ACRONYMS

A/S	Anti Skid
ADC	Air Data Computer
BCU	Brake Control Unit
BCV	Brake Control Valve
BTMS	Brake Temperature Monitoring System
CAS	Crew Alerting System
CB	Circuit Breaker
CMC	Central Maintenance Computer
CWSIU	Combined Wheel Speed Interface Unit
DC	Direct Current
EGPWS	Enhanced Ground Proximity Warning System
EHSV	Electro-Hydraulic Servo Valve
EBCM	Electronic Brake Control Module
HSI	Horizontal Situation Indicator
LGSCU	Landing Gear and Steering Control Module
LRU	Line Replaceable Unit
MFA	Maintenance Free Accumulator
MLG	Main Landing Gear
NWS	Nose Wheel Stearing
PBC	Parking Brake Cable
PBH	Parking Brake Handle
PEV	Park Emergency Valve
PFCS	Primary Flight Control System
PPT	Pedal Position Transducer
RA	Radar Altimeter
RBPA	Rudder Brake Pedal Assembly
RPSA	Rotating Pressure Sensor Assembly
RTO	Rejected Take Off
RVDT	Rotary Variable Differential Transformer
SCU	Steering Control Unit
SIU	
SSBV	Steering Selector Bypass Valve
SSPC	Solid State Power Controller
SOV	Shut Off Valve
TPIS	Tire Pressure Indicating System
TPMU	Tire Pressure Monitoring Unit
WOW	Weight On Wheels

INTRODUCTION

ATA 32: landing gear, wheels and brakes, and nose wheel steering system information is separated into:

- ATA 32_1: Landing gear,
- ATA 32_2: Wheels and brakes,
- ATA 32_3: Nose Wheel Steering.

INTRODUCTION

The Falcon 7X features:

- Two main Landing Gears,
- One nose Landing Gear.

Landing gears are:

- Electrically controlled,
- Hydraulically actuated.

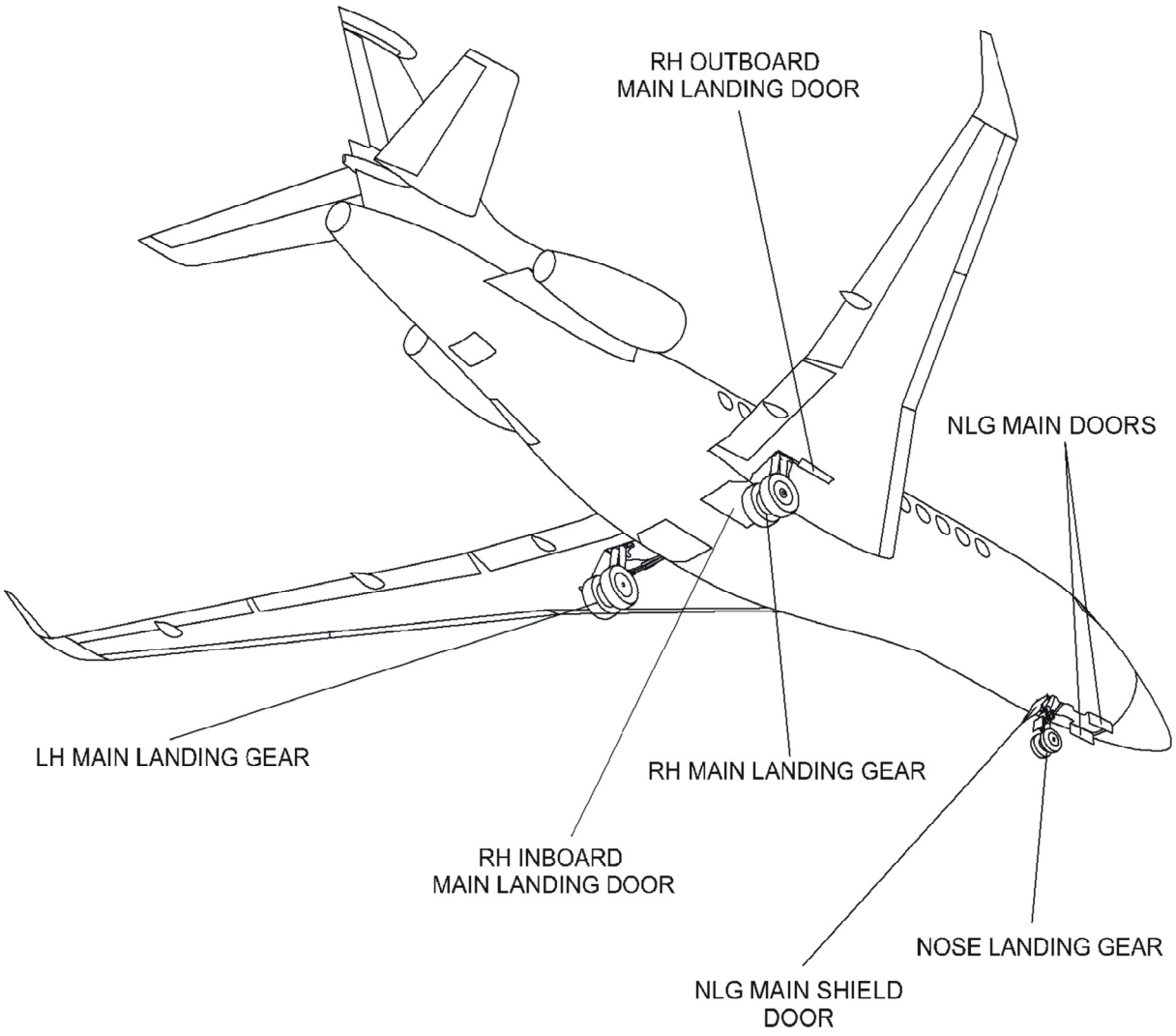


FIGURE 02-32_1-05-00 LANDING GEARS PICTURE

FLIGHT DECK OVERVIEW

CONTROLS

Crew control of landing gear system is performed via:

- Normal operation Landing Gear Handle,
- Three landing gear free fall extension handles (also referred to as emergency operation gear handles).

INDICATIONS

Cockpit indications related to Landing Gear system are displayed:

- On the right hand corner of the HSI, on the PDU for Landing Gear status
- On speed placard markings in front of each pilot for the limitations,
- On the ENG-CAS window for CAS messages,
- On the STATus synoptic / FAULT tab for fault messages.

Additionally, the landing gear system features a dedicated aural alert "GEAR", related to the landing gear handle position. This configuration aural alert is in supplement to aural alerts triggered by the EGPWS.

➢ *Refer to ATA 34 for a description of GEAR aural alerts triggered by the EGPWS system.*

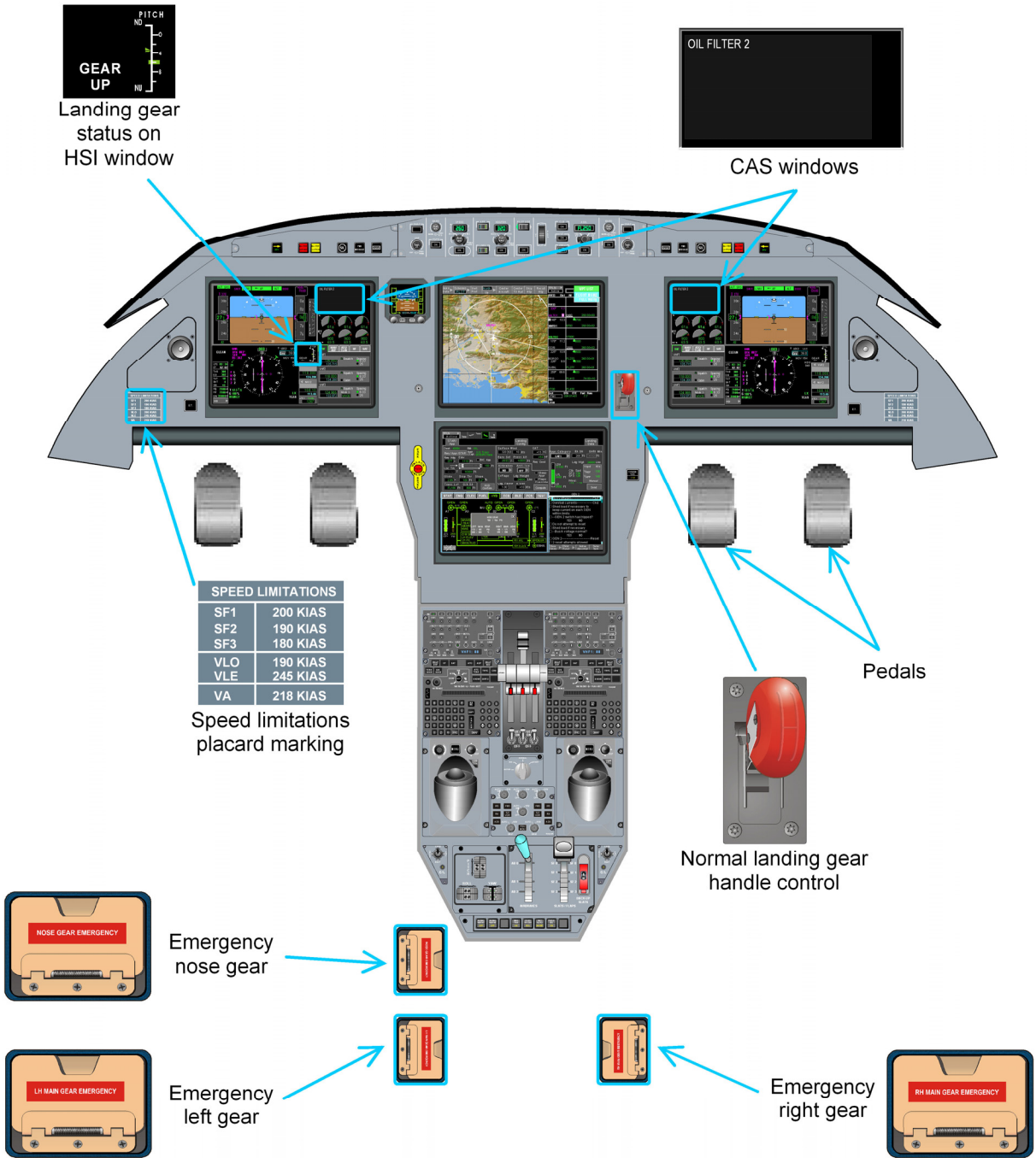


FIGURE 02-32_1-05-01 - FLIGHT DECK OVERVIEW

GENERAL

The Landing Gear System provides the following functions:

- Extend and lock down landing gear in normal and emergency mode (free fall),
- Retract and lock up landing gear,
- Manage main gear doors sequence during gear extension and retraction,
- Provide landing gear position to aircraft systems,
- Provide Weight On Wheel (WOW) signals to aircraft systems.

Control of the landing gear system is performed by a dual channel computer named Landing Gear and Steering Control Unit (LGSCU).

➢ *Refer to ATA 32_3 for the Nose Wheel Steering control function of the LGSCU.*

The landing gears also provide the following "mechanical functions":

- Absorb landing and taxi loads (with shock absorber, wheels and tires),
- Ensure that nose wheels are centred when the nose landing gear is extended,
- Provide Shimmy damping for the nose landing gear.

Hydraulic A is used for normal operation of the landing gear system.

MAIN CHARACTERISTICS

MAIN LANDING GEAR

Each main landing gear has the following characteristics:

- Inboard retracting configuration,
- Doors are operating in sequence with the gear,
- Twin wheels,
- Each main gear and doors are fitted with double set of proximity switches providing:
  - Signal of gears and doors position to LGSCU,
  - Signal of WOW (Weight On Wheels) to transmit to all systems:
    Either directly from one relay,
    Or through consolidated WOW signal based on a combination of relays.

