CHAPTER 32 - LANDING GEAR

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GENERAL

The aircraft has a retractable tricycle landing gear fitted with oleo-pneumatic shock absorbers, to both support the aircraft weight while on ground and absorb loads during taxiing and landing manoeuvres. The landing gear consists of:

- ***Main Landing Gear***
- ***Nose Landing Gear***
- ***Extension and Retraction System***
- ***Wheels and Brakes***
- ***Nose Wheel Steering System***

MAIN LANDING GEAR

The main landing gear locates at each side of the fuselage. The two landing gear assemblies (left and right) are protected by fairings and retract backwards inside the fuselage, where they are partially covered by the fairings once retracted.

DESCRIPTION

Each main landing gear is hydraulically operated by an actuator (refer to EXTENSION AND RETRACTION, in this chapter), which retracts and extends it to and from the unpressurized wheel bay.

Each main landing gear (left and right) has two tandem legs, each fitted with its own separate damper, strut and swing arm. Both strut and swing arm are mounted on stub axles, protruding from the fuselage and about which, they turn. Each leg is fitted with a braking unit and a wheel (refer to BRAKES and WHEELS, in this chapter).

A pair of tie rods between the fore and rear leg of each main landing gear, transmits actions between them and synchronize their movements.

A set of levers locks the landing gear in the fully-down position. The unit has a set of holes for insertion of a lock pin so as to prevent the landing gear from being retracted while maintenance activities.

The main landing gear is fitted with a series of microswitches to inhibit or activate certain aircraft systems:

– Leg microswitches: one at each leg, they are operated by the associated damper movement. Microswitches give the AIR/GROUND (weight-on-wheels) signal.

– Actuator microswitches: operated by the actuator movement, send the DOWN LOCKED/UNLOCKED signal.

– Up-lock hook microswitches: opened and closed by the landing gear up-lock hook to send the UP LOCKED/UNLOCKED signal.

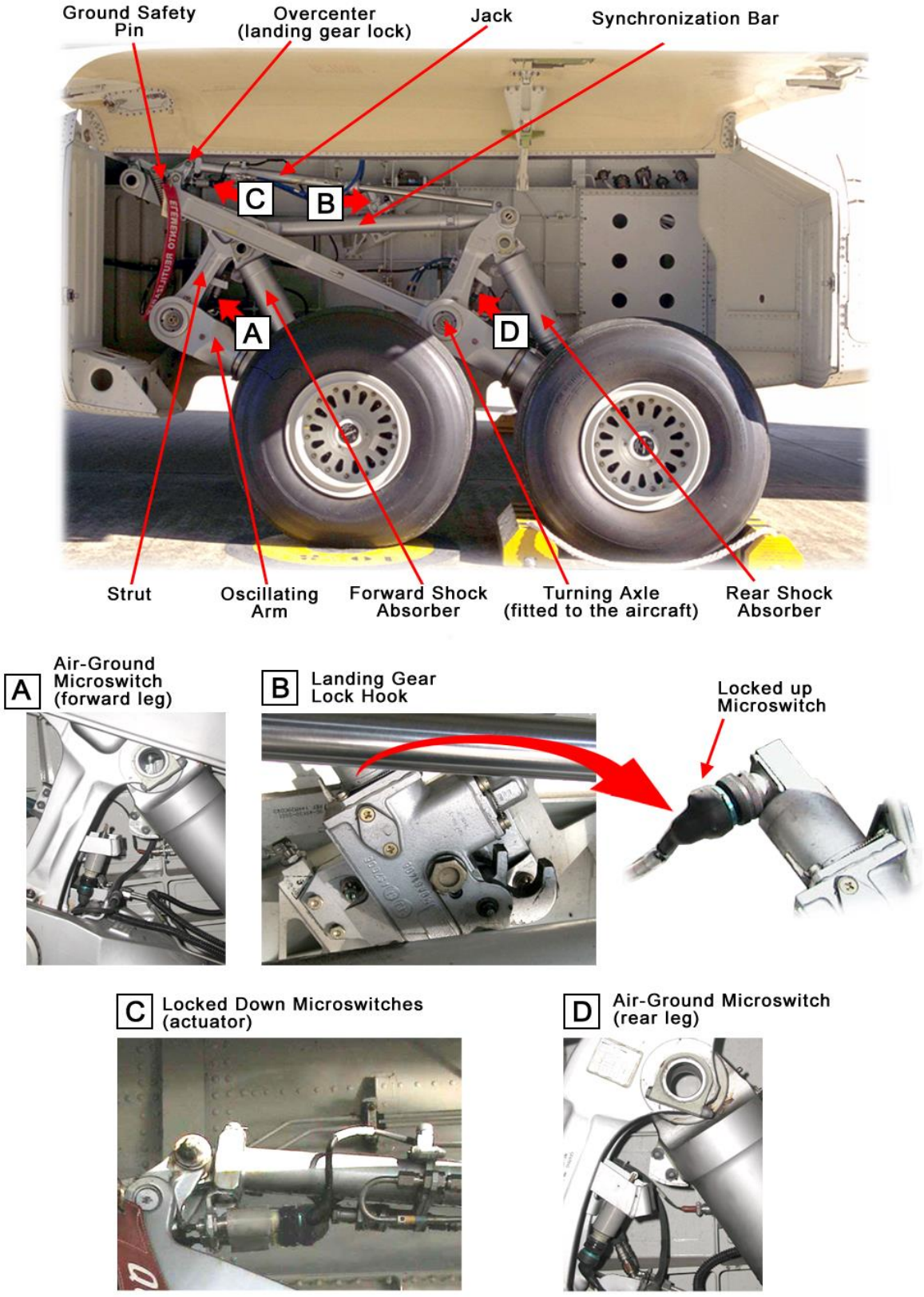

Figure 32-1 Main Landing Gear

NOSE LANDING GEAR

The nose landing gear is located beneath the central fore fuselage and retracts forwards.

DESCRIPTION

The nose landing gear is hydraulically operated by an actuator (refer to EXTENSION AND RETRACTION, in this chapter), which retracts and extends it to-and from, a non-pressurized bay. The nose gear bay is closed by a pair of doors, which shut during retraction the final stages.

The nose landing gear has a leg and an actuator unit. The leg includes a transversal axis swing arm, to which the two wheels are attached (refer to BRAKES and WHEELS, in this chapter). To damp down impact loads, there is a damper located between the swing arm and the fixed section of the leg. The leg unit has a pair of stub axles mounted in the fuselage, about which the leg turns during extension/retraction. It also has an internal device to self-centre the wheel as the damper extends just prior to landing gear retraction.

An internal locking mechanism in the actuator (hydraulically-released), locks the nose landing gear in the fully extended position. In case of an emergency, there is a gravity extension backup system to extend the landing gear and lock it down. In the fully retracted position, the nose landing gear is locked in place by an up-lock hook, attached to the aircraft structure (refer to EXTENSION AND RETRACTION, in this chapter).

The hydraulic steering is operated by a bi-directional actuator at right-angles to the landing gear leg. The actuator houses a toothed piston which turns the lower section of the landing gear then it moves left or right according to actuations on the cockpit steering wheel (refer to NOSE WHEEL STEERING, in this chapter).

Nose gear doors turn on hinges along the sides of the wheel bay. The doors are opened and closed mechanically by a system of levers linking them to the landing gear. When nose landing gear is fully down, the doors are locked open by both a lever and a spring arrangement.

The nose landing gear is equipped with a series of microswitches to inhibit or activate certain aircraft systems:

- Leg microswitches: damper movement operated, send the AIR/GROUND signal.
- Actuator microswitches: actuator movement operated, send the DOWN LOCKED/UNLOCKED signal.
- Up-lock hook microswitches: opened and closed by the landing gear up-lock hook to give the UP LOCKED/UNLOCKED signal.

