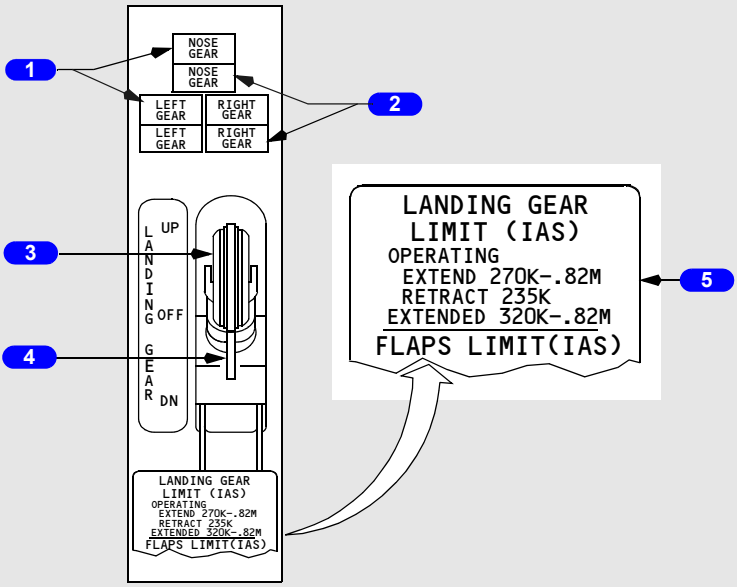
Landing Gear Panel



CENTER INSTRUMENT PANEL

1 Landing Gear Indicator Lights (top)

Illuminated (red) –

- landing gear is not down and locked (with either or both forward thrust levers retarded to idle)
- related landing gear is in disagreement with LANDING GEAR lever position (in transit or unsafe)

Extinguished –

- landing gear is up and locked with landing gear lever UP or OFF
- landing gear is down and locked with landing gear lever DN.

2 Landing Gear Indicator Lights (bottom)

Illuminated (green) – related gear down and locked.

Note: Landing gear warning horn is deactivated with all gear down and locked.

Extinguished – landing gear is not down and locked.

3 LANDING GEAR Lever

UP – landing gear retract

OFF – hydraulic pressure is removed from landing gear system

DN – landing gear extend.

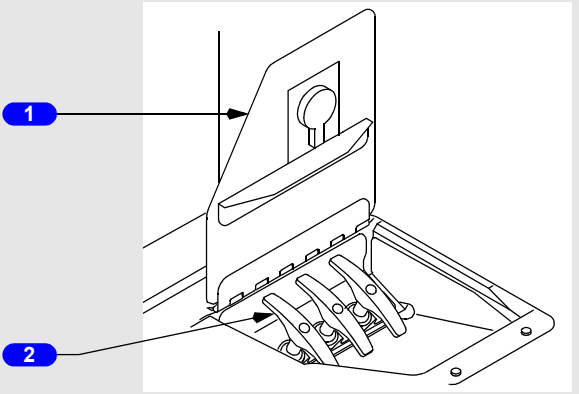
4 Override Trigger

Allows LANDING GEAR lever to be raised, bypassing lever lock.

5 LANDING GEAR LIMIT Speed Placard

Indicates maximum speed while operating landing gear and after gear extension.