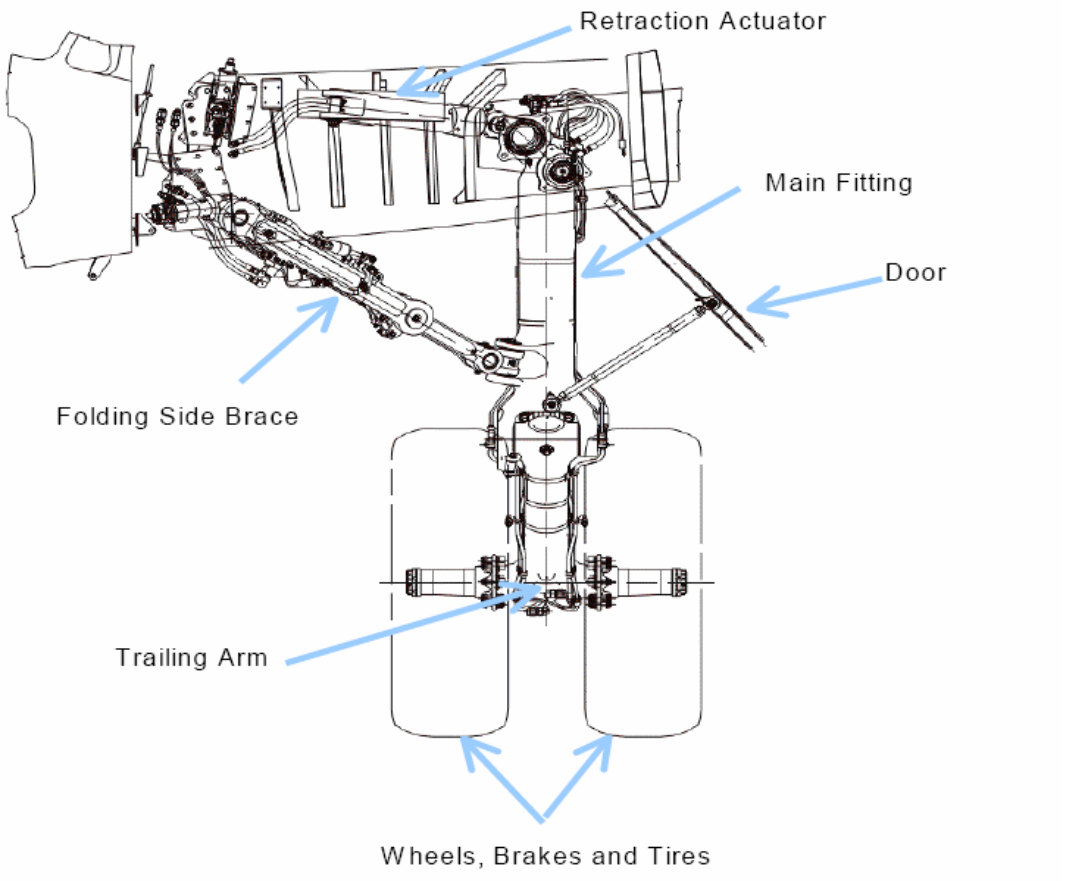


FIGURE 02-32_1-10-00 - RH MAIN LANDING GEAR EXTENDED - AFT VIEW

NOSE LANDING GEAR

The nose landing gear has the following characteristics:

- Forward retracting configuration,
- Doors are mechanically actuated by gear movements,
- It is fitted with an oleo-pneumatic shock absorber including two cams centring the nose wheels when nose landing gear is completely extended,
- The nose landing gear incorporates the nose wheel steering hydraulic module,
- Provides shimmy damping,
- Nose landing gear is fitted with double set of proximity switches providing:
  - Signal of gear (and doors) position to LGSU,
  - Weight On Wheels transmit to all systems:

    Either directly from one relay,

    Or through consolidated WOW signal based on a combination of relays.

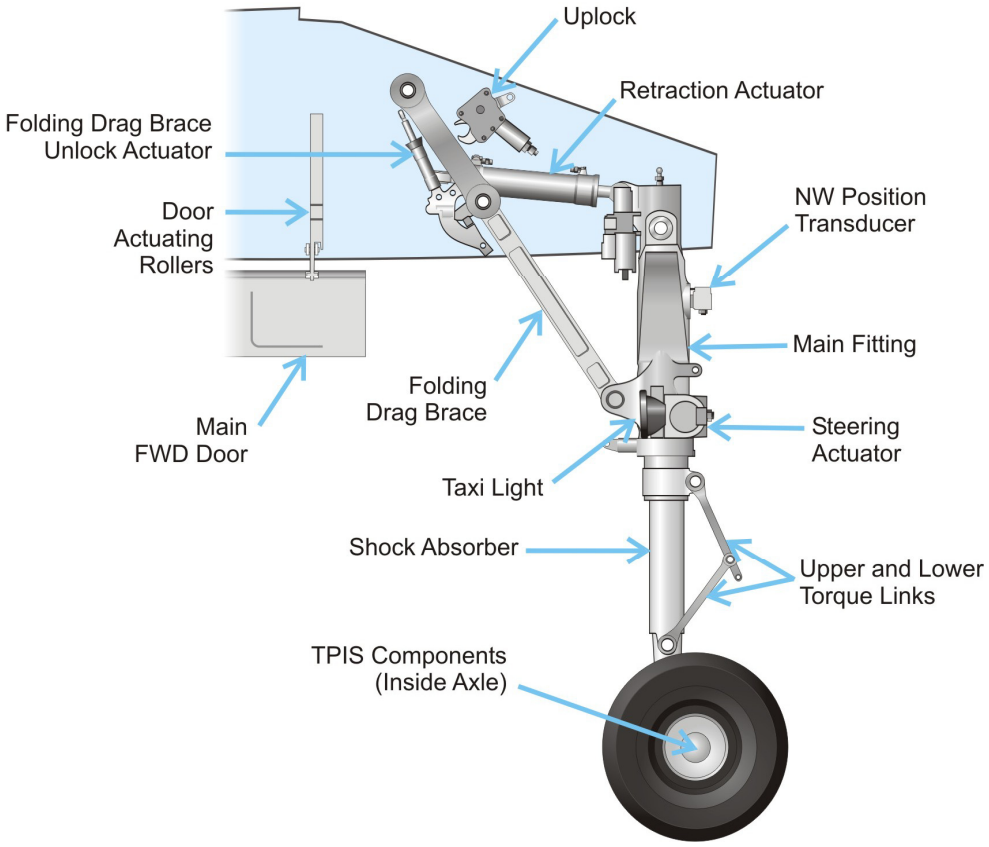


FIGURE 02-32_1-10-01 - NOSE LANDING GEAR EXTENDED - LEFT SIDEVIEW

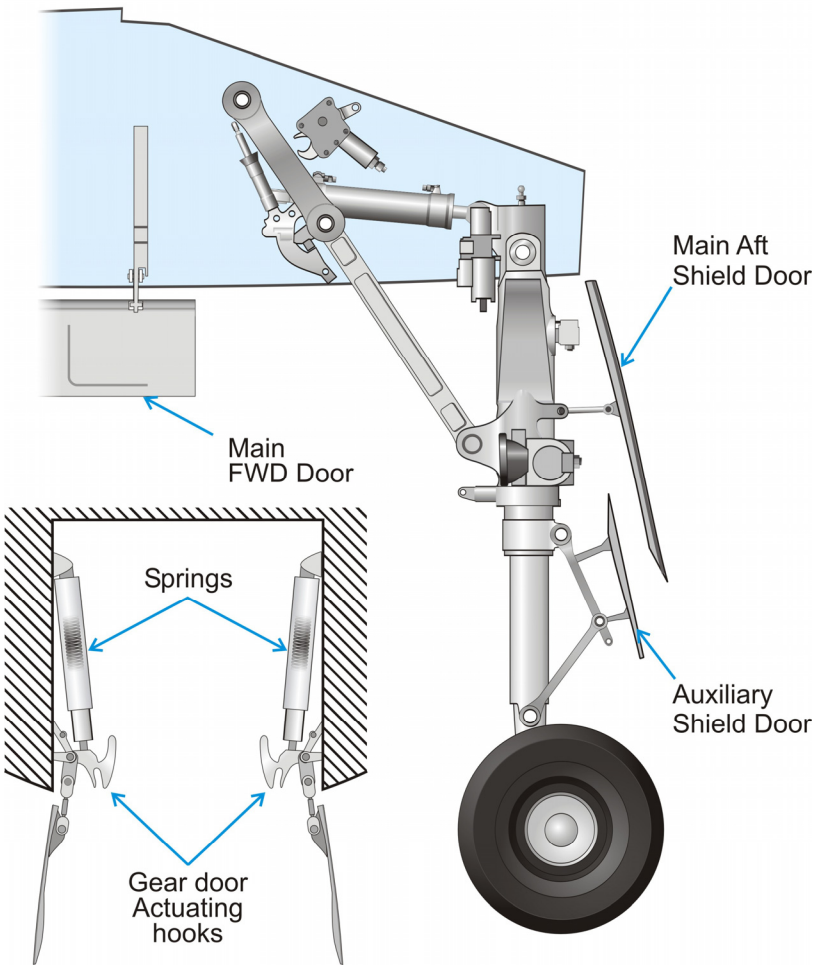


FIGURE 02-32_1-10-02 - NOSE LANDING GEAR DOOR MECHANISM AND SHIELD DOORS

LANDING GEAR CONTROL

NORMAL OPERATION

During normal operation, control of the landing gear is performed:

- By the Landing Gear and Steering Control Unit (LGSCU),
- Which commands hydraulic power to be provided:
  - Through the landing gear selector valve and main doors selector valve,
  - To the three landing gear actuators and two main doors actuators.

NOTE

The nose gear doors are mechanically opened or closed by the nose gear.
They are not controlled by the LGSCU.

EMERGENCY / FREE FALL EXTENSION

For emergency or free fall extension, control of the landing gear is performed:

- By using three floor-mounted emergency extension handles,
- Each handle directly actuates mechanically the uplock of each landing gear and each main landing gear door.

LANDING GEAR AND STEERING CONTROL UNIT

The LGSCU is dual channel:

- One channel is the active channel (in control),
- The other channel is in stand by.

The stand by channel performs the same functions as the active channel. If the active channel fails, the stand by channel automatically takes over the control. This transfer is performed without any pilot action.

The active channel is the first channel powered. The active and stand by channel alternate during the flight, after gear retraction.

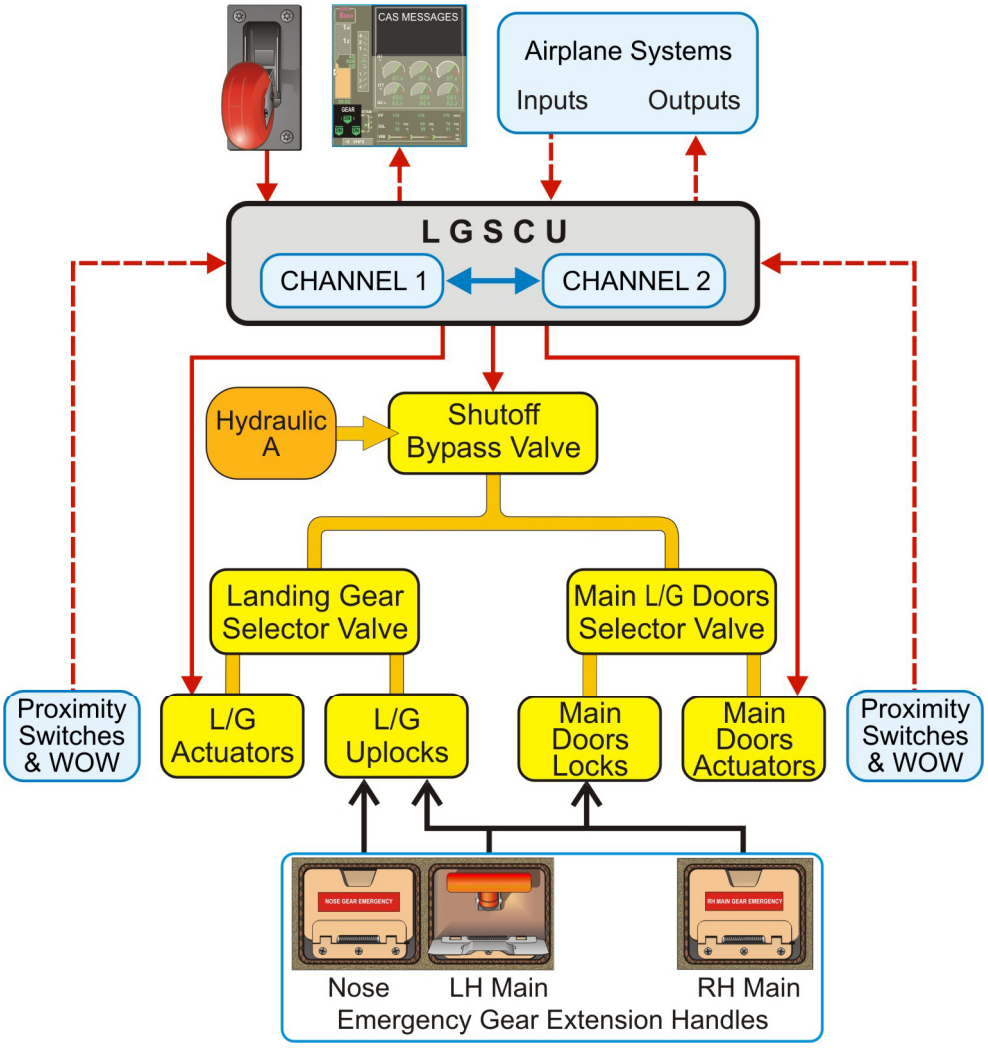


FIGURE 02-32_1-10-03 - LANDING GEAR OPERATION FUNCTIONAL DIAGRAM

SEQUENCING

The sequencing of nose and main landing gears and main doors is controlled by the LGSCU.