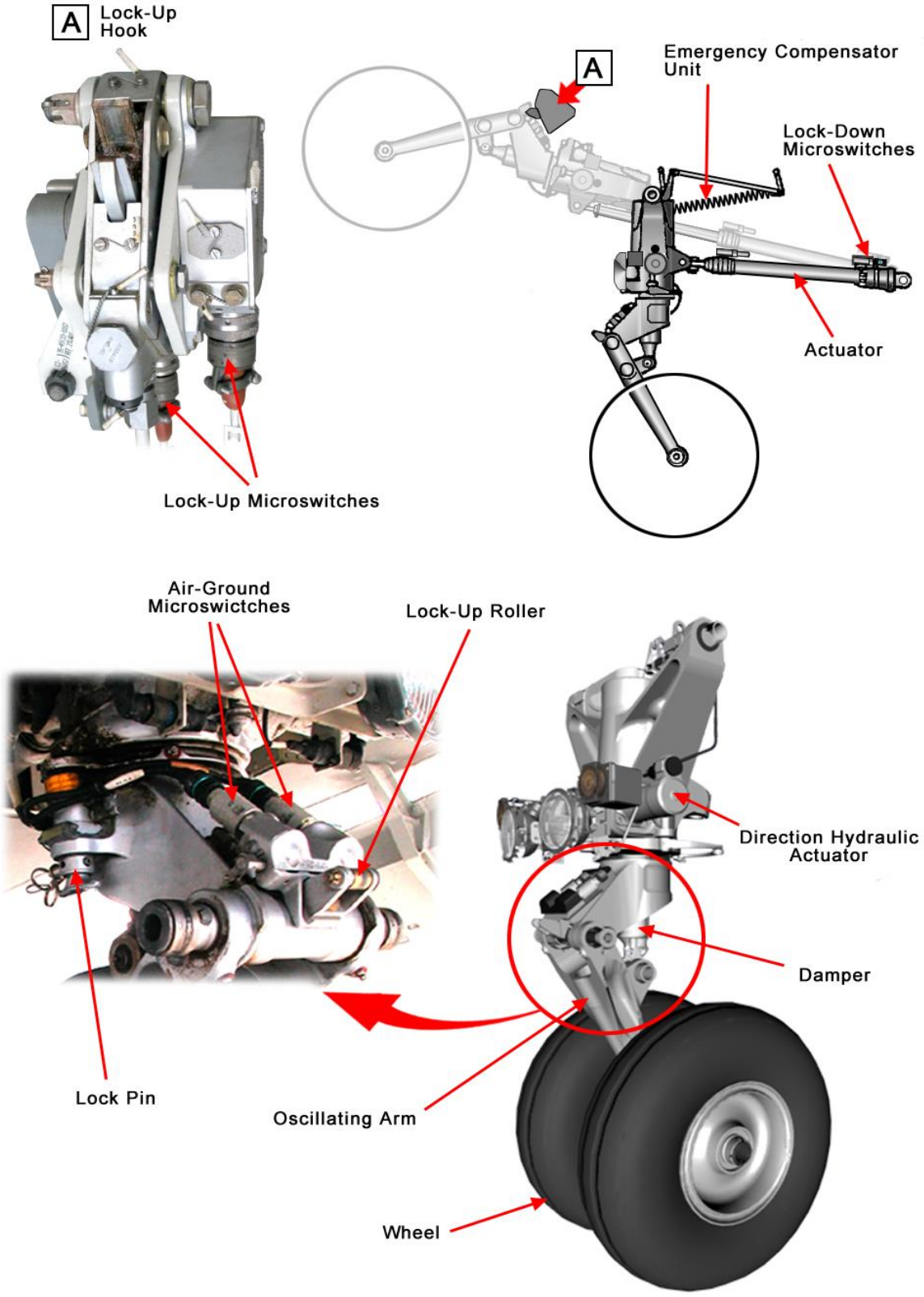

Figure 32-2 Nose Landing Gear

EXTENSION AND RETRACTION

The landing gear extension and retraction system is divided into two sub-systems:

– The normal extension and retraction system, which extends and retracts the landing gear by means of hydraulic pressure.

– The emergency extension system, which extends the landing gear by means of its own weight.

Each landing gear position is shown (by means of an associated visual indicator) on a panel above the Landing Gear Lever on the central instrument panel. There is a visual indicator associated with each landing gear leg. The indicators are controlled by microswitches on the actuators (down and locked) and locks (up and locked) of each landing gear. Each visual indicator indicates UP, a red stripe or a green stripe, depending on whether the associated landing gear is up and locked, in transition (landing gear insecure) or down and locked, respectively.

NORMAL EXTENSION AND RETRACTION

DESCRIPTION

The landing gear normal extension and retraction system consists of:

– ***Landing Gear Lever:*** located at the central panel if operated, extends or retracts the landing gear.

– ***Selector Valve:*** intended to drive hydraulic fluid pressure to the actuator chambers, depending on the position to which the Landing Gear Lever is set.

– ***Actuators:*** two for the main landing gear (one at each side) and one for the nose landing gear, all of them for landing gear extension and retraction operations.

– ***Landing Gear Retraction Locks:*** two for the main landing gear and one for the nose landing gear, are hydraulically released when the Landing Gear Lever is in the DOWN position and mechanically engaged when the landing gear lever is in the UP position.

The locks are fitted with a series of microswitches to inhibit or actuate certain aircraft systems (refer to MAIN LANDING GEAR and NOSE LANDING GEAR, in this chapter).

EXTENSION OPERATION

Under normal conditions, the Landing Gear Lever is in the UP position, the landing gear is up and locked and the up-lock microswitches contacts are closed. These microswitches force visual indicators on landing gear position panel to show UP.

When the Landing Gear Lever is moved to the DOWN position, the selector valve solenoid is energized.

The solenoid opens valve connections as required to deliver general system hydraulic fluid to both main and nose landing gear actuators. At the same time, hydraulic pressure is driven to nose and main landing gear locks, opening the up-lock hooks and allowing landing gear to extend.

When up-lock hooks are released and landing gear moves to the fully-down position, visual indicators on the landing gear position panel display in red. The Landing Gear Lever grip flashes in red as well.

When the nose landing gear initiates extension, a twin-cam device (landing gear operated) opens the doors fully. Doors have an overcentre linkage, keeping them open until the landing gear retracts.

Nose gear actuators final movement locks the overcentre, by means of an internal locking device. The main landing gear is locked at its final extended position by the landing gear articulated overcentering system.

Once the landing gear is locked in the fully extended position, the selector valve is de-energized and the valve returns to the neutral position, where both sides of the actuators are connected to the hydraulic return line. The visual indicators on the landing gear position panel indicate a green line. The Landing Gear Lever grip also stops flashing.

RETRACTION OPERATION

Retraction process is similar to the extension one, and is initiated by moving the Landing Gear Lever to the UP position. This takes place once the aircraft is airborne and the weight-on-wheels microswitch unlocks the Landing Gear Lever. Basic sequential differences are:

– Selector Valve reverses both pressure and return lines.

– Actuators mechanically open the down lock.

– Nose landing gear retraction forces nose landing gear doors to close, thus moving the cam device.

– When landing gear rollers are pressed, the three up-lock hooks close.

– Visual indicators on the landing gear position panel change to indicate UP (in white on a black background).

PROTECTION MECHANISMS

The Landing Gear has the following protection mechanisms:

– **UNSAFE LANDING CONFIGURATION:** if any of the following conditions are met while the aircraft is airborne, GEAR UP warning displays on the IEDS and both MASTER and HORN audible warnings sound in sequence (refer to CHAPTER 31 - INDICATING AND RECORDING SYSTEMS):

  1. CASE 1: Landing gear is not down and locked and flap position is above 15º.

  2. CASE 2: Landing gear is not down and locked, flap position is 15º and the rate of descent exceeds 300 fpm for more than five seconds.

  3. CASE 3: Landing gear is not down and locked, the radio altimeter reads below 1000 ft and the rate of descent exceeds 300 fpm for more than five seconds.

  In CASE 1, IEDS message will go off if any conditions ceases.

  In CASES 2 and 3, IEDS warning will remain on even if the rate of descent drops below 300 fpm. It will only go off if:

  1. In CASE 2: Landing gear is down and locked or flap position is below 15º (i.e. TO or UP).

  2. In CASE 3: Landing gear is down and locked or the radio altimeter reads above 1000 ft.

Pushing either of the MASTER WARNING lights makes them go out and the IEDS stop flashing. However, it does not override the HORN (audible warning). Audible warning can be overridden by pressing the MUTE WARN LDG GR TAKE OFF button when it came on as a result of CASE 2 or 3, but not of CASE 1.

– **LANDING LEVER LOCKING WHILE ON THE GROUND:** once the aircraft is grounded, weight-on-wheels microswitch disables the Landing Gear Lever circuits. This leaves it locked in the DOWN position by means of an electromechanical lock. The Landing Gear Lever lock can be mechanically disabled if necessary, by pressing the OVERRIDE button located above the Landing Gear Lever.