Manual Gear Extension



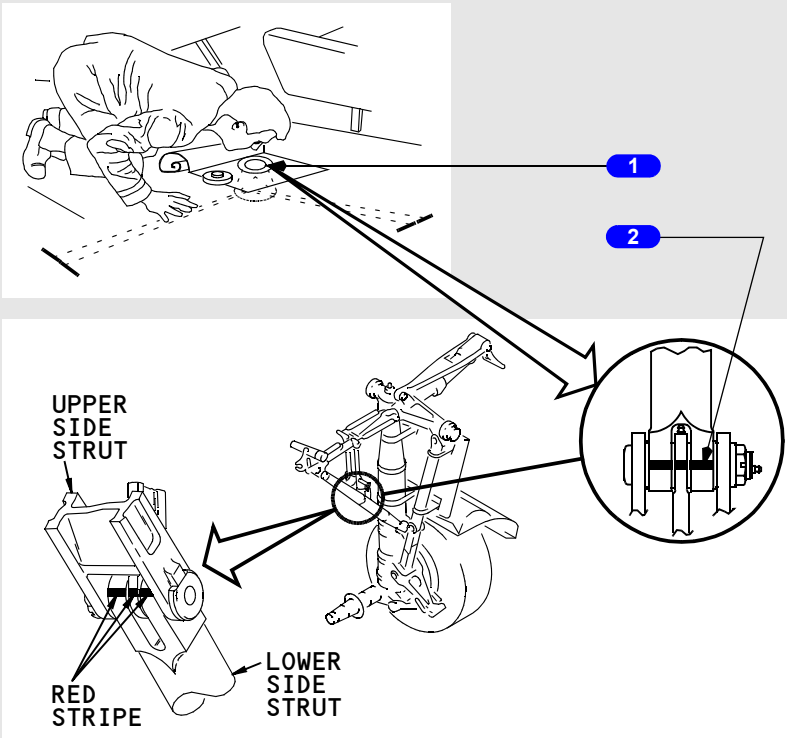
FLIGHT DECK FLOOR

1 Manual Extension Access Door

2 Manual Gear Extension Handles

Right main, nose, left main– With LANDING GEAR lever in the OFF position, each landing gear uplock is released when related handle is pulled to its limit, approximately 18 inches (45 cm) for the main gear, approximately 8 inches (20 cm) for the nose gear.

Main Gear Viewer



PASSENGER CABIN FLOOR and MAIN LANDING GEAR

1 Viewer Access

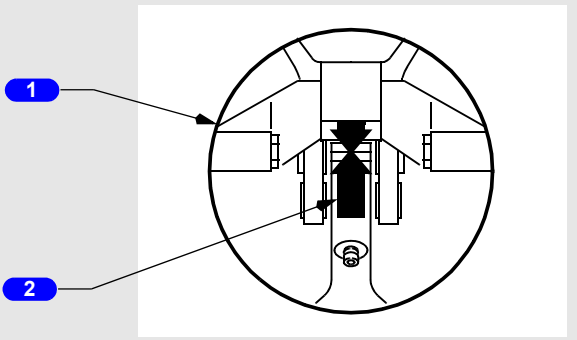
Opposite the 3rd window behind the aft overwing exit and one foot left of center. Pull up the carpet identified by a metal button to sight through viewer. Before leaving the cockpit, position the WHEEL WELL light switch ON.

Note: In some installations the viewer may be under an aisle seat.

2 Paint Stripes (red)

Indication that the landing gear is down and locked is provided by observing the alignment of red paint stripes, located on the down lock and the side struts.

Nose Gear Viewer



FLIGHT DECK FLOOR

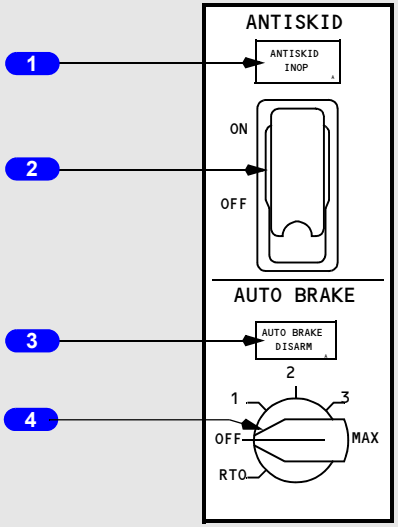
1 Viewer Access –

Cover plate for the nose landing gear viewer is located on the floor just inside the cockpit door. The WHEEL WELL light switch must be ON.

