Undercarriage, Wheels & Brakes
LANDING GEAR

General Description

The aircraft is equipped with a tricycle undercarriage (nose and two main legs) which can be retracted in flight. Retraction and extension is by hydraulic power supplied by the Left-Hand hydraulic system with provision for emergency extension should hydraulic power be lost in flight. When retracted, the main landing gear wheels protrude just below the sponsons. Built into the main legs are crash protection devices, which enable a vertical landing of 5 metres per second to take place with no damage to the aircraft structure.

Hydraulically operated disc-type brakes are fitted to main wheel and are controlled by transmitters on Captain's pedals or by the parking brake handle.

The nose wheel is fully castoring and can be locked in the ahead position by means of a handle in the cockpit.

13 Proximity Switches fitted to the landing gear control the logic circuits associated with indications and extension/retraction operations and 3 Micro Switches give warning of landing gear not lowered below 60 kts.

Limitations

No limitations apply to Landing Gear operations but it is recommended that speed be reduced to 110 Kts before lowering the landing gear.

| Taxying Limits | 40 Knots |
| Braking Limits  | 30 Knots |

Tyre Pressures –

| Nose wheels     | 7 bar (actual 98 psi) |
| Main wheel      | 7.2 bar (actual 100 psi) |

| Retraction Time | 10 seconds |
| Extension Time  | 9 seconds  |
COCKPIT CONTROLS & INDICATIONS

The locations of the normal and emergency controls are shown in Figure 1.

The following warnings are associated with the landing gear -

32 Alpha Panel –

![L/G SIG](image)
Loss of 28V DC supply to indicating sensors (loss of cockpit indications)

![L/G CONT](image)
Loss of 28V DC supply to control solenoid valves (loss of electrical control)

Edge of Instrument Panel –

![L/G](image)
Landing gear not lowered below 60 kts.

Landing Gear Control Panel –

![Indicate gear locked down](image)
Indicate gear locked down.

![‘Gear Moving’ - Indicates gear is traveling up or down](image)

![REARM](image)
Indicates logic circuits have been interrupted and require re-setting. The light is also the reset button.

![EMERG](image)
Indicates gear locked down in Emergency hydraulic condition.
Figure 1 – Cockpit Controls and Indications

1. Central Warning Panel (32 Alpha)
2. Landing gear retracted warning lights
3. Landing gear emergency lowered lights
4. Landing gear in transit light
5. Landing gear down and locked indications
6. Landing gear selector switch
7. Electrical emergency extension switch
8. Gear logic reset button
9. Hand pump
10. Accumulator pressure gauge
11. Nose wheel lock
12. Flap covering hand pump
13. Accumulator/Normal selector lever
14. Parking brake
15. Emergency hydraulic gear extension lever
NOSE LANDING GEAR

Refer to Figure 2. The nose landing gear consists of an oleo-pneumatic shock absorber, charged with nitrogen to 13.5 bar, fitted with a fully castoring twin wheel assembly. This assembly is fitted with an anti-shimmy friction pad between the rotating and fixed parts and can be locked in the fore and aft position by means of a spring loaded locking pin controlled by a handle in the cockpit. This lock is normally ‘in’ for take-off and landing and must be removed before taxiing.

The wheels are self-centering from 60° either side of neutral under the action of cams in the oleo as the leg extends after take-off. A proximity switch (CE) senses the centering and extension of the leg and assists in the production of "GROUND" or "FLIGHT" Logics.

The landing gear assembly is attached to the airframe by arms at the top of the shock absorber, which pivot on self-lubricating bearings. The assembly is retracted and extended by a self-locking hydraulic Jack connected to the assembly and to the airframe. Fitted to the Jack are two proximity switches, which detect Jack retracted (LU - landing gear ‘locked up’) and Jack extended (LD - Landing Gear ‘locked down’). A micro switch (LGE ‘landing gear extended’) at the top of the leg assembly is activated by a striker when the leg is extended and, in conjunction with micro switches on the main legs, operates the L/G warning lights if landing gear is not lowered below 60 kts.

