'Space Shuttle'
FLIGHT MANUAL

PART II – **Orbiter Systems**

ABOUT THIS MANUAL

VERSION: 22 DECEMBER, 2006

WARNING: THIS MANUAL IS DESIGNED FOR MICROSOFT® FSX 'SPACE SHUTTLE' EXPANSION ONLY. DO NOT USE FOR FLIGHT.

The 'Space Shuttle' FLIGHT MANUAL is organized into three Parts:
Each Part is provided as a separate Acrobat® PDF document:

Click START > Programs > Captain Sim > Space Shuttle > Flight Manual >

- **Part I – User's Manual**
  - The User's Manual describes the 'Space Shuttle' product as a software title.

- **Part II – Orbiter Systems - this document.**
  - This document describes what to expect from 'Space Shuttle' product in terms of Orbiter systems functionality.

- **Part III – Flight Procedures**
  The Flight Procedures Manual covers the mission phases as follows:
  - Entry interface (EI) to terminal area energy management (TAEM) interface
  - TAEM
  - Approach, Landing, and Rollout

Adobe Acrobat® Reader Required

CONTENTS

SYSTEMS AND EQUIPMENT

The 'Space Shuttle' is an entertainment title designed to provide some general idea of the Space Shuttle Orbiter vehicle construction, functionality and operations.

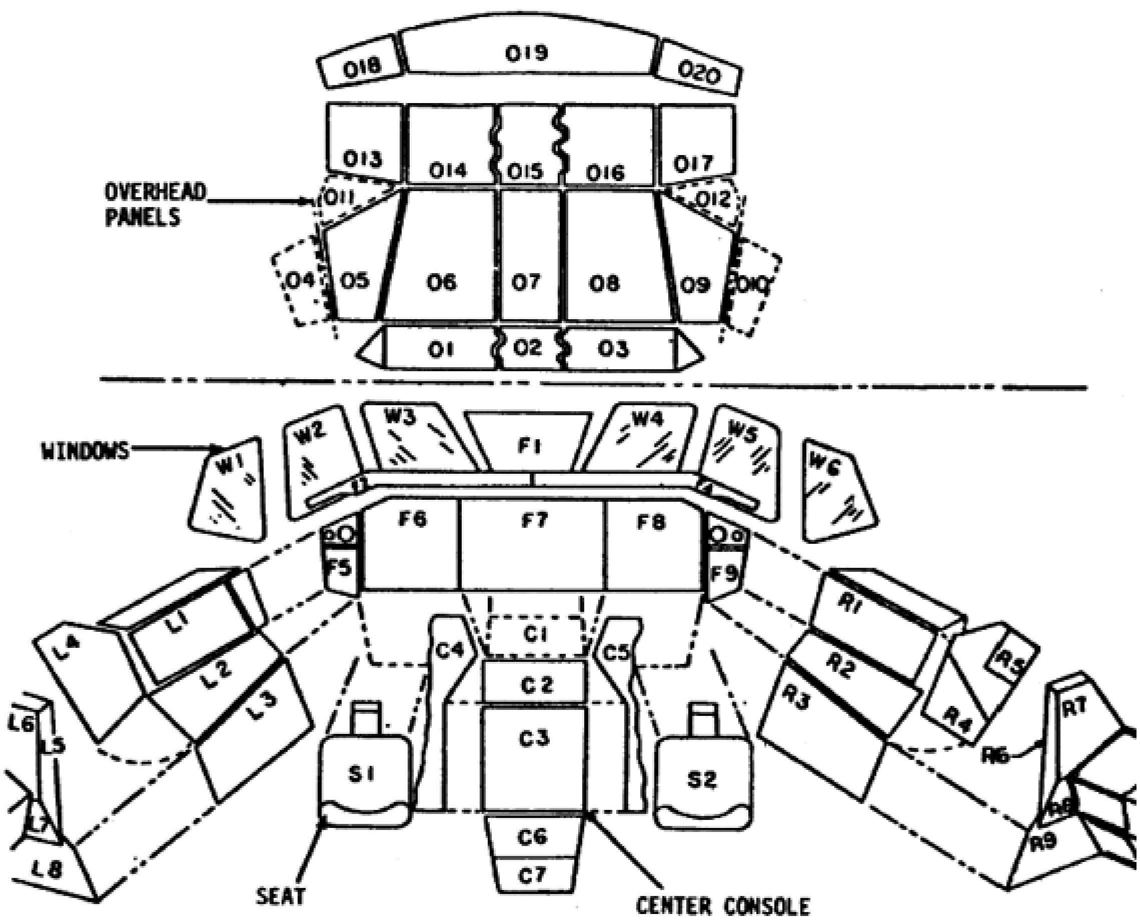
Please do not expect all systems to be functional and programmed in strict accordance with real Space Shuttle Orbiter specifications. For obvious reasons the 'Space Shuttle' title cannot be seriously considered or used as a piece of training software.

The 'Space Shuttle' expansion features limited functionality of some of major systems that are normally in use during the following Space Shuttle Orbiter descent phases:

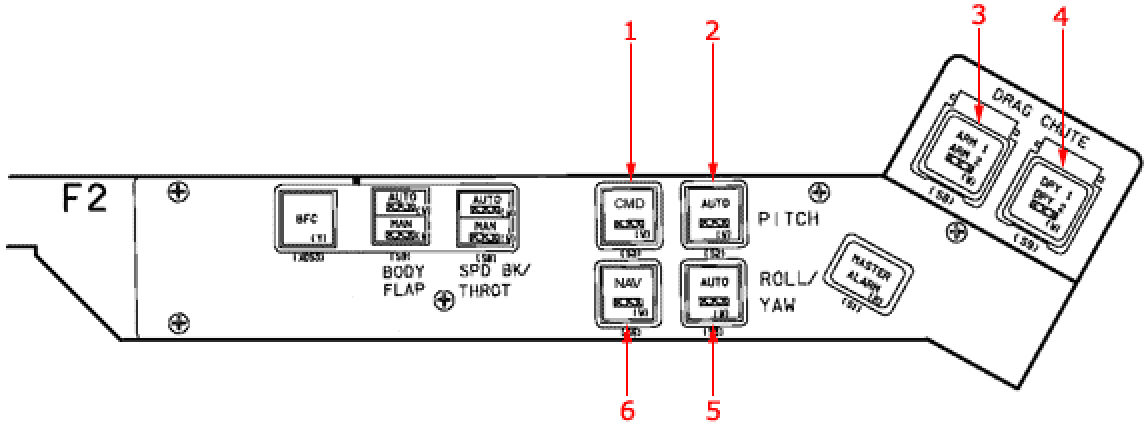
- Entry through the atmosphere
- Terminal Area Energy Management (TAEM)
- Approach, Landing and Rollout

This document describes what to expect from 'Space Shuttle' product in terms of Orbiter systems functionality.

ORBITER PANEL CONFIGURATION



F2



1. Autopilot Engagement Switch
2. AUTO Pitch Pushbutton Indicator
3. Drag Chute ARM Pushbutton
4. Drag Chute Deployment Pushbutton
5. Autopilot Approach Pushbutton Indicator
6. Autopilot Lateral Navigation Pushbutton Indicator

1. AUTOPILOT ENGAGEMENT SWITCH

The switch engages/disengages Space Shuttle autopilot.

2. AUTO PITCH PUSHBUTTON INDICATOR

The pushbutton engages autopilot attitude hold mode.

3, 4. DRAG CHUTE CONTROLS

The drag chute deployment and jettison pushbuttons, ARM 1(2), DPY 1(2), and JETT 1(2) are installed on either side of both the CDR's and PLT's HUDs. Activation of each lighted pushbutton initiates a signal through the primary and redundant paths simultaneously.

The DPY pushbutton signal will only be effective if the ARM command has previously been initiated.
The JETT pushbutton signal will only be effective if the DPY command has previously been initiated.

