either you were very far off the trajectory line or your plane (right-left position) was incorrect.

PROBLEM: Once in orbit, Y axis is off badly.

SOLUTION: Plane (right-left) was not centered at MECO.

PROBLEM: Once in orbit, Z is off badly.

SOLUTION: You shut down your engines too early. Remember, your Z axis is directly related to your altitude. The lower your altitude, the more negative your Z axis. A Z-15 axis equals an altitude of 196.0 miles. When Z axis equals 0, altitude is 210 nautical miles, the altitude of the orbiting satellite.

PROBLEM: Once in orbit, X is badly off.

SOLUTION: Cargo Bay Doors were closed too long and Shuttle overheated. You have approximately 30 seconds to open Doors after you achieved orbit.

DOCKING: PROBLEMS

PROBLEM: Although axes are adjusted, satellite is never sighted and docking screens never appear.

SOLUTION: Check your pitch and Yaw. If pitch is not −28 (Shuttle nose-down), you'll never be in line of sight of satellite. If Yaw is + or − 17 or greater, you'll also be out of line of sight (Shuttle line of sight will be too far left or right). With Z and Y axes adjusted to 0, docking screens should appear when the satellite is at X + or −16, assuming pitch is −28 and yaw = 0.

PROBLEM: Conducting OMS burn sends Shuttle into dramatically high or low altitudes.

SOLUTION: Check your pitch. *Always* make sure your pitch is 0 before conducting an OMS burn unless you intentionally wish to adjust your altitude during burn.

PROBLEM: Axes all adjusted. Satellite spotted. But, you can't dock.

SOLUTION: Check your speed. The satellite always travels at Mach 23.9. So, if you're having trouble docking, adjust Shuttle speed + or − 1 Mach.

REENTRY: PROBLEMS

PROBLEM: After conducting a successful Deorbit Burn, you still aren't losing altitude for reentry.

SOLUTION: The Satellite may be interfering. Wait until it is at least 128 miles (x axis) away before conducting a deorbit burn. Also, make sure your altitude is 210 (z axis 0) and, speed mach 23.9 before attempting burn.

PROBLEM: Burn up during reentry.

SOLUTION: If your pitch is greater than + 24, your Shuttle cannot be protected by its special insulation. If pitch is less than + 24, you'll skip into space. If yaw does not equal 0, you'll spin out. And if your Cargo Bay Doors are left open, your Shuttle will also burn up.

LANDING: PROBLEMS

PROBLEM: Mission Abort as soon as you break through the cloud covering.

SOLUTION: You *cannot* be off course (Klaxon horn is on) during the last few seconds of your reentry (screen). This will place you in the wrong position for Final Approach—altitude and speed will be adversely affected! So, stay right on course at the end of reentry—don't let up.

PROBLEM: You crash into the desert floor.

SOLUTION: This is probably a result of improper use of your Altitude Direction Indicator (ADI). The ADI is your left computer screen during landing. It tracks your altitude and descent. Always keep the Shuttle above the lower of its two lines.

Moving the Joystick forward or back helps do this by raising or lowering the nose of the Shuttle (quickens or slows descent).

Importantly, as soon as you drop landing gear, drag will cause the nose to flare up. So, when landing gear is dropped, push and hold Joystick forward to bring and keep nose down.

EARNING YOUR WINGS

Pilots are a skilled and hearty breed indeed. If you're able to successfully dock your Shuttle five times and land with at least 4,500 units of fuel, you're worthy of Pilot status and an official Pilot patch.

If, after hours of hard training, study and preparation, you make that sixth and final satellite docking with at least 7,500 fuel units in your tanks, you'll be one of the few, the proud, the elite—Space Shuttle Commanders! Anyone achieving this magnificent ranking will be rewarded with a distinguished on-screen display! Snap a photo of the TV screen, and we'll send you the appropriate patch shown below.

Be sure to write "Space Shuttle" on the bottom left hand corner of the envelope.

LANDING SCREEN EVALUATION

FLIGHT NOTES FROM DESIGNER, STEVE KITCHEN

"Ever since I can remember, the Space Program has meant something very special to me. Every time a mission took off, so did my imagination.

"That's why designing a home video version patterned after the real Space Shuttle seemed so appealing—yet challenging. It was quite a task to achieve maximum accuracy in my work.