---

Figure 2 – Nose Landing Gear Components

1. Airframe attachment points
2. Shock absorber charging point
3. Self-locking Retraction/Extension jack
4. Actuator/Airframe attachment
5. Landing gear UP lock proximity switch 'LU'
6. Landing gear DOWN lock proximity switch 'LD'
7. Landing gear CENTRED & EXTENDED proximity switch ‘CE’
8. Actuator/leg attachment bearing
9. Torque links
10. Twin wheels
11. Sliding tube
12. Rotating tube
13. Castoring lock pin
14. Shock absorber assembly
15. Micro switch ‘LGE’
**Nose Landing Gear - Self Locking Jack**

**Operation**

The Jack is shown locked in the retracted position where the flexible locking jaws (9) are gripping around the locking bush (8) and are prevented from opening by the locking collar (4) held in place by the spring loaded plate. The cam on the locking collar has moved the target out and made the 'Locked Up' proximity switch 'LU' (10).

When Hydraulic pressure is applied to extend the Jack at (A), the pressure acts on the spring-loaded plate and the faces of the locking collar (4) in chamber (D) and moves them down against the spring together with the locking cap (4). The flexible locking jaws (9) are now free to open into the recess of the locking collar so that, as the pressure acts on the piston and moves it left, the locking springs ride out over the locking bush and the Jack extends. At the end or it's travel the other locking bush (8) will pass through the locking jaws (13) and as they ‘click’ over the bush, the locking collar (14) will be pushed down by the spring loaded plate and retain the springs in their locked position.

The cam on the collar will move the target out and activate the proximity switch (12). The upper proximity switch target (11) will have dropped down the cam into the recess and de-activated the ‘Locked Up’ ‘LU’ proximity switch.

1. Actuator Rod
2. Piston
3. Locking Spring
4. Locking Collar
5. Shuttle slide valve (for normal and emergency extension)
6. 2-way calibrated hole – determines actuator operating time
7. Actuator casing
8. Locking bushing
9. Flexible locking jaws
10. Proximity sensor (11) push-rod target
11. LOCKED UP sensor ‘LU’
12. LOCKED DOWN sensor ‘LD’
13. Flexible Locking Jaw
14. Locking Collar

A. Pressure port for normal extension and return port for retraction.
B. Pressure port for retraction and return port for extension.
C. Pressure port for emergency extension

**Figure 3 – Nose landing Gear Actuator**
Nose Wheel Locking

Figure 5 – Nose Wheel Locking System

1. Nose Wheel Locking Handle – pull and turn to the right
2. Teleflex control cable
3. Spring-loaded rod
4. Locking pin
5. Strut assembly
6. Rotating tube
7. Indicating flag – visible when nose leg locked

The nose wheel can be locked in the fore and aft position by means of a handle and teleflex cable situated behind the centre consol.

To engage the nose wheel lock the handle should be pulled ‘up’ by 6 cm and turned through 90° to lock.

The nose wheel lock must be engaged for all running landings or wheel ‘shimmy’ may be encountered.

The locking pin contains a load-limiting shear area, which will allow the pin to break if left ‘in’ rather than cause damage to the nose leg.

As an indication to ground handlers there is a red warning flag which hangs down in front of the nose undercarriage leg whenever the nose wheel lock pin is engaged.
General

On the main landing gear, a single wheel unit, with a hydraulic disc-type brake, is fitted on a trailing arm, which pivots on a self-lubricated bearing attached to the airframe. The trailing arm is connected to the lower end of a shock strut, which is a combined shock absorber and retraction jack. The upper end of the shock strut, connected to the airframe, consists of an oleo-pneumatic shock absorber, charged with nitrogen to 14 bar, whilst the lower end, attached to the trailing arm, is the retraction/extension actuator. The legs are locked up and down by means of a Hydraulic-locking unit on each leg. Two proximity switches on the actuator (Jack) assembly give indications of Actuator Retracted (AR) and Actuator Extended (AE).

