

06 HYDRAULICS, FLIGHT CONTROLS, LANDING GEAR, BRAKES



BOEING 737 NEXT GENERATION **737**

Course overview

- Airplane General
- Air Systems
- Warning Systems, Communications, Ice & Rain Protection
- Electrical
- Engines, APU, Fuel System
- **Hydraulics, Flight Controls, Landing Gear, Brakes**
- Flight Instruments & Displays
- Automatic Flight
- Flight Management, Navigation
- Normal Operations



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Topics

Flight controls

- Overview
- Controls & indicators
- Roll control
 - Ailerons
 - Flight spoilers
- Pitch control
 - Elevators
 - Stabilizer
 - Stalls
- Yaw control
 - Rudder
 - Yaw damper
- Speed brakes
- Flaps & slats

Hydraulic system

- Overview
- Controls & indicators
- Hydraulic power distribution
- A & B systems
- System leaks
- Power transfer unit
- Landing gear transfer unit
- Standby system

Landing gear & brakes

- Controls & indicators
- Landing gear operation
- Brake system
- Air/Ground system

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Hydraulic system

Overview

The airplane has three hydraulic systems: A, B and standby. The standby system is used if system A and/or B pressure is lost. The hydraulic systems power the following systems:

- flight controls
- leading edge flaps and slats
- trailing edge flaps
- landing gear
- wheel brakes
- nose wheel steering
- thrust reversers
- autopilots


Either A or B hydraulic system can power all flight controls with no decrease in airplane controllability.

Each hydraulic system has a fluid reservoir located in the main wheel well area. System A and B reservoirs are pressurized by bleed air. The standby system reservoir is connected to the system B reservoir for pressurization and servicing. Pressurization of all reservoirs ensures positive fluid flow to all hydraulic pumps.

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Hydraulic system

Controls & indicators: Hydraulic panel

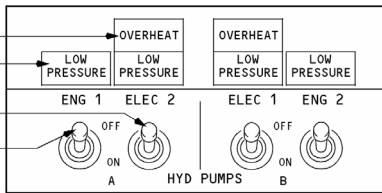


ELEC hyd pump overheat lights

Hyd pump LOW PRESS lights

ELEC hyd pump switches

ENG hyd pump switches



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Hydraulic system

Controls & indicators: Indications (DU)

System pressure indication

Caution (amber) operating limit (red)

HYD P

HYD Q %

95

70 RF

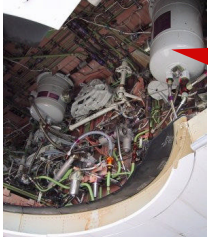
Refill indication

Sys quantity indication

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Hydraulic system
Main wheel well

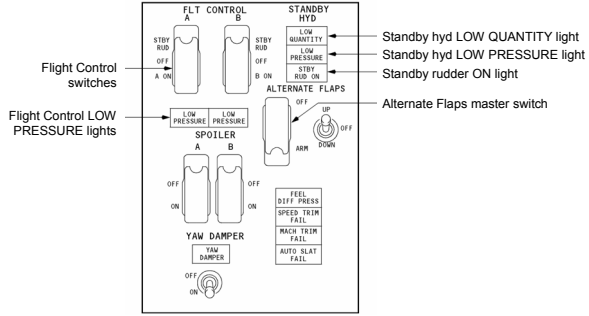


SYSTEM A & B reservoirs

Pressure gauge

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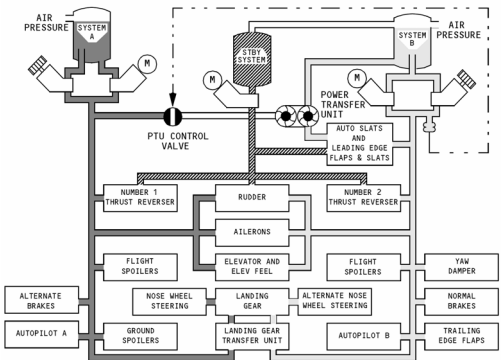
Hydraulic system
Control & indicators: Flight control panel



- Standby hyd LOW QUANTITY light
- Standby hyd LOW PRESSURE light
- Standby rudder ON light
- Alternate Flaps master switch

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Hydraulic system
Hydraulic Power Distribution