– **WHEEL BRAKING WHILE ON RETRACTION:** to prevent the wheels from turning while the main landing gear is being retracted, retraction circuit hydraulic pressure is driven to the brakes (refer to BRAKES, in this chapter).

EMERGENCY EXTENSION

DESCRIPTION

The emergency landing gear extension system includes components as necessary to allow both main and nose landing gears to be extended in an emergency.

LANDING GEAR EMERGENCY EXTENSION OPERATION

In case of an emergency, the co-pilot can gravity-extend the landing gear.

The landing gear gravity-extends when both hydraulic actuators pressure and up-lock hooks are released. To extend the landing gear this way, there is a Landing Gear Emergency Lowering Cover and a Landing Gear Emergency Lowering Lever.

Pulling the Lateral Safety Pin and raising the Landing Gear Emergency Lowering Cover, mechanically operates the Discharge Valve. This jettisons the landing gear actuators hydraulic fluid.

Pulling-on the Landing Gear Emergency Lowering Lever operates a pulley and cable device thus simultaneously opening the up-lock hooks on both main and nose landing gear, and landing gear is enabled to extend by gravity.

Both gears are locked in the fully extended position by the same system as for normal extension.

Every indication on the visual indicators at the landing gear position panel operates the same way as for normal extension.

EMERGENCY EXTENSION SYSTEM CONTROLS

(1) Lateral Safety Pin:

allows opening Landing Gear Emergency Cover.

(2) Landing Gear Emergency Lowering Cover:

releases hydraulic actuators pressure.

(3) Landing Gear Emergency Lowering Lever (under cover):

releases up-lock hooks.

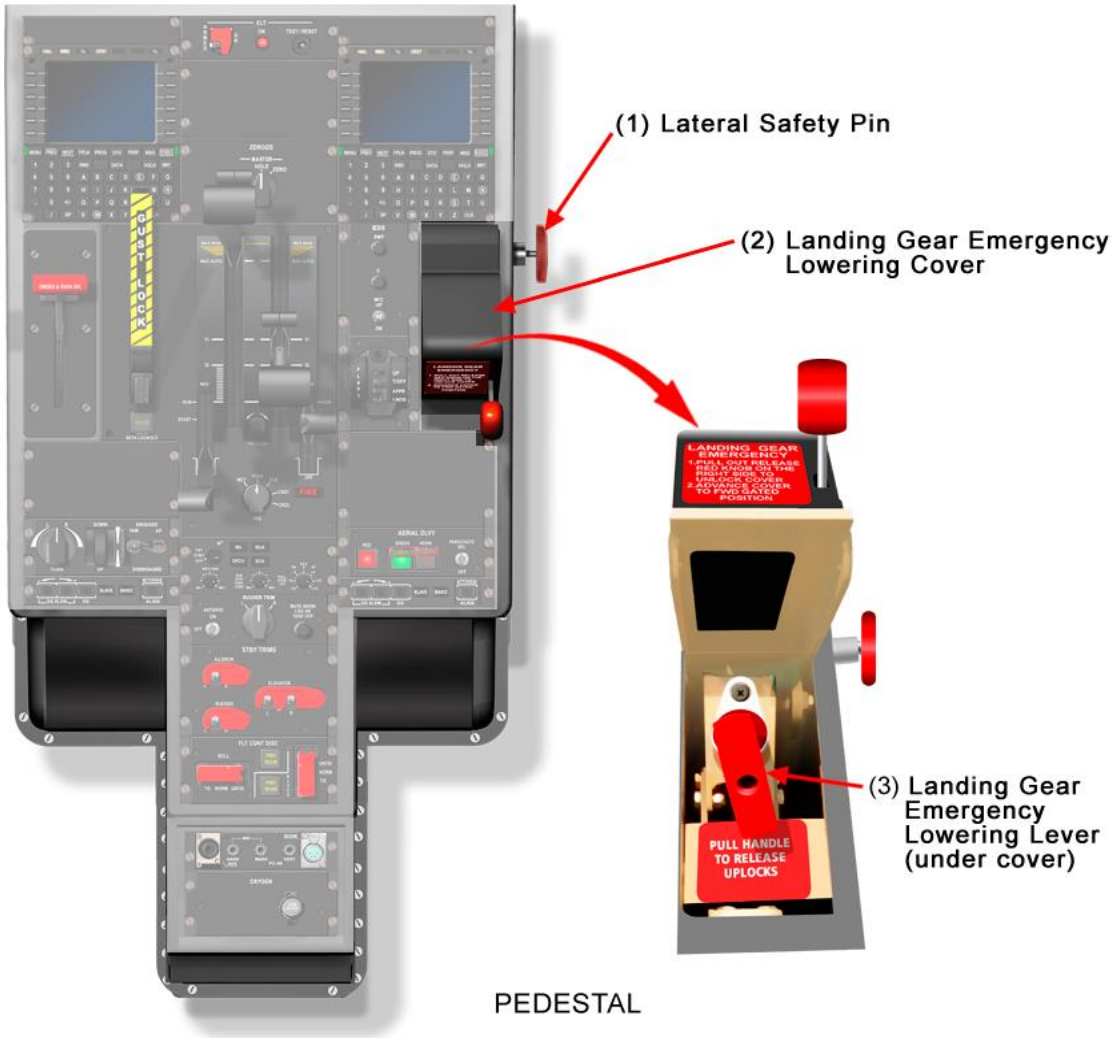

Figure 32-3 Emergency Extension - Controls and Indicators

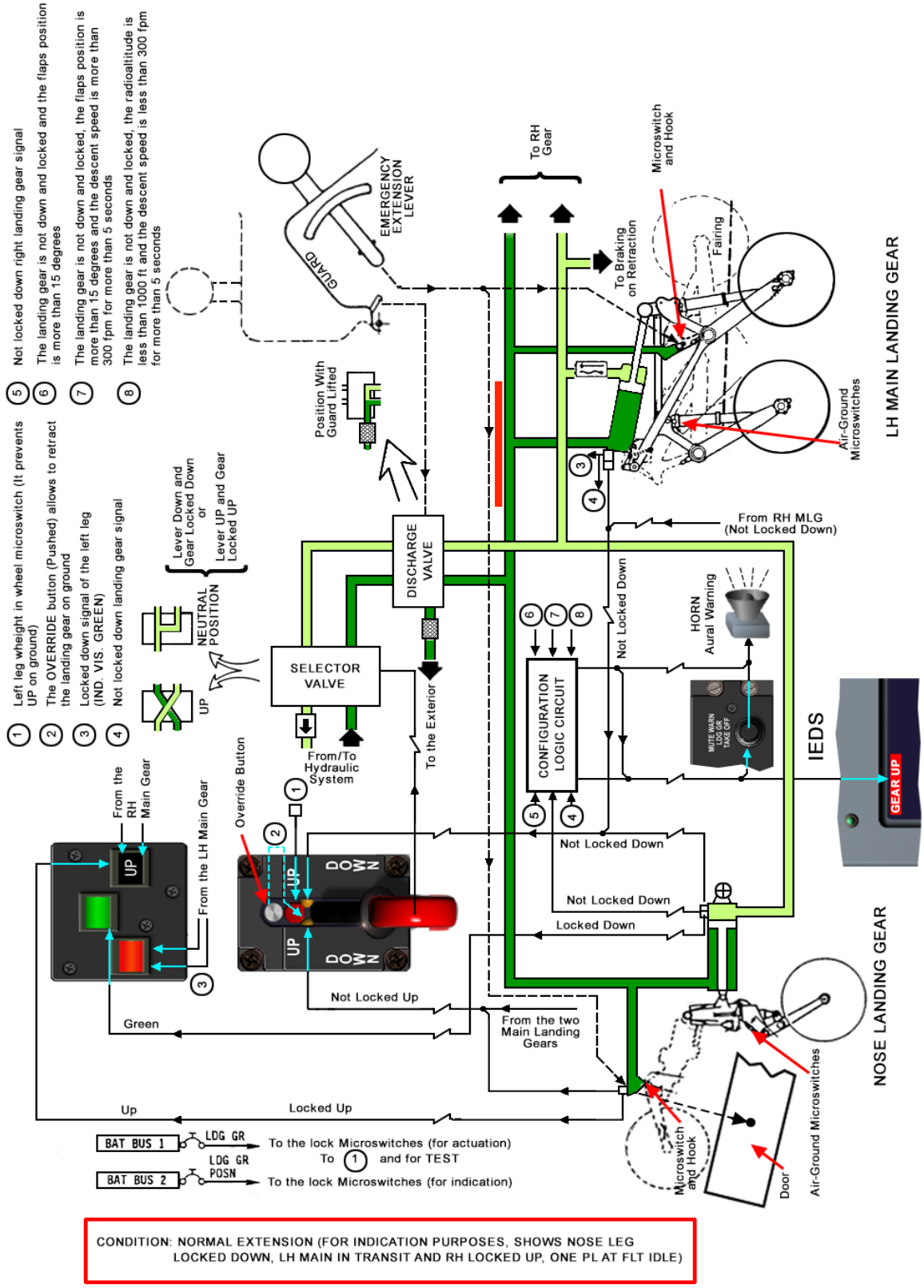

Figure 32-4 Extension and Retraction

CONTROLS AND INDICATORS

(1) Landing Gear Visual Indicators:

indicate both position and security status for each landing gear.