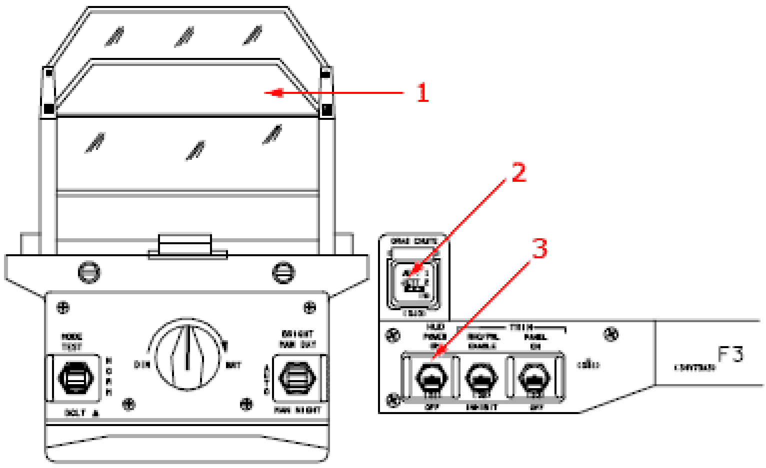
5. AUTOPILOT APPROACH PUSHBUTTON INDICATOR

The pushbutton engages autopilot approach mode.

6. AUTOPILOT LATERAL NAVIGATION PUSHBUTTON INDICATOR

The pushbutton engages autopilot lateral navigation mode. When the mode is engaged, the autopilot uses GPS track for lateral navigation.

F3



1. HUD (Head-Up Display)
2. Drag Chute Jettison Pushbutton
3. HUD Power Switch

1. HUD (HEAD-UP DISPLAY)

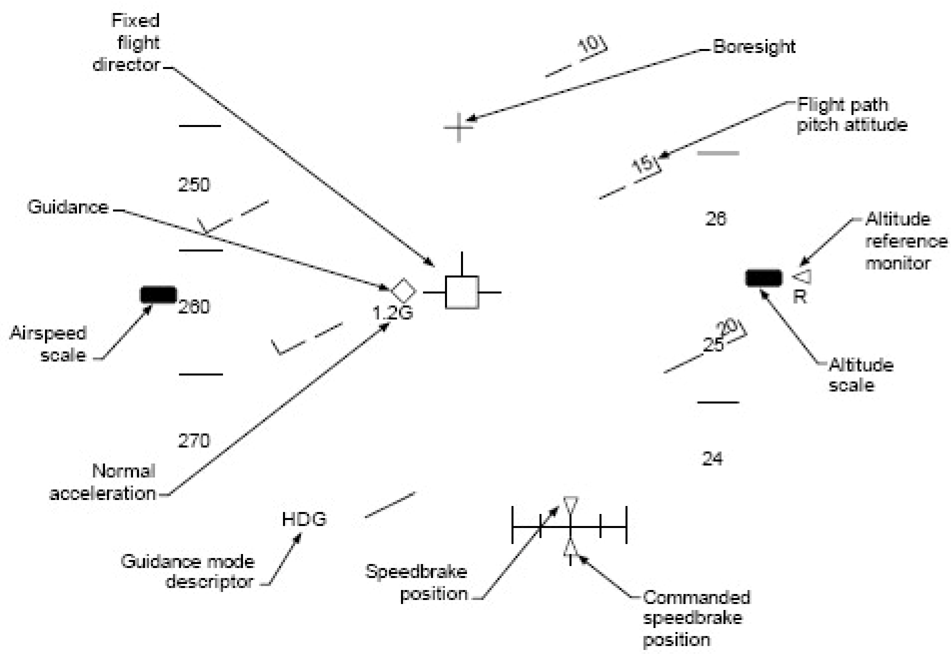
The head-up display (HUD) is an optical miniprocessor that cues the commander and/or pilot during the final phase of entry and particularly in the final approach to the runway. With minimal movement of their eyes from the forward windows (head up) to the dedicated display instruments (head down), the commander and pilot can read data from headup displays located in the front of them on their respective glareshields. The head-up display presents the same data presented on several other instruments, including the attitude director indicator, surface position indicator, alpha/Mach indicator, and altitude/vertical velocity indicator.

The head-up display allows out-of-the-window viewing by superimposing flight commands and information on a transparent combiner in the window's field of view. Since the orbiter avionics systems are digital, and minimal impact on the orbiter was paramount, the headup display drive electronics were designed to receive data from the orbiter data buses. The head-up display drive electronics utilize, to the maximum extent possible, the same data that drive the existing electromechanical display devices. The orbiter display device uses a CRT to create the image, which is then projected through a series of lenses onto a combining glass.

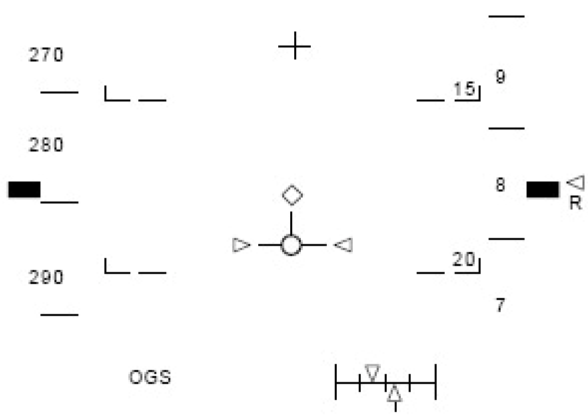
Essential flight information for vehicle guidance and control during approach and landing is projected on the combiner glasses and focused at infinity. The images, generated by a small CRT and passed through a series of lenses, are displayed to the flight crew on the combiners as lighted symbology. The transmissiveness of the combiner allows the crew to look through it and see actual targets like the runway.

The head-up display has proved to be a valuable landing aid and is considered the primary pilot display during this critical flight phase.

DO NOT USE FOR FLIGHT

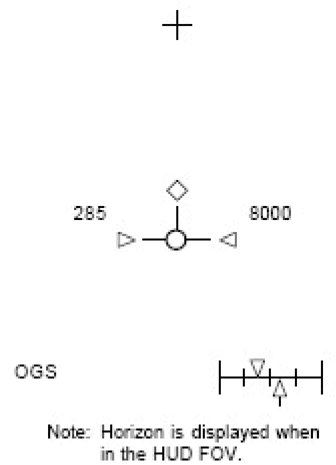


Approach and Land Display (TAEM Heading Phase); No Declutter



Approach and Land Display (Declutter Level 1)

DO NOT USE FOR FLIGHT



Approach and Land Display (Declutter Level 2)

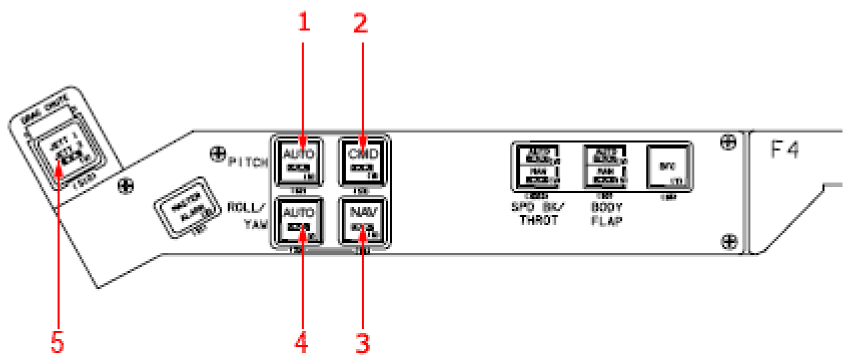
2. DRAG CHUTE JETTISON PUSHBUTTON

See F2 panel description for details.

3. HUD POWER SWITCH

A HUD Power ON/OFF Switch located on the left side of panel F3 provides and terminates electrical power to the commander's head-up display on panel F6. A second switch is located on the right side of panel F3 for the pilot's head-p display on panel F8.