2 Arrow head (red) –

Indication that the nose gear is down and locked is provided by observing the two red arrow heads on the down lock strut are in contact.

Autobrake and Antiskid Controls



CENTER INSTRUMENT PANEL

1 Antiskid Inoperative (ANTISKID INOP) Light

Illuminated (amber) – a system fault is detected by antiskid monitoring system, or switch is off

Extinguished – antiskid system operating normally.

2 ANTISKID Control Switch

ON – guarded position

OFF – turns off antiskid system, illuminates ANTISKID INOP light and illuminates AUTO BRAKE DISARM light if the system is armed.

3 AUTO BRAKE DISARM Light

Illuminated (amber) –

- 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
- RTO mode selected on ground
  - illuminates for one to two seconds then extinguishes

- a malfunction exists in automatic braking system
- the pilot has turned off the antiskid

Extinguished –

- AUTO BRAKE select switch set to OFF
- autobrakes armed.

4 AUTO BRAKE Select Switch

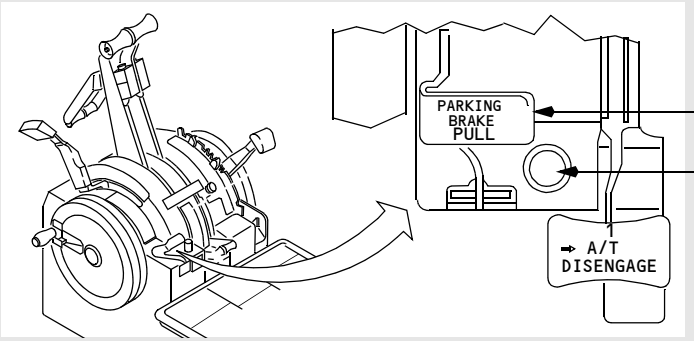
OFF – autobrake system deactivated

1, 2, 3, or MAX –

- selects desired deceleration rate for landing
- switch must be pulled out to select MAX deceleration

RTO – automatically applies maximum brake pressure when thrust levers are retarded to idle at or above 90 knots.

Parking Brake



CONTROL STAND

1 PARKING BRAKE Lever

Forward – parking brake is released

Aft – sets parking brakes when either Captain's or First Officer's brake pedals are fully depressed.

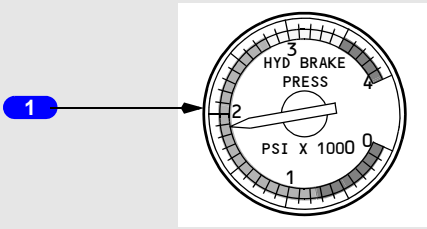
2 Parking Brake Warning Light

Note: Parking brake repeater light located on the external power receptacle panel.

Illuminated (red) – parking brake is set (lights operate from battery power)

Extinguished – parking brake is released.

Hydraulic Brake Pressure Indicator



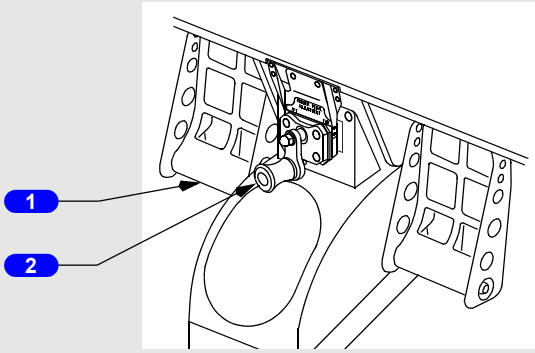
FIRST OFFICER'S INSTRUMENT PANEL

1 Hydraulic (HYD) BRAKE Pressure (PRESS) Indicator

Indicates brake accumulator pressure:

- normal pressure – 3000 psi
- maximum pressure – 3500 psi
- normal precharge – 1000 psi.