NORMAL LANDING GEAR EXTENSION

The extension sequence of landing gears and doors during normal operation is the following:

- 1. Main doors open,
- 2. Main and nose landing gears extend,
- 3. Main doors close.

As previously mentioned nose landing gear doors are mechanically open by the nose landing gear and remain open while the nose landing gear is extended.

LANDING GEAR RETRACTION

Before landing gear retraction sequence is allowed:

- The airplane must be in air mode (WOW proximity switches),
- The nose wheel must be centred.

The sequencing is the same as for extension:

- 1. Main doors open,
- 2. Main and nose landing gears retract,
- 3. Main doors close.

During retraction sequence, brake pressure is applied by the braking system to stop main wheels rotation.

➢ *Refer to DESCRIPTION - SUPPLEMENTARY INFORMATION for additional information*

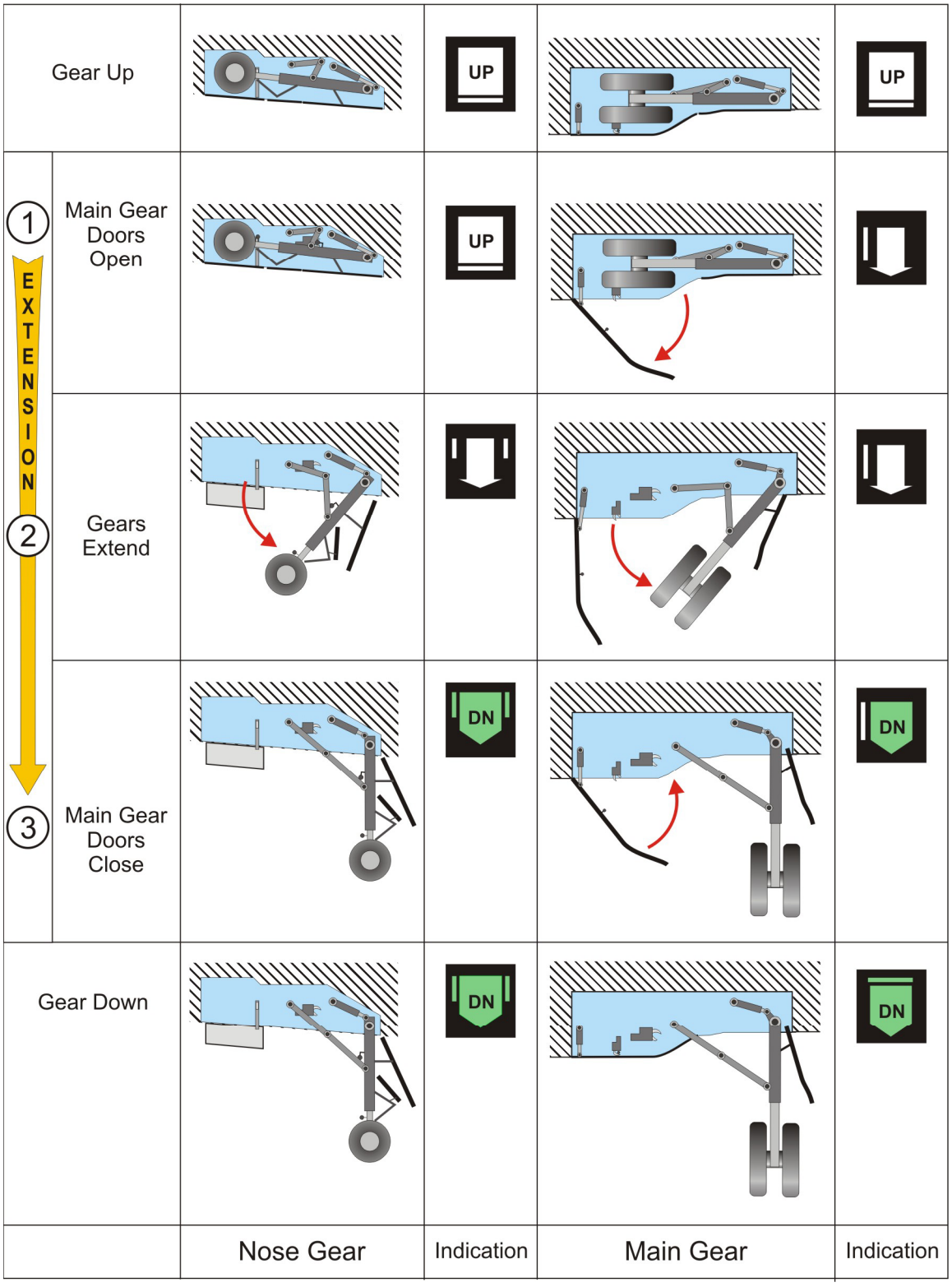


FIGURE 02-32_1-10-04 - LANDING GEAR NORMAL EXTENSION

DESIGN PRINCIPLES

The landing gear system was designed by the following design principles:

- With regard to technology :
  - Shock absorber is not in the main fitting, not to be sensitive to side loads, and configuration is a trailing arm type, to increase comfort and stability (main landin gear only).
  - Springs in the brace allow locking of the landing gears. Therefore actuators do not have to perform the locking of the landing gear, and their size could be optimized.

- With regard to architecture:
  - The dual channel control computer allows using normal extension operation even after the loss of one electrical bus or computer channel,
  - Emergency landing gear extension operates by gravity only (free fall extension), such that it is operational in case of hydraulic A loss.

- With regard to safety:
  - The main landing gear is attached to the airplane via fused pins preventing damage to the wings fuel tanks in case of excessive hard landing and exit of runaway.

EQUIPMENTS LOCATION

The LGSCU is located in the underfloor

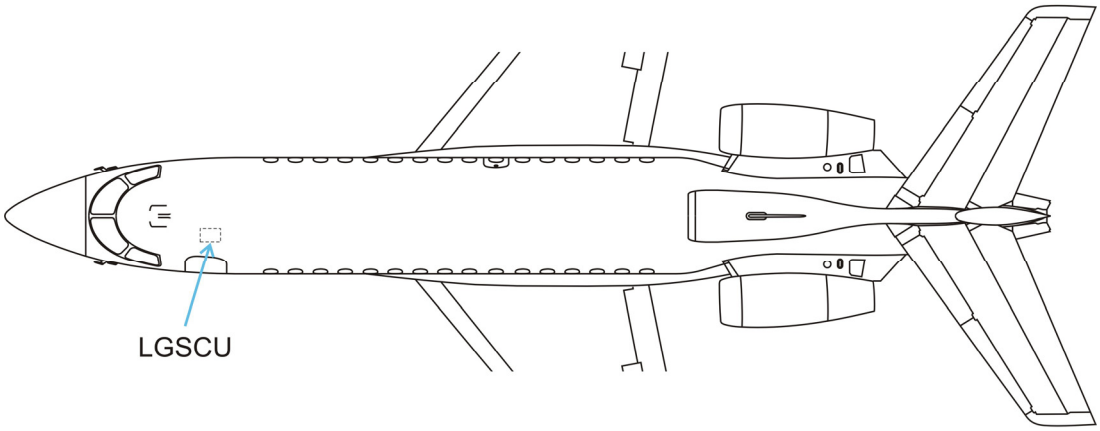


FIGURE 02-32_1-15-00 - LANDING GEAR AND STEERING CONTROL MODULE (LGCU)

ELECTRICAL POWER SUPPLY

Following paragraph describes the power supply of the different equipment of the landing gear system.

Electrical protection is provided:

- Either by Solid State Power Controllers (SSPC) ,
- Or by Circuit Breakers (CB).

➢ *Refer to ATA 24 – ELECTRICAL POWER for additional information.*

EQUIPMENT	POWER SUPPLY	TYPE OF PROTECTION
LGSCU channel 1	LH and RH essential buses	CB
LGSCU channel 2	LH and RH main buses	CB

EMERGENCY EXTENSION

GENERAL

In case of emergency extension:

- Two switches, located just under the floor, cut electrical power between the LGSCU and the Shut Off Valve of the Landing Gear hydraulic manifold.
- Hydraulic lines are depressurized
- Fluid in the retract lines can then be dumped back to the reservoir.

On ground, a mechanics technician will need to reset the free fall handles and the switches after a free fall extension.

PRINCIPLE DIAGRAM

Following figure shows:

- Mechanical links between the emergency handles and the main doors latches and three landing gear uplocks,
- It also shows that, if at least one channel of the LGSCU is available, the landing gear position remain available.