- *UP:* associated landing gear is up and locked.
- *Red Stripe:* associated landing gear is not locked (landing gear unsafe).
- *Green Stripe:* associated landing gear is down and locked.

(2) Override Button:

- *Pushed:* Unlocks the Landing Gear Lever, so that (under special circumstances) the landing gear can be retracted while the aircraft is grounded.

(3) Landing Gear Lever:

controls the hydraulic Selector Valve, so as to raise or lower the landing gear. Pulling the ring around the lever up to the grip is mandatory to move the Landing Gear Lever. While on the ground, the Landing Gear Lever cannot be raised without prior-pressing the override button, close next located.

- *UP:* pressure is driven to the three actuators in order to disable up-locks retract, the main landing gear actuators and extend the nose landing gear. It also drives pressure to actuate on the main landing gear brakes while on retraction.
- *DOWN:* pressure is driven to open the three up-locks and operate the three actuators while landing gear extends.

  If any landing gear does not match the position commanded by lever (landing gear unsafe) the lever grip will flash in red.

(4) (IEDS) GEAR UP Warning:

unsafe landing configuration.

(5) MUTE WARN LDG GR TAKE OFF Button:

- *Pressed:* silences the audible unsafe landing configuration warning (HORN), if not because the landing gear is not down and locked and the flap position is above 15º (APP).

(6) LDG GR LAMP Button:

- *Pressed:* checks the red light on the landing gear lever (light flashes).

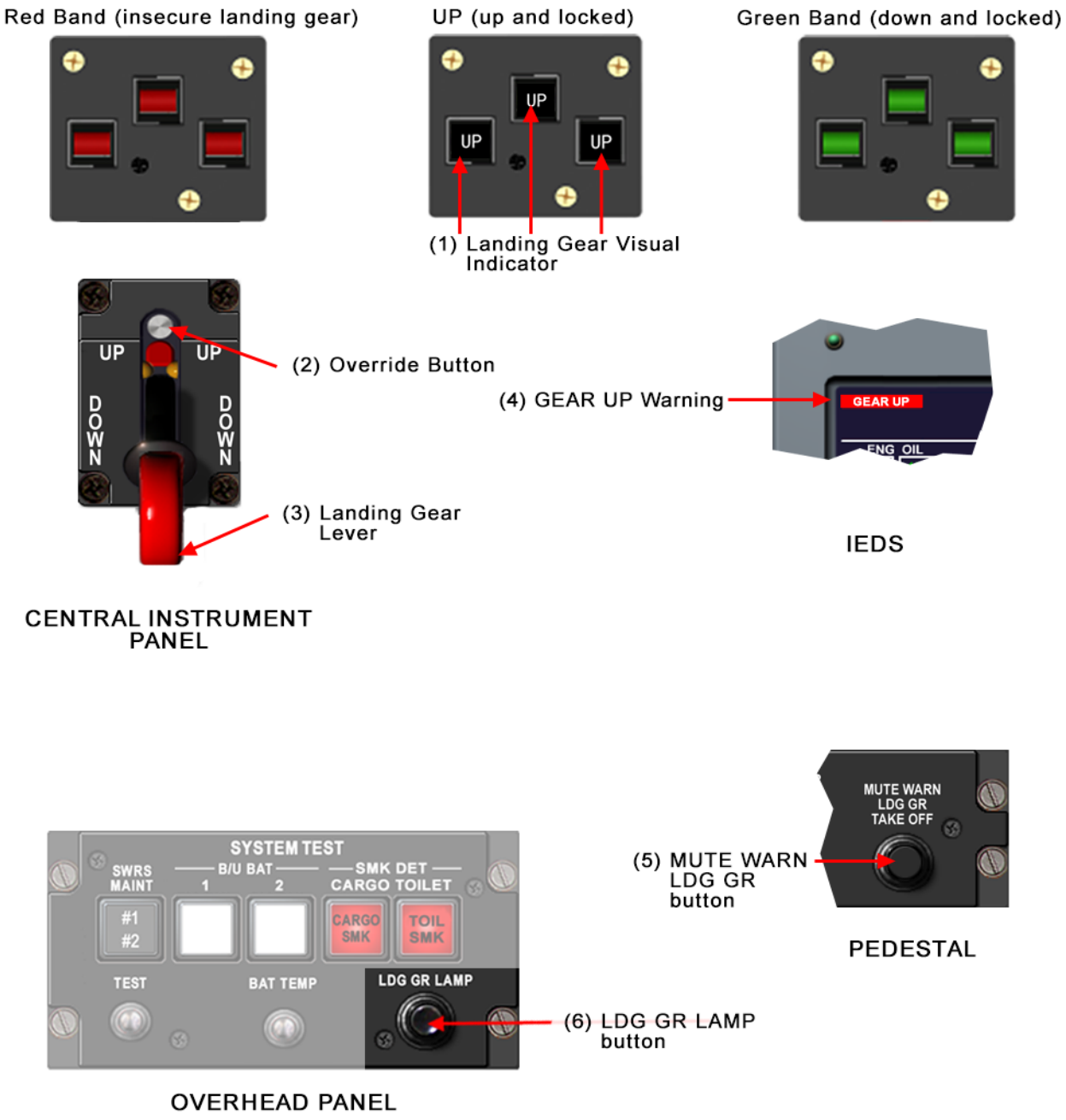

Figure 32-5 Extension and Retraction - Controls and Indicators

WHEELS AND BRAKES

The main landing gear has a set of hydraulically-actuated brakes which are operated by pressing down C/M-1 and C/M-2 pedals. Braking is differential (the brakes can be operated to the left and right wheels separately) and proportional to the pedals deflection. An Antiskid unit allows for maximum braking power under adverse conditions, preventing both the brakes from locking and the wheels from skidding.

In an emergency, the aircraft can be braked using a hydraulic circuit, separate from the normal braking one. This braking action is performed simultaneously at every wheel and does not have Antiskid protection.

BRAKE UNITS

Each main landing gear wheel has a disc-brake unit which is hydraulically operated by five pistons. Two of each unit disc turn with the wheel and are located between three discs fixed to the axle on which the wheel turns. When braking pressure is driven to the unit, the first two discs are compressed between the other discs, which are pushed by the hydraulic pistons. When braking pressure is released, the springs at the pistons restore the separation between discs and adjust for wear while allowing the wheel to turn freely.

Brake pads-mounted on the fixed discs, wear is detected (with brakes actuated) by length reduction of a pin which protrudes from the hydraulic block.

There is a brake temperature indicator which shows the brake unit temperature as selected on the wheel selector.

CAUTION

Up to six minutes since last application of wheel brakes may be required to obtain a stabilized temperature indication.

The red OVHT light comes on if one brake unit has overheated (temperature pointer will be in red band when the selector is either in MAX position or that one of the overheated brake unit). If temperature pointer falls below red and then, the switch is set to OFF for five seconds minimum, the red OVHT light goes off.