Rudder/Brake Pedals



CREW STATION

1 Rudder/Brake Pedals

Push full pedal – turns nose wheel up to 7 degrees in either direction

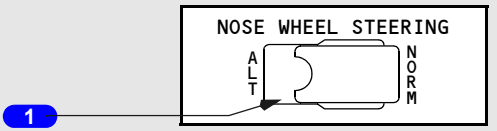
Push top of pedal only – activates wheel brakes

2 RUDDER PEDAL ADJUSTMENT Crank

AFT (counter–clockwise) – adjusts rudder pedals aft

FWD (clockwise) – adjusts rudder pedals forward.

Nose Wheel Steering Switch



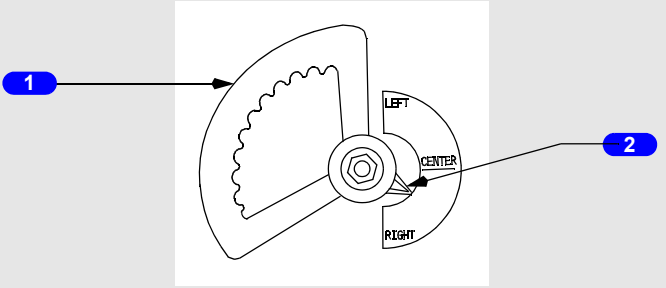
CAPTAIN'S INSTRUMENT PANEL

1 NOSE WHEEL STEERING Switch

ALT – hydraulic system B provides power for nose wheel steering

NORM – hydraulic system A provides power for nose wheel steering.

Nose Wheel Steering Wheel



CAPTAIN'S SIDE PANEL

1 Nose Wheel Steering Wheel

Rotate –

- turns nose wheel up to 78 degrees in either direction
- overrides rudder pedal steering.

2 Nose Wheel Steering Indicator

LEFT – indicates nose wheel steering displacement left of center position

CENTER – normal straight ahead position

RIGHT – indicates nose wheel steering displacement right of center position.

Introduction to Landing Gear

The airplane has two main landing gear and a single nose gear. Each main gear is a conventional two–wheel landing gear. The nose gear is a conventional steerable two–wheel unit.

Hydraulic power for retraction, extension, and nose wheel steering is normally supplied by hydraulic system A. A manual landing gear extension system and an alternate source of hydraulic power for nose wheel steering are also provided.

The normal brake system is powered by hydraulic system B. The alternate brake system is powered by hydraulic system A. Antiskid protection is provided on both brake systems, but the autobrake system is available only with the normal brake system.

Landing Gear Operation

The landing gear are normally controlled by the LANDING GEAR lever. On the ground, a landing gear lever lock prevents the LANDING GEAR lever from moving to the up position. An override trigger in the lever may be used to bypass the landing gear lever lock. In flight, the air/ground system energizes a solenoid which opens the lever lock.

Landing Gear Retraction

When the LANDING GEAR lever is moved to UP, the landing gear begins to retract. During retraction, the brakes automatically stop rotation of the main gear wheels. After retraction, the main gear are held in place by mechanical uplocks. Rubber seals and oversized hubcaps complete the fairing of the outboard wheels.

Note: Manual brake application during flight may cause brake pedal vibration until pedal force is released.

The nose wheels retract forward into the wheel well and nose wheel rotation is stopped by snubbers. The nose gear is held in place by an overcenter lock and enclosed by doors which are mechanically linked to the nose gear

Hydraulic system B pressure is available for raising the landing gear through the landing gear transfer valve. Hydraulic system B supplies the volume of hydraulic fluid required to raise the landing gear at the normal rate when all of the following conditions exist:

- airborne
- No. 1 engine RPM drops below a limit value

Å LANDING GEAR lever is positioned UP

Å either main landing gear is not up and locked.

Hydraulic pressure is removedfrom the landing gear system with the LANDING GEAR lever in the O FF position.