Figure 5 – Main Landing Gear Components

1. Shock strut (shock absorber/actuator assembly
2. Wheel
3. Tyre (pressure 7.2 bar)
4. Single disc brake unit
5. Trailing arm
6. Mounting spindle (self lubricating)
7. Position sensing unit
8. ‘LGR’ micro-switch (controls Warning)
9. ‘ARSAC’ proximity switch (fully retracted)
10. ‘ARSAE’ proximity switch (kneel position)
11. Proximity target (moves with trailing arm)
12. ‘AESAE’ proximity switch (fully extended)
13. End fitting ball joint
14. Shock absorber rod
15. Shock absorber casing
16. ‘AR’ proximity switch (actuator retracted)
17. ‘AE’ proximity switch (actuator extended)
18. Actuator casing
19. Hydraulic locking device
Fitted at the airframe end of the trailing arm is a target, which moves over three proximity switches on the airframe as the arm pivots round during retraction and extension. The three proximity switches give indications of the position of the arm, and hence leg, during flight.

The switches are known as -

**AESAE** - Actuator Extended - Shock Absorber Extended (Fully down position)
**ARSAE** - Actuator Retracted - Shock Absorber Extended (Kneeling position, Emergency Hydraulic lowering).
**ARSAC** - Actuator Retracted - Shock Absorber Compressed (Retracted position).

Also fitted to the airframe, and activated at the fully retracted position of the arm, is a micro switch ‘LGR’ (landing gear retracted) which is used in conjunction with the nose leg switch to operate the landing gear not lowered "L/G red lights with the speed below 60 kts. Fitted into the base of the actuator is a piston under which is a chamber charged with nitrogen to 210 bar. This is part of the anti-crash protection system described later.

A sectioned view of the shock strut is shown in Figure 6 and the list of internal components is listed below.

### Key for Figure 6

1. Low-pressure shock absorber charging valve
2. Shock absorber rod (secured to structure)
3. Shock absorber casing
4. Plunger tube
5. Actuator extended ‘AE’ indicating rocker lever
6. Hydraulic fluid distribution valves
7. Hydraulic unit
8. High-pressure shock absorber charging valve
9. Throttling valve
10. Flexible locking jaws
11. Locking Ring
12. Retraction actuator
13. Actuator Retracted ‘AR’ sensor
14. Proximity sensor (13) target
15. Throttling valve

D  Extension chamber
D’  High-pressure shock absorber fluid chamber
F  Retraction cylinder
G  Low-pressure shock absorber nitrogen/fluid chamber
H  Low pressure shock absorber fluid chamber
K  Extension chamber
L  High-pressure shock absorber nitrogen chamber
Operation During Retraction

Initially the shock strut is in the position shown in Figure 6: fully extended with weight off wheels and hydraulic locking valves closed. The plunger tube (4) is held down by the nitrogen pressure extending the two portions (2 & 3) of the Shock Absorber.

The actuator (12) is extended and proximity switch ‘AE’ is activated by the rocker lever (5) whilst the ‘AESAE’ switch is made by the trailing arm.

Refer to Figure 7. When the Landing Gear ‘UP’ selection is made the logic circuits energise the UP solenoid valve in the hydraulic system. This allows pressure to act in the hydraulic locking unit via pipe (B). This forces down the piston of the upper locking valve (2), opening the valve and allowing fluid from chamber (D) and (K) to flow to return. At the same time the pressurised fluid in line ‘B’ acts on the lower locking valve (2), opening it, and passes into chamber (F) via the drillings in the retraction tube (6) and plunger tube (7). This pressure bearing against the plunger tube base pushes the shock absorber casing (5) upwards displacing the fluid from chamber (H) to chamber (G) via the drilling in the fixed part of the shock absorber. This compresses the nitrogen in the upper chamber of the shock absorber until it’s pressure balances the pressure exerted by the hydraulic fluid and the shock absorber stops retracting. The hydraulic pressure is still acting upon the lower face of the retraction tube (6) and so the tube is pushed upwards, retracting the actuator body (3) as it moves, until it reaches it’s end of travel stop and the flexible jaws lock over the locking ring. The proximity switch ‘AR’ is activated, and the ‘ARSAC’ switch is made by the trailing arm. These signal the logics to de-energise the ‘UP’ solenoid valve which cuts off pressure to the hydraulic unit. With no pressure acting in line (B) the two hydraulic locking valves close off under action of their springs and the shock strut is hydraulically locked in the retracted position. Actuator Retracted Shock Absorber Compressed.