"In the photo on this page, I'm sitting in an actual NASA Space Shuttle simulator. It gave me a firsthand look at what our astronauts really go through. And I can assure you the Space Shuttle cartridge you now have is quite true to real life.

"So, don't be discouraged if you don't achieve Commander on your first flight. There are plenty of skills and a whole lot of knowledge you need to master first. I strongly suggest you fly Space Shuttle with a friend as co-pilot—functioning as navigator and assistant.

"Learn and understand this manual. The knowledge you gain will not only help with my program but, who knows, may get you a seat on the next real trip into orbit."

Steve Kitchen

Steve Kitchen is a master software designer, engineer and inventor. He was involved in the development of digital watches, the first handheld electronic games and electronic calculators. Steve welcomes and encourages your letters, comments and questions regarding his first work for Activision.

ACRONYMS

AX: Axis

ALT: Altitude

FLT: Flight

MET: Mission-Elapsed Time

MECO: Main Engine Cut-Off

OMS: Orbital Maneuvering Systems

RCS: Reaction Control System

RNG: Range

SRB: Solid Rocket Booster

SP/M: Speed in Mach

SSME: Space Shuttle Main Engine

STS: Space Transportation System

TAEM: Terminal Area Energy Management

DAP: Digital Auto Pilot

STAT MESSAGES

If you're encountering a problem, or just want to check your status, hold your Status Switch down until "STAT" appears. Then, use the following guide. Operational messages are prelaunch alerts. However, Mission Abort messages mean you've made a catastrophic mistake (Flights #2, #3 only) and must relaunch. For further explanations for some of these messages, see "Problems & Solutions."

MESSAGE NUMBER	MESSAGE OR ACTION NEEDED
	(Prelaunch-Non Abort)
0	All clear
4	Shutdown Primary Engines
24	Shutdown Primary and Back-up Engines
44	Shutdown Primary Engines and close Cargo Bay Doors.
64	Shutdown all Engines and close Cargo Bay Doors.
20	Shutdown Backup Engines.
40	Close Cargo Bay Doors.
60	Shutdown Backup Engines and close Cargo Bay Doors.

MESSAGE NUMBER	MESSAGE OR ACTION NEEDED
	(Inflight-Mission Abort)
0	All clear
1000	Not lined up with runway on touchdown
7000	Altitude too low to sustain orbit (below 195)
7500	Altitude too high (255 miles maximum)
9500	Speed/altitude too low to attain orbit at MECO
1500	Touchdown too early (hit desert)
2000	Touchdown too late (run off runway)

MESSAGE NUMBER	MESSAGE OR ACTION NEEDED
	(Inflight-Mission Abort)
3000	Nose gear not down at end of runway
3500	Not on course at beginning of banking turn (Klaxon horn is on)
4000	Landing gear not down at touchdown
8500	Cargo bay doors not open during orbit (overheat)
5000	Cargo bay doors not closed at ascent or entry interface
8000	Speed too low to sustain orbit (below M 17)
5500	Pitch greater than 24 on reentry into atmosphere (skip into space)
6000	Pitch greater than 24 on entry interface (burn up)
6500	Yaw not 0 on entry interface
9000	Orbit insertion angle incorrect at MECO
9900	Out of fuel

MESSAGE NUMBER	MESSAGE OR ACTION NEEDED
	(After safely landing)
1-99	Number of dockings. Also may appear as the last digit of a Mission Abort stat.

GLOSSARY

APOGEE: The highest point of an earth ORBIT.

ALTITUDE: Vertical height from Earth's mean surface (sea level).

ATITUDE: The position of the vehicle; for example, flying tail-first with cargo bay toward the earth.

AXIS: A line through a body about which it rotates.

CONFIGURE: To set equipment to certain specifications.

DEORBIT BURN: The firing of a RETRO-ROCKET to slow the spacecraft to a speed lower than that required to maintain ORBIT. On the Orbiter, this is accomplished with the orbiter maneuvering system (OMS) engines.

GLIDESCOPE: The angle at which you descend in the Orbiter or other glider with respect to the ground.

KILOMETER: 1000 meters, or 0.621 of a mile.