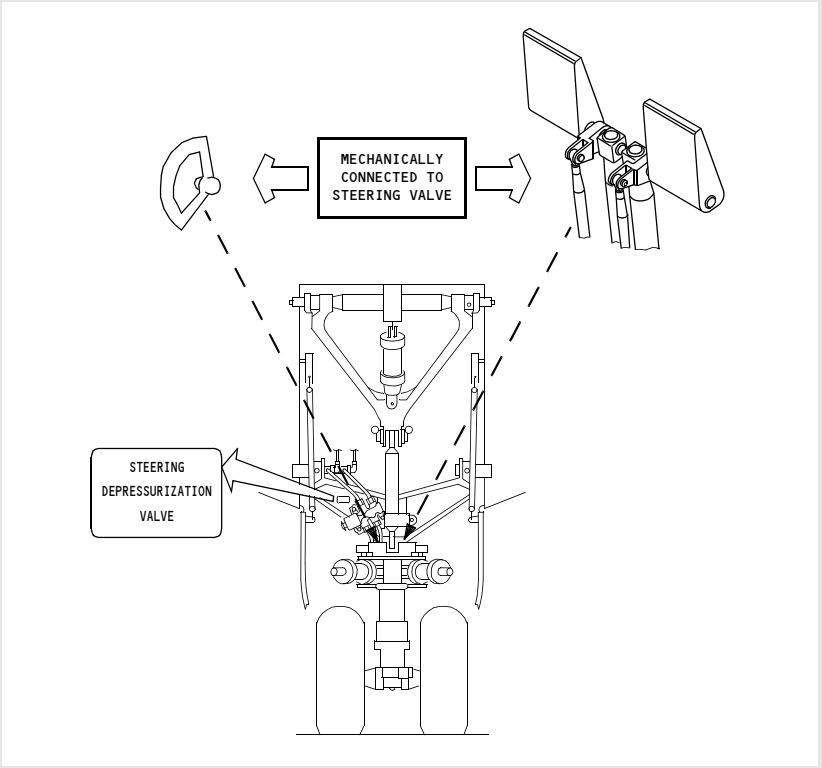
Landing Gear Extension

When the LANDING GEAR lever is moved to DN, hydraulic system A pressure is used to release the uplocks. The landing gear extends by hydraulic pressure, gravity and air loads. Overcenter mechanical and hydraulic locks hold the gear at full extension. The nose wheel doors stay open when the gear is down.

Landing Gear Manual Extension

If hydraulic system A pressure is lost, the manual extension system provides another means of landing gear extension. Manual gear releases on the flight deck are used to release uplocks that allow the gear to free–fall to the down and locked position. The forces that pull the gear down are gravity and air loads.

Nose Wheel Steering



NOSE WHEEL STEERING

The airplane is equipped with nose wheel steering which is powered by hydraulic system A when the NOSE WHEEL STEERING switch is in the NORM position and when the airplane is on the ground. Nose wheel steering is powered by hydraulic system B when the NOSE WHEEL STEERING switch is placed to ALT. In the event of a hydraulic leak downstream of the Landing Gear Transfer Unit, resulting in a loss of hydraulic system B fluid in the reservoir, a sensor closes the Landing Gear Transfer Valve and alternate steering will be lost.

Primary steering is controlled through the nose wheel steering wheel. Limited steering control is available through the rudder pedals. A pointer on the nose steering wheel assembly shows nose wheel steering position relative to the neutral setting. Rudder pedal steering is deactivated as the nose gear strut extends.

A lockout pin may be installed in the towing lever to depressurize nose wheel steering. This allows airplane pushback or towing without depressurizing the hydraulic systems.

Brake System

Each main gear wheel has a multi–disc hydraulic powered brake. The brake pedals provide independent control of the left and right brakes. The nose wheels have no brakes. The brake system includes:

- normal brake system
- alternate brake system
- brake accumulator
- antiskid protection
- autobrake system
- parking brake

Normal Brake System

The normal brake system is powered by hydraulic system B.

