

## ***Pre-Launch Checklist (Classroom Computer Training Simulator)***

*Shuttle Launch Commands for the Left Terminal MFD (Mission Commander)*

*Load before beginning checklist pre-launch.*

1. Confirm HUD is on and in Orbit Earth mode. **[Ctrl] H** will turn HUD on and the **H** key will cycle through the various HUD options.
2. Have the Student hit **[SEL]** on the left MFD with the mouse and then select **[Terminal MFD]** (You may have to hit **[SEL]** twice to get to this prompt)
3. Then select **[INP]**. An "Input Script Command" dialog box will pop up.
  - a. Type in **run"atlantis/launch"** and press **ENTER**
4. Select **[INP]** and then type in **do\_oms2=false** and press **ENTER**
5. Select **[INP]** and then type in **launch()**
6. Press **ENTER** when you are cued to launch the shuttle at T-minus 4 seconds. Be careful not to touch the keyboard before then or it may change or erase the final command and mess up your launch timing with the Pilots Power Point.

(The number identified next to a command represents the panel location)

The following abbreviations clarify who is responsible for specific actions or communication

**C – Mission Commander**

**P – Pilot**

**E – Flight Engineer**

**Advise – must receive a confirmation**

**Announce- No response expected, information only**

COM	TIME	PROCEDURE	Mission Control Notes
1	T -HOLD STAND BY	CABIN DOOR to CLOSE (2)  CABIN DOOR LCK to LATCH (2)  <i>Confirm</i> BAY DOOR to CLOSE (2)  <i>Confirm</i> BAY DOOR LCK to LATCH (2)  <i>Confirm</i> GEAR to UP (2)  <i>Confirm</i> GEAR to DISABLE (2)  <i>Confirm</i> CHUTE to DISARM (2)  <i>Confirm</i> SPEED BRAKE to OFF (2)  <i>Confirm</i> FIRE SUPPRESSION (AV BAY 1/ AV BAY 2/ AV BAY 3) to SAFE (2)	Advise: Confirm Side Hatch is Closed & Locked

		START LAUNCH CLOCK P -[space bar]	
2	T-00:10:00	<p><b>Key in ITM</b> <b>Select A</b> <b>Key in DPS</b> <b>Select 1 (OPS 1)</b> <b>Key in EXE</b></p> <p>BOILER CNTRL PWR (1/2/3) to ON (4)</p> <p>BOILER CNTRL HTR (1/2/3) to ON(4)</p> <p>BOILER N<sub>2</sub> SUPPLY (1/2/3) to ON (4)</p> <p>OMS ENGINE VLV (LEFT/RIGHT) to ON(3)</p> <p>OMS ENGINE (LEFT/RIGHT) to ARM (3)</p>	<p>Advise: Go for Load OPS 1 and Execute</p> <p>Announce: Confirm Boiler Power On</p> <p>Advise: Go for OMS Engines Initialization</p>
3	T-00:09:00	<p><b>Key in DPS</b> <b>Select 2 (OPS 2)</b> <b>Key in EXE</b></p> <p>Check CABIN PRESSURE gauge for possible depressurization (normal is 760 torr)</p>	<p>Advise: Go for Load OPS 2 and Execute</p> <p>Advise: Go for Cabin Leak Check</p>
4	T-00:08:00	<p>He ISOLATION A (LEFT/CNTR/RIGHT) to OPEN (1)</p> <p>He ISOLATION B (LEFT/CNTR/RIGHT) to OPEN (1)</p> <p>PNEUMATIC He ISOL (LEFT/CNTR/RIGHT) to OPEN (1)</p>	<p>Advise: Go for Helium (He) Pressurization</p> <p>Advise: Go for Main Propulsion System (MPS) initialization</p>