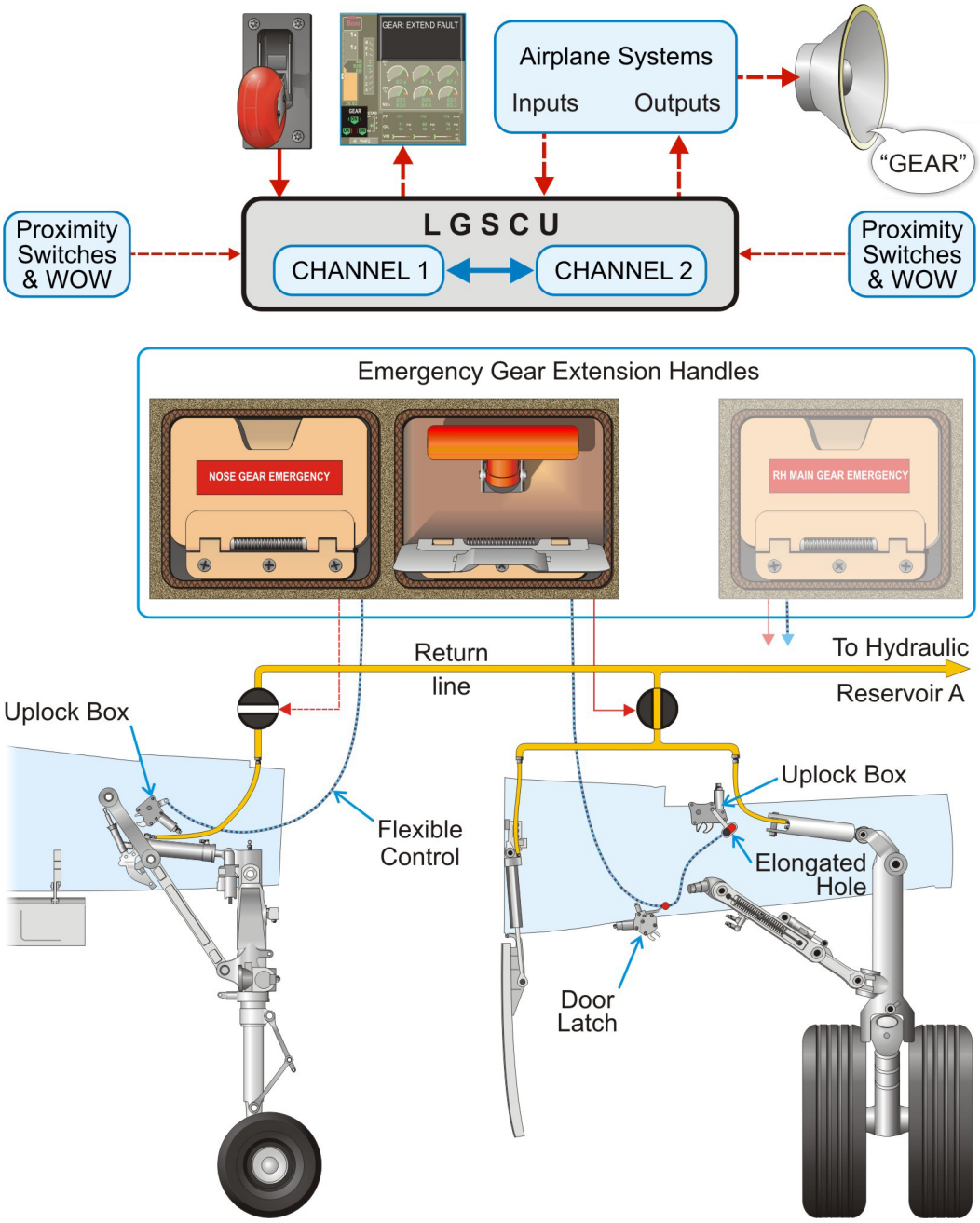


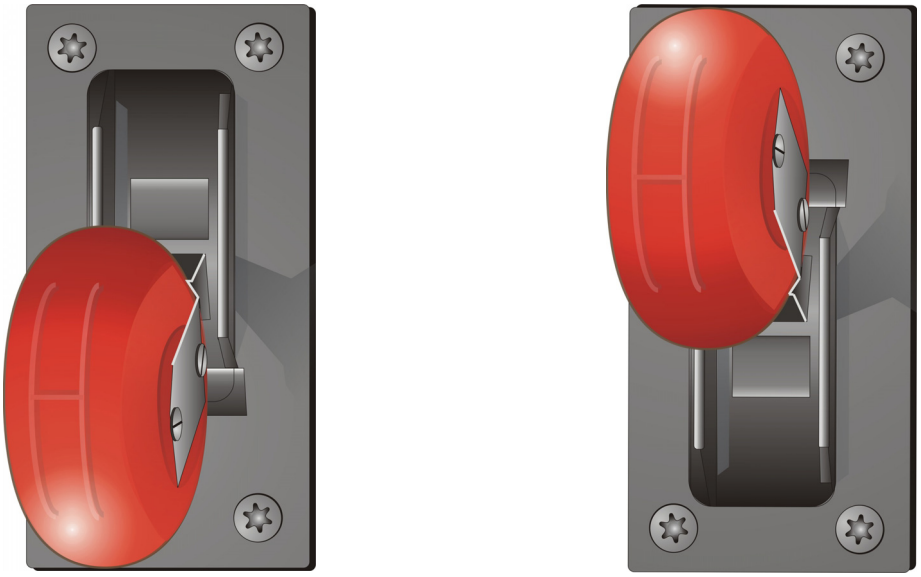
FIGURE 02-32_1-15-01 - EMERGENCY - FREE FALL LANDING GEAR EXTENSION

CONTROLS

Control of the Landing Gears is performed:

- In normal operation, via the Landing Gear control handle,
- In abnormal or emergency operation, via three emergency extension Handles.

NORMAL OPERATION LANDING GEAR HANDLE



LANDING GEAR EXTENDED **LANDING GEAR RETRACTED**

FIGURE 02-32_1-20-00 - NORMAL OPERATION GEAR HANDLE

The normal operation Landing Gear Handle:

- Is located on the RH side of the lower MDU,
- Commands normal landing gear operation (electrical control),
- Has two position UP / DOWN,
- Must be pulled aft before it can be moved UP or DOWN.

NOTE

Maximum Landing gear Operating Speed:

VLO: 200 KIAS - MLO: 0.7

Maximum Landing gear Extended Speed:

VLE: 245 KIAS - MLE: 0.75

EMERGENCY GEAR EXTENTION HANDLES

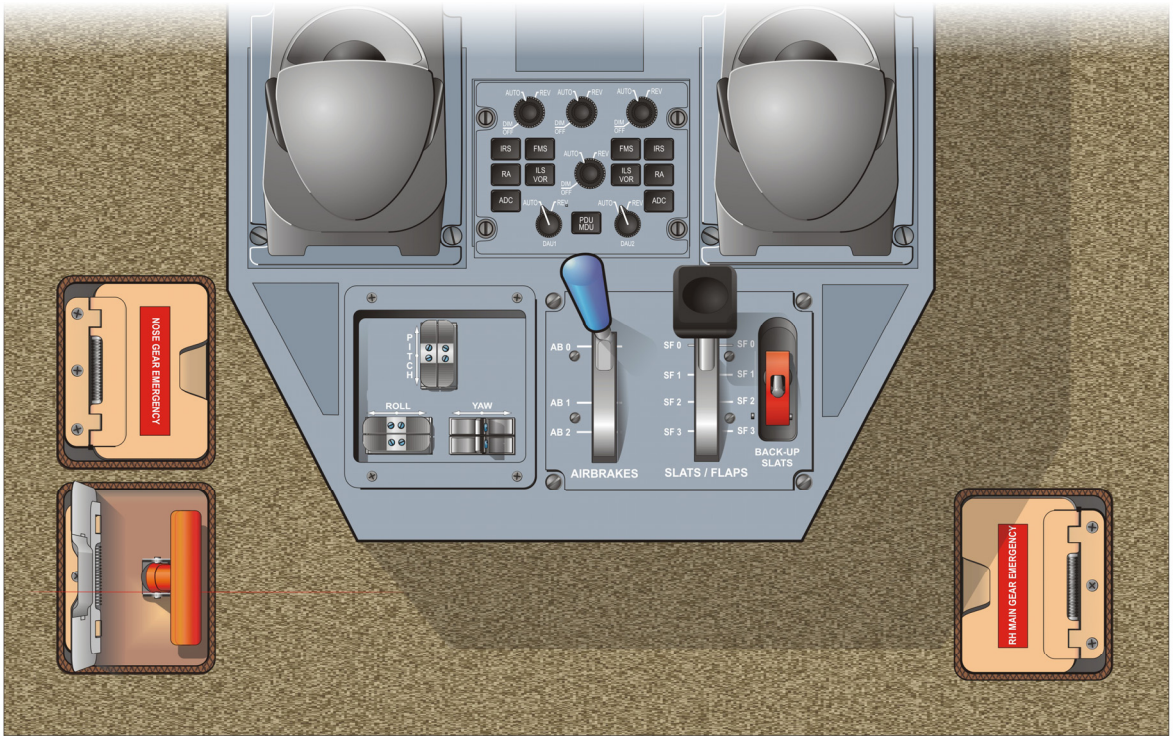


FIGURE 02-32_1-20-01 - EMERGENCY GEAR HANDLES

The three emergency operation landing gear handles:

- Are located on both sides of the pedestal,
- Each one being dedicated to one gear,
- Command the unlocking of the associated door, to allow gear free fall extension.

INDICATIONS

Indications related to the gears are displayed:

- On the right hand corner of the HSI, on the PDU for landing gear status
- On the ENG-CAS window for white configuration CAS messages,
- On speed placard markings in front of each pilot for the gear extension and operation limitations,
- On the ENG-CAS window for CAS messages,
- On the STATus synoptic / FAULT tab for fault messages.

Additionally, the landing gear system features a dedicated aural alert "GEAR", related to the landing gear Handle position. This configuration aural alert is in supplement to aural alerts triggered by the EGPWS.

➢ *Refer to ATA 34 for a description of GEAR aural alerts triggered by the EGPWS system.*

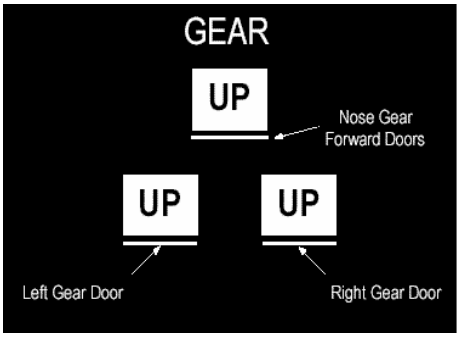
PDU INDICATION

Landing gear position status:

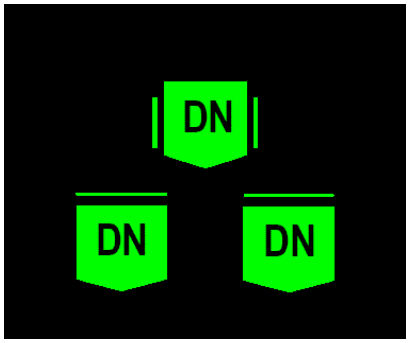
- Is displayed on both PDU, in the upper RH side of the HSI window, below FL180,
- Indicates UP, DowN or in transit status.

FIGURE 02-32_1-20-02 - GEAR INDICATIONS IN THE HSI WINDOW

Gear display in normal configuration



Gear Up, Doors Closed less than 10 seconds

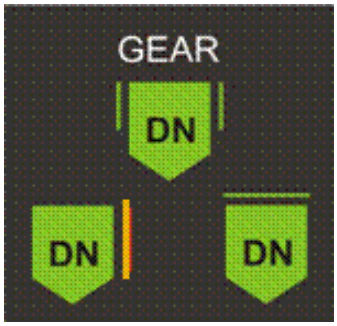


Gear Down, Main Landing Doors Closed

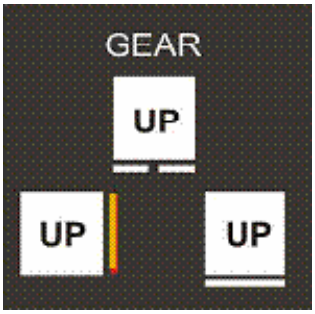
Gear Up, Doors Closed after 10 seconds below 18,500 ft

Gear Up, Doors Closed after 10 seconds above 18,500 ft

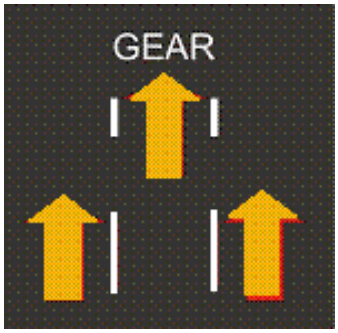
Gear display in abnormal configuration



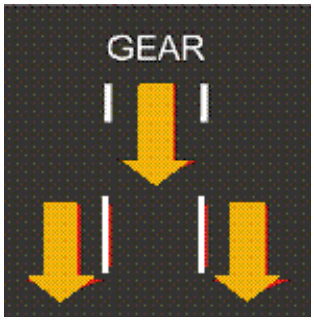
Gears down and locked
Left main gear door not uplocked



Gears up and locked
Left main gear door not uplocked



Gear UP command for more than 28s, but gear not uplocked, associated with **GEAR: RETRACT FAIL** CAS message



Gear DOWN command for more than 28s, but gear not downlocked, associated with **GEAR: EXTEND FAULT** CAS message

Gears extended with emergency gear handles (main doors remain open)

WHITE CONFIGURATION MESSAGES AND AURAL ALERT GEAR

The system provides following verification of configuration:

- After a take off or go around: if the landing gear handle is still selected DOWN 30 s after take off or 30 s after the go around pushbutton was triggered, the message **CONF: GEAR NOT UP** is displayed,
- During approach: below 1,200ft, if the landing gear handle is not selected DOWN, the message **LDG CONF: GEAR NOT DOWN** is displayed.
- For final configuration: below 400 ft (RA), if the landing gear handle is not selected DOWN, an aural alert "GEAR" is triggered, which can not be reset by the crew.