MACH: The term used to describe the speed of objects relative to the speed of sound (about 690 mph). For example, Mach 2 is twice the speed of sound. The shuttle travels through space (in orbit) at approx. 22 mach or 17,000 mph.

ORBIT: A balance between a body's inertia, or tendency to fly off into space, and the gravitational attraction of a central object.

PITCH: Up-down rotation of the nose of the craft (see Roll and Yaw).

RANGE: Distance to edge of runway.

RETRO-FIRE: To fire engines in the direction of motion in order to reduce forward velocity. In orbit, this permits gravity to pull you downward.

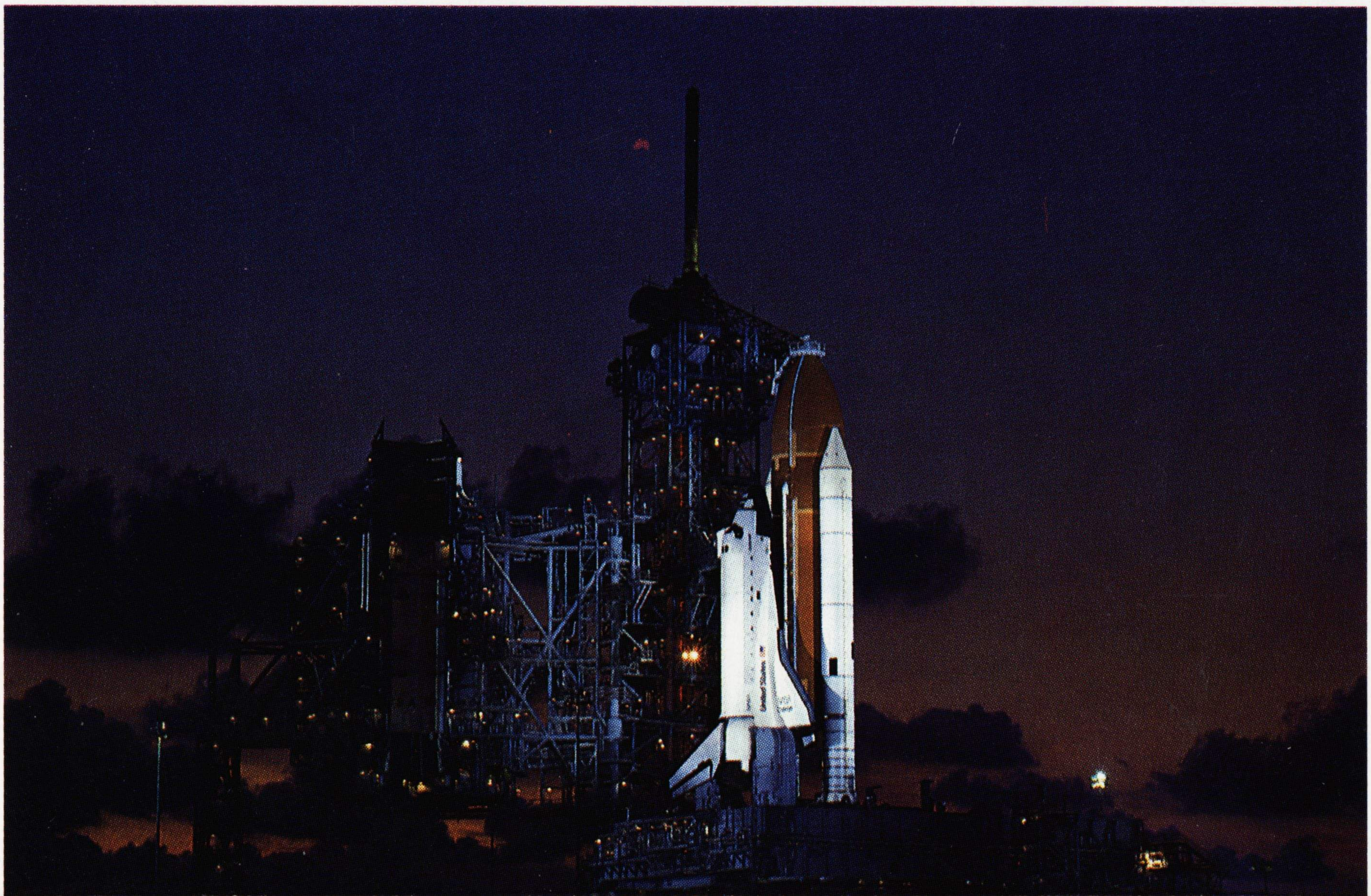
ROLL: To rotate about an axis from front to back (nose to tail) of the Orbiter. To the pilot, a roll is like a cartwheel (see Pitch and Yaw).

