SPACE SHUTTLE
A JOURNEY INTO SPACE™

FLIGHT MANUAL

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MSK I & II

VLUCHTHANDLEIDING
MSK I & II

ACTIVISION
HOME COMPUTER SOFTWARE™

MISSION BRIEF – CONFIDENTIAL:

You have been hand picked to take command of the Space Shuttle DISCOVERY on its 101st mission. You must learn the controls quickly and use them effectively, remaining calm at all times.

On this mission you will be required to:-

* successfully lift-off
* establish required orbit 210 miles above Earth
* launch a top secret scientific satellite
* dock with other satellites
* turn Shuttle around for re-entry
* re-enter Earth's atmosphere without burning up
* land Shuttle at Edwards Air Force Base

A successful mission will earn you a high ranking. As an experienced Shuttle operator, you may then take the Shuttle on further missions to increase your ranking. We all wish you the best of luck. . .

This Flight Manual will guide you through each stage of flight, giving key facts. You are encouraged to experiment in order to gain maximum proficiency with the Shuttle. Control of the Shuttle is by keyboard and **joystick** and **keyboard only**. If you are using keyboard only, refer to the "CONSOLE INSTRUMENT CONTROL" section as joystick controls are detailed in this manual – keyboard equivalents are listed therein.

LOADING SPACE SHUTTLE:

From Cassette

* Set-up your Computer system as detailed in the Manufacturer's instruction booklets that accompany your Computer. If you use a disk drive, ensure it is not connected (unless it is built-in to the computer).
* Switch your computer, monitor and cassette recorder ON
* Insert the Activision SPACE SHUTTLE cassette into the cassette recorder and rewind to the beginning
* Type the following command to load:
  BLOAD "?",R
  (If your computer has a built-in disk drive, you will need to type this command to load: BLOAD "CAS: ?",R)
* Now press the RETURN key

Activision's SPACE SHUTTLE program will now load into your computer memory.

SHUTTLE CONTROLS

The Visual Console:

On your screen you see the view from two portholes. Beneath them two indicators, one marked "C" the other "T". "C" is your onboard computer indicating the amount of thrust required during lift-off, and "T" shows the actual thrust you are providing.

Below these indicators are three display areas:

The centre area gives you a variety of readings at each stage of the mission. You need to study and control these carefully.

The left-hand display has three ON/OFF readings, showing the status of SSME (the main Engines ON or OFF), PLBD (the cargo bay doors ON [open] or OFF [closed] and GEAR (land gear ON [down] or OFF [UP]).

The right-hand display shows the status of RCS (the Reaction Control System – 2 methods of movement while in orbit, either TRN or ROT), RVZ (the number of successful rendezvous you have achieved with satellites) and C-W (Correction Warnings – a number relating to a warning or a reason for a mission abort).

Console Instrument Controls:

Instrument Description	Joystick Control	Keyboard Control
Pre-flight:		
Flight Mode Selector	Fire button	SHIFT
General:		
Primary Engines ON/OFF	–	E
Thrust	Fire button	SHIFT
Status Check	–	SPACE BAR
Pause Flight	–	P
Cargo Doors		
OPEN/CLOSE	–	C

Movement:

X AXIS (forward & back)	forward or back	↑ or ↓ cursor keys
Y AXIS (left & right)	left or right	→ or ← cursor keys
Z AXIS (up & down)	forward or back and Fire Button	↑ or ↓ and SHIFT
ROTATIONAL Engine –		R
TRANSITIONAL Engine –		T

Landing:

Landing Gear UP/DOWN	–	G

If a mission aborts press the RETURN key to start a new mission.

FLIGHT EVALUATION

During the mission your onboard computer will alert you of conditions that could endanger the Shuttle. If an error condition is bad enough, the screen will display a "MISSION ABORT" message from which there is no recovery. Pre-launch errors ("LAUNCH SCRUB") merely cause a re-start of the countdown sequence. Both messages indicate that the mission has failed, and you should try again. The following numbers can appear during your mission in the C-W display window, or after a mission has aborted. Check these numbers against the cross-reference table below in order to identify the problem areas you experience:-