NOTE

In case of landing gear extension failure, the aural alert "GEAR" will also be triggered, but it will be automatically inhibited while passing below 100ft (RA).

PLACARD MARKINGS

The "SPEED LIMITATIONS" placard reminds the speed limitations for VLO and VLE.

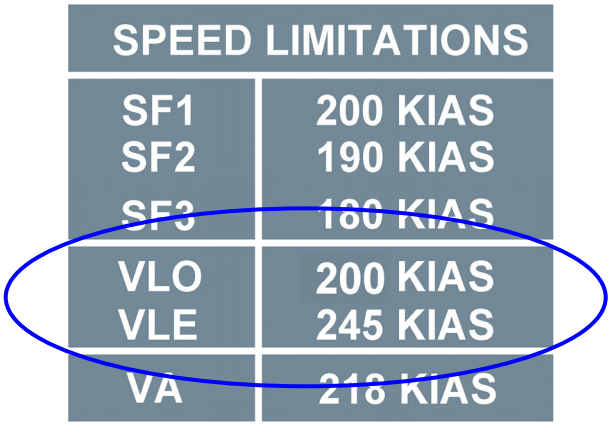


FIGURE 02-32_1-20-03 - SPEED LIMITATIONS PLACARD MARKINGS

No supplementary information to be provided on Controls and Indications at present time.

SYSTEM MONITORING

Following parameters are monitored:

- Position of the Landing Gear and Doors compared to Landing Gear Handle position,
- Continuous testing of the validity of LGSCU channels, even in cruise.

➢ *Refer to CODDE 2 for a complete list of CAS messages.*

ACTIVE PROTECTIONS

In case of failure of the active channel of the LGSCU, the stand by channel will automatically take over the control.

STRUCTURAL PROTECTIONS

The main landing gear is attached to the airplane via fuse pins that are designed to prevent damages to the wing fuel tanks in case of excessive hard landing and exit of runaway.

Two cams located in the shock absorber centre the nose wheels when the shock absorber is extended avoiding interferences during gear retraction.

No supplementary information to be provided on System Protections at present time.

Landing gear system does not require any ground operation.

INTRODUCTION

Each nose and main landing gear features twin wheels with tubeless radial tires.

Each main landing gear wheel is fitted with carbon brakes. An anti skid system maintains optimal stopping performances.

The braking system is:

- Electrically controlled,
- Hydraulically actuated.

There is no optional equipment associated with the braking and Tire Pressure Monitoring Systems (TPMS).

FLIGHT DECK OVERVIEW

CONTROLS

Crew control of the braking system is performed via:

- Pedals,
- The parking brake handle also referred to as "Emergency Brake".

INDICATIONS

Cockpit indications related to wheels and braking system are displayed:

- On the WHEELS page (tire pressure and brake temperature) accessible through the HYDraulic synoptic page,
- On the SERVICING page accessible through TEST synoptic for tire pressure and park brake accumulator pressure
- On the ENG-CAS window for CAS messages,
- On the STATus synoptic / FAULT tab for fault messages.

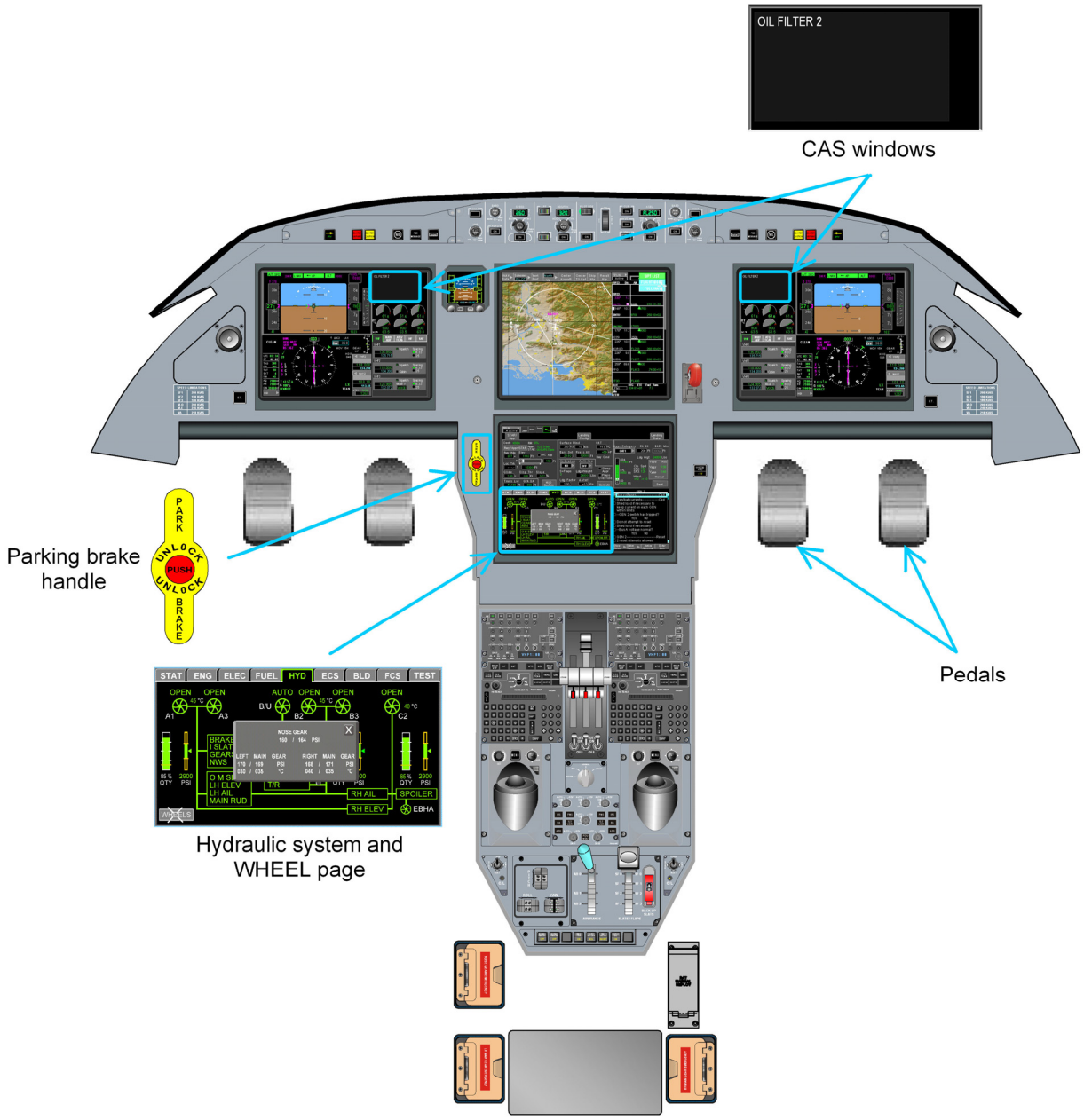


FIGURE 02-35_2-05-00 - FLIGHT DECK OVERVIEW

GENERAL

Each main landing gear is fitted with two multi-disks carbon brakes (one on each wheel).

The braking system provides:

- Airplane braking with a deceleration rate based on pedal deflexion,
- Anti skid protection (disabled below 10 Kt wheels speed),
- Directional control via differential braking,
- Spin down of main wheels at landing gear retraction,
- Touch down protection,
- Contribution to the automatic extension of airbrakes
- Parking brake,
- Emergency braking.

Control of the braking system is performed by a dual channel computer named Brake Control Unit (BCU). Each channel is named an "Electronic Brake Control Module" (EBCM).

Each brake is fitted with two sets of pistons powered by two separate hydraulic systems.

Hydraulic A and B are used for the normal braking systems, hydraulic B for the park / emergency brake system.

BRAKING SYSTEM CONTROL

PRINCIPLE DIAGRAM

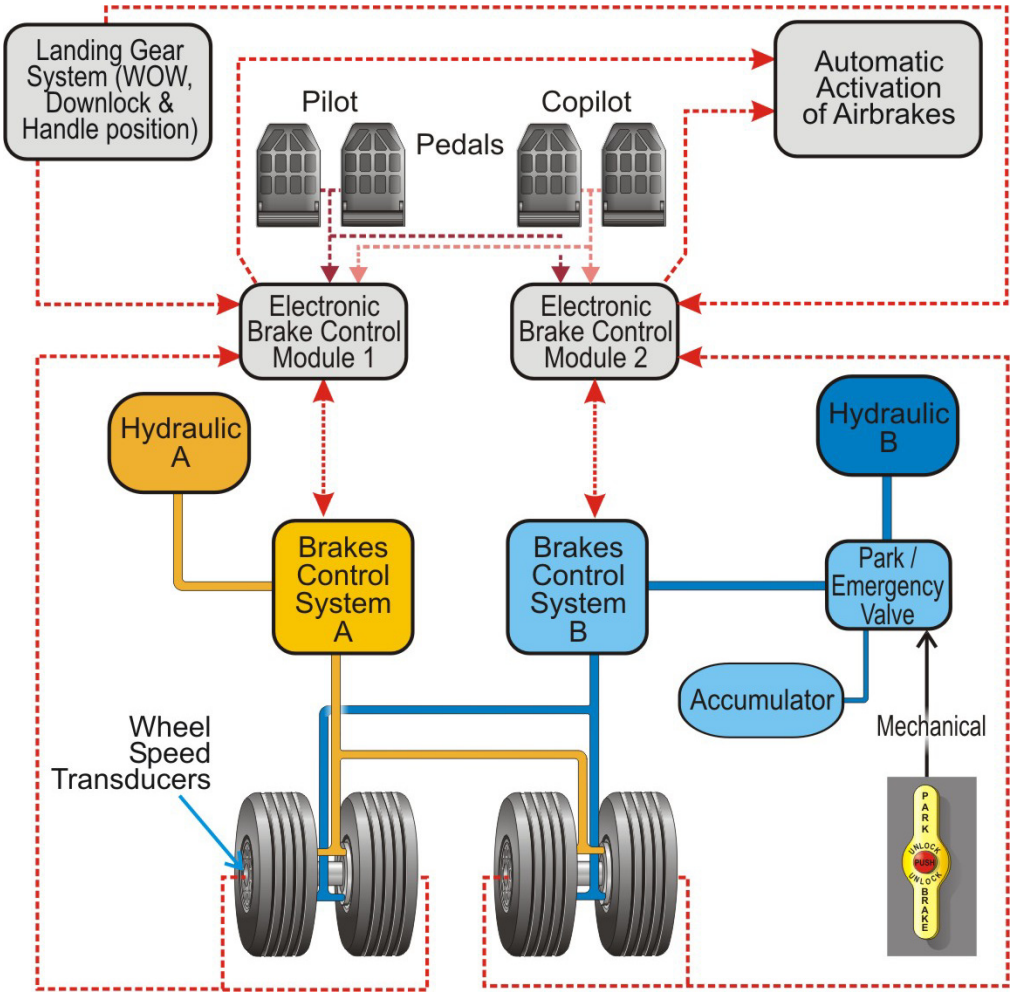


FIGURE 02-32_2-10-00 - BRAKE SYSTEM - PRINCIPLE DIAGRAM

NORMAL BRAKING OPERATION

During normal operation, control of the braking system is performed:

- By the dual channel Brake Control Unit,
- Which commands hydraulic power to be provided through brake shut off valves,
- To the brake control valves.

Hydraulic pressure is modulated according to:

- Brake pedal position,
- Anti skid protection.

Hydraulic A is used by brake system 1, while hydraulic B is used by brake system 2.

In case of dual hydraulic system failure, the braking action on pedals remains possible with antiskid using only pressure of park / emergency brake accumulator. Braking action is limited to park / emergency brake accumulator capacity.