RENDEZVOUS: To meet in space and orbit together.

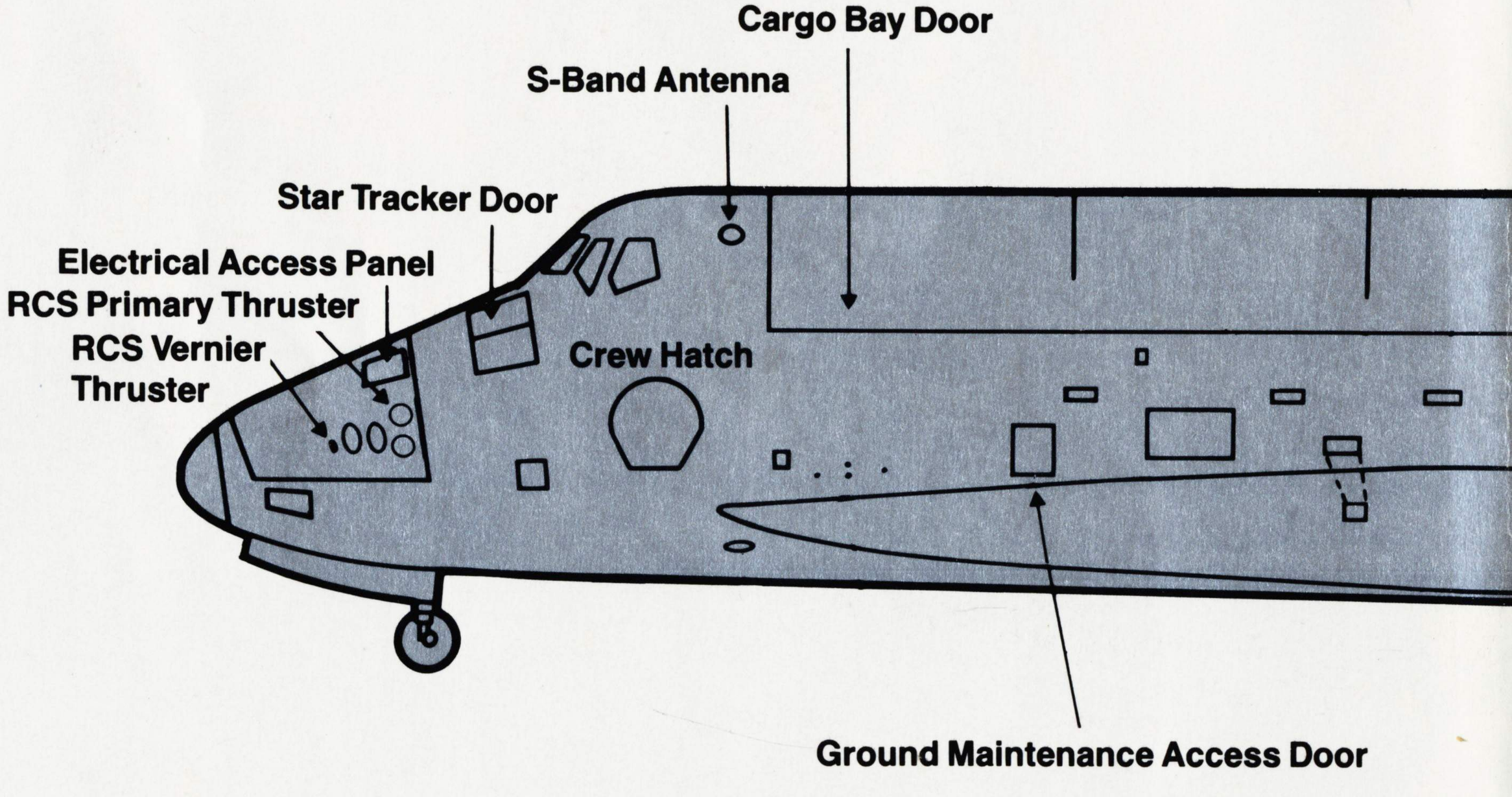
ROTATION: Movement of the Orbiter around its three principal axes producing Pitch, Yaw, or Roll.