C-W NUMBER	MESSAGE/ACTION NEEDED
Pre-Launch, Non-Abort	
0	All clear
4-60	Check Engines Shutdown & Cargo Bay Doors Closed
Inflight – Mission Abort	
1000	Not lined up with runway on touchdown
1500	Touchdown too early (hit desert)
2000	Touchdown too late (overshoot runway)
2500	Crashed back to Earth
3000	Nose gear not down at end of runway
4000	Landing gear not down at touchdown
5000	Cargo bay doors not closed at ascent or re-entry
5500	Pitch greater than +24 on re-entry (skip into space)
6000	Pitch less than +24 on re-entry (burn-up)
6500	Yaw not 0 on re-entry
7000	Altitude too low to sustain orbit (below 195)
7500	Altitude too high (above 255)
8000	Speed too low to sustain orbit (below mach 17.0)
8500	Cargo bay doors not open during orbit (overheat)
9000	Orbit insertion angle incorrect at MECO
9500	Speed/Altitude too low to attain orbit at MECO
9900	Out of fuel
After safely landing	
1-99	Number of dockings. May also appear as the last digits of a C-W number.

RANKING:

Once you have completed this mission and safely landed the Shuttle at Edwards Air Force Base using FLT #3, your performance can be evaluated and your ranking determined by the number of successful dockings & number of fuel units remaining at the end of your flight:-

Ranking	Dockings	Qualifications Minimum Fuel Units
Commander	6 or more	7500
Pilot	4 – 5	4500
Mission Specialist	2 – 3	3500
Payload Specialist	1	1

PRE-FLIGHT

FLIGHT MODE SELECTION:

Before you begin the countdown to lift-off, you must decide which flight mode you wish to use – FLIGHT 1 is the easiest, FLIGHT 3 the most difficult. Press the FIRE BUTTON on your joystick to select your required Flight Mode, then press the RETURN key.

NOTE: Shuttle automatically enters a demonstration mode if no flight is selected shortly after loading. Wait until the demonstration is complete and then select your required Flight Mode.

FLT #1: AUTOFLIGHT:

Flight 1 is a special mission that takes you on a training flight controlled from Earth. Whilst on this flight, you may like to experiment with the movement controls, which at non-crucial stages of flight will override the ground computer – however, any errors you make are usually corrected to ensure your safety. This is a good introduction to flying the Shuttle as it takes you through all stages of the mission.

FLT #2: SIMULATOR:

Flight 2 allows you to control most of the Shuttle's controls. The ground computer controls your fuel consumption, so the time taken to complete a mission is not crucial. Ground control also assists you during flight by compensating for less than perfect piloting skills, and most flight aborts are overridden. This is an excellent flight to choose for experimenting with the controls and gaining experience of Shuttle movement.

FLT #3: STS 101:

Flight 3 is the real thing. You are on your own. The only help you'll get now is from your onboard computer warning you if things begin to go wrong . .!

LAUNCHING THE SHUTTLE

Your objective is to launch the Shuttle and arrive as close to the satellites' orbit as possible. The centre display will show the Tracking Screen. The curve indicates the correct trajectory for the Shuttle. The Shuttle will appear as a small, flashing dot near the curve. You must keep the satellite on this curve for a successful launch. Note on the Tracking Screen three numbers – these indicate the launch phases – (1) Solid Rocket Boosters are automatically fired (2) Shuttle reaches maximum acceleration (3) engine shutdown approaches. The "X" symbol indicates MECO (Main Engine Cut-Off). Just below "X" is a small box – this indicates your PLANE. During launch, you must keep another small dot central within the PLANE box. You will also need to watch closely the "C" and "T" thrust indicators and keep them aligned until you reach orbit.

LAUNCH GUIDE:

1. Select Flight Mode required by pressing the FIRE BUTTON on the joystick and press RETURN. (If FLT #1 is selected, the following is controlled automatically)