F4

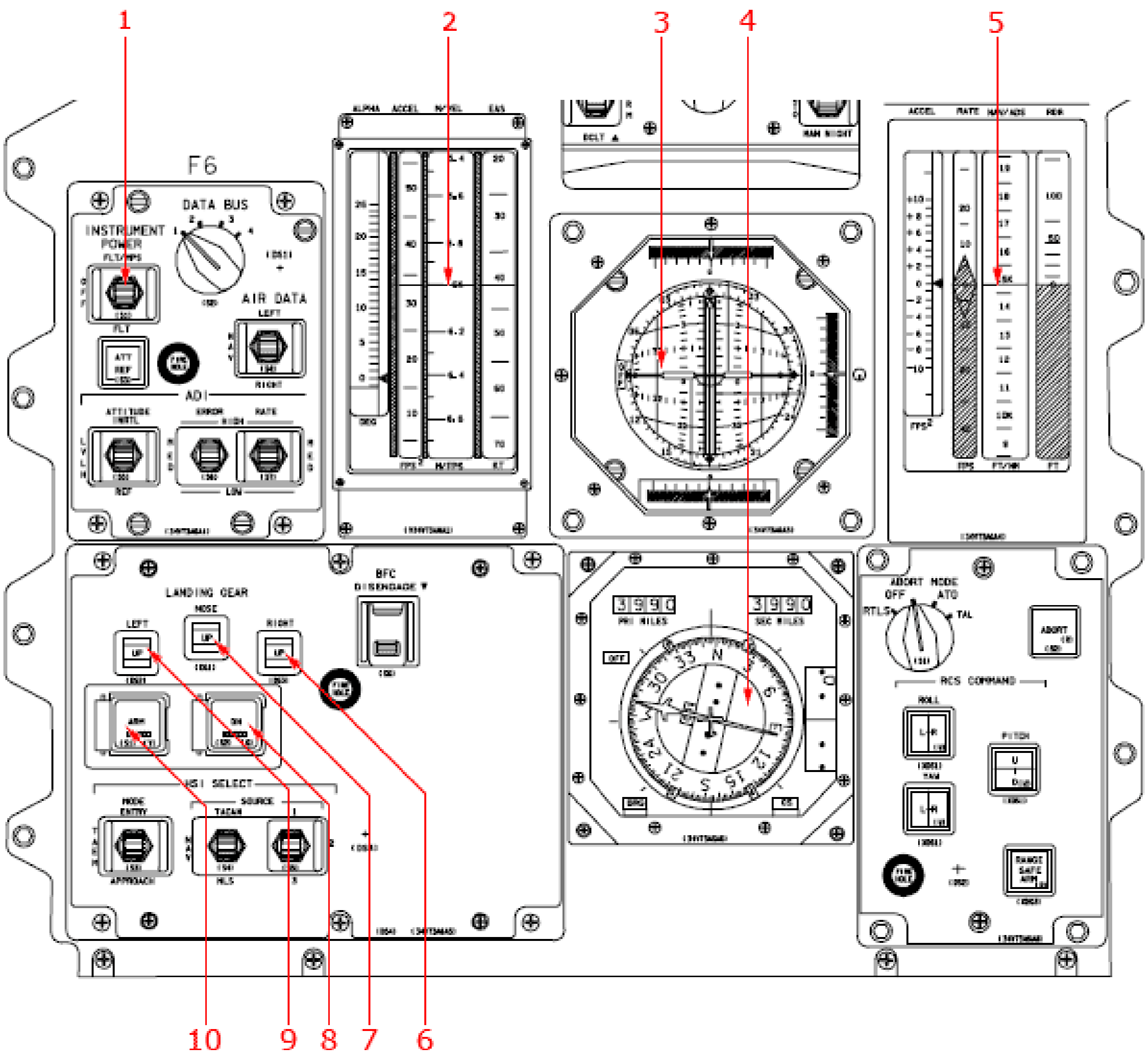


1. AUTO Pitch Pushbutton Indicator
2. Autopilot Engagement Switch
3. Autopilot Lateral Navigation Pushbutton Indicator
4. Autopilot Approach Pushbutton Indicator
5. Drag Chute Jettison Pushbutton

See F2 panel description for details.

DO NOT USE FOR FLIGHT

F6



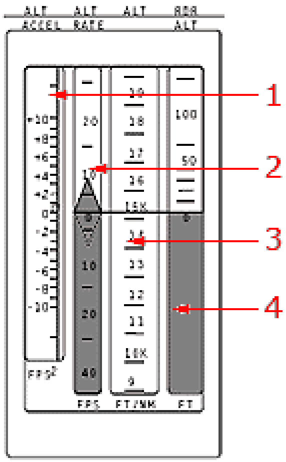
1. Instrument Power Switch
2. Altitude/Vertical Velocity Indicator
3. Attitude Director Indicator
4. Horizontal Situation Indicator
5. Alpha/Mach Indicator
6, 7, 9. Landing Gear Talkback Indicators
8. Landing Gear Arm Pushbutton
10. Landing Gear Control Down Pushbutton

1. INSTRUMENT POWER SWITCH

The Instrument Power Switch on panel F6 supplies main bus A power to the commander's and pilot's instruments. The switch on panel F6 is a two-position ON/OFF switch.

2. ALTITUDE/VERTICAL VELOCITY INDICATORS

The altitude/vertical velocity indicators (AVVIs) are located on panel F6 for the commander and panel F8 for the pilot. These indicators display vertical acceleration (ALT ACCEL), vertical velocity (ALT RATE), altitude (ALT), and radar altitude (RDR ALT).



1. ALT ACCEL Indicator

The alt accel indicator, which displays altitude acceleration of the vehicle, is read at the intersection of the moving pointer and the fixed scale. The scale range is minus 13.3 to 13.3 feet per second squared, and the scaling is 6.67 feet per second squared per inch. Software limits acceleration values to plus or minus 12.75 feet per second squared.

2. ALT RATE Scale

The alt rate scale displays vehicle altitude rate, which is read at the intersection of the moving tape and the fixed lubber line. The scale range is minus 2,940 to plus 2,940 feet per second with scale changes at minus 740 feet per second and plus 740 feet per second. The negative and positive regions are color-reversed: negative numbers are white on a black background and positive numbers are black on white.

3. ALT Scale

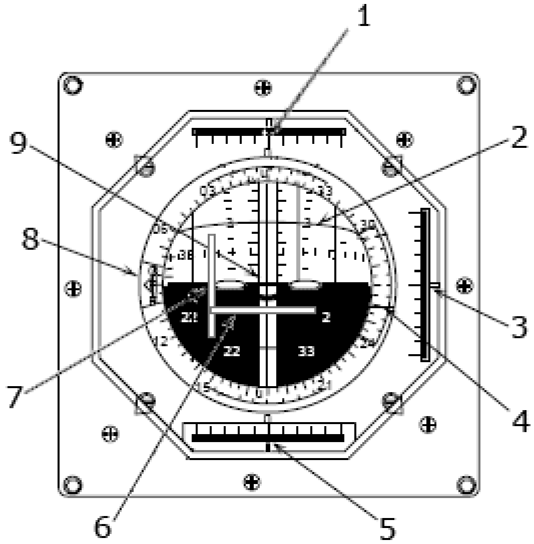
The alt scale, a moving tape read against a fixed lubber line, displays the altitude of the vehicle above the runway (barometric altitude). The scale range is minus 1,100 feet to plus 165 nautical miles (189 statute miles), with scale changes at minus 100, zero, 500 feet and plus 100,000 feet. The scale is in feet from minus 1,100 to plus 400,000 and in nautical miles from plus 40 to plus 165 (46 to 189 statute miles). Feet and nautical miles overlap from plus 40 to plus 61 nautical miles (46 to 70 statute miles).