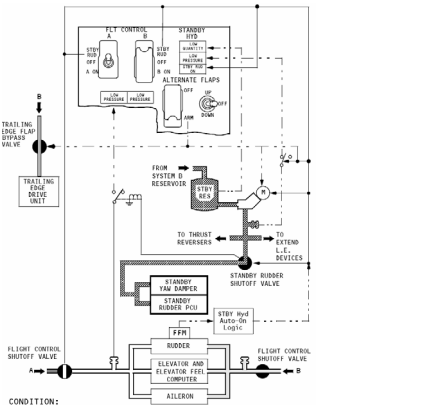
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Hydraulic system
A & B systems
Components powered by hydraulic systems A and B:

<p>System A</p> <ul style="list-style-type: none"> • ailerons • rudder • elevator and elevator feel • flight spoilers (two on each wing) • ground spoilers • alternate brakes • No. 1 thrust reverser • autopilot A • normal nose wheel steering • landing gear • power transfer unit (PTU) 	<p>System B</p> <ul style="list-style-type: none"> • ailerons • rudder • elevator and elevator feel • flight spoilers (two on each wing) • leading edge flaps and slats • normal brakes • No. 2 thrust reverser • autopilot B • alternate nose wheel steering • landing gear transfer unit • autoslats • yaw damper • trailing edge flaps.
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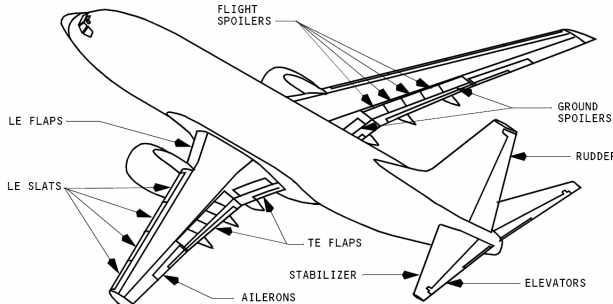
Hydraulic system
Standby system