NORMAL AND ANTISKID BRAKES

DESCRIPTION

Normal braking system includes:

- ***Brake Pedals*** (two pairs): pilots braking action is mechanically driven to the brakes.
- ***Brake Control Valves*** (two): intended to drive hydraulic pressure to the brake units, depending on the pressure on the brake pedals.
- ***Antiskid Valves*** (one per unit): intended to regulate hydraulic pressure as driven to each brake unit by the control valve.
- ***Pressure Gauge:*** gives a hydraulic pressure at the cockpit, as detected in the normal brake accumulator.
- ***Accumulator:*** located at the rear of the RH main landing gear fairing, a nitrogen-charged piston separator type. It is intended to supply hydraulic pressure if the hydraulic power system fails or disconnects.
- ***Check Valve:*** located at the hydraulic fluid inlet line to the normal brake system, avoids accumulators pressure from being lost at the hydraulic duct.
- ***Speed Sensors (four):*** one in each main landing gear axle, measures angular speed at each wheel and sends the reading to the Antiskid Control Unit (ASCU).
- ***Antiskid Control Unit*** (ASCU): supplied with a number of signals including those from the speed sensors, and operates the Antiskid Valves to ensure each brake gets hydraulic pressure as required.
- ***Hydraulic Fuses:*** four hydraulic fuses one at each brake unit, which cut off hydraulic fluid flow in case of leakage.
- ***Temperature Sensors:*** one at each braking unit. Sensors readings inform the pilots on brakes temperature.

OPERATION

Normal braking is obtained by pressing down on the pedals. On normal braking, the pedals act separately. Braking using this system is differential, thus either left pedals will operate the LH main landing gear brakes, and either right pedals will operate RH main landing gear brakes. Pedals movement is limited by mechanical stops.

The normal braking system is hydraulically operated through the Brake Control Valves, which are mechanically actuated from the pedals. This valve modulates the pressure as driven to the braking units (up to a maximum of 2000 psi) according to the pedals deflection, which is proportional to the pressure as operated on them.

The Brake Control Valve receives a signal to operate the brakes, separately from the pedals and throughout the landing gear retraction sequence. Once the landing gear is fully retracted, brakes are released.

If there is insufficient hydraulic pressure from the pumps and the accumulator has 3000 psi, six normal brakes full operations can be performed, but the pressure in the accumulator will quickly drop to zero once 1500 psi are reached. The accumulator also meets hydraulic power demand peaks if other hydraulic systems are being operated simultaneously. The normal brake system accumulator has a gauge (BKR PRESS) on the HYDRAULIC SYS control panel at the cockpit.

The normal braking system can be operated through the Antiskid System to provide maximum braking power under any conditions, by avoiding skidding and thus reducing the maximum braking distance. This system operated by two pairs of Antiskid Valves (one for each unit) located between the Brake Control Valves and the braking units. Under normal braking conditions, each Antiskid Valve simply measures the pressure as driven by the Brake Control Valve to ensure braking is proportional to the pedals deflection. If a wheel decelerates excessively when braking such that it comes close to blocking and hence skidding, the signal its speed sensor sends the ASCU will force this to operate the Antiskid Valve so as to release pressure from the brake line to the return line. When the wheel rotates normally, the Antiskid Valve allow the measured pressure to be driven again.

For the Antiskid system to work, the ANTISKID switch on the pedestal must be in the ON position. The Antiskid system allows three protection functions, which are automatically activated when mandatory conditions happen:

1. **ANTISKID PROTECTION:** intended to prevent the wheels from skidding when brakes are applied. This system is automatically activated at each wheel. Thus:

   – performs Antiskid protection to each wheel if acceleration reaches 30 kt.

   – overrides Antiskid protection at each wheel if deceleration reaches 10 kt.

2. ***TOUCHDOWN PROTECTION:*** intended to prevent the aircraft from brakes-on landing:

   When any wheel turns below 30 kt and weight-on-wheels signal indicates the aircraft is airborne, wheel brake pressure will be released to the return line. This capability allows the braking distance to be significantly reduced, if the pilot applies brake pedals fully down before touchdown, and brakes will only come into operation when wheels reach 30kt, even in absence of weight-on-wheels signal (at this point, brakes come into action as quickly as possible).

3. ***LOCKED WHEEL PROTECTION:*** intended to prevent wheels from locking, comes into operation if any main landing gear wheel reaches 30 kts. It operates by comparing the separate speed at each wheel with a reference speed (that of the fastest-turning) such that:

   – When a wheel turns at least 30% slower than the reference speed, its Antiskid Valve releases braking pressure to the return line.

– Subsequently, when the wheel speed reaches 70% of the reference speed, protection is overridden (the Antiskid Valve allows again the measured brake pressure to be driven).

Both ANTISKID PROTECTION and LOCKED WHEEL PROTECTION functions are inhibited for 10 seconds after the Landing Gear Lever goes from 'DOWN' to 'UP' position and the weight-on-wheels signal indicates that the aircraft is airborne. This allows the main landing gear brakes to be activated during retraction. After this 10 second period, ANTISKID PROTECTION and LOCKED WHEEL PROTECTION functions will again be available since the above mentioned conditions are met.

If one of the wheel speed sensors fails, the ASCU will take the speed sensor signal from the other wheel on the same landing gear. For example, if the speed sensor of the fore left wheel fails, the ASCU will use the signal from the rear left wheel in terms of protection functions for the fore left wheel.

In case of a system failure, IEDS will display the following messages:

– A-SKD DGD (Antiskid degraded): indicates the Antiskid Control Unit (ASCU) is operating with limited functionality. This means that one or more of the system functions (not necessarily braking) is/are limited.

– A-SKD FLD (Antiskid failure): indicates none Antiskid System protection functions are operative (Antiskid Protection, Touchdown Protection and Locked Wheel Protection).

If a caution message was given while at operation (A-SKD DGD and/or A-SKD FLD) the message may cancel once the ANTISKID system is reset (if the conditions causing the original failure do not recur) in order to recover the previously lost system capabilities.

When the ANTISKID switch is in the OFF position, IEDS displays A-SKD DGD and A-SKD FLD caution messages.

Finally, the Antiskid system has a self-test which is run when the ANTISKID switch is moved to the ON position. If the test is carried out satisfactory, A-SKD DGD and A-SKD FLD messages will go off the IEDS.

EMERGENCY AND PARKING BRAKES

DESCRIPTION

The Emergency and Parking Braking System uses a separate hydraulic circuit from that of the normal brakes and is used to stop the aircraft if normal braking system fails, and secure the aircraft when parked. Main components of the system are:

- ***Operating Lever*** (EMER & PARK BR lever): mechanically transmits the pilots braking action to the brakes.
- ***Emergency and Parking Brake Valve:*** Lever movement actuated, delivers hydraulic pressure as required by the four braking units.
- ***Pressure Indicator:*** gives a hydraulic pressure reading at the cockpit, as detected in the normal brake accumulator.
- ***Accumulator:*** located at the nose wheel bay, is a nitrogen-charged piston separating type. Keeps hydraulic pressure, for indefinite period, if the hydraulic power system fails or disconnects.
- ***Hydraulic Fuse:*** four fuses, one in each braking unit, to cut off hydraulic fluid flow to prevent the circuit from leakage.
- ***Slide Valves:*** four valves (one in each braking unit) allowing hydraulic pressure in from either the normal brake circuit or the emergency and parking brake circuit.
- ***Check Valve:*** located in the hydraulic fluid inlet line to the emergency and parking brake system, avoids Accumulators pressure leakage through the hydraulic duct.

OPERATION

The emergency and parking brakes are operated by a Lever located on the left side of the pedestal. The hydraulic circuit gets pressure from the pumps, or an identical accumulator to that in the normal braking system, delivering pressure to the braking units when the EMER & PARK BR lever on the pedestal is pulled. The lever mechanically opens the Emergency and Parking Brake Valve by means of a Teleflex cable. The pressure has to overcome the Slide Valves to enter the brake units. With 3000 psi in the accumulator, six normal brakes full operations can be performed, but the pressure in the accumulator will quickly drop to zero once 1500 psi are reached.

The emergency and parking brake does not allow for the same antiskid protection functions as the normal system, as its circuit does not operate through the Antiskid System. The pressure delivered to the brakes is proportional to the Lever movement and is delivered equally to each of the four units. Maximum pressure will be 2000 psi while on emergency operation (when the lever is moved as far as the small stop, without having to pull-on the trigger) and 3000 psi when parked (when the Lever is moved all the way to the stop by pulling-on the trigger).

To unlock the brake from the parking position, the unlock trigger on the Lever has to be raised and released (pilot´s hand should not rest on it so it can move freely) thus returning to the front stop.

CAUTION

If the pilot´s hand does follow the lever movement, residual pressure may be left in the brakes.

If during takeoff with weight-on-wheels (nose wheel) signal present and a PL position above 66.5º (close to MAX AUTO), the parking brake is on the Unsafe Takeoff Configuration and warning will come on, i.e. the UNSAFE TO warning will display on the IEDS and the associated audible warning will be heard (refer to CHAPTER 31 - INDICATING AND RECORDING SYSTEMS).