4. The RDR ALT Scale

The RDR ALT scale is a moving tape read against a fixed lubber line. It displays radar altitude (corrected to wheels) during major mode 305, below 9,000 feet (normally not locked in until below 5,000 feet; prior to radar altimeter lock-on, the meter is ''parked'' at 5,000 feet). The scale ranges from zero to 9,000 feet with a scale change at 1,500 feet. Each scale on the AVVI displays an off flag in the event of indicator malfunction, invalid data received at the DDU or power failure (all flags appear).

Failure warning flags are provided for all four scales on the AVVIs and AMIs. The flags appear in the event of a malfunction in the indicator or in received data. In the event of power failure, all four flags appear.

3. ATTITUDE DIRECTOR INDICATOR



1. Roll Rate Pointer
2. +30° Pitch Circle
3. Pitch Rate Pointer
4. Pitch Error Needle
5. Yaw Rate Pointer
6. Director bar (Glideslope)
7. Director bar (Loc)
8. "OFF" Flag
9. Pitch & Yaw Index Marker

The commander's, pilot's and AFT ADIs are supported throughout the mission. They give the crew attitude information as well as attitude rate and attitude errors, which can be read from the position of the pointers and needles.

The orbiter's attitude is displayed to the flight crew by an enclosed ball (sometimes called the eight ball) that is gimbaled to represent three degrees of freedom. The ball, covered with numbers indicating angle measurements (a 0 is added as the last digit of each), moves in response to software-generated commands to depict the current orbiter attitude in terms of pitch, yaw, and roll.

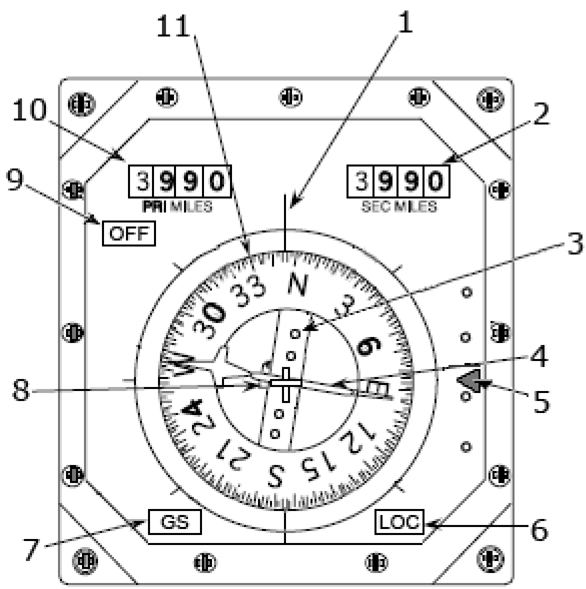
1-6. Roll Rate Pointer, Pitch Rate Pointer, Yaw Rate Pointer

Each attitude director indicator has a set of three rate pointers that provide a continuous readout of vehicle body rotational rates. Roll, pitch and yaw rates are displayed on the top, right and bottom pointers, respectively. The center mark on the graduated scale next to the pointers shows zero rates; the rest of the marks indicate positive (right or up) or negative (left or down) rates.

11. Attitude Sphere

The orbiter's attitude is displayed to the flight crew by an enclosed ball (sometimes called the eight ball) that is gimbaled to represent three degrees of freedom. The ball, covered with numbers indicating angle measurements (a zero is added as the last digit of each), moves in response to software-generated commands to depict the current orbiter attitude in terms of pitch, yaw and roll.

4. HORIZONTAL SITUATION INDICATOR



1. Lubber line
2. Secondary Range (flag down)
3. Course Deviation Dots
4. Course Deviation Indicator
5. Bearing Reciprocal
6. LOC Flag
7. Glide Slope Flag
8. Course Deviation Flag
9. OFF Flag
10. Primary Range
11. Compass Card

The Horizontal Situation Indicator for the commander and pilot displays a pictorial view of the vehicle's position with respect to various navigation points and shows a visual perspective of certain guidance, navigation and control parameters, such as directions, distances and course/glide path deviation. The flight crew uses this information to control or monitor vehicle performance. The HSIs are active during the entry and landing and ascent/RTLS phases.

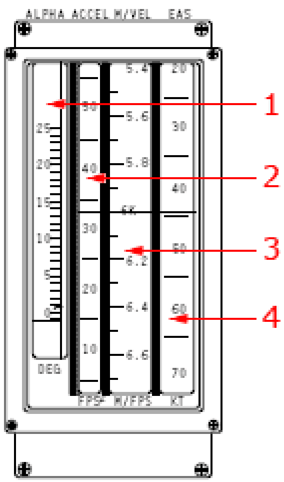
Each HSI displays magnetic heading (compass card), selected course, runway magnetic course, course deviation, glide slope deviation, primary and secondary bearing, primary and secondary range, and flags to indicate validity.

Each HSI consists of a case-enclosed compass card measuring zero to 360 degrees. At the center of the compass card is an aircraft symbol, fixed with respect to the case and about which the compass card rotates.

5. ALPHA MACH INDICATOR

The Alpha indicator indicates the shuttle angle of attack. The angle of attack is the angle between the shuttle X axis and the relative wind flowing across the shuttles wings.

The AMI consists of four tape meters displaying angle of attack (Alpha), vehicle acceleration (ACCEL), vehicle velocity (M/VEL) and equivalent airspeed (EAS). The two units are driven independently but can have the same data source.



1. Alpha Tape Meter

Alpha displays vehicle angle of attack, defined as the angle between the vehicle plus X axis and the wind-relative velocity vector (negative wind vector). Alpha is displayed by a combination moving scale and moving pointer. For angles between minus 4 degrees and plus 28 degrees, the scale remains stationary and the pointer moves to the correct reading. For angles less than minus 4 degrees or greater than plus 28 degrees, the pointer stops (at minus 4 or plus 28 degrees) and the scale moves so that the correct reading is adjacent to the pointer. The alpha tape ranges from minus 18 to plus 60 degrees with no scale changes. The negative scale numbers (below zero) have no minus signs; the actual tape has black markings on a white background on the negative side and white markings on a black background on the positive side.

2. ACCEL Tape Meter

The ACCEL scale displays vehicle drag acceleration, which is the deceleration along the flight path. This is a moving tape upon which acceleration is read at the fixed lubber line. The tape range is minus 50 to plus 100 with a scale change at zero feet per second squared. Minus signs are assumed on the accel scale also; the negative region has a black background and the positive side has a white background. (Normal acceleration and total load factor are measured in g's, with 10 equal to 1 g, 20 equal to 2 g's, etc.)

3. M/VEL Tape Meter

The M/VEL scale displays Mach number or relative velocity. Mach number is the ratio of vehicle airspeed to the speed of sound in the same medium. Relative velocity in this case is the vehicle airspeed. The actual parameter displayed is always Mach number; the tape is simply rescaled above Mach 4 to read relative velocity in thousands of feet per second (above 2,000 feet per second, Mach number = V REL /1,000). The M/VEL scale is a moving tape from which Mach/velocity is read at the fixed lubber line. The scale ranges from zero to 27 with a scale change at Mach 4.

4. EAS Tape Meter

The EAS scale is used to display equivalent airspeed. On the moving-tape scale, equivalent airspeed is read at the fixed lubber line. The tape range is zero to 500 knots, and scaling is 1 inch per 10 knots.