		MAIN ENGINE POWER (LEFT/CNTR/RIGHT) to ON (3)	
5	T-00:07:00	<p>APU FUEL TNK VLV (1/2/3) to CLOSE (4)</p> <p>APU TK VLV to CLOSED(3)</p> <p>APU SHTDWN to ENABLE(3)</p> <p>HYD MAIN PUMP PRESSURE (1/2/3) to LOW(1)</p> <p>APU SPEED SELECT (1/2/3) to NORMAL (1)</p> <p>HYD CIRC PUMP (1/2/3) to GPC (1)</p> <p>APU PWR to ON(3)</p> <p>APU CNTRL POWER (1/2/3) to ON(4)</p>	<p>Announce: APU Pre-start Check Is Underway</p> <p>Announce: Confirm Crew Access Arm Retracted</p>
6	T-00:06:00	<p>APU TK VLV to OPEN(3)</p> <p>APU FUEL TNK VLV (1/2/3) to OPEN (4)</p> <p>APU /HYDRAULICS (1/2/3) to START/RUN (1)</p> <p>HYD MAIN PUMP PRESSURE (1/2/3) to NORMAL(1)</p> <p>HYD CIRC PUMP (1/2/3) to OFF(1)</p>	<p>Announce: Nominal APU Start</p> <p>Announce: Check Hydraulic (APU) Pressure (normal is 3000psi)</p>

7 Cont.	T-00:05:00	<p><b><u>Launch HOLD</u></b></p> <p>INTERNAL SHUTTLE SYSTEM PWR (BAT A / BAT B) to ENABLE(3)</p> <p><i>Confirm central HUD is on and in <u>Orbit Earth Mode</u>:</i></p> <ul style="list-style-type: none"> <li><i>If needed <b>Select 0</b> (toggle until <u>Orbit Earth</u> HUD is visible)</i></li> </ul> <p>C - [In Orbiter [Ctrl] H will turn the HUD on and off, the H key will cycle through the various HUD options] <b><u>This should have been done before starting.</u></b></p> <p>STAR TRKR to ON (3)</p> <p><i>C - Request <b>Go/ No Go</b> for launch</i></p> <p><b>Initiate Launch Clock Restart when Go order received</b> P - [space bar]</p>	<p>Announce: Launch Hold</p> <p>Advise: Mission Control confirms all systems are nominal. You are <b><u>Go</u></b> for launch.</p> <p><b><u>OR</u></b></p> <p>Mission Control confirms some systems are Off-Nominal. You are <b><u>No Go</u></b> for launch until these systems are corrected.</p> <p>Announce: Stand by to Initiate radar at T-4:00</p> <p>Advise: Confirm Shuttle Is On Internal Power (Occurs at T-00:04:55)</p>
8	T-00:04:00	<p><i>Initiate Radar /Monitor System</i></p> <p><b>Key in – ON</b> E - [space bar]</p> <p>RATE GYRO ASSEMBLY (RG1/ RG2-3/ RG4) to ON(1)</p>	

			<p>Announce: External Tank Liquid Oxygen (LOX) vents are closing</p> <p>Announce: The External Tank is beginning to pressurize.</p> <p>Announce: External Tank Cap is retracted</p>
9	T-00:03:00	<p><b>Key in DPS</b>  <b>Select 3 (OPS 3)</b></p>	<p>Advise: Load OPS 3</p> <p>Announce: External Tank Liquid Hydrogen vents are closed.</p>
10	T-00:02:00	APU SHTDWN to INHIBIT(3)	Announce: Confirm APU Power Shutdown is inhibited
11	T-00:01:00	AC BUS SNSR to AUTO(3)	
12	<b>T-00:00:04</b>	<p><b>Key in EXE</b>  C - [ENTER] on keyboard for Orbiter program</p>	Advise: Go for Execute OPS 3
13	<b>T-00:00:00</b>	Liftoff	<p><b><i>Initiate Mission Elapsed Time Clock</i></b></p> <p>Announce: Shuttle liftoff, the clock is running</p>