Figure 7 – Undercarriage Retraction
Operation During Normal Extension

Refer to Figure 8. When the landing gear is selected down, the logic circuits energise the 'DOWN' solenoid allowing pressure to be applied via pipe (A) at the hydraulic locking unit. This opens the upper locking valve (5) and, acting on the top piston of the lower locking valve (5), opens it to allow fluid in chamber (F) to flow to return. With the two locking valves open there is no longer any hydraulic lock and the leg begins to fall under gravity with the shock absorber extending under the action of the stored nitrogen pressure. The fluid in chamber (G) returns to chamber (H) as the shock absorber extends with the flow being restricted by the throttling valve.

Pressurised fluid, acting in chambers (D) & (K), pushes against the plunger tube and the actuator assembly. This overcomes the grip of the flexible jaws (1) and the actuator is extended.

At the end of the extension cycle, when proximity switch ‘AE’ is activated and the trailing arm target has activated ‘AESAE’ proximity switch, the logics de-energise the ‘DOWN’ solenoid valve cutting off hydraulic pressure to the locking unit. The two locking valves close under action of their springs and the leg is hydraulically locked in the down position.

![Figure 8 – Normal Undercarriage Extension](image)

**Figure 8 – Normal Undercarriage Extension**
Emergency Hydraulic Extension

Refer to Figure 9. When the hand pump has to be used to lower the landing gear the fluid enters the hydraulic locking unit via pipe (C) and passes into the area between the double pistons or the locking valves. As the pump is operated the pressure forces both lower pistons down opening both locking valves. Note that the fluid does not flow into the shock strut but only between the double pistons.

As soon as the locking valves are opened the leg begins to fall assisted by the stored nitrogen pressure in (G), and the shock absorber extends. Suction draws fluid into the leg via line (A) from the left-hand hydraulic reservoir. As there is no pressure being applied in the actuator it remains held retracted by the flexible locking jaws (3) and the landing gear lowers to the ‘kneeled’ position only. When the ‘ARSAE’ proximity switch is activated indications are given to pilot of the landing gear position and the hand pumping can be stopped. When the pumping ceases the hydraulic pressure is bled away via a restrictor valve in the hydraulic circuit and the locking valves (4) close under action or their springs.

Figure 9 – Emergency Undercarriage Extension
Heavy Landing Protection Devices

Refer to Figure 11. Fitted into the shock strut assembly are two protection devices to prevent the shock absorber and actuator from bursting should a heavy landing be made. Under normal operations they are not brought into action with the shock absorber taking the load on landing and taxying and acting as a normal shock absorber would. The fluid flow being restricted by sliding valve (1) from chamber (H) to chamber (G) as the leg compresses and restricted further via the throttling valve (2) as the leg extends.

The sliding valve (1) is the protection for the shock absorber. Fitted into the base of the actuator is a ‘Crash Piston’ with the chamber (L) underneath pressurised with nitrogen to 210 bar. The piston remains stationary under normal operating conditions.

Should a heavy landing occur the shock absorber cannot be compressed fast due to the restriction in flow and the pressure rise developing in chamber (H) could burst the casing. This increased pressure lifts the sliding valve off it's seat, against the spring, allowing increased fluid flow from chamber (H) to chamber (G) thus limiting the pressure rise and allowing faster compression of the shock absorber. On extension the spring pushes the sliding valve back to it's normal position and the re-bound is damped by the throttling valve.

The actuator tends to retract thus increasing the pressure of the fluid locked inside and to prevent bursting of the casing the crash piston is forced down into chamber (D’) against the nitrogen pressure thus maintaining the same volume and reducing the pressure rise inside the actuator casing. On rebound the piston is returned to it's original position under action of the nitrogen pressure. The fluid flows back from chamber (D’) to chamber (D) at a reduced rate via the throttling valve (3).
The shock strut absorbs the touch down energy up to 5mtr/sec (approximately 975 ft/min). Above this figure (up to 8 mtr/sec) the energy is absorbed by distortion of the lower structure. At over 8mtr/sec (approximately 1560 ft/min) there is a danger of aircraft crashing. Oh Really?