6, 7, 9. LANDING GEAR TALKBACK INDICATORS

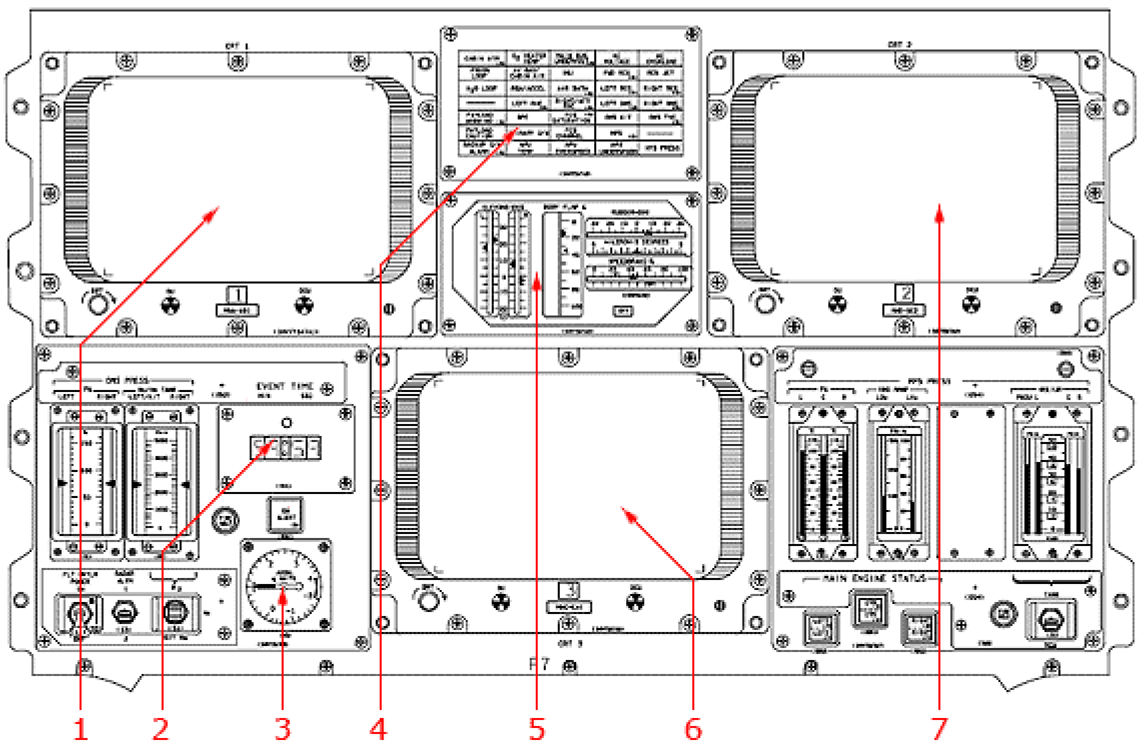
The proximity switches on the nose and main landing gear doors and struts provide electrical signals to control the Landing Gear Nose, Left, and Right indicators on panels F6 and F8. The output signals of the landing gear and door uplock switches drive the landing gear UP position indicators and the backup pyrotechnic release system. The output signals of the landing gear downlock switches drive the landing gear DN position indicators. The landing gear indicators are barberpole when the gear is in transit.

8, 10. LANDING GEAR ARM PUSHBUTTON, LANDING GEAR CONTROL DOWN PUSHBUTTON

Landing gear deployment is initiated when the commander (on panel F6) or pilot (on panel F8) depresses the guarded Landing Gear Arm pushbutton and then the guarded DN pushbutton at least 15 seconds before predicted touchdown at a speed no greater than 312 KEAS at 300 ±100 feet above ground level (AGL). Depressing the ARM pushbutton energizes latching relays for the landing gear extend valves 1 and 2 in preparation for gear deploy. It also arms the nose and main landing gear pyrotechnic initiator controllers and illuminates the yellow light in the ARM pushbutton. This is normally performed by the pilot at approximately 2,000 feet AGL.

The DN pushbutton is then depressed. This energizes latching relays that open the hydraulic system 1 extend valve 1 and hydraulic system 2 landing gear extend valve 2. Fluid in hydraulic system 1 flows to the landing gear uplock and strut actuators and the nose wheel steering switching valve. The green light in the DN pushbutton indicator is illuminated.

F7



1, 6, 7. CRT Displays

2. Event Timer

3. Accelerometer

4. Caution/Warning Indicator Lights

5. Surface Position Indicator

1.6.7. CRT DISPLAYS

There are three CRTs (or display units) on flight deck forward display and control panel F7 and one at the side aft flight deck station. The display unit uses a magnetic-deflected, electrostatic-focused CRT. When supplied with deflection signals and video input, the CRT displays alphanumeric characters, graphic symbols and vectors on a green-on-green phosphorous screen activated by a magnetically controlled beam.

Note

CRT displays gauges randomly display a sequence of screenshots from original CRT displays. Also you can call next page by clicking on a display glass. But no functional Flight Management Computer included in the product.

2. EVENT TIMER

The forward event timer is on panel F7 and its control switches are on panel C2. The aft event timer is on panel A4 and its control switches are on panel A6.

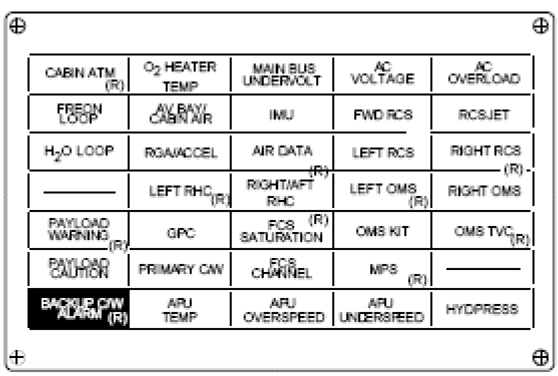
The Event Time Clock indicates the time as set from the Event Timer Switches.

3. ACCELEROMETER

There are four accelerometer assemblies aboard the orbiter, each containing two identical single-axis accelerometers, one of which senses vehicle acceleration along the lateral (left and right) vehicle Y axis while the other senses vehicle acceleration along the vertical (normal, yaw and pitch) Z axis.

The g-meter is a self-contained accelerometer and display unit mounted on panel F7. It senses linear acceleration along the Z axis (normal) of the vehicle. A mass weight in the unit is supported vertically by two guide rods and is constrained by a constant-rate helical spring. The inertial force of the mass is proportional to the inertial force of the vehicle and, hence, to the input acceleration, under conditions of constant acceleration. Displacement of the mass is translated to pointer displacement through a rack-and-pinion gear train whose output is linear with input acceleration. The display indicates acceleration from minus 2 g's to plus 4 g's. The g-meter requires no power and has no software interface. Like all the dedicated displays, it has an external variable incandescent lamp.

4. CAUTION AND WARNING LIGHT MATRIX

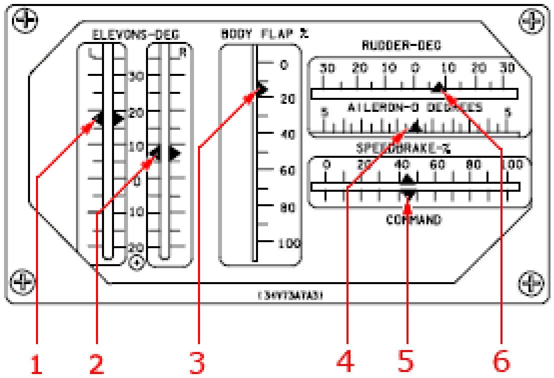


Illuminate to alert the crew of malfunctions within the shuttles systems. A red light is a warning that a condition exists which is very serious. An amber light illuminates for a system malfunction which may cause farther damage to the system if not corrected.

Note:

No malfunctions simulation is provided in the Product. You can turn the lights ON only by pressing Annunciator Lamp Test switch on panel O6.

5. SURFACE POSITION INDICATOR



1,2. Elevon Position Indicators

3. Body Flap Position Indicator

4. Speed Brake Position Indicator

5. Aileron Display

6. Rudder Position Indicator

3. Body Flap Position Indicator

The body flap scale reads body flap positions from zero to 100 percent of software-allowed travel. Zero percent corresponds to full up; 100 percent corresponds to full down.