## *Ascent Checklist*

COM	MET	PROCEDURE	Mission Control Notes
14	T+00:00:20	Switch Left MFD back to Surface Mode <b>Key in 9</b> C –[select in orbiter program left MFD]	
15	T+00:00:44		Announce: Automatic Main Engines Throttle Down to 65%
16	T+00:01:10		Announce: Automatic Main Engines Throttle Up to 104%
17	T+00:02:05	<i>SRB Separation</i>	Announce: OMS assist burn start
18	T+00:03:00	Check that the (Freon) EVAP OUT TEMP data display shows below 60 degrees <i>(Located on Pilot PowerPoint lower MFD)</i>	Advise: Check Flash Evaporator Is Operational
19	T+00:04:20		Advise: Negative Return
20	T+00:08:00		Advise: Go for Engines Automatic Throttle Down In Preparation for Main Engine Cutoff (MECO)
21	T+00:08:55	<i>Main Engine Cutoff (MECO)</i>	Advise: Confirm Main Engine Shutdown and Engine Cutoff (MECO)

### *Orbit Insertion Checklist (Post MECO)*

COM	MET	Procedure	Mission Control Notes
22	T+00:09:00	FWD RCS He TANK ISOL (A/B) to OPEN(3)  FWD RCS He MANIFOLD ISOL (1/2/3) to OPEN (3)	Announce: External Tank Separation initiation
23	T+00:09:15	OMS ENGINE VLV (LEFT) to ON (3)  OMS ENGINE VLV (RIGHT) to ON (3)  OMS ENGINE (LEFT/RIGHT) to ARM(3)	Announce: Standing by for Auto OMS1 Burn
24	T+00:09:30	FLT CNTLR POWER to INHIBIT (3)  ENG DAP to AUTO(3)	Announce: MPS Propellants Automatic Dump initiated.
25	T+00:09:45	MAIN ENGINE POWER (LEFT/CNTR/RIGHT) to OFF(3)	Announce: Auto Propellant Dump Complete
26	T+00:10:00	He ISOLATION A (LEFT/CNTR/RIGHT) to GPC (1)  He ISOLATION B (LEFT/CNTR/RIGHT) to GPC(1)  PNEUMATIC He ISOL to GPC (1)  H <sub>2</sub> SYSTEM LINE VENT to OPEN(4)	Announce: Confirm External Tank Separation
27	T+00:10:30	HYD MAIN PUMP PRESSURE (1/2/3) to LOW(1)  APU / HYDRAULICS (1/2/3) to OFF(1)  APU FUEL TNK VLV (1/2/3) to CLOSE(4)	

27 Cont.		<p>APU TK VLV to CLOSED(3)</p> <p>APU CNTRL POWER (1/2/3) to OFF(4)</p> <p>APU PWR to OFF (3)</p> <p>BOILER CNTRL PWR (1/2/3) to OFF (4)</p> <p>BOILER N<sub>2</sub> SUPPLY (1/2/3) to OFF (4)</p> <p>HYD CIRC PUMP (1/2/3) to GPC(1)</p> <p>H<sub>2</sub> SYSTEM LINE VENT to GPC(4)</p>	Announce: APU Shutdown complete
28	T+00:11:00 approximate	<i>C- Advised Mission Control when OMS Burn Initiated</i>	Advise: Confirm OMS Burn Initiated
29	T+00:15:10 approximate	<p><i>C- Advised Mission Control when OMS Burn Complete</i></p> <p>OMS ENGINE (LEFT/RIGHT) to OFF(3)</p> <p>AC BUS SNSR to MONITOR(3)</p>	Advise: OMS Burn complete
30	Mission Dependent	<p>Confirm central HUD is on and set to “Orbit Earth Mode”: If needed <b>Select 0</b> (toggle until <u>Orbit Earth</u> HUD is visible)</p> <p><i>C –[In Orbiter [Ctrl] H will turn the HUD on and off, the H key will cycle through the various HUD options]</i></p> <p>H<sub>2</sub> SYSTEM OUTBRD VLV to GPC(4)</p> <p>H<sub>2</sub> SYSTEM INBRD VLV to GPC (4)</p> <p>ENG DAP to MANUAL (3)</p> <p>FLT CNTRLR POWER to ENABLE(3)</p> <p>RATE GYRO ASSEMBLY (RG1/ RG2-3/ RG4) to OFF(1)</p>	Advise: Set Liquid H <sub>2</sub> Outboard Fill & Drain Valve to Computer Control