CONDITION:
SYSTEM A LOST, STANDBY SYSTEM AND SYSTEM B PRESSURIZED
STBY RUDDER ON Light illuminated

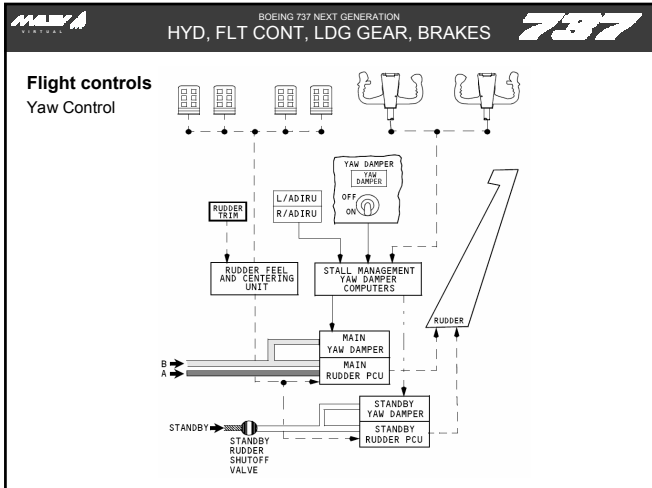
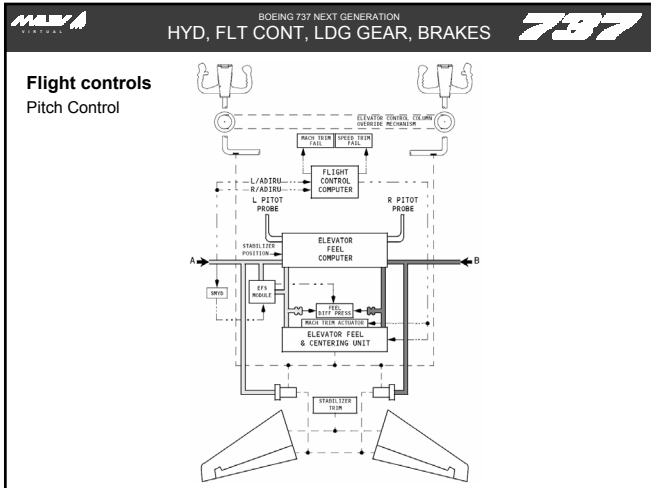
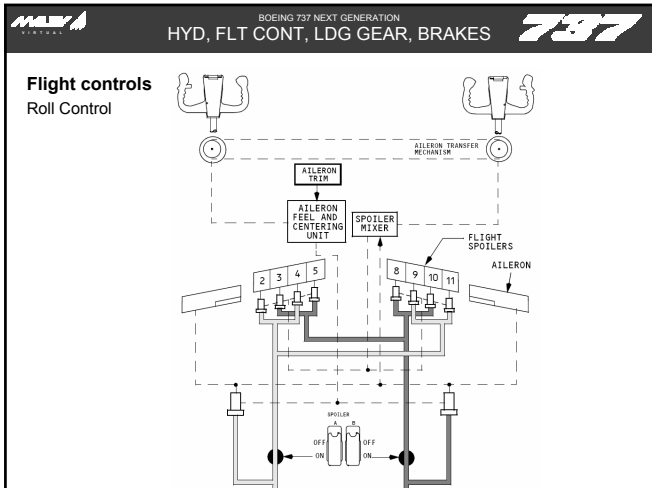
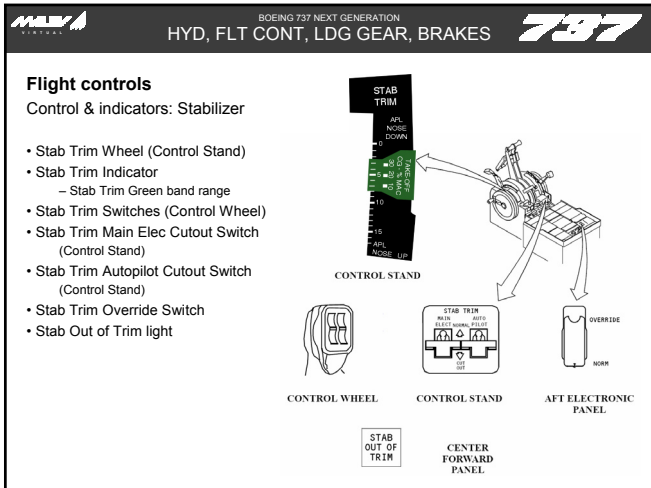
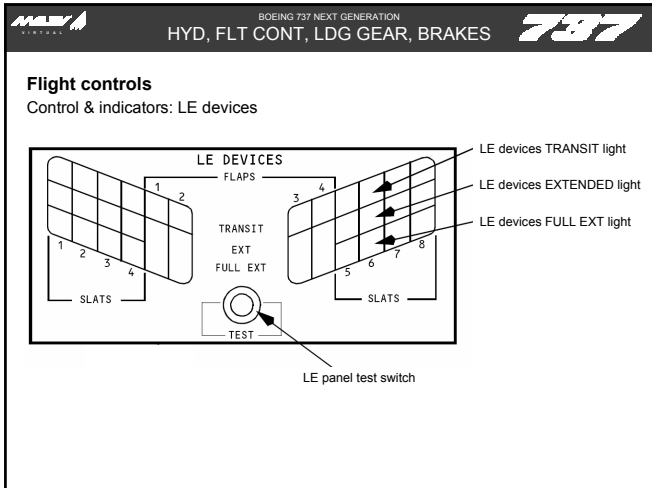
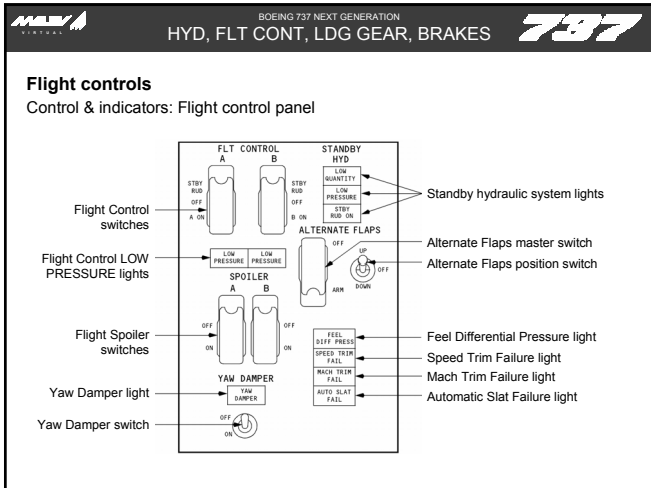
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Flight controls
Overview
Flight control surfaces location