Body Flap Position controlled by MSFS pitch trim controls.

4. Speed Brake Position Indicator

The speed brake position indicator indicates the actual position on the upper scale and commanded position on the lower scale. The position ranges zero to 100 percent; zero percent is fully closed and 100 percent is fully open, which corresponds to 98 degrees with respect to the hinge lines. The small point at 25 percent is fixed and represents the point at which the speed brake surfaces and the remainder of the tail form a smooth wedge.

The speed brake command is scaled identically to position and has the same travel limits. It always represents the speed brake auto guidance command.

5. Aileron Display

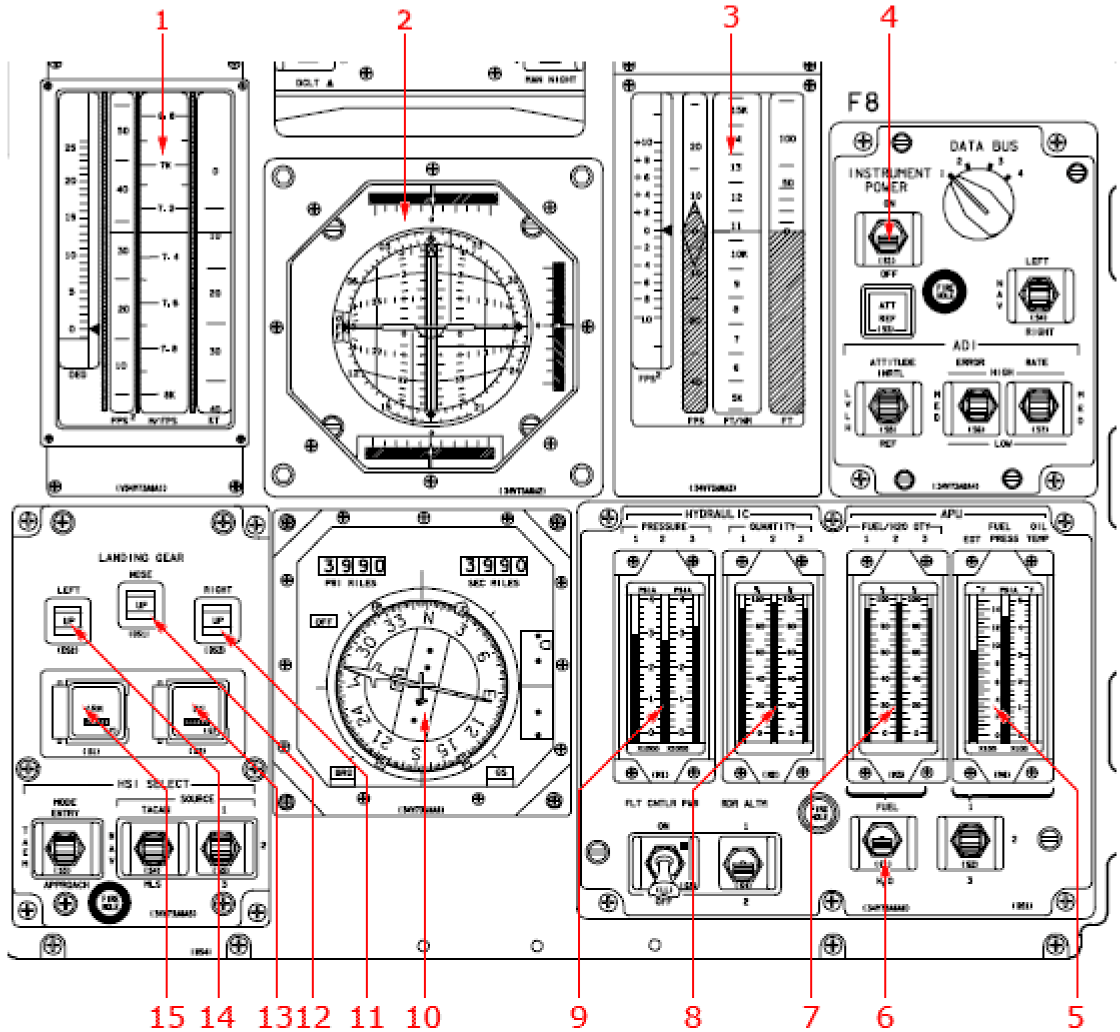
The aileron display measures the effective aileron function of the elevons in combination. Aileron position equals the average of the left and right elevon divided by two. Deflection of the pointer to the right of center indicates a roll-right configuration (left elevons down, right elevons up) and vice versa. The scale is minus 5 to plus 5 degrees, with minus 5 at the left side. The aileron command can exceed plus or minus 5 degrees (maximum plus or minus 10 degrees), in which case the meter saturates at plus or minus 5 degrees.

6. Rudder Position Indicator

Rudder position is displayed as if viewed from the rear of the vehicle. Deflection to the left of center represents left rudder. The scale is plus 30 degrees (left) to minus 30 degrees (right), but software limits the rudder command to plus or minus 27.1 degrees.

DO NOT USE FOR FLIGHT

F8



1 Alpha Mach Indicator

2. Attitude Director Indicator

3 Altitude/Vertical Velocity Indicator

4. Instrument Power Switch

5,7. APU Fuel/H_2O Quantity Meters

6. Fuel Selector Switch

8,9. Hydraulic Pressure and Quantity Meters

10. Horizontal Situation Indicator

11, 12, 14. Landing Gear Talkback Indicators

13. Landing Gear Arm Pushbutton

15. Landing Gear Control Down Pushbutton

1 ALPHA MACH INDICATOR

See F6 panel description for details.

2 ATTITUDE DIRECTOR INDICATOR

See F6 panel description for details.

3 ALTITUDE/VERTICAL VELOCITY INDICATORS

See F6 panel description for details.

4 INSTRUMENT POWER SWITCH

See F6 panel description for details.

5,7. APU FUEL/H_2O QUANTITY METERS

The APU has numerous indicators to monitor its performance. Each APU fuel tank's and Boiler H_2O quantity is monitored and calculated through the onboard computer and transmitted to the meters on panel F8. When the APU fuel/ H_2O switch on panel F8 is positioned to fuel, the quantity in APU fuel tanks 1, 2 and 3 is displayed simultaneously in percent. The fuel quantity of 100 percent on the meter is equivalent to 325 pounds. Turbine exhaust gas temperature, lube oil temperature and fuel pressure for each auxiliary power unit are transmitted to panel F8.

6. FUEL SELECTOR SWITCH

The Fuel Selector Switch is used to set fuel/ H_2O to be displayed on the APU Fuel/ H_2O Quantity Meter.

8,9. HYDRAULIC PRESSURE AND QUANTITY METERS

A pressure sensor in the filter module for each hydraulic system monitors the hydraulic system source pressure and displays the pressure on the hydraulic pressure 1, 2 and 3 meters.

10. HORIZONTAL SITUATION INDICATOR

See F6 panel description for details.

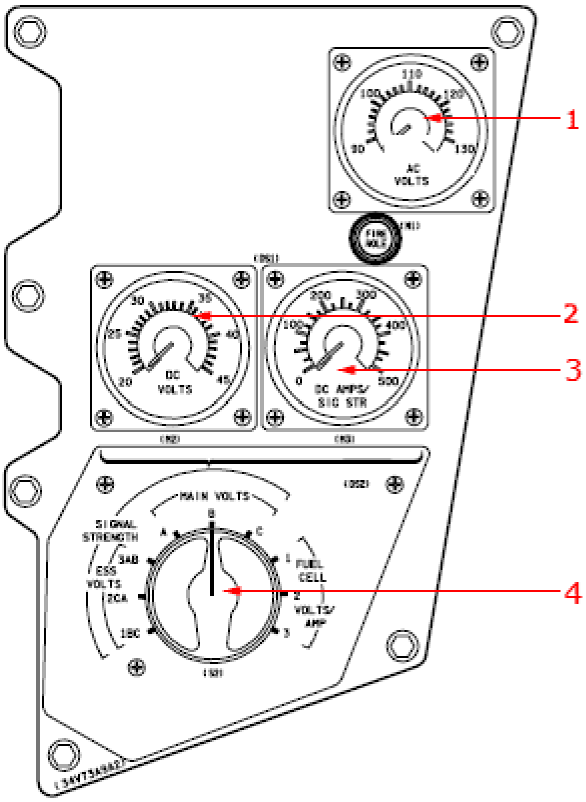
11, 12, 14. LANDING GEAR TALKBACK INDICATORS

See F6 panel description for details.