Note - The Crash Piston is not available when landing in the emergency ‘kneeled’ position since the actuator is still retracted and may be considered as a solid item.

Figure 11 – Shock Absorber Assembly
1. Emergency hydraulic extension pull lever
2. Distributor control lever
3. Emergency hydraulic extension system distributor
4. Micro-switch controlled by lever (2)
5. Parking brake teleflex actuating cable
6. Double extension and retraction electro-valves

Figure 12 – Undercarriage Hydraulic Unit Location

General

A unit located in the base of the flying controls Cabinet controls the hydraulic retraction and extension of the undercarriage. It is shown above in Figure 12. It ensures normal retraction and extension via the Left-Hand hydraulic system or extension via the hand pump system in an emergency. Mounted on the unit are the ‘UP’ and ‘DOWN’ solenoid valves.

Coupled to the unit by a teleflex control is the emergency hydraulic extension handle situated in the cockpit. When this handle is pulled up a micro-switch is tripped cutting off electrical power to the solenoid valves thus ensuring they are both de-energised. It also moves a valve in the unit to open the hand pump line to the extension circuit and cut off supply from the left-hand hydraulic system.

A pressure distributing and reducing valve in the unit delivers reduced pressure to the brakes via either the pedal transmitter or the parking brake handle, which is coupled to the unit by teleflex control.

Incorporated in the hydraulic system is a ‘flow limiter’ (30 ltr/min), to ensure pressure is retained at the Main Servos when landing gear is operated.
A ‘flow distributor’ fitted in right-hand wheel-well ensures that both legs move up and down together during operating cycles. Should the flow rate in one of the main landing gear systems be greater than the other the pressure in chambers ‘A’ and ‘B’ is no longer equal. The ‘slide valve’ will now move to reduce the faster flow rate. Hence the landing gear units retract and extend at the same rate.

![Figure 13 – Undercarriage Flow Distributor](image)

**Retraction Operation**

Refer to Figure 14. When the undercarriage switch is selected ‘up’, the retraction electro-valve is energised and opens. This allows Left-Hand hydraulic system pressure to the retraction lines.

This pressure fluid flows past a ‘flow limiter’, which is designed to ensure that the main servos get priority during the retraction/extension cycle. The flow is limited to 30 ltr/min.

Return fluid passes through the ‘flow divider’ to maintain equal flow from both main legs and therefore equal speed of operation. Should the flow from one side be too great the slide valve will move across, under action of the differential pressure affecting it and will reduce that flow rate.

The landing gear retracts and at the end of the cycle the electro-valve is de-energised and pressure supply is cut off.

**Extension Operation**

Refer to Figure 15. The extension electro-valve is energised and opens allowing Left-Hand hydraulic system pressure to pass through the ‘flow limiter’ and the ‘flow divider’ to extend the landing gear.

Return fluid flows direct to the reservoir. Should the main pump pressure fall during the extension operation the auxiliary pump will automatically cut in to give the additional flow requirements. The total flow rate is limited by the flow restrictor to ensure that the Main Servo controls are not starved of fluid. At the end of the extension cycle the electro valve is de-energised and the supply cut off.
Figure 14
Hydraulic Retraction Cycle
Figure 15 – Normal Hydraulic Extension Cycle
Emergency Extension Operation

Refer to Figure 16. In the event of Left-Hand hydraulic system failure, the undercarriage may be lowered by means of a hand pump.

When the emergency extension handle is pulled up, the ‘manual distributor valve’ moves across cutting off the supply from the left-hand system and opening up the Hand Pump line to the emergency extension circuit. With the Normal/Accessory selector in the ‘normal’ position (aft), the Hand Pump is then operated to lower the undercarriage. Approximately 40 cycles of operation may be required. It is recommended to continue pumping for a few seconds after the ‘kneeled’ position indications have illuminated to ensure legs are extended.

During extension of the landing gear using this emergency hand pump system the ‘kneeled’ lights will illuminate together with a nose wheel ‘green’ when the wheels are fully down in the ‘kneeled’ position.

![Indications with the gear ‘down’ in the ‘kneeled’ position](image)

When pumping ceases the pressure is reduced via the ‘restricted bleed’ away to return, and the lock valves in the hydraulic locking unit on the legs close. Note that check valve ‘A’ allows suction to fill the legs as they extend thus preventing cavitation and ‘hang up’ of the legs.