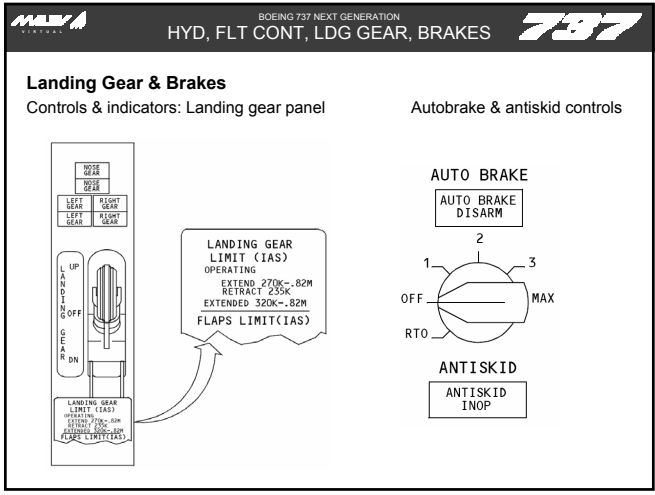
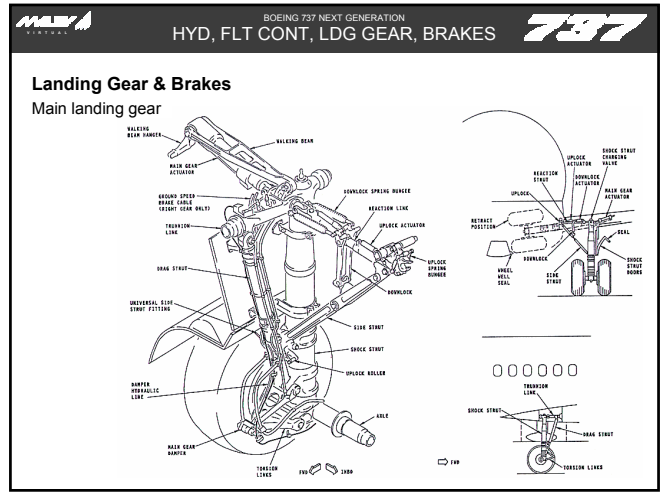
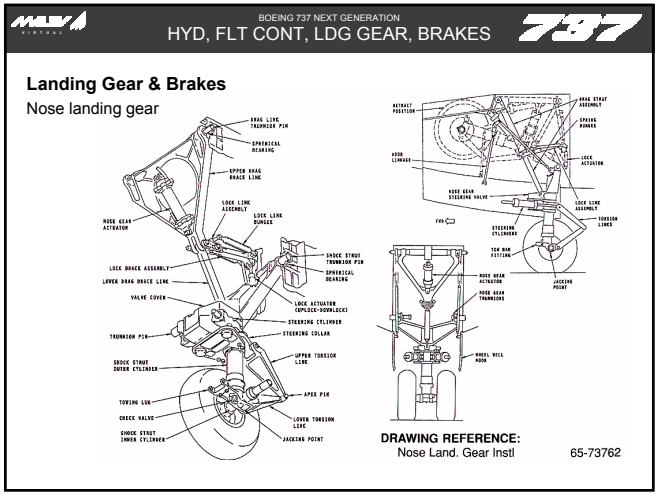
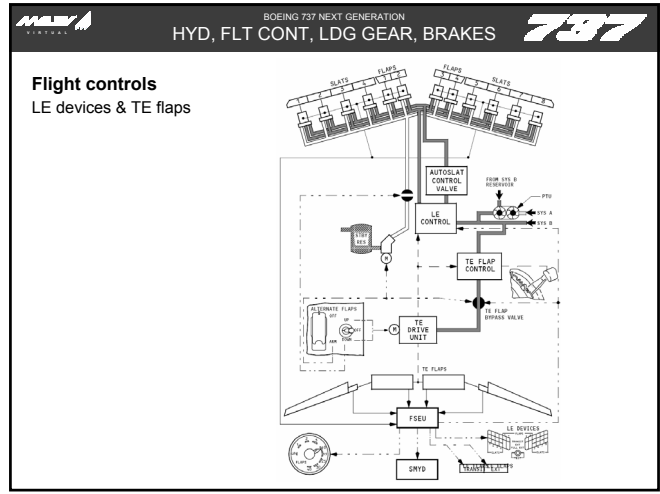
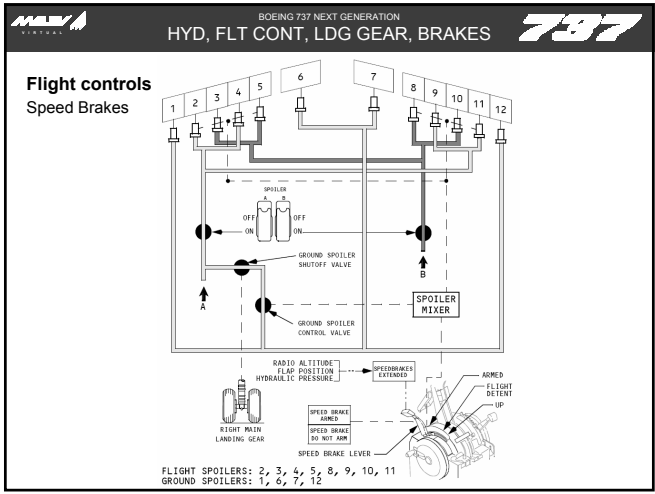


