LANDING GEAR OPERATION

Features

General
The Landing Gear (LG) consists of a forward retracting nose gear and two rearward retracting main gears. Doors enclose the landing gear bays. The LG is retracted and extended hydraulically. In the event of a hydraulic system failure, the landing gear can be lowered by gravity.

Main gears
The main gears are kept in retracted position by hydraulic pressure. In case of pressure loss, the main gears are held in retracted position by mechanical uplocks. The main gear doors open and close mechanically by the main gear struts. When extended, the main gears will lock mechanically.

Nose gear
The nose gear is held in retracted position by hydraulic pressure. In case of pressure loss, the nose gear will rest on the mechanically locked nose gear doors. The forward nose gear doors open and close hydraulically. The nose gear will not extend or retract before the forward doors are open. The forward doors close again when the nose gear is down and locked. The aft doors open and close mechanically by the nose gear strut. When extended, the nose gear will lock mechanically.

Control

Hydraulic operation
Hydraulic operation is controlled by a two position (UP or DOWN) LG selector, located at the center main instrument panel. The electrically controlled LG selector valve directs hydraulic pressure accordingly. On the ground UP selection is prevented by a selector lock. This lock will be released automatically as soon as the aircraft becomes airborne. In the event of an automatic lock release failure, the lock can be released by depressing the LOCK OVERRIDE button.

Alternate operation
The ALTERNATE LG selector is located at the RH aft side of the pedestal, and has to be pulled upward to select alternate down. Operation of this lever releases the up locks of main gear and nose gear doors, and dumps the hydraulic pressure of landing gear and nose wheel steering operation. Herewith the LG will extend by gravity and lock by spring force.
Indications

LG lights
LG position lights are located at the LG selector panel. All lights are out when the gears are up and locked. The ‘down and locked’ position of the main gears is indicated by one green light for each gear. Nose gear ‘down and locked’ is indicated by two green lights. The second light is a backup locked down indication. If the main gear lights are inoperative, the locked down condition of each main gear may be checked by verifying, through the cabin windows, that the red lines on the lock strut are in line. During retraction and extension a blue light, incorporated in the LG selector knob illuminates. When the light illuminates due to an alternate down selection, it remains on until the LG selector is selected DOWN.

LG level 2 alerts
Any disagreement between the position of the gears and the LG selector is indicated by amber lights at the LG selector panel. When the gears are in transit, no alert will be presented.

LG level 3 alerts
When the LG is not down and locked, a level 3 alert is presented when flaps are selected 25 or more. The same level 3 alert will be presented when the LG is not down and locked and the rate of descent is in excess of 200 feet per minute while below 830 feet radio altitude with a LH and/or RH power lever setting below the TO detent. When the radio altitude is not available, an IAS below 140 knots will complete the above condition.

MWL and chime can be cancelled by selecting the LG DOWN or alternate down. The red LG light at the CAP goes out when all gears are down and locked. When any of the gears does not lock, the relevant level 2 alert will be presented.

NOTE: When the alerts are presented due to the rate of descent etc, MWL and chime can also be cancelled in the normal way. The LG light at the CAP goes out when the alert condition has been removed.
Functional diagram

SYSTEM SHOWN
WITH GEARS UP, DOORS CLOSED

HYDRAULIC PRESSURE

RETURN

DUMP VALVE

ALTERNATE LG SELECTOR

NOSE WHEEL STEERING

RETURN

LG SELECTOR

DOWN

UP

RH MAIN GEAR

UP

LH MAIN GEAR

UP

LH MAIN GEAR

DOWN

RH MAIN GEAR

DOWN

UP LOCK

UP LOCK

RETURN

SEQUENCE

VALVES

DOORS

UNLOCKED

AND OPEN

NOSE GEAR

UP

NOSE GEAR

DOWN

DOORS

CLOSED

AND LOCKED

RETURN

SEQUENCE

VALVES

RETURN
Controls and indicators

**LG POSITION INDICATOR**

- NOSE (green)
  - Backup light to indicate nose gear down and locked.
- LEFT/NOSE/RIGHT (green)
  - Relevant gear is down and locked.
- LEFT/NOSE/RIGHT (amber)
  - Relevant gear not locked in the selected position.

**LG SELECTOR OVERRIDE BUTTON**

Push button to release LG SELECTOR lock.

**LANDING GEAR SELECTOR**

- UP
  - LG selected UP.
- DOWN
  - LG selected DOWN.

**NOTE:** The light in the selector knob comes on (blue) when the gears are in transit.
UNLOCK HANDLE

ALTERNATE LG SELECTOR

To extend LG by gravity:
- Open cover.
- Pull unlock handle rearward.
- Pull selector upward.
Alerts

<table>
<thead>
<tr>
<th>CONDITION(S) / LEVEL</th>
<th>AURAL</th>
<th>MWL/MCL</th>
<th>CAP</th>
<th>LOCAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>LG NOT LOCKED IN THE SELECTED POSITION</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAUTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEFT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOSE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LG NOT SELECTED DOWN+AIRCRAFT IN APPROACH CONFIGURATION</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WARNING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RIGHT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
NOSE WHEEL STEERING

Description

The nose gear is equipped with a hydraulic nose wheel steering and centering system. When the LG has been lowered by gravity, nose wheel steering and centering are not available because LG hydraulic pressure has been dumped. There is no fault indication.

Steering

Two interconnected tillers, one on each side panel, control the steering control valve mechanically. This valve directs hydraulic pressure to either side of the steering motor. A shut-off valve is electrically controlled by steering angle limit switches. When the steering angle exceeds 73 degrees, the shut-off valve closes, thus preventing a further steering angle increase. When marks on tiller and side panel are aligned the nosewheel is in its central position.