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2. All systems will now become operational, and the Tracking Screen displayed.
3. When countdown begins, press "E" to activate Main Engine.
4. When the "C" indicator starts to move (at approx MET -005) you must press the FIRE BUTTON to ignite the Main Engine, and start to build up the thrust. The Shuttle will begin to shake now under the tremendous vibration of these massive engines. The amount of thrust you generate is shown by the "T" indicator.
5. Though your engines are firing, you won't leave the ground until MET + 3, as hold down bolts keep the Shuttle on the ground until the engines develop enough thrust to overcome the force of gravity. Use the FIRE BUTTON to keep "C" and "T" aligned until you reach orbit. If "T" flashes, you must adjust your thrust to match "C".
6. Watch the Tracking Screen:-
   • move joystick forward or back to maintain correct trajectory. Try to keep the small dot on or just below the plotted curve.
   • move joystick left or right to keep another dot centred in the small PLANE box
7. Press the SPACE BAR from time to time during flight to keep a check on your status (Mach speed, FUEL, MET [elapsed time] and ALTitude)
8. At approx. ALT 200 press "E" to shut off the Main Engine. The closer you are to the required altitude of 210, the nearer you'll be to the satellite's target orbit.

If the mission scrubs for any reason, ensure that the Main Engines are switched OFF, and the countdown will commence again.

STABILIZING ORBIT & LAUNCHING SCIENTIFIC SATELLITE

Now that Main Engines have been cut, you must establish a stable orbit as close to ALT 210 as possible. You will see at the bottom of the portholes planet Earth rotating beneath you! Your current speed and altitude are displayed together with the Ground Track Screen (the curve on this screen represents on full rotation of the Earth.) You have two manoeuvering possibilities in your Shuttle – the ROT (Rotational Engines) for adjusting Yaw and Pitch, and TRN (Transitional Engines) for adjusting X Y and Z axis. You must adjust the pitch to -028, and get the X Y and Z axis as close to zero as possible. Additionally, you must maintain the correct speed for the satellite. Once this has been achieved, the top secret scientific satellite that you are carrying will be launched automatically by the onboard computer. You can check the status of the various axes by pressing the SPACE BAR until the desired axis is displayed. Your first task, however, must be to open the Cargo Bay Doors, a vital operation. Radiators that shed excess heat generated during launch are on the inner surfaces of these doors, and if they remain closed the heat build up within the Shuttle will cause a mission abort within 30 seconds!

ORBIT GUIDE:

1. Press "C" to open Cargo Bay Doors
2. Use the ROT and TRN engines to adjust your position. Use as necessary until the onboard computer launches the satellite. Note that you will drift as you travel through space, so check your position regularly.

* Press "R" to activate the OMS Rotational Engines. (WARNING: The nose of the Shuttle is now facing down – if you press the FIRE BUTTON now, ALT will decrease but speed will increase. Beware of falling back to Earth!
   > PITCH: Move joystick forward or back to set pitch to -028
   > YAW: Move joystick left or right to set YAW to 0
* Press "T" to activate the RCS Transitional Engines.

   > Z AXIS: Press FIRE BUTTON and move joystick forward or back so Z axis becomes 0. When Z axis is zero. ALT will be 210
   > X AXIS: Move joystick left or right until Y axis is 0
   > Y AXIS: Move joystick forward or back to increase or decrease the Shuttle's speed. The satellite should travel at mach 23.9 The X axis reading indicates the distance from the launch point of the satellite – a negative reading indicates it is behind (hence you will need to decrease speed), a positive means it is ahead (hence an increase in speed is required). Note: The onboard computer may launch the satellite at a speed close to Mach 23.9 and away from it's desired launch point to save fuel.

MAINTAINING ORBIT & DOCKING WITH SATELLITES

Now you have launched the top secret satellite, you still have one more task to achieve with the Shuttle – to dock with an orbiting satellite. You can dock with as many satellites as you wish – each successful docking earns you an extra fuel unit (FLT #3) but becomes a little more tricky. The more dockings, the higher your ranking when you get back to Earth. Once you have docked, you must lose visual contact with the satellite before the next satellite can be pursued.

Docking procedures are similar to those you have already used in launching of a satellite. On the Ground Track Screen, you will see an "S" type of curve – this indicates one full rotation of the Earth for both Shuttle and the next satellite with which you are to dock. A small dot indicates the Shuttle's position, the other dot is the satellite. When you are close to the satellite, two smaller radar screens will be displayed. The left 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 and micro (close in) Y axis.

DOCKING GUIDE:

1. Using the same instructions in ORBIT GUIDE, obtain a visual contact with satellite, and maintain these readings for 2 seconds.

   Pitch: -028, YAW: 0, Z AXIS: 0, Y AXIS: 0, X AXIS: 0, SPEED: Mach 23.9.3.