- FLIGHT SPOILERS
- LE FLAPS
- LE SLATS
- TE FLAPS
- AILERONS
- STABILIZER
- ELEVATORS
- GROUND SPOILERS
- RUDDER

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Landing Gear & Brakes

Indications

LIGHT	INDICATION	VALID FOR						
		300	400	500	600	700	800	900
NOSE GEAR	LANDING GEAR LIGHT (green / same for other gear) ILLUMINATED Respective gear down and locked. A sensor-select switch in the E & E compartment can be used to select which set of sensors is associated with the aural warning. <i>NOTE: The landing gear warning horn is deactivated when all three gears are down and locked as determined by the lights on the aft overhead panel.</i>	X	X	X	X	X	X	X
NOSE GEAR	LANDING GEAR LIGHT (red / same for other gear) ILLUMINATED - Gear is not down and either thrust lever is retarded to idle, 737 NG and below 800 ft AGL. - Gear is unlocked. - Gear position disagrees with Landing Gear position.	X	X	X	X	X	X	X
ANTISKID DISARM	ANTISKID DISARM LIGHT (amber) Can only illuminate with gear selected down. ILLUMINATED: - A system fault is detected by automatic antiskid monitoring system. - B737 Classics: Antiskid Control Switch is OFF. - Disagreement between parking brake lever and shutoff valve.	X	X	X	X	X	X	X

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Landing Gear & Brakes

Indications

AUTOBRAKE DISARM	<p>AUTOBRAKE DISARM LIGHT (amber)</p> <p>ILLUMINATED:</p> <ul style="list-style-type: none"> - Speed brake lever moved to down detent during RTO or landing. - Manual brakes applied during RTO or landing. - Thrust lever(s) advanced during RTO or landing (except during first 3 seconds after touchdown for landing). - Landing made with RTO selected (light illuminates after (B737 Classics) 2 minutes (737 NG) 2 seconds). - RTO mode selected on ground. <p>Illuminates for 1 to 2 seconds then extinguishes:</p> <ul style="list-style-type: none"> - A malfunction exists in automatic braking system. <p>EXTINGUISHED:</p> <ul style="list-style-type: none"> - AUTO BRAKE select switch set to OFF or auto brakes armed. 	X	X	X	X	X	X
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Landing Gear & Brakes

Main landing gear (photo)

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Landing Gear & Brakes

Pushback procedures

WARNING: Prior to installing the nose gear steering lockout pin, do not make any electrical or hydraulic power changes with tow bar connected. Any change to electrical power may cause momentary pressurization of the nose wheel steering actuators causing unwanted tow bar movement.

CAUTION: If the nose gear steering lockout pin is not installed, system A HYDRAULIC PUMPS must be placed off.

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Köszönöm a figyelmet!

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