Centering

The centering mechanism is hydraulically activated when the LG is selected UP.
Functional diagram
Controls and indicators

NOSE WHEEL STEERING TILLER

Enables steering when:
- The landing gear is down, and
- Hydraulic pressure is available.
BRAKE CONTROL SYSTEM

Brakes

Operation
The hydraulic brake system is mechanically operated by the brake pedals. Two brake control valves meter hydraulic pressure to the brakes, thus allowing for differential braking. In the event of a hydraulic system failure, an accumulator provides for a limited number of brake applications. A pressure indicator is located at the center main instrument panel. The brake system is equipped with a skid control system, which modulates the brake pressure.

Alternate operation
An alternate brake system, which has no skid control provisions, is controlled with two handles at the LH side panel. Brake handle movement is mechanically transmitted to two alternate brake control valves. Differential braking is possible. The alternate brake system accumulator enables a limited number of full brake applications in the event of a hydraulic failure. A pressure indicator is located at the center main instrument panel.

Parking brake operation
The parking brake is applied by depressing the brake pedals, then pulling the parking brake handle, and then releasing the brake pedals. The applied pressure is locked between brake control valves and parking brake shut-off valves. The parking brake (handle and pressure) can be released by depressing either set of brake pedals. The parking brake handle is located below the main instrument panel near the LH side panel.

Skid control

Pressure modulating
Individual wheel brake pressure is continuously and rapidly modulated to guarantee that each wheel has the maximum effective braking force without locking of the wheel. A deceleration of one or more wheels will be detected by the skid control box. The relevant skid control valves are signalled to reduce the pressure in accordance with the rate of deceleration. A SKID CTL light at the CAP illuminates when a failure in the skid control box is detected.

Locked wheel protection
When the speed of a wheel decelerates to a point where the wheel may lock, the relevant brake is fully released to allow the wheel to spin up. Locked wheel protection is inactive at normal taxi speed.

Touchdown protection
The locked wheel protection mode releases all pressure from the brakes in flight with LG down, and for a period of seven seconds after touchdown in case of no wheel spin-up (e.g. due to hydroplaning).
Skid control test

The skid control system is tested by depressing the SKID CTL TEST button at the test panel. The system is divided into separate circuits for the inboard wheels and for the outboard wheels (INBD and OUTBD). When one or both skid control test lights remains illuminated after the button is released, a fault is present. The test can be performed on the ground when the aircraft is stationary. When the test is performed in the air, the ERP will default to GA.

NOTE: Skid control is not available when the TOWING switch/push button is in the ON position.
Controls and indicators

NORMAL BRAKE PRESSURE INDICATOR
- Green range between 800 and 3500 psi.

ALTERNATE BRAKE PRESSURE INDICATOR
- Green range between 800 and 3500 psi.

NORMAL BRAKE

ALTERNATE BRAKE

ALTERNATE BRAKE HANDLES
Alternate control of hydraulic pressure to corresponding wheel brakes.

Page 13
PARKING BRAKE HANDLE

To set parking brake:
- Depress brake pedals.
- Pull handle.
- Release brake pedals.

To release parking brake:
- Depress brake pedals.
TOWING SWITCH (guarded)

ON
- Skid control not available.
- Skid control test not possible.
- Normal and alternate brake pressure indication with engines out.

OFF
- Skid control available.
- Skid control test possible.

Controls and indicators - Type I

TOWING P/B (guarded)

ON [white]
- Skid control not available.
- Skid control test not possible.
- Normal and alternate brake pressure indication with engines out.

NORMAL [blank]
- Skid control available.
- Skid control test possible.

Controls and indicators - Type II
A TEST PANEL

AUTO FEATHER TEST

PROP OVSPD TO CONFIG

LH

RH

SKID CTL

TEST

ALERT SYS

FIRE TEST

SMOKE TEST

INBD

OUTBD

SKID CTL TEST SWITCH

Depress and release to test the serviceability of skid control.

NOTE:
1. The TOWING switch must be in the OFF position.
2. When depressed during flight, the ERP will default to GA.

SKID CTL TEST LIGHT

During SKID CTL TEST both lights come on (white). If a light remains on after SKID CTL TEST, a skid control fault is present.
## Alerts

<table>
<thead>
<tr>
<th>CONDITION(S) / LEVEL</th>
<th>AURAL</th>
<th>MWL/MCL</th>
<th>CAP</th>
<th>LOCAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKID CONTROL FAILURE</td>
<td>2</td>
<td></td>
<td></td>
<td>SKID CTL</td>
</tr>
</tbody>
</table>

- **SKID CTL**: CAUTION
SYSTEM OPERATION

Push-back

Do not oppose or hold the nose-wheel steering tiller during push-back.

Operation with skid-control inoperative

For performance with skid-control inoperative see performance asection of your AFM. Use the brakes such that no tire skid will occur.

Operation with nose-wheel steering inoperative

After landing, use differential power and braking to steer the aircraft. Avoid U-turns and sharp turns.

Gear operating time

Retraction time: 5 seconds.
Extension time: approximately 20 seconds.

Nose-wheel steering angle

With nose-wheel steering: 73 degrees either side (effective 70 degrees).
Aircraft towing: 115 degrees either side.

Minimum turning radius

Outer main landing gear; with nose-wheel steering: 7.2 meters; 23.6 feet.

Parking brake

For correct parking brake setting both brake pedals must be depressed simultaneously, then pull the parking brake handle and release the brake pedals. The parking brake can be released by depressing either set of brake pedals.