Note – With the undercarriage in the ‘kneeled’ position, the nose gear is fully extended.

Electrical Emergency Extension

Should an electrical fault occur and normal Landing Gear extension is not possible the guarded switch on the landing gear control panel should be used. This will supply 28V direct from the PP1 bus bar to energise the extension solenoid valve. This supply is permanently live. The Landing Gear will extend fully to it's normal ‘down’ position. There is no effect on the hydraulic system and the emergency handle does not need to be moved.

When the emergency electrical switch is used the REARM caption will illuminate. This indicates interruption of the logic circuits power supply and re-setting is necessary after rectification of the fault. During extension of the Landing Gear using this emergency electrical system the ‘kneeled’ lights will illuminate as the gear transits the ‘kneel’ position during extension cycle and then normal indications of 3-greens should appear. With failure of the normal indicating system the landing gear may be checked down by noting that the flashing red lights remain out when airspeed is reduced below 60 kts.
Figure 16 – Emergency Hydraulic Extension Cycle
There are two circuit breakers on the PP4 bus bar and one on the PP1 bus bar supplying the electrical power to the landing gear control logics and electro solenoid valves. A schematic diagram of these supplies is given in Figure 17 with the first stages of control logics to illustrate the operation of the warning lights.

In normal position, relays \((K1)\), \((K2)\) & \((K3)\) are energised and the indicator lights are out. The power supplies are available to operate the electro solenoid valves, supply the proximity switches and indicator lights, and to power the logic PCB. Logics \((L1)\) & \((L2)\) are at their 'rest' position.

The control supply energises relay \((K3)\), making it's contact, and then passes through the closed micro switch of the Emergency Hydraulic extension to energise relay \((K1)\). When \((K1)\) is energised its two contacts are made and the two supplies can pass to their respective services. The \(L/G\) SIG and \(L/G\) CONT lights are out, as is the REARM light.

Should the Emergency Hydraulic extension handle be pulled, micro switch \((1)\) is opened and \((K1)\) de-energised, cutting off control supply to Electro Solenoid valves and logic PCB. The upper contact \((A)\) of this relay makes an earth to Illuminate \(L/G\) CONT and REARM lights.

---

**Figure 17 – Undercarriage Electrical System**
When the Electrical Emergency switch is made Logic (L1) is activated and breaks the control supply to relay (K1) which is de-energised with the same results as previously mentioned.

If the 28V supply for control power is lost relays (K3) & (K1) are de-energised with loss of electro-valve operating and Logic PCB power supplies. The L/G CONT light will illuminate with the REARM light. Pressing in the REARM light will activate Logic (L2) to re-set the system should the fault be of a temporary nature.

Note that with any of the above actions, the indicating power supply is still available at the sensors and normal indications are not lost.

Should the indicating power supply be lost relay (K2) will be de-energised and the supplies to sensors and indications and to Logic PCB will be lost. The L/G SIG light will illuminate via the earth at the contact of the de-energised (K2) relay. A loss of indicating power supply will also activate logic (L1) and relay (K1) will de-energise cutting off supply to solenoid valves. The L/G CONT and REARM lights will therefore illuminate.

In either of the above cases, loss of 'control' power, or loss of 'indicating' power a re-set should be attempted and if unsuccessful the landing gear can be lowered using the electrical emergency switch.

One further function of Logic (L1) is to break the control power supply if the connecting plug to the extension solenoid valve is not correctly made, thus preventing retraction of landing gear with the consequential failure of extension later.

Note - should PP4 be 'shed' in an electrical emergency all landing gear normal operating and indicating systems are lost.

Functions of the Various Sensors (Proximity switches)

The position sensors provide the following functions designed to fulfill operation and safety requirements.

**Ground/Flight Logics**

These prevent the operation of certain items or systems whilst the aircraft is on the ground or in flight.

**Ground**
- Prevents Landing Gear retraction.
- Pressure control for the Aux. Pump when on battery only
- Reduced electrical power supply to pitot heaters.