Alternate Brake System

The alternate brake system is powered by hydraulic system A. If hydraulic system B is low or fails, hydraulic system A automatically supplies pressure to the alternate brake system.

Brake Accumulator

The brake accumulator is pressurized by hydraulic system B. If both normal and alternate brake system pressure is lost, trapped hydraulic pressure in the brake accumulator can still provide several braking applications or parking brake application.

Antiskid Protection

Antiskid protection is provided in the normal and alternate brake systems. The ANTISKID control switch controls power to the antiskid controller.

The normal brake hydraulic system provides each main gear wheel with individual antiskid protection. When the system detects a skid, the associated antiskid valve reduces brake pressure until skidding stops. The alternate brake hydraulic system works similar to the normal system. However, antiskid protection is applied to main gear wheel pairs instead of individual wheels.

The normal and alternate brake systems provide skid and hydroplane protection. Locked wheel and touchdown protection is available only with the normal braking system.

Antiskid protection is available even with loss of both hydraulic systems.

Autobrake System

The autobrake system uses hydraulic system B pressure to provide maximum deceleration for rejected takeoff and automatic braking at preselected deceleration rates immediately after touchdown. The system operates only when the normal brake system is functioning. Antiskid system protection is provided during autobrake operation.

Rejected Takeoff (RTO)

The RTO mode can be selected only when on the ground. Upon selection, the AUTO BRAKE DISARM light illuminates for one to two seconds and then extinguishes, indicating that an automatic self–test has been successfully accomplished.

To arm the RTO mode prior to takeoff the following conditions must exist:

- airplane on the ground
- antiskid and autobrake systems operational
- AUTO BRAKE select switch positioned to RTO
- wheel speed less than 60 knots
- forward thrust levers positioned to IDLE.

The RTO mode is activated when wheel speed reaches 60 knots. If the takeoff is rejected while wheel speed is between 60 and 90 knots, the AUTO BRAKE DISARM light illuminates, autobraking is not initiated. If the takeoff is rejected after reaching a wheel speed of 90 knots, maximum braking is applied automatically when the forward thrust levers are retarded to IDLE. Braking force is the equivalent of full manual braking.

The RTO mode is automatically disarmed when the right main gear strut extends. The AUTO BRAKE DISARM light does not illuminate. The selector switch must be manually positioned to OFF. If a landing is made with RTO selected, no automatic braking action occurs and the AUTO BRAKE DISARM light illuminates two minutes after touchdown. To reset, position the selector to OFF.

Landing

When a landing autobrake selection is made, the system performs a turn–on–self–test. If the turn–on–self–test is not successful, the AUTO BRAKE DISARM light illuminates and the autobrake system does not arm.

Four levels of deceleration can be selected for landing. However, on dry runways, the maximum autobrake deceleration rate in the landing mode is less than that produced by full pedal braking.

After landing, autobrake application begins when:

- both forward thrust levers are retarded to IDLE, and
- the main wheels spin–up.

To maintain the selected landing deceleration rate, autobrake pressure is reduced as other controls, such as thrust reversers and spoilers, contribute to total deceleration. The autobrake system brings the airplane to a complete stop unless the braking is terminated by the pilot.

Autobrake – Disarm

The pilots may disarm the autobrake system by moving the selector switch to the OFF position. This action does not cause the AUTO BRAKE DISARM light to illuminate. After braking has started, any of the following pilot actions disarm the system immediately and illuminate the AUTO BRAKE DISARM light:

- moving the SPEED BRAKE lever to the down detent
- advancing the forward thrust lever(s) after touchdown, or
- applying manual brakes.

Parking Brake

The parking brake can be set with either A or B hydraulic systems pressurized. If A and B hydraulic systems are not pressurized, parking brake pressure is maintained by the brake accumulator. Accumulator pressure is shown on the HYDRAULIC BRAKE PRESSURE indicator.