The emergency and parking brake system Accumulator has a gauge (EMER BKR PRESS) on the Cockpit HYDRAULIC SYS control panel.

WHEELS

Both nose landing gear and main landing gear have wheels and tyres. Wheels are aluminium alloyed split-rim type. Tyres are standard or low-pressure tubeless.

The nose landing gear has two wheels in a twin configuration. The main landing gear has four wheels (two on each side) in a tandem configuration. Tyres characteristics and inflating pressure are:

LANDING GEAR	TYRE TYPE	INFLATING PRESSURE	
		Normal Operation (up to 21000 Kg)	Logistical Operation (up to 23200 Kg)
Principal	DUNLOP DR 30420T 34 x 14.0 - 14 14 PR	5.6 Kg/cm2 (80 psi)	6.3 Kg/cm2 (89 psi)
Nose wheel	DUNLOP DR 15854T 24 x 7.7 8 PR	4.6 Kg/cm2 (65 psi)	4.6 Kg/cm2 (65 psi)

Table 32-1 Landing Gear Tyres Type and Inflating Pressure

Each main landing gear wheel tyre has a fuse plug. This fuse plug is designed to be blown away, and fully deflate the tyre, approximately when the related BRAKE TEMP indicator reaches the red band.

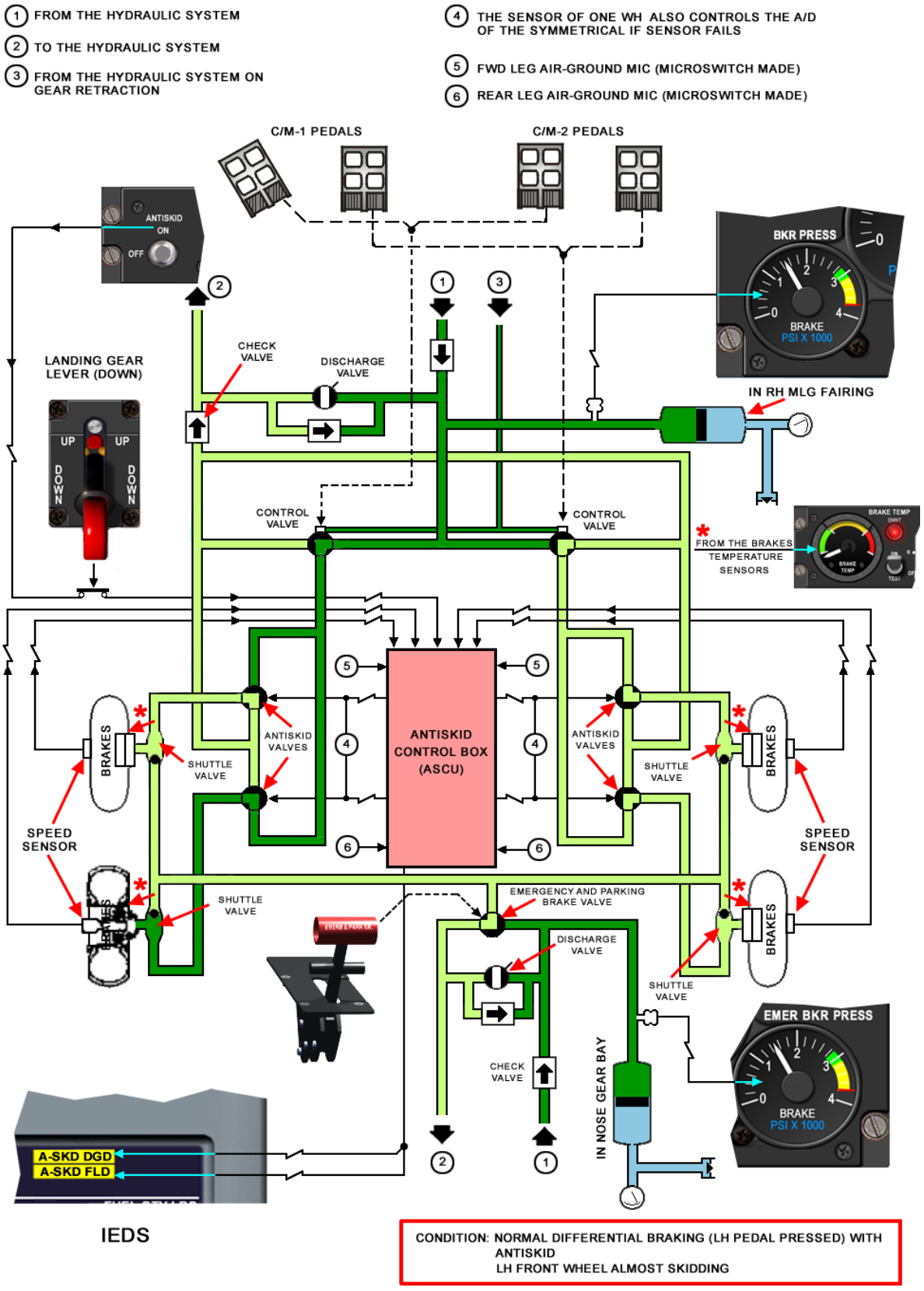

Figure 32-6 Brakes and Wheels

NORMAL BRAKING SYSTEM CONTROLS AND INDICATORS

(1) BKR PRESS Indicator:

indicates the pressure in the normal brake Accumulator.

(2) ANTISKID Switch:

- *ON:* turns on the Antiskid System, allowing the Antiskid Control Unit (ASCU) to respond appropriately to the signals from the speed sensors in each wheel. Thus, when the conditions required for Antiskid System protections activation, the normal braking system operates through the Antiskid System.
- *OFF:* disconnects the Antiskid System by inhibiting the Antiskid Control Unit (ASCU). The normal braking system operates without Antiskid System protection.

(3) Brake Pedals (two pairs):

- Pressing down on the upper pedals to increase pressure to the wheels Antiskid valves on the same aircraft side as the pedal. If the Antiskid System is inoperative, the change in pressure is transmitted directly to the braking units.

(4) BRAKE TEMP Indicator:

indicates the temperature of the selected braking unit.

(5) OVHT Light:

- *On:* indicates that one braking unit has exceeded the maximum permitted temperature.

(6) Wheel Selector:

- *MAX:* the temperature indicated on the temperature gauge is the highest on any of the brake units.
- *L(F):* the temperature gauge indicates the fore left wheel braking unit temperature.
- *L(R):* the temperature gauge indicates the rear left wheel braking unit temperature.
- *R(F):* the temperature gauge indicates the fore right wheel braking unit temperature.
- *R(R):* the temperature gauge indicates the rear right wheel braking unit temperature.

(7) Temperature Indication System Switch:

- *ON:* connects the Brake Temperature Indicator System.
- *OFF:* disconnects the Brake Temperature Indicator System.
- *TEST:* performs a system test, to be considered satisfactory if with the switch in the TEST position, the BRAKE TEMPERATURE gauge needle moves to the red zone when the wheel selector is in each of its positions and the OVHT light is on throughout the test.

(8) A-SKD DGD Caution (Antiskid Degraded):

the Antiskid Control Unit (ASCU) is operating with limited functionality. This means one or more of the system functions (not necessarily braking) is/are limited.

(9) A-SKD FLD Caution (Antiskid Failure):

indicates that every Antiskid System protection function has been lost (Antiskid Protection, Touchdown Protection and Locked-Wheel Protection).