**Flight**
- Prevents testing of the Autopilot
- Enables Landing Gear operations.

Because the signals from the sensors give conflicting information during landing gear operation the logics remember the original information for 10 seconds (operating cycle)

**Logics to Power Up/Down Solenoid Valves**

Before the landing gear retraction or extension solenoid valves can be energised the logics ensure that the following conditions are correct:

1. At least one sensor not made in the UP or DOWN position.
2. Neither electro valve is already energised
3. 'Flight' signal present.
4. Switch selected UP or DOWN.

These control logics are delayed by 3 seconds to ensure that retraction/extension cycles are completed before the opposite cycle can be made, to overcome possible inertia of the hydraulics, and to prevent premature detection of the cycle completion closing the appropriate electro valve.
Logics of Indication Lights

1. 3 Greens

Nose sensor ‘LD’ (locked down) made. 
Main sensor ‘AE’ (actuator extended) made, for each light and the electro-valve not energised.

2. Gear Moving

Signaled by control of power supply to electro valve relay (i.e. no electro-valve operating means no movement) and therefore no light. However in emergency operations no electro valve is energised by the control power supply and the sensors take over the indications control role. The light comes on as soon as the Nose ‘LU’ (locked up) sensor is opened.

   Emergency Electrical Extension
   Closure of nose ‘LD’ (locked down) and mains ‘AE’ (actuator extended) the last closing sensor extinguishing the light.

   Emergency Hydraulic Extension
   Nose ‘LD’ (locked down) and mains ‘ARSAE’ (actuator retracted shock absorber extended) the last closing sensor extinguishing the light.

3. EMERG Position Lights

Controlled by closure of the ‘ARSAE’ sensors during ‘flight’ conditions and by closure of ‘AR’ (actuator retracted) sensors during ‘ground’ conditions.

4. Landing Gear Not Lowered Lights

These lights are controlled by the 3 micro switches on the landing gear and the power supply is via the Auxiliary Warning Board which is part of the Central Warning system and therefore will still operate when L/G SIG power is lost.

Should the aircraft be heavy when landing with the landing gear in the ‘kneeled’ position there is the possibility of making the ‘LGR’ (landing gear retracted) micro switch and the ‘ARSAC’ proximity switch. This will operate the L G flashing lights due to the sensor giving ‘flight’ information and landing gear retracted below 60Kts.

However, a modification is on hand to inhibit these sensors when emergency hydraulic extension is used.
WHEEL BRAKES

General

Refer to Figure 18. The wheels are fitted with disc type hydraulic brakes supplied with power by the Left-Hand hydraulic system through the landing gear control unit. Each brake has 6 pistons acting on friction linings to bear against the rotating disc. The hydraulic pressure is reduced as it passes through the control unit and can be applied either by pressure transmitters fitted to Captain's pedals or by means or the Parking Brake Handle. With rotors stationary, pressure can be applied from the utility services accumulator.

Max Pressure by pedals - Approximately 70 bar.
Parking Brake Pressure - Approximately 55 - 60 bar.
Accumulator Brake Storage Time - 24 Hours
Number of Cycles From Accumulator - 20

The accumulator can be re-charged by the hand pump if NORM/ACC selector is set to ACC position.

Wheel Brake System

Differential Braking

When only one pedal is depressed the transmitter pressure acts under one piston valves lifting it up against the spring and raising in turn, the ball valve off it's seat. Pressure from the Left-Hand system can now pass via the ball valve, through the drillings in the valve assembly and out to the appropriate brake cylinder. As the pressure increases in the lines to the brake cylinder it is felt on the head of the piston assembly which descends against it's spring thus allowing the ball valve to return to it's seat.

When transmitter pressure is released the piston valve and piston assembly descend opening up the pressure in the brake line to return.

Parking Braking

Pulling the parking brake handle up and turning it locks it in the ON position. The cams in the bottom of the braking unit have been turned through 90° and lifted the piston valves creating the same sequence of events as for transmitter operation. The pedals do not have to be pressed to apply the Parking Brake.

Note – Should the parking brake teleflex cable become detached from the wheel brake unit the brakes will fail 'OFF'. In this case the pedal brakes will still function correctly.
Figure 18 – Wheel Brake System