The parking brake is set by depressing both brake pedals fully, while simultaneously pulling the PARKING BRAKE lever up. This mechanically latches the pedals in the depressed position and commands the parking brake valve to close.

The parking brake is released by depressing the pedals until the PARKING BRAKE lever releases. A fault in the parking brake system may cause the ANTISKID INOP light to illuminate.

The takeoff configuration warning horn sounds if either forward thrust lever is advanced for takeoff with the parking brake set.

Air/Ground System

Inflight and ground operation of various airplane systems are controlled by the air/ground system.

The system receives air/ground logic signals from sensors located on the right main gear and the nose gear. These signals are used to configure the airplane systems to the appropriate air or ground status.

Air/Ground System Logic Table

SYSTEMS	NORMAL INFLIGHT OPERATION	NORMAL ON GROUND OPERATION	RMK
Drain Mast Heaters	115 volt AC operation.	28 volt AC operation.	
Pack Valves	With one pack operating regulates to high flow with flaps up.	With one pack operating, regulates to high flow only when pack is operating from the APU and both engine bleed switches are OFF.	
Pressurization (CPCS)	Allows programmed pressurization in the standby and automatic modes.	Allows pressurization as determined by the FLT/GRD switch.	
Ram Air	Turbofans operate only when air conditioning packs operate and flaps are not up.	Turbofans operate whenever air conditioning packs operate. Deflectors are extended.	
Wing Anti–ice (Ground Operating System)	Control valves open when switch is ON. Thrust setting and duct temperature logic is bypassed.	With switch ON, valves cycle open and closed. Switch trips to OFF at lift–off.	
Autothrottle	Enables go–around below 2000 ft radio altitude.	Disengaged 2 seconds after landing. Takeoff mode enabled.	
TO/GA switch	Flight director engages go–around mode.	Flight director engages takeoff mode.	
ACARS	Sends out signal on strut extension for takeoff signal.	Sends out signal on strut compression for landing signal.	
Voice Recorder	Prevents tape erasure.	Allows tape erasure when parking brake is set.	
Standby Power	Standby busses automatically transferred to battery and inverter power when standby power switch is in AUTO	BAT position must be selected for transfer of standby busses	
APU Control	APU operation possible with battery switch OFF.	APU shutdown if battery switch is positioned OFF.	

SYSTEMS	NORMAL INFLIGHT OPERATION	NORMAL ON GROUND OPERATION	RMK
APU Generator	May be connected to only one generator bus.	May be connected to two generator buses.	
Engine Idle Control	Idle control and indication system is armed.	Maintains high idle until 4 seconds after landing.	
Thrust Reverser	Thrust reverse disabled by gear sensors and radio altimeter.	Thrust reverse enabled.	
APU Fire Horn	Wheel well horn disabled.	Wheel well horn enabled.	
Speed Brake Lever Actuator	Can be armed to raise ground spoilers for landing.	Activates SPEED BRAKE lever on landing if armed. Rejected take–off feature available. Drives to DOWN when thrust lever advanced.	
Auto Slat	System enabled with flaps 1, 2, or 5 selected. PTU available if system B pressure is lost.	System disabled.	
Flight Recorder	Operates when transfer bus No. 1 is powered	Operates when transfer bus No. 1 is powered and either engine is operating.	
FMC	Position updated from DME or VOR/DME.	Does not update.	
Standby Hydraulic	Pump automatic operation with flaps extended and A or B pressure lost.	Wheel speed must be greater than 60 knots for automatic operation.	
Antiskid	Releases normal brakes for touchdown protection.	Allows normal antiskid braking after wheel spin–up.	
Autobrake	Allows selection of landing mode.	RTO mode available.	
Landing Gear Lever Lock	Lever Lock solenoid released.	Lever Lock solenoid latched.	
Landing Gear Transfer Unit	Enabled.	Disabled.	
Stall Warning	Enabled.	Disabled.	
Takeoff Warning	Disabled.	Enabled.	