   Switch to ROT engines shortly before visual contact if possible.

2. A "Rendezvous" message indicates a successful docking, and the number of successful dockings you have achieved this mission is shown on the RVZ display.

If you do not achieve a successful docking shortly after visual contact, or, after a docking, your controls will be temporarily jammed (a security mechanism) allowing the satellite to escape.

DEORBIT BURN

You must now prepare the Shuttle for leaving orbit. It must be travelling tail first, which helps it decelerate to re-entry speed. If the Z axis and pitch are not set correctly, firing the engines will make the Shuttle climb or dive. After deorbit burn, the Shuttle must be reorientated nose forward to the correct altitude. Entering Earth's atmosphere backwards will cause the Shuttle to burn up! Beware of satellite interference – wait until you see a dramatic change in your X axis after docking – if you don't, your deorbit burn is unsuccessful and you'll never leave orbit!

DEORBIT GUIDE:

1. Press "T" to activate TRN engines.
2. Adjust Z axis until ALT reads 210.
3. Pull joystick back or push forward to set speed to Mach 23.9
4. Press "R" to activate ROT engines
5. Turn Shuttle around – Move joystick left or right to set Yaw at 128 degrees.
6. Now set Pitch at -004
7. Press FIRE BUTTON until speed is Mach 19.0
8. Turn Shuttle around nose forward by resetting Yaw to 0 (Warning: Ensure that Altitude does not fall below 25.0 during Deorbit)

RE-ENTRY

This is one of the most critical stages of your mission – successfully re-entering Earth's atmosphere. There are three important stages:-

ENTRY INTERFACE: This is where atmospheric entry officially begins. As the shuttle descends, atmospheric drag dissipates tremendous energy generating a great deal of heat (portions of the Shuttle's exterior can reach 1,540 C!) Pitch and speed must be correct in order to utilize the Shuttle's Thermal Protection System.

TERMINAL AREA ENERGY MANAGEMENT (TAEM): Conserving energy by maintaining correct position, altitude, velocity and heading.

LOSS OF SIGNAL (LOS): During re-entry, the Shuttle superheats the gas of the upper atmosphere creating flashes of colour outside the Shuttle. Heat strips electrons from the air around the Shuttle, enveloping it in a sheath of ionized air that blocks all communication with the ground. This occurs at approx. 160 miles, so you need to keep a close watch on the console at this point; data is likely to be intermittent at this time.

Your console will display the re-entry screen – study it, and you will see that X indicates cut-off of engines after deorbit burn, T indicates TAEM, and L indicates your transition to final landing approach. You must try and keep the small dot (representing the Shuttle) on the curve which represents the correct path. A small box on the left-hand side represents the PLANE, and you must keep a small dot centred within this box at all times.

RE-ENTRY GUIDE:

1. Pull joystick back to set Pitch at +24 for proper re-entry altitude
2. Close cargo bay doors by pressing "C"
3. Move joystick sideways. Move joystick left and right to keep dot within PLANE box central.

LANDING – TOUCHDOWN AT EDWARD AIR FORCE BASE

As you leave the re-entry phase and enter your final approach, you'll see the mountains around Edwards Air Force Base. At this point, the Shuttle is a glider. Take care! Watch all instruments on the console very closely as events happen quickly from now. You'll need to keep your nose pulled up to slow descent, while watching altitude and range (RNG) – this is your distance from the runway. When RNG is negative, you're above the runway. You need to centralise yourself above the runway – the right-hand final approach screen in the centre of your console will help you do this. The left-hand screen shows your upper and lower safe limits – keep the dot centralised between the two for safety. You'll hear a beeping noise which will increase the closer you get to the runway. You must remember to put landing gear down, and get ready for touchdown. Stand by! The mission is nearly complete. . .

LANDING GUIDE:

1. As soon as you see the mountains, make a right turn. Line up Shuttle on runway using right-hand radar screen
2. Follow final approach course on both radar screens:-
   Left screen: Keep the dot centred between the two arched lines
   Right screen: Keep dot centred 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 centralise dots.
3. When range goes negative, press "G" to drop landing gear
4. Push joystick forward to lower nose
5. When Shuttle hits runway the nose may pop up, so keep the joystick pushed forward to keep the nose down!

Welcome Home!