The BCU features a deceleration control function when the antiskid is not active. Deceleration is then based on pedal deflection.

➢ *Refer to "Description - Supplementary information" section for additional information on the brake deceleration law.*

EMERGENCY BRAKING OPERATION

Parking brake and emergency braking is performed:

- By using the park brake handle,
- The handle and associated cable acts on the park / emergency braking valve.

In this case, hydraulic power is provided by hydraulic B or an accumulator in the even of complete loss of normal hydraulic system B.

When a CAS message indicates that accumulator pressure is low, park brake system can provide six braking actions. However, if this message is displayed when the airplane is parked, only two braking actions are available.

NOTE

Emergency braking is performed without Anti-Skid protection and without differential braking

AUTOMATIC FUNCTIONS OF THE BRAKING SYSTEM

Beside the wheel braking function, the BCU provides the following functions:

- Spin down of main wheels at landing gear retraction,
- Triggering of airbrake automatic extension upon landing or during a rejected take off.

➢ *Refer to ATA 27_4 Airbrakes for a description of airbrake automatic extension function.*

BRAKING CONTROL UNIT

The BCU is dual channel:

- Each channel is named "Electronic Brake Control Module": EBCM,
- Both channels operate simultaneously from independent electrical and hydraulic systems,
- EBCM 1 controls brake system 1 which uses hydraulic A,
- EBCM 2 controls brake system 2 which uses hydraulic B or park brake accumulator.

DESIGN PRINCIPLES

The braking system was designed with the following design principles:

- With regard to architecture:
  - The dual channel control computer allows using normal braking even after the loss of one electrical bus or computer channel,
  - In case of dual hydraulic system failure, the braking system is still controlled by one of the EBCM, using park / emergency brake accumulator,
  - In case of dual electrical system failure, the braking system is controlled by the park / emergency brake, by pulling the park / emergency brake handle,
  - The tire pressure indicating system will ease preflight and maintenance with regard to tire pressure measurement.
- With regard to efficiency:
  - Antiskid system controls wheels skids and prevents wheels lockups.
- With regard to safety:
  - In case of total hydraulic power loss a brake accumulator can provide hydraulic pressure for at least six emergency brake actions,
  - Three fusible plugs on each main wheel allow the release of tire pressure in case of a high energy stop, to prevent from rim release,
  - Hydraulic fuses are used in the main brake hydraulic lines to limit fluid loss.

EQUIPMENT LOCATION

The BCU equipment is located in the underfloor.

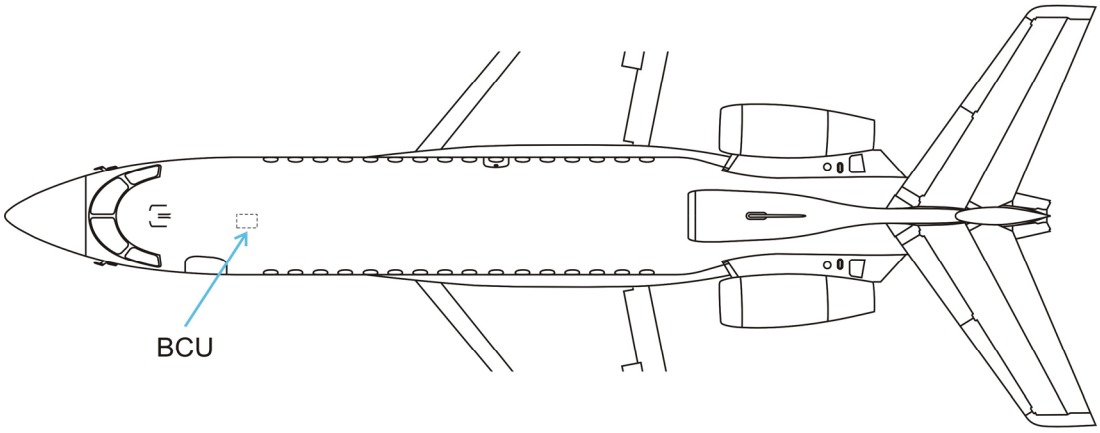


FIGURE 02-32_2-15-00 - BRAKE CONTROL UNIT

ELECTRICAL POWER SOURCES

The following paragraph describes the power supply of the different equipment of the braking system.

Electrical protection is provided:

- Either by Solid State Power Controllers (SSPC) ,
- Or by Circuit Breakers (CB).

➢ *Refer to ATA 24 – ELECTRICAL POWER for additional information.*

EQUIPMENT	POWER SUPPLY	TYPE OF PROTECTION
EBCM 1	- LH essential bus	CB
EBCM 2	- RH essential bus	CB

BRAKING SYSTEM CONTROL - DETAILED DESCRIPTION

GENERAL

The following figure shows the different hydraulic components involved in the Braking system:

- Hydraulic shut off valves,
- Brake control valves,
- Hydraulic fuses,
- Pressure transducers,
- Park / emergency valve and accumulator.

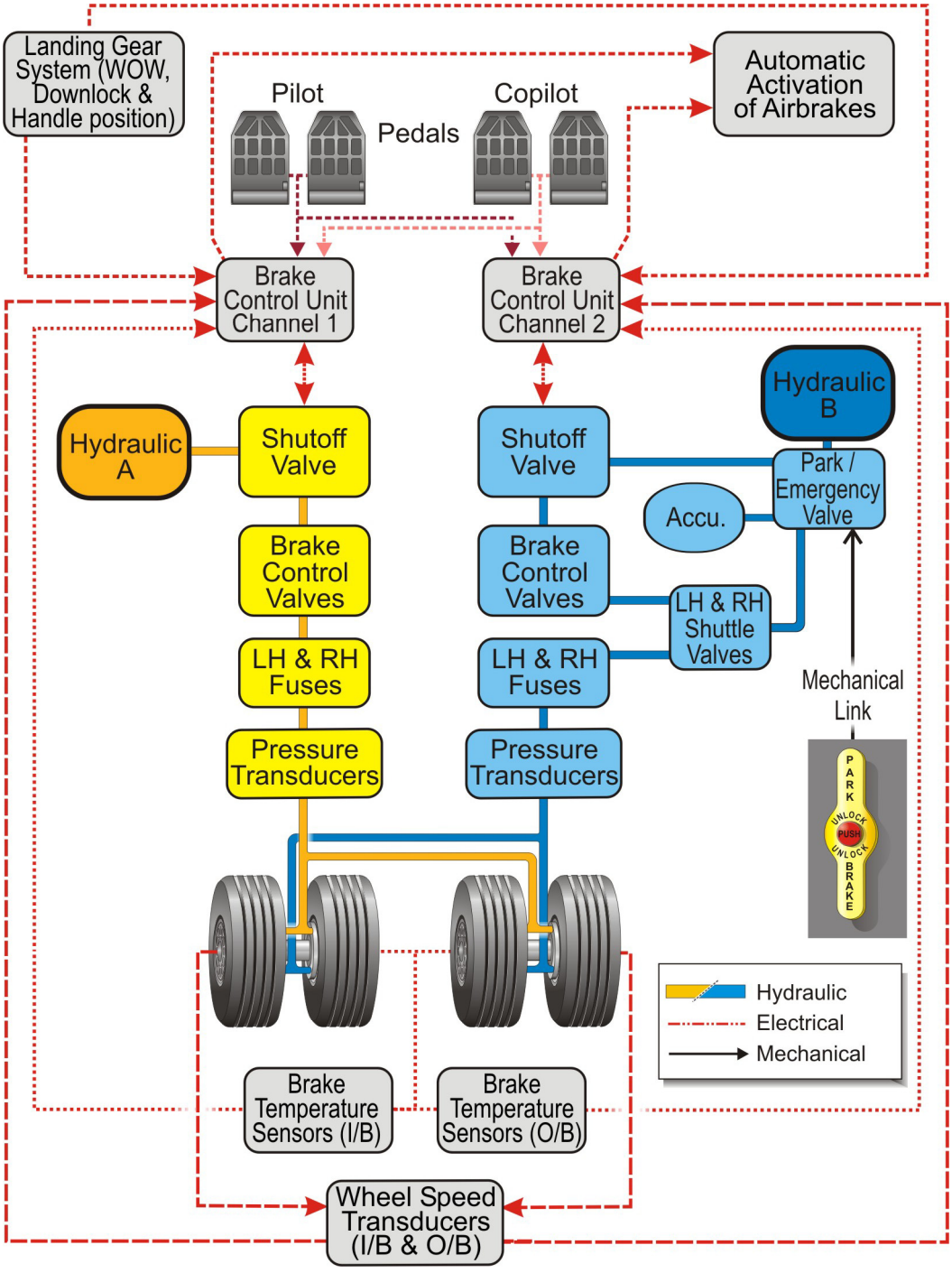


FIGURE 02-32_2-15-01 BRAKING SYSTEM - DETAILED PRINCIPLE DIAGRAM

NORMAL WHEEL BRAKING OPERATION

When the antiskid not active, the BCU commands a deceleration based on pedals deflection.

Reference deceleration is the airplane deceleration, based on wheels speed.

Effect of wheel braking system is only one of the contributor to this deceleration with Airbrakes and spoilers, and thrust reverser.

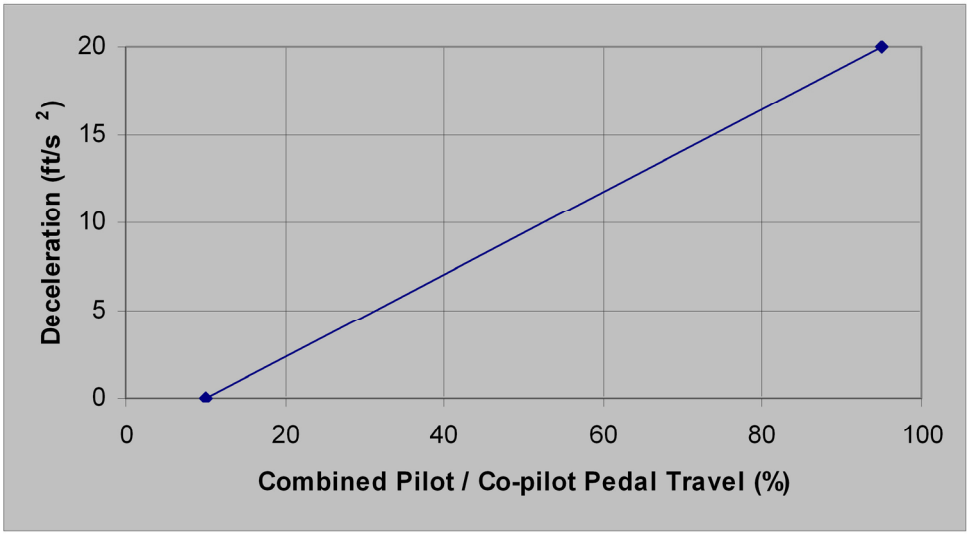


FIGURE 02-32_2-15-02 DECELERATION CONTROL VERSUS PEDAL DEFLECTION

CONTROLS

Crew control of braking system is performed via:

- Park / emergency brake handle at parking,
- Pedals for normal wheel braking,
- Park / emergency Brake handle when normal braking is lost.

PEDALS

FIGURE 02-32_2-20-00 - PEDALS

Pedals are not mechanically linked for braking action.

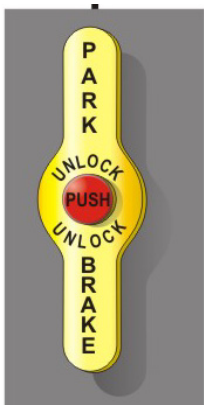
There is one pedal position transducer for each left and right seat pedals

Braking becomes efficient only for a pedal deflection greater than 8% of full possible displacement.

Left pilot and right pilot pedal deflections are cumulative:

- Below 8% pedal deflection for each pilot: no addition of pilots inputs;
- Above 8% pedal deflection for both pilots: effect of both pilots commands is cumulative.