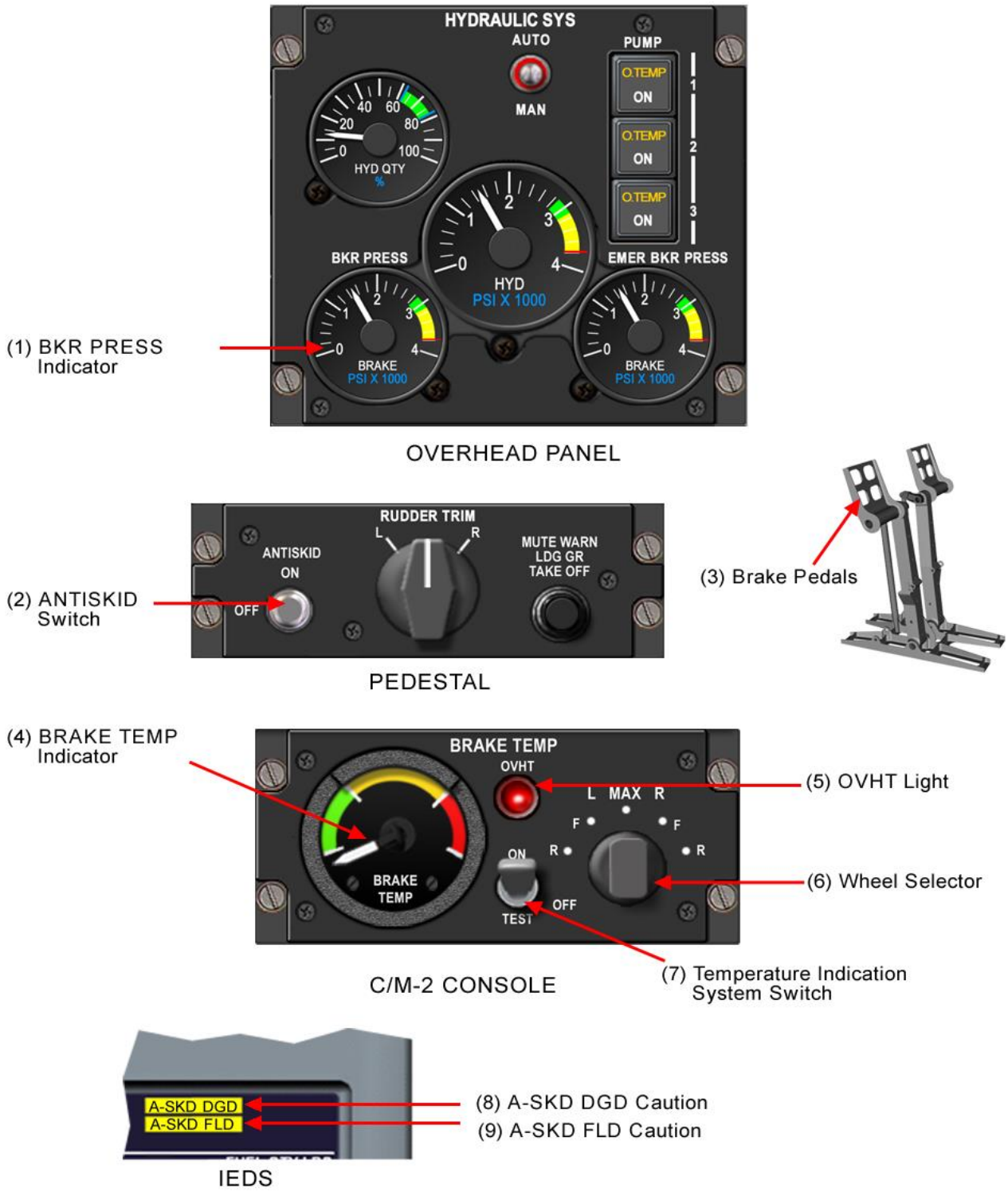

Figure 32-7 Normal Brakes - Controls and Indicators

EMERGENCY AND PARKING BRAKES CONTROLS AND INDICATORS

(1) EMER BKR PRESS Indicator:

indicates the emergency brake accumulator pressure.

NOTE

Indication in the yellow arc during descent phase is considered acceptable.

(2) EMER & PARK BR Lever:

when the lever is pulled-back, an identical braking pressure is delivered to each wheel, without Antiskid System protection. Locking it in the maximum position (turning the catch) delivers the maximum braking pressure. In this position, the aircraft is immobilized while parked.

(3) Lock Release Button:

- Pulling-on the catch locks/unlocks the EMER & PARK BR lever in/from its maximum position (parking brake) and releases the lever.

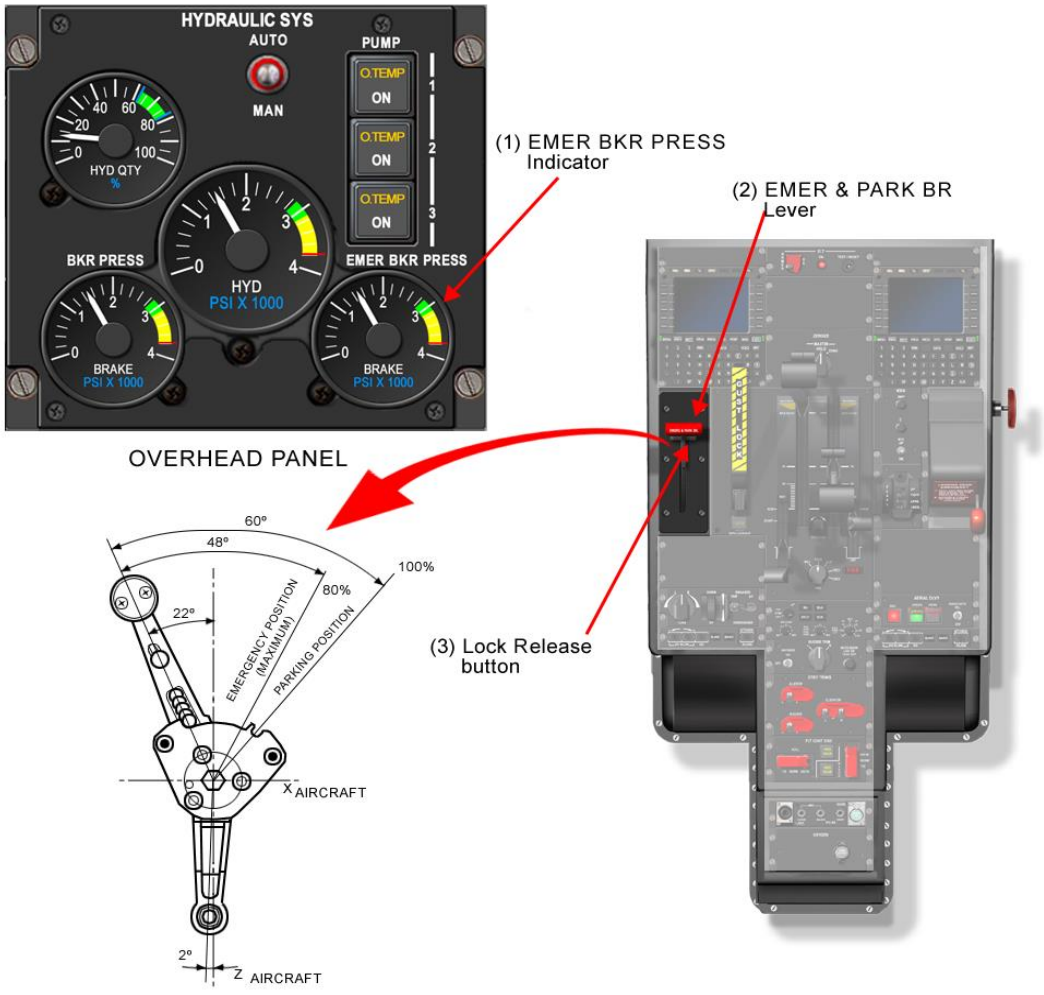

Figure 32-8 Emergency and Parking Brakes - Controls and Indicators

NOSE WHEEL STEERING

DESCRIPTION

The nose landing gear has a hydraulic/mechanical system that allows the pilot to drive the aircraft while taxiing. The system is operated from the Nose Gear Steering Wheel on the C/M-1 console. The system includes:

- ***Steering Control Panel:*** located on the C/M-1 console, includes the Nose Gear Steering Wheel and the WHL STEER button.

- ***Steering Control Valve:*** delivers pressurized hydraulic fluid to the left or right side of the Steering Actuator, depending on the Steering Wheel position.

- ***Anti-Shimmy Valves:*** restrict the hydraulic fluid flow in the pressurized circuit and at the same time allows the circuit to be resupplied more rapidly once depressurized.

- ***Steering Actuator:*** the cylinder gets pressure from the Steering Control Valve and links the hydraulic actuator system with the mechanical section of the nose wheel steering system.

- ***Accumulator:*** a low pressure nitrogen-charged piston type. Intended to smooth out system pressure variations. System pressure is reached and maintained by a Pressure Reducing Valve.

The Nose Gear Steering Wheel can be disengaged mechanically for ground servicing purposes (aircraft towing), by removing the lock pin which secures the fixed section of the nose landing gear (where the Steering Actuator is located) to the moving section (which includes the nose wheels). Thus releasing the wheels for free 360º degrees turning. The system includes an Anti-Shimmy device to avoid nose wheels oscillation.

OPERATION

The system is energized on the ground with the control panel WHL STEER button pushed (OFF light off).