13, 15. LANDING GEAR ARM PUSHBUTTON, LANDING GEAR CONTROL DOWN PUSHBUTTON

See F6 panel description for details.

F9



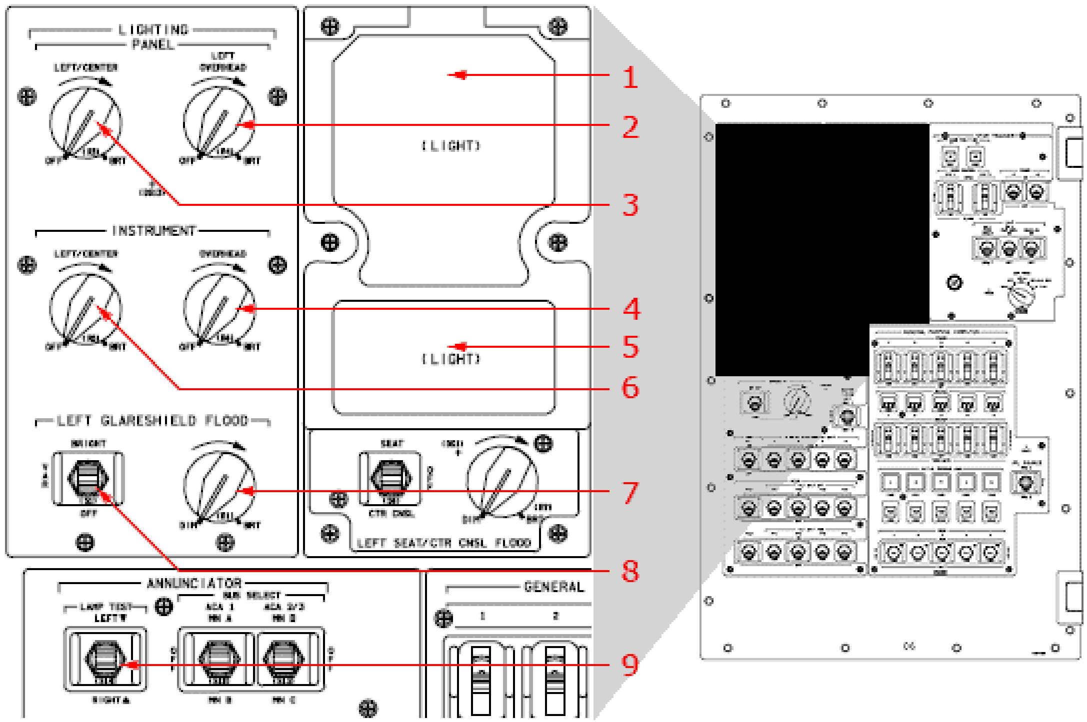
1,2 Dc Voltmeters

3. Dc Amps Meter

4. Fuel Cell Volts/Amp Rotary Switch

DO NOT USE FOR FLIGHT

O6



2-4, 6-8. Lighting Controls

9. Annunciator Lamp Test Switch

1, 5. Flood Lights

1, 5. FLOOD LIGHTS

Interior floodlights provide general illumination throughout the crew cabin and allow the flight crew to function within the flight deck,

There are two seat/center console floodlights: one for the commander and one for the pilot. Each light has two incandescent bulbs: the left one illuminates the commander's lap or the center console, and the other illuminates the pilot's lap or the center console.

2-4, 6-8. LIGHTING CONTROLS

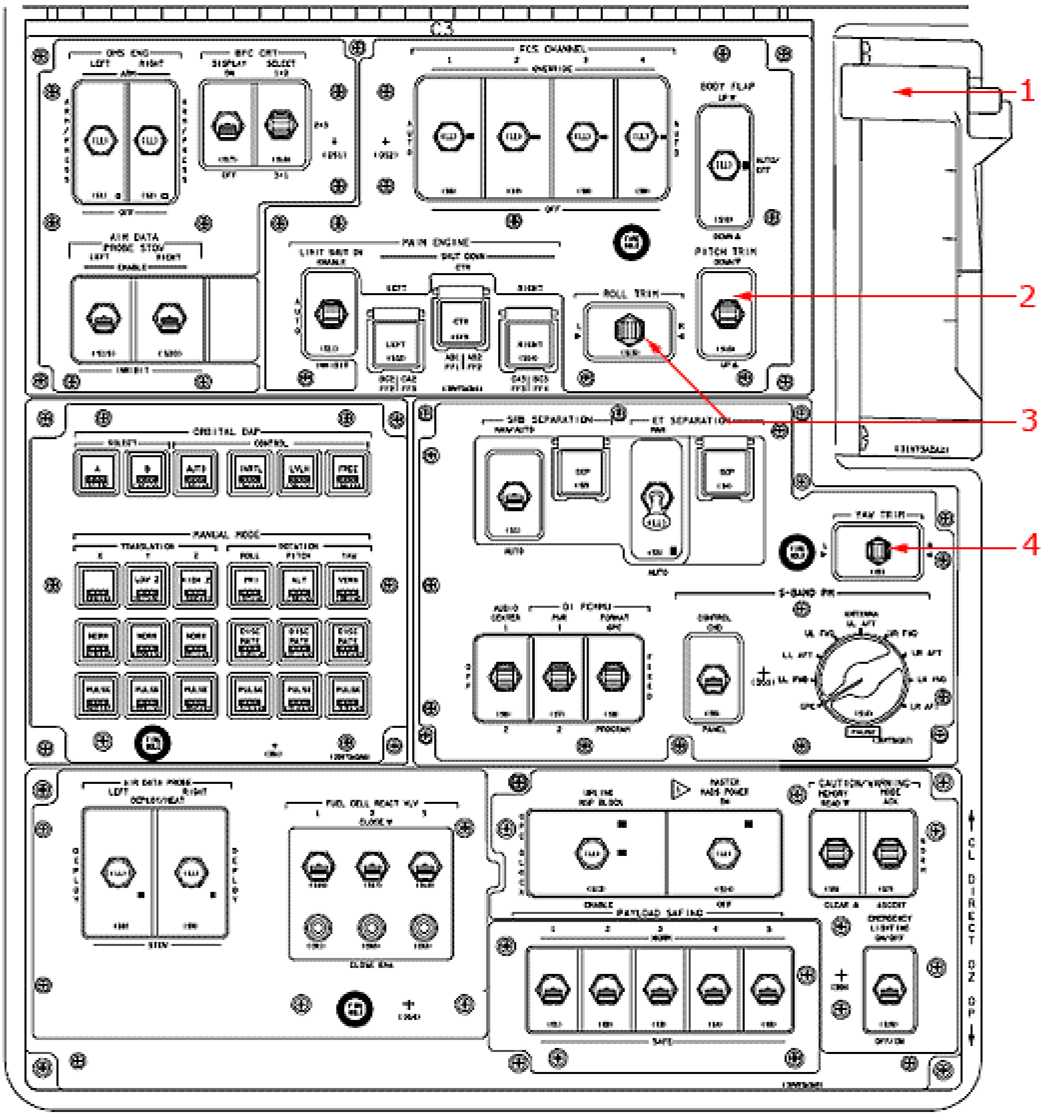
Interior lighting consists of panel, instrument and left glareshield flood lighting. All knobs control the same (the only one) interior light available in MSFS. (Shift L)