30 Cont.		<p><b><i>**Rotate The Shuttle to Zero Attitude, kill rotation to stabilize. Attitude must be zero in both the horizontal and vertical planes.</i></b></p> <p><b>Key in 4 – Kill rotation C - (orbiter screen)</b></p> <p><b>**To see this action demonstrated ensure that the orbiter HUD is in "Orbit Earth Mode" then click on "PROGRADE". The Commander is required to normally perform this operation manually. If your Joystick does not have "rudder" capabilities you can use the 1 and 3 key on the number pad for left and right translation.</b></p>	<p>Announce: Go for Initiating Manual Zero Attitude Correction</p> <p>Announce: Confirm Shuttle in zero attitude (manual prograde)</p>
31	Mission Dependent	<p>THERMAL CONDITION SYSTEM HYD / FUEL to AUTO (4)</p> <p>THERMAL CONDITION SYSTEM ENV to AUTO (4)</p> <p>THERMAL CONDITION SYSTEM POD / JET to AUTO(4)</p>	Announce: Go for Configuring the Thermal Condition of the Shuttle
32	Mission Dependent	<p>ENVIRONMENTAL SYSTEM O<sub>2</sub> SYS2 to CLOSE(4)</p> <p>ENVIRONMENTAL SYSTEM N<sub>2</sub> SYS2 to CLOSE (4)</p> <p>ENVIRONMENTAL SYSTEM H<sub>2</sub>O LOOP to OFF(4)</p>	
33	Mission Dependent	<p>BAY DOOR LCK to RELEASE(2)</p> <p>BAY DOOR to OPEN(2)</p> <p><i>Initiate Payload Bay Door, KU Antenna and Radiator Open Program</i></p>	Advise: Go for payload bay door open program

33 Cont.		<p><b>Key in PBD</b> E -[space bar]</p> <p><b>Key in OPEN</b> E -[space bar]</p> <p><i>E - Confirm Bay door is open</i></p>	<p>Announce: Confirm KU Antenna Deployment</p> <p>Announce: Confirm Radiator Deployment</p>
34.	Mission Dependent	<p>GLOBAL POSITIONING SYSTEM (GPS1/ GPS2/ GPS3) to ON(4)</p> <p><i>De-select HUD</i></p> <p><b>Key in IO</b> C -[In Orbiter [Ctrl] H will turn the HUD on and off, the H key will cycle through the various HUD options]</p>	<p>Advise: Activate Global Positioning System (GPS)</p> <p>Announce: Confirm activation of GPS 1, GPS 2 and GPS 3</p>
35	Mission Dependent	<p><i>MFD CRT Display Left and Right to OFF</i></p> <p><b>Key in CRT</b></p> <p><b>Key in SPC</b> (sets pad to red)</p> <p><b>Key in Red-CRT</b></p> <p><b>Key in SPC</b> (sets pad to blue)</p> <p>C -[In Orbiter use the mouse to click on [PWR] to turn MFD on and off]</p> <p><i>C- Shuttle is Configured &amp; Ready For Mission</i></p>	<p>Advise: Go for MFD terminal shutdown</p>