TRAJECTORY Flight Path.

YAW: Left-Right rotation of the nose of the craft (see Pitch and Roll).



SPACE SHUTTLE EXTERIOR
THRUSTER, ENGINES, PENETRATIONS



Launch Umbilical Panel
Rudder/Speed Brake Power
OMS/AFT RCS Access
RCS Vernier Thruster
RCS Primary Thruster

MISSION CONTROL HOTLINE

If you have questions about *Space Shuttle—A Journey Into Space* ™ call toll-free at (800) 633-GAME. In California, please call (415) 940-6044/5.

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LAUNCH

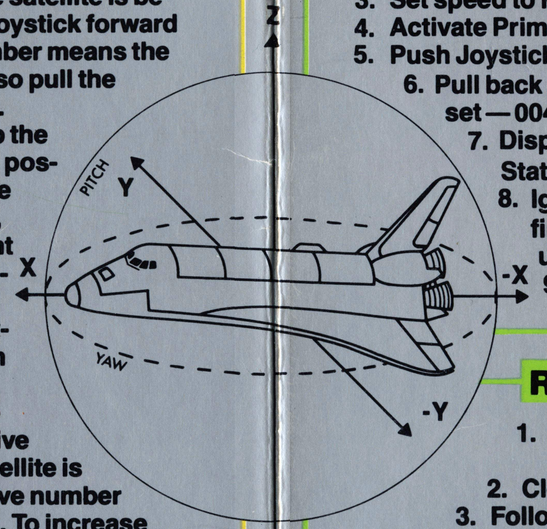
1. Internal Power On.
2. Primary and Backup Engines Shutdown.
3. Cargo Doors Closed, Landing Gear Up.
4. Use Status Switch to select flt. #2 or #3.
5. Activate Countdown.
6. At MET—015 activate Primary Engines.
7. At MET—004 ignite Engines by pressing red button on Joystick. Match "T" arrow with "C" arrow during launch.
8. Maintain proper trajectory and plane watching display.
9. At 205 nautical miles, shutdown Engines.

STABILIZING ORBIT

1. Activate Primary Engines.
2. Push Joystick forward to set—28 pitch.
3. Shutdown Primary Engines.
4. Open Cargo Bay Doors.

DOCKING

1. Correct Z axis to 0: Hold down red button and tap Joystick forward. A negative number means the satellite is below you, so push the Joystick forward to dive. A positive number means the satellite is above you, so pull the Joystick back to climb.
2. Correct Y axis to 0: Tap the Joystick to the right. A positive number means the satellite is right of you, so push your stick right to line up with it. A negative number means it is left of you. Push Joystick left to line up with satellite.
3. Correct X axis: Tap the Joystick back. A positive number means the satellite is ahead of you. A negative number means it is behind you. To increase Shuttle speed, push Joystick forward. To decrease speed, pull Joystick back. Use status control to check Shuttle speed.



DEORBIT BURN

1. Check X axis. Wait until X = 128.
2. Correct Z axis to 0.
3. Set speed to Mach 23.9.
4. Activate Primary Engines.
5. Push Joystick left to set Yaw—128.
6. Pull back or push Joystick forward to set—004 Pitch.
7. Display Speed (Sp/m) using Status Switch.
8. Ignite engines by pressing red fire button. Hold down button until speed is 19.0.
9. Reset Yaw to 0.

REENTRY

1. Pull back Joystick to set +24 Pitch.
2. Close Cargo Bay Doors.
3. Follow reentry course on computer screen. Pull stick back to go right; push stick forward to go left. Left and right on stick centers small "plane".

FINAL APPROACH

1. As soon as you see the mountains, make a right turn. Line up Shuttle on runway using radar screen.
2. Follow final approach course on computer screen. Push Joystick forward to quicken descent. Pull Joystick back to slow descent.
3. Press red button to display altitude. Release button to display range.
4. When range goes negative, drop landing gear.
5. Push Joystick forward to lower nose.
6. When Shuttle hits runway, keep Joystick pushed forward.

WELCOME HOME!

STS 101

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