9. ANNUNCIATOR LAMP TEST SWITCH

The Annunciator Lamp Test switch on panel O6 positioned to LEFT applies power to the ACA 1, 2, and 3 annunciator lamp test circuits, illuminating the following lights:

- Caution And Warning Light Matrix
- Body Flap AUTO-MAN Pushbutton Indicator
- Speed Brakes/Throttle Pushbutton Indicator
- AUTO Pitch Pushbutton Indicator
- GPS is driving Nav 1 indicator AUTO Pitch Switch
- AUTO Roll/Yaw Pushbutton Indicator
- Landing Gear Talkback Indicators
- APU Indicators
- Drag Chute Pushbutton Indicators

C3



1. Speed Brake/Thrust Controller
2. Roll Trim Switch
3. Pitch Trim Switch
4. Yaw Trim Switch

1. SPEED BRAKE/THRUST CONTROLLER

There are two SBTCs, one on the commander's left-hand side of the flight deck forward on panel L2 and one on the pilot's left-hand side on the center console on panel C3. During entry, the commander's or pilot's SBTC may be used to control aerodynamic drag (hence airspeed) by opening or closing the speedbrake. At the forward setting, the SSME thrust level is the greatest, or the speedbrake is closed. Rotating the SBTC back decreases the SSME thrust level or opens the speed brake.

DO NOT USE FOR FLIGHT

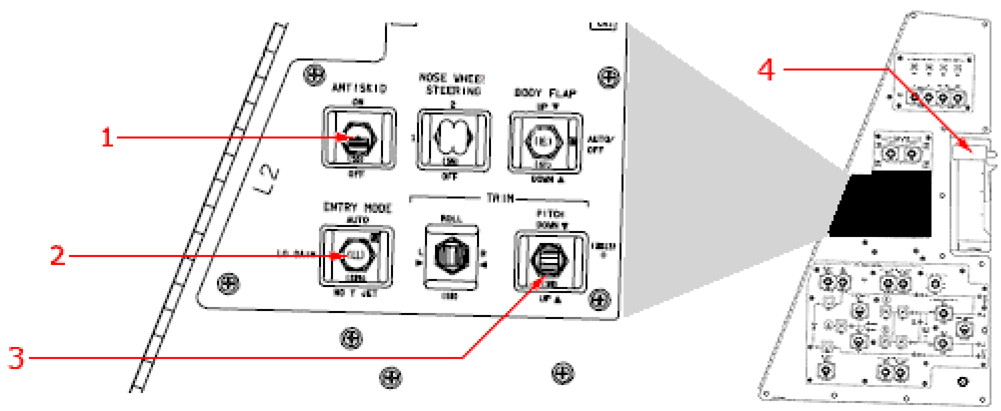
2-4. TRIM SWITCHES

Roll and pitch panel trim switches allow the crew to actually move the aerosurfaces, whereas the RHC trim switches change the rate command. The yaw panel trim switch inputs an acceleration bias into the yaw channel.

The TRIM PANEL switches on panel F3 enable control bus power to a set of three panel trim switches. The dual-redundant TRIM RHC/PANEL switches on panel F3 provide signals to the GPCs, prohibiting software execution of the associated RHC and panel trim switch inputs while in the INHIBIT position. The ENABLE position permits the RHC and TRIM PANEL switch to be used for trimming. Six panel switches control roll, pitch, and yaw. The switches, labeled ROLL TRIM, PITCH TRIM, and YAW TRIM, are located on panel L2 for the commander and panel C3 for the pilot. The commander's trim switches on panel L2 are activated when the TRIM PANEL switch on the left side of panel F3 is positioned to ON. The pilot's trim switches on panel C3 are activated when the TRIM PANEL switch on the right side of panel F3 is positioned to ON. The corresponding TRIM RHC/PANEL switch must be in ENABLE for roll, pitch, and yaw trimming to take place. Likewise, the commander and pilot RHC trim is activated when the corresponding FLT CNTRL POWER switch on panel F7 or F8 is ON and the corresponding TRIM RHC/PANEL switch on F3 is in ENABLE. All the trim switches on the RHC and on panels L2 and C3 are spring loaded to the OFF position.

Redundancy management processes the two sets of TRIM switches. If two switches generate opposing commands, the resultant trim command in that axis is zero.

L2



1. Antiskid Control Switch

2-3. Trim Switches

4. Speed Brake/Thrust Controller

1. ANTISKID CONTROL SWITCH

The Antiskid Control Switch turns on/off the antiskid system. The antiskid system prevents the landing gear brakes from locking up a tire while braking during landing roll out.

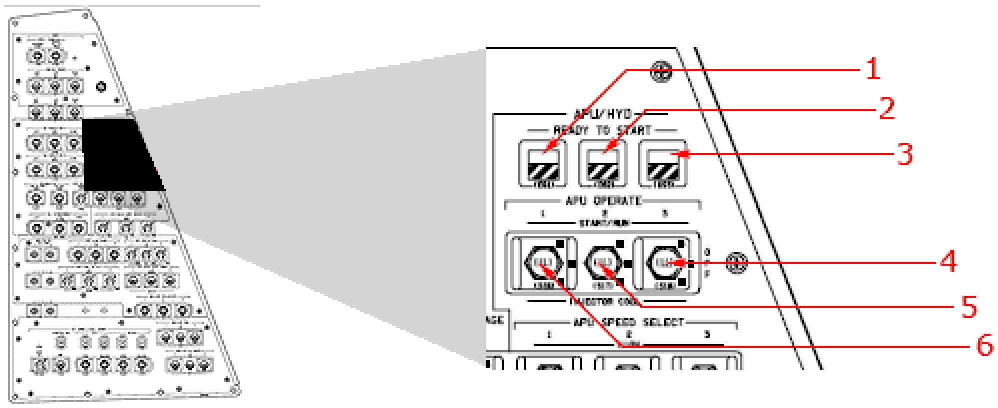
2-3. TRIM SWITCHES

See C3 panel description for details.

4. SPEED BRAKE/THRUST CONTROLLER

See C3 panel description for details.

R2



1-3. APU Indicators

4-6. APU Control Switches

1-3. APU INDICATORS

When the auxiliary power unit is started the corresponding indicator is lighten up.

4-6. APU CONTROL SWITCHES

The start or ride/run position of each APU control switch overrides the APU prestart conditions (gas generator temperature above 190 F, turbine speed less than 80 percent and gearbox pressure above 5.5 psi) to permit a start of the respective unit if one or more of the prestart conditions are not met.

The APU start control switches, 1, 2, and 3 are located on panel R2 for each auxiliary power unit. When the switch is positioned to start/run, the corresponding APU controller activates the start of that unit and removes electrical power automatically from the unit's gas generator and fuel pump heaters. The off position of each switch removes the start signal from the corresponding APU controller.

CUSTOMER SUPPORT

TECHNICAL SUPPORT

Trouble with your game? Welcome to Technical Support Section:
http://www.captainsim.com/cgi-bin/kb.pl

ACCOUNT SUPPORT

Can't buy? Lost links, keys? Welcome to Account Support Section:
http://www.captainsim.com/support/acss/

DOWNLOADS

Looking for Free liveries, banners, etc... Welcome to Downloads Section:
http://www.captainsim.com/support/dl/

CONTACT US

For Press, Business and General Inquires please use Contact Us Section:
http://www.captainsim.com/company/contact.html

BUSINESS HOURS

Please use the online services or contact our team using the web forms that are available 24/7.

All inquires are processed by Captain Sim team in our European office. Please note, the office business hours are: Monday-Friday 7:00-16:00 GMT. Usually we respond within 24 business hours.

Thank you,

Enjoy your flight!

Captain Sim Customer Support Team
www.captainsim.com