PARK BRAKE HANDLE

CONTROL	FUNCTION	TO ACTIVATE TO DEACTIVATE
	Mechanically activates braking through hydraulic system B or accumulator First detent: for parking and emergency braking Second detent for one engine run-up **NOTE** Chocks must be used for run-up with more than one engine.	To set to first detent: pull the handle to the stop, To set to second detent: push the unlock button and pull the handle fully.

INDICATIONS

Cockpit indications related to Wheels and Braking system are displayed:

- On the WHEELS page (Tire pressure and Brake temperature) accessible through the HYDraulic synoptic page,
- On the SERVICING page accessible through TEST synoptic page, for Tire pressure and park / emergency brake accumulator pressure,
- On the ENG-CAS window for CAS messages,
- On the STATus synoptic / FAULT MSGS tab for fault messages.

WHEEL DIALOG BOX

Brake temperatures and tire pressure are displayed in WHEELS dialog box selectable through the HYDraulic synoptic page.

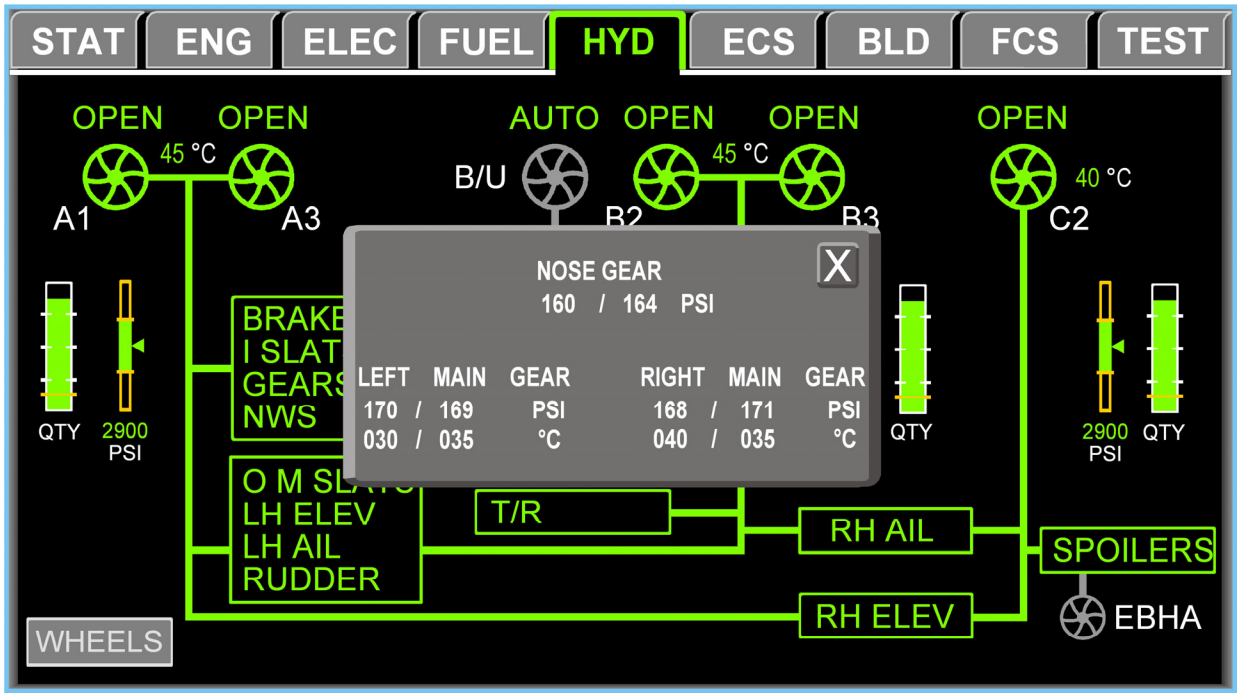


FIGURE 02-32_2-20-01 - WHEELS DIALOG BOX IN HYDRAULICS SYNOPTIC PAGE

The following information is provided:

- Nose gear:
  - Tire pressures,
- Main gears:
  - First line corresponds to tire pressures,
  - Second line corresponds to brake temperature,

Data is provided in a similar arrangement to wheels layout, from left to right:

- LH outboard wheel for the left main gear,
- LH inboard wheel for the left main gear,
- RH inboard wheel for the right main gear,
- RH outboard wheel for the right main gear.

SERVICING PAGE

The SERVICING page is accessible through the TEST synoptic page. It provides tire pressure and park / emergency brake accumulator pressure.

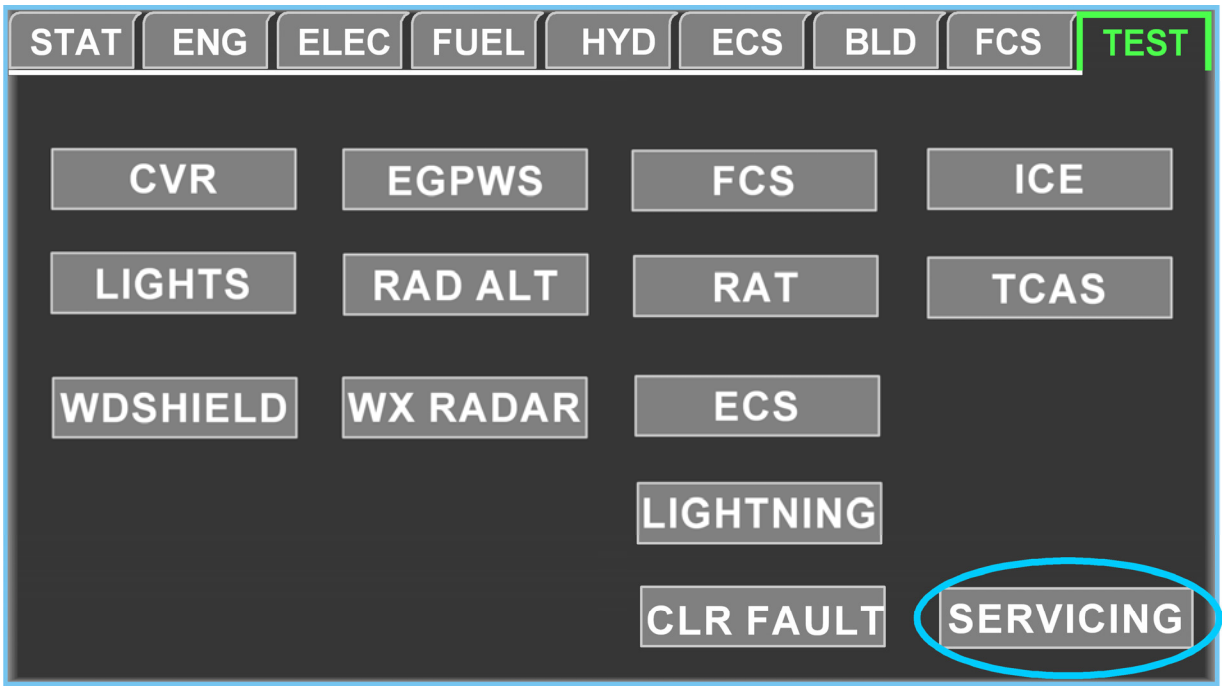


FIGURE 02-32_2-20-02 - TEST SYNOPTIQUE

TIRE PRESSURE INDICATION

The Tire Pressure Indicating System (TPIS) is a standalone system using wireless technology to transfer the tire pressure information from the pressure sensor mounted on the wheel to the axle-mounted equipment.

The main components of the TPIS are:

- A pressure sensor holder, mounted on each wheel, which allows the pressure sensor to be plugged on the wheel.
- A rotating pressure sensor assembly, mounted on each wheel, and connected to the pressure sensor holder: it allows pressure measurement, signal elaboration and transmission via a rotating antenna.
- A static interface unit, mounted in each gear axle. It is a static antenna which interfaces between Rotating Pressure Sensor Assembly (RPSA) and the Tire Pressure Monitoring Unit (TPMU). The SIU is combined with wheel speed transducer for the main landing gear (CWSIU).
- A tire pressure sensor monitoring unit, mounted in the nose cone, which provides remote power to RPSA via the SIU, receives information from the RPSA via the SIU, processes data and transmits to the avionics MAU 2.

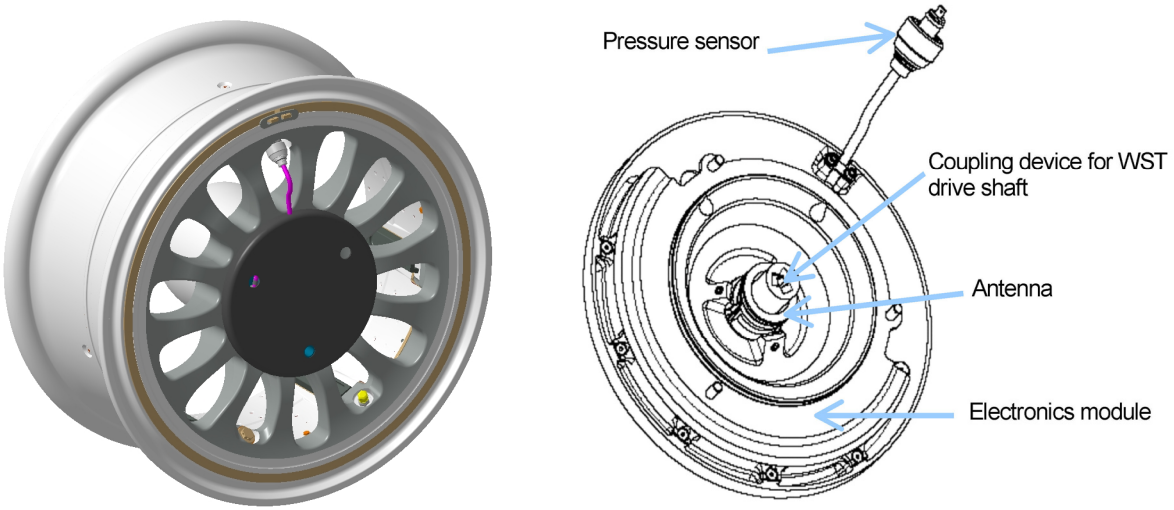


FIGURE 02-32_2-25-00 - MAIN ROTATING PRESSURE SENSOR ASSEMBLY

SYSTEM MONITORING

The following parameters are monitored:

- Continuous testing of the validity of BCU channels, and brake valves and sensors even in cruise,
- Monitoring of wheel speed transducers at landing gear extension,
- Monitoring of asymmetrical pressure in the system,
- Monitoring of residual pressure in the system when no braking is commanded,
- Validity of brake pedal transducers,
- Brake temperatures,
- Pressure in the park brake accumulator,
- Tire pressures,
- Integrity of the tire pressure indicating system.
- Integrity of data inputs.

➢ *Refer to "CONTROLS and INDICATIONS" section for a description of associated indications and to CODDE 2 for a complete list of CAS messages.*

ACTIVE PROTECTIONS

ANTI SKID SYSTEM

While optimizing braking performance, the anti skid system provides protection against:

- Significant tire skidding,
- Locked wheels.

TOUCH DOWN PROTECTION

Even if pilot depresses the brake pedals, hydraulic pressure is not allowed in the brakes until either one wheel on each strut has spun up or weight on wheel switches indicate ground.

TIRE BURST PROTECTION

Three fusible plugs on each main wheel allow the release of tire pressure in case of a high energy stop, to prevent from rim release.

On the wheel, one pressure release plug also provides tire pressure release in case of excessive pressure due to over-inflation of the tire.

HYDRAULIC LEAK PROTECTION

Four hydraulic fuses in the main brake hydraulic lines limit fluid loss in the event of a rupture and leak in that line.

No supplementary information to be provided on System Protections at present time.

TIRE PRESSURE AND PARK / EMERGENCY BRAKE ACCUMULATOR PRESSURE

Tire pressure and park /emergency brake accumulator pressure are provided in the SERVICING page.