The Steering Wheel mechanically drives the Steering Control Valve. The valve delivers hydraulic pressure to one side or another of the Steering Actuator through the Anti-Shimmy Valve depending on the Steering Wheel position. The Actuator makes the nose wheels to turn as required. A tracking device repositions the Steering Control Valve in its neutral position once the nose wheels have reached the required deflection. It remains in the neutral position, until the Steering Wheel is moved again. Maximum deflection of the wheels by using the Steering Wheel is 50 degrees either side of the wheel centred position.

For the Actuator to receive hydraulic pressure as required to turn nose wheels, is mandatory:

1. At least one hydraulic pump connected.

2. Nose Landing Gear down and locked.

3. Nose Gear Damper compressed (Selector Valve directed towards the pressure line).

4. WHL STEER button pushed (OFF light off) (directs 3-way Solenoid Valve towards the pressure line if condition 2 is also met).

5. Nose Gear Steering Wheel ordering a change of direction.

When the Steering Control Valve is in the neutral position, the Anti-Shimmy device is able to eliminate nose wheels vibrations while taxiing. In this position, the Steering Actuator gets hydraulic pressure from the Accumulator through the Anti-Shimmy Valves, thus damping any Actuator oscillations from the nose wheels.

Once airborne, the nose gear damper is no longer compressed. The Selector Valve moves towards the hydraulic return line, centring the nose wheels, so they can be retracted into the landing gear bay without any damage.

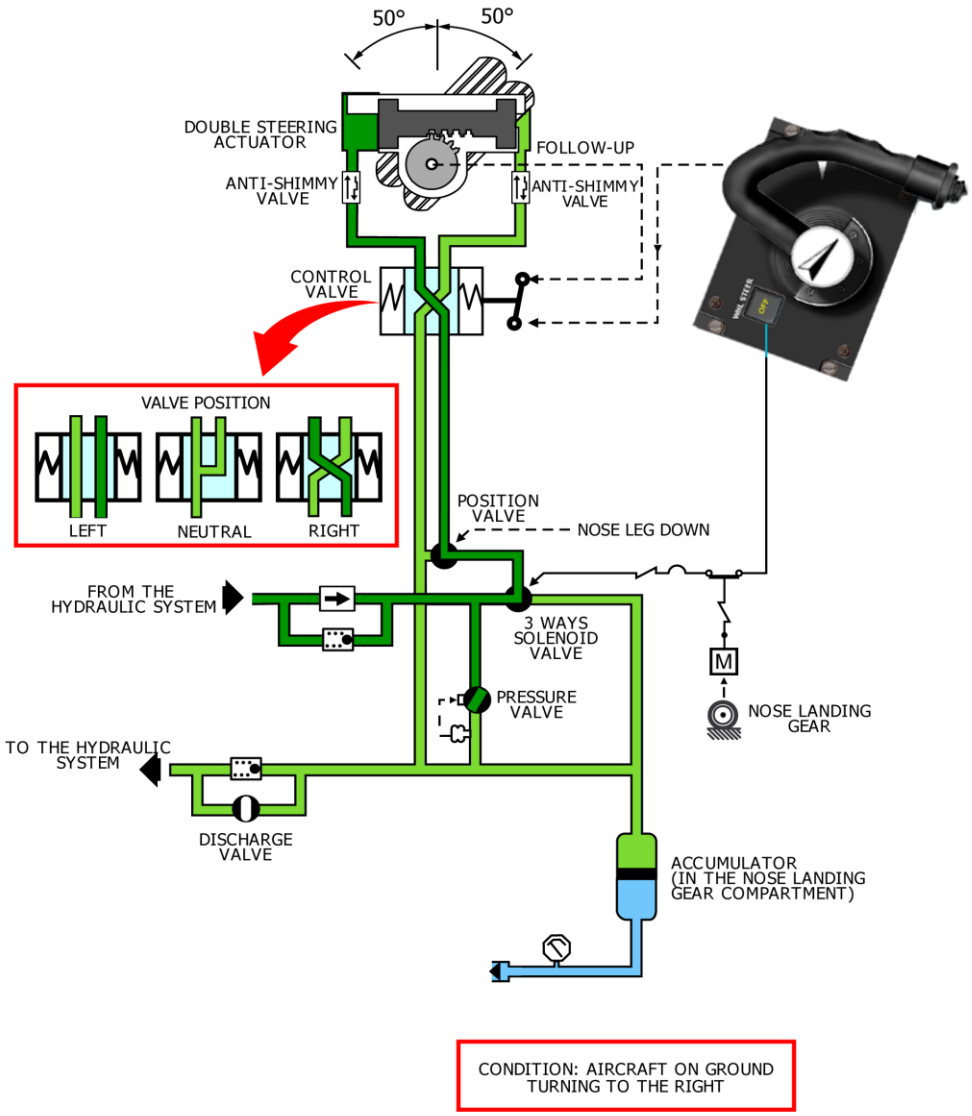

Figure 32-9 Nose Wheel Steering

CONTROLS AND INDICATORS

(1) WHL STEER Pushbutton:

- *Pressed (OFF light off):* allows hydraulic pressure (controlled by the Steering Wheel) to reach the Steering Control Valve with aircraft grounded (Nose Gear Damper compressed) and nose gear down and locked.

(2) Nose Gear Steering Wheel:

- Mechanically operates the Steering Control Valve to turn nose wheels in the same direction as the Steering Wheel. To get nose wheels hydraulic control of the nose wheels is mandatory:

  1. At least one hydraulic pump connected.
  2. Nose Landing Gear down and locked.
  3. Nose Gear Damper compressed.
  4. WHL STEER button pushed (OFF light off).
  5. The lock pin attaching the fixed and moving parts of the nose landing gear is in place.

CAUTION

Do not force nose wheels to turn until the aircraft starts moving. The Nose Gear Steering Wheel (WHEEL STEERING) must be carefully operated.

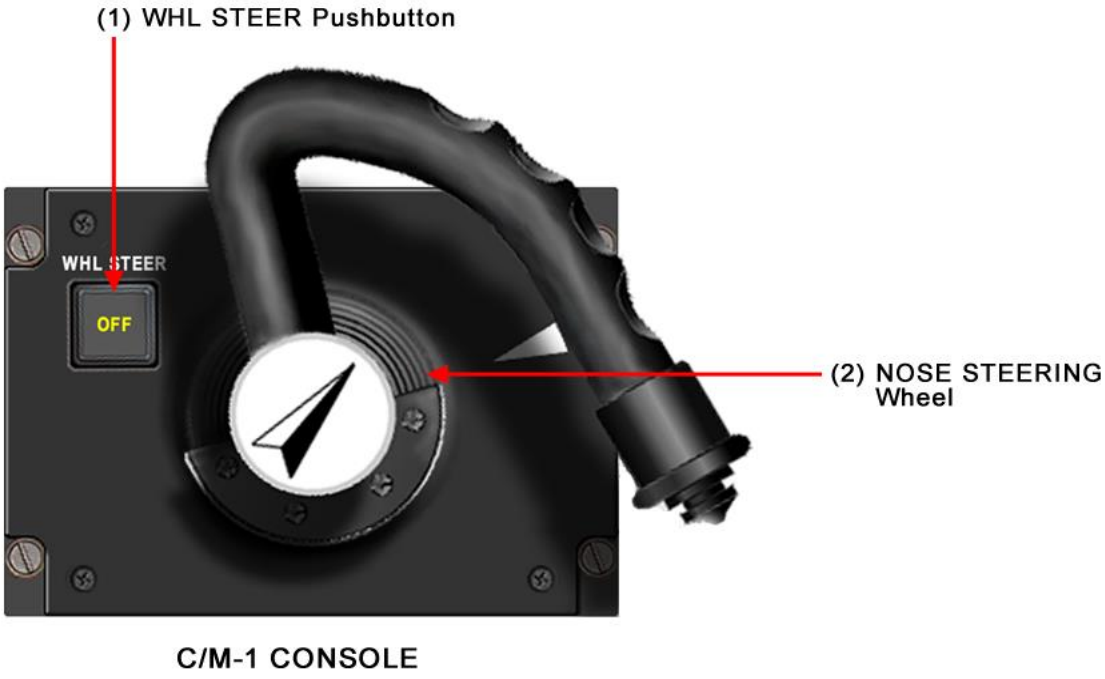

Figure 32-10 Nose Wheel Steering - Controls and Indicators

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