## *De-Orbit Checklist*

COM	MET	Procedure	Mission Control Notes
36	Mission Dependent	<p><i>Run <u>De-orbit system check</u></i></p> <p><b>Key in RSD</b> P - [space bar]</p> <p><i>MFD CRT Display Left and Right to ON</i></p> <p><b>Key in CRT</b> <b>Key in SPC</b> (sets pad to red) <b>Key in Red-CRT</b> <b>Key in SPC</b> (sets pad to blue) C –[In Orbiter use the mouse to click on [PWR] to turn MFD on and off]</p> <p><i>Confirm Mission Commander MFD on and in SRFC mode</i></p> <p><i>Confirm Pilot MFD on and in Orbit Mode</i></p>	Advise: Go for MFD terminal initialization
37	Mission Dependent	<p>STAR TRKR to OFF(3)</p> <p>BAY DOOR to CLOSE(2)</p> <p><i>Initiate Payload Bay Door, KU Antenna and Radiator Close Program</i></p> <p><b>Key in PBD</b> E - [space bar] <b>Key in CLOSE</b> E - [space bar]</p> <p><i>E - Confirm Bay door is closed</i></p> <p>BAY DOOR LCK to LATCH(2)</p>	<p>Advise: Confirm Star Tracker Disabled</p> <p>Advise: Go for Payload Bay Door Close program.</p> <p>Announce: Confirm Radiator Retracted</p> <p>Announce: Confirm KU Antenna Retracted</p>
38	Mission Dependent	<p><i>Initiate HUD – place in surface mode</i></p> <p><b>Key in IO</b> <b>Select 0</b> (Toggle until surface HUD)</p>	

38 Cont.		<p>C –[In Orbiter [Ctrl] H will turn the HUD on and off, the H key will cycle through the various HUD options]</p> <p>BOILER CNTRL HTR (1/2/3) to ON (4)</p> <p>HYD CIRC PUMP (1/2/3) to OFF(1)</p>	
39	Mission Dependent	<p><i>Position The Shuttle to The Correct Attitude - Retrograde</i></p> <p><b>Key in 6</b> – Retrograde</p> <p>C –[Select retrograde on Orbiter screen]</p>	Announce: Confirm Shuttle in retrograde attitude
40	Mission Dependent	<p>THERMAL CONDITION SYSTEM HYD / FUEL to AUTO (4)</p> <p>ENG DAP to MANUAL (3)</p> <p>ENVIRONMENTAL SYSTEM O<sub>2</sub> SYS2 SUPPLY to OPEN(4)</p> <p>ENVIRONMENTAL SYSTEM N<sub>2</sub> SYS2 SUPPLY to OPEN(4)</p>	Announce: Final Switch Configuration check in progress
41	Mission Dependent	<p>He ISOLATION A (LEFT/CNTR/RIGHT) to OPEN (1)</p> <p>He ISOLATION B (LEFT/CNTR/RIGHT) to OPEN (1)</p> <p>PNEUMATIC He ISOL (LEFT/CNTR/RIGHT) to OPEN (1)</p>	Announce: Main Propulsion System Helium Release confirmation
42	Mission Dependent	<p>BOILER N<sub>2</sub> SUPPLY (1/2/3) to ON (4)</p> <p>BOILER CNTRL PWR (1/2/3) to ON(4)</p> <p>APU TK VLV to OPEN(3)</p> <p>APU FUEL TNK VLV (1/2/3) to OPEN(4)</p> <p>APU PWR to ON (3)</p>	