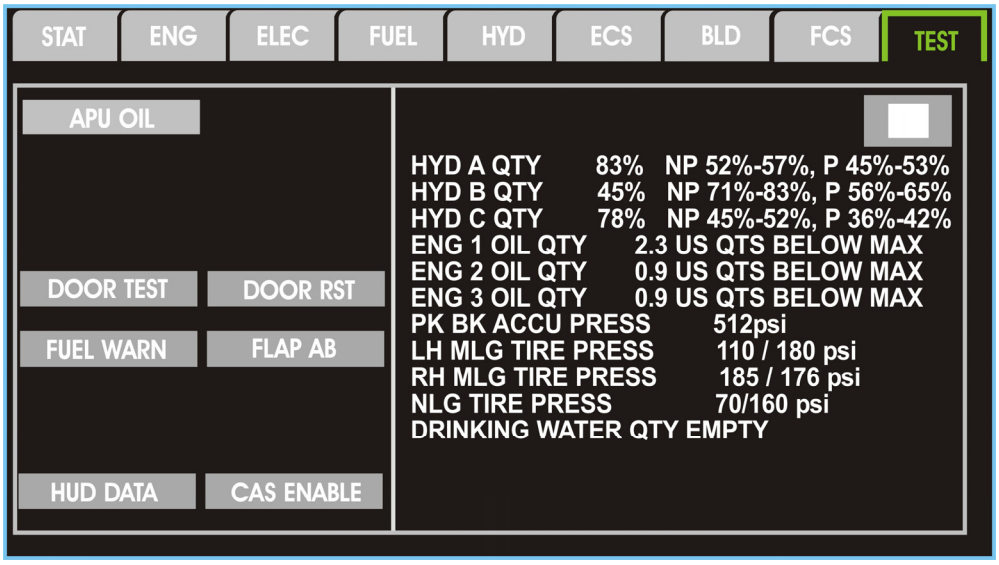


FIGURE 02-32_2-40-00 - SERVICING PAGE

➢ *Refer to Controls and Indications section for additional information.*

BRAKE WEAR

Each brake is fitted with two wear indicator pins which provide a visual mean of determining brake wear.

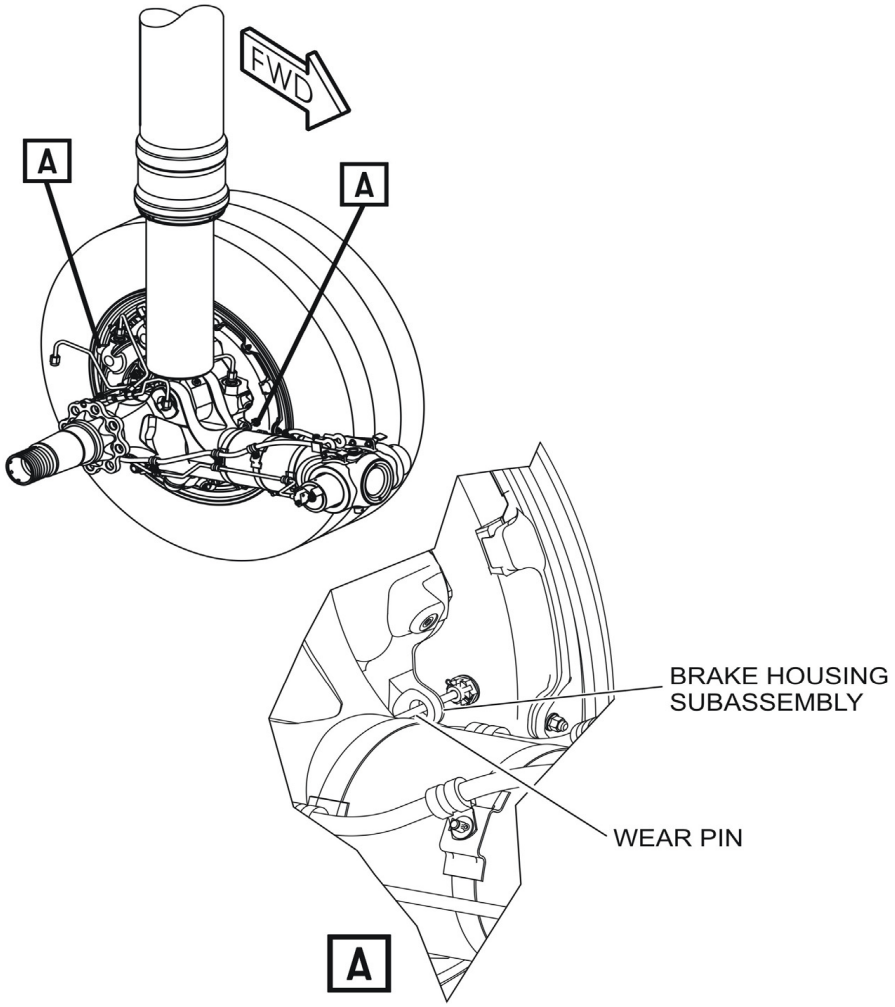


FIGURE 02-32_2-40-01 - BRAKE WEAR

INTRODUCTION

A Nose Wheel Steering (NWS) system provides:

- Directional control of nose wheel for taxi, take-off and landing, when rudder efficiency is insufficient,
- Shimmy damping (dynamic stability of the Nose Landing Gear).

Nose wheel Steering is:

- Electrically controlled,
- Hydraulically actuated.

FLIGHT DECK OVERVIEW

CONTROLS

Crew control of the steering system is performed via:

- Rudder pedals,
- A Nose Wheel Steering (NWS) disarm pushbutton on the Overhead Panel.

INDICATIONS

Cockpit indications related to the Nose Wheel Steering system are displayed:

- On the ENG-CAS window for CAS messages,
- On the STATus synoptic / FAULT tab for fault messages.

No indication related to the Nose Wheel Steering System is available on synoptic pages.

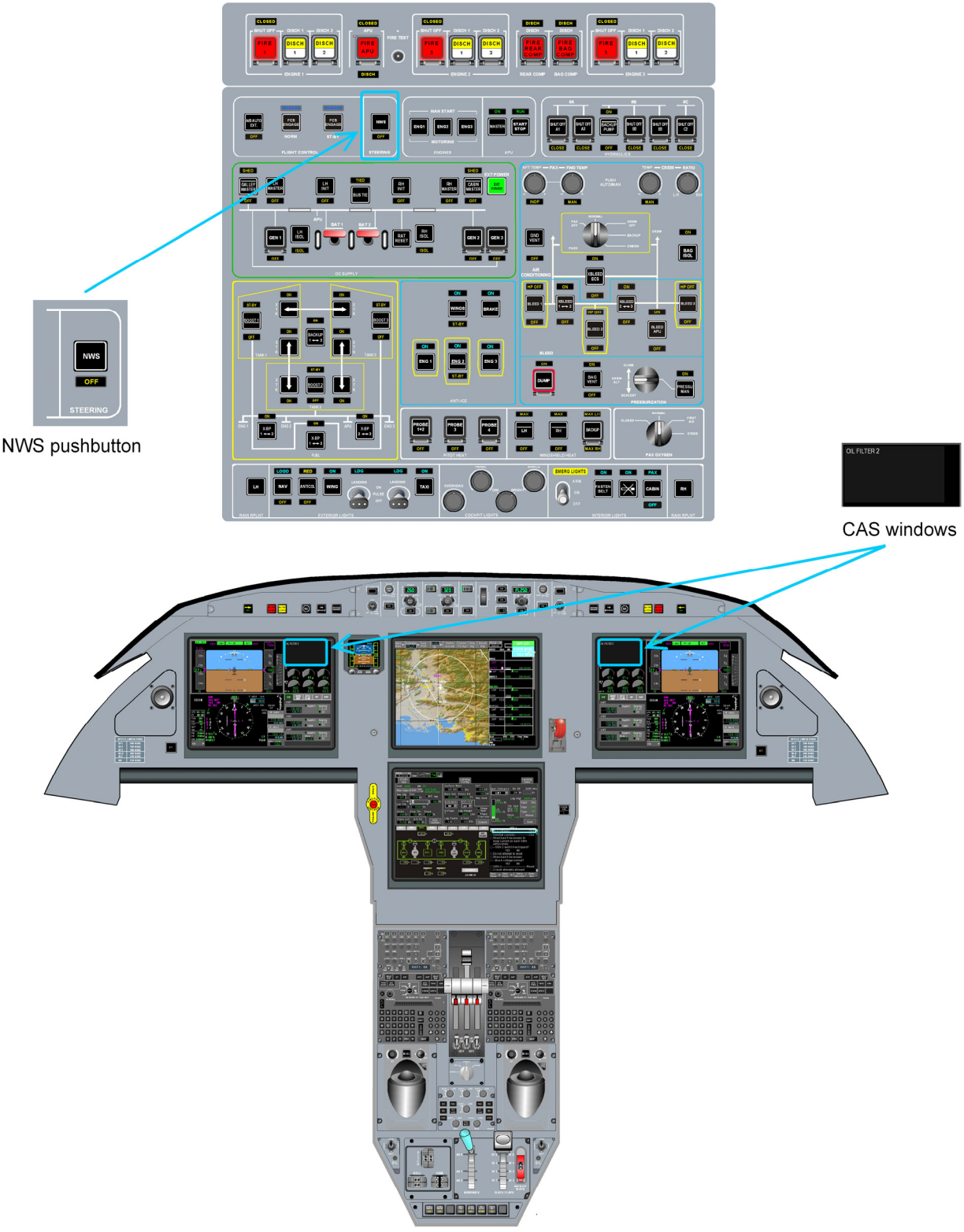


FIGURE 02-32_3-05-00 - FLIGHT DECK OVERVIEW

GENERAL

The Nose Wheel Steering system performs following function:

- Steering of the nose wheels:
  - On ground, based on pedals position and airplane speed,
  - In the air, to maintain a zero angle command.
- Shimmy damping when steering is disarmed or inoperative.

With regard to Steering, the nose landing gear is fitted with the following main components:

- Two steering actuators,
- A turning tube,
- An upper and lower torque links between the turning tube and the nose wheels.
- Hydraulic A is used for Nose Wheel Steering.

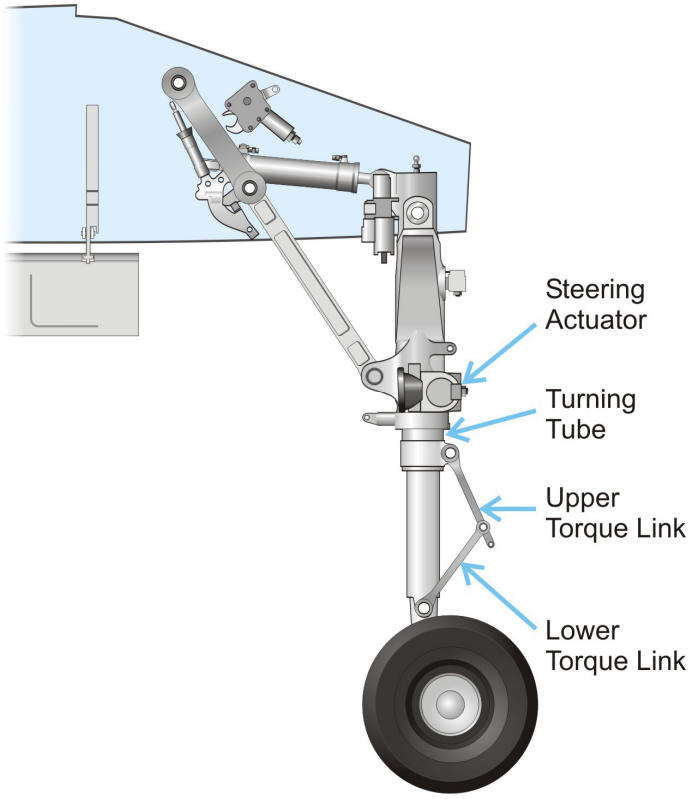


FIGURE 02-32_3-10-00 - NOSE WHEEL STEERING SYSTEM - LH SIDEVIEW

Control of the Nose Wheel Steering system is performed by the dual channel landing gear and steering control unit (LGSCU).

➢ *