42 Cont.		<p>APU CNTRL POWER (1/2/3) to ON(4)</p> <p>APU SHTDWN to INHIBIT(3)</p> <p>HYD MAIN PUMP PRESSURE (1/2/3) to LOW (1)</p> <p>APU SPEED SELECT (1/2/3) to NORMAL(1)</p> <p>APU / HYDRAULICS (1/2/3) to START/RUN(1)</p> <p>DUMP ISOL VLV to OPEN(3)</p>	
43	Mission Dependent	<p><i>Confirm</i> OMS ENGINE VLV (LEFT) is ON(3)</p> <p><i>Confirm</i> OMS ENGINE VLV (RIGHT) is ON(3)</p> <p>OMS ENGINE (LEFT/RIGHT) to ARM (3)</p> <p><b>Engine Throttle to Maximum</b> C- [Ctrl +]</p>	<p>Advise: Go for Perform De-orbit Burn (Burn time data provide by Mission Control, usually 1-2 minutes. Give 10 second countdown to throttle up and burn clock start)</p>
44	Mission Dependent	<p><b>Engine Throttle to OFF</b> C- [Ctrl -]</p> <p>OMS ENGINE (LEFT/RIGHT) to OFF (3)</p> <p>OMS ENGINE VLV (LEFT) to OFF (3)</p> <p>OMS ENGINE VLV (RIGHT) to OFF(3)</p>	<p>(Give 10 second countdown to throttle down)</p> <p>Advise: Confirm De-orbit Burn Complete</p>
45	Mission Dependent	<p><i>Position The Shuttle to The Correct Attitude – Prograde</i></p> <p><b>Key in 7 – Prograde</b> C –[Select prograde on orbiter screen]</p>	

			Announce: Confirm Shuttle in prograde attitude
46	Mission Dependent	HYD MAIN PUMP PRESSURE (1/2/3) to NORMAL(1)	Announce: Confirmation of Auto Dump RCS Propellant
47	Mission Dependent	FWD RCS He TANK ISOL (A/B) to CLOSE (3)  FWD RCS He MANIFOLD ISOL (1/2/3) to CLOSE (3)  DUMP ISOL VLV to CLOSED(3)	Announce: Pressure cycle complete
48	Mission Dependent		<b><i>Advise: De-Orbit Procedure is Complete</i></b>

## *Landing Checklist*

Have the Mission Commander exit out of the Orbiter program using the **F4 key** and then select **[exit]**. When landing select “Atlantis Landing Preparation” to practice the actual approach to the Kennedy Space Center.

<b>Key board landing controls for Orbiter</b>	
<u>Trim control</u>	[Insert] down / [delete] up
<u>Speed Brake</u>	[CTRL] B
<p>The timing and use of the speed brake is at the discretion of the Mission Commander. It may be used any time during the landing approach and can be used repeatedly, if so requested by the Commander.</p>	
<u>Left and right wheel brake</u>	, (comma) and . (period) simultaneously

COM	Altitude	Procedure	Mission Control Notes
49	35 k	<p><i>Disengage RCS mode</i>  <b>Key in SPC</b> (sets pad to red)  <b>Key in Red-9</b>  C -[Select on Orbiter in top left of screen]</p> <p><i>Run Landing System Check</i>  <b>Key in LSD</b>  P - [space bar]</p> <p><i>Initiate Landing System Radar</i>  <b>Key in LSR</b>  E -[space bar]  <b>Key in ON</b>  E -[space bar]</p>	
50	28 k	<i>(Lift takes affect)</i>	Announce: Current altitude and speed
51	25 k	THERMAL CONDITION SYSTEM HYD / FUEL to AUTO(4)	<p>Advise: Hydraulics / Brake Heater activated</p> <p>Announce: Current altitude and speed every 5 km (change to 1 km beginning</p>

			at 10 km in altitude)
52	<b>3 k</b>	<i>Power Up Landing Gear</i> GEAR to ARM (2)	Announce: Current altitude and speed of orbiter every 1 km
53	<b>2.5 k</b>	GEAR to DOWN (2) C - [G key in Orbiter]	Announce: Gear deployed
54	<b>0.5 k (500 m)</b>	SPEED BRAKE to DEPLOY (2)  The speed brake is required to help stop the shuttle after landing. Its use at this point may be delayed until touchdown by order of the Mission Commander.	
55	<b>Touchdown</b>	CHUTE to DEPLOY (2)	Announce: Touchdown
56		<i>End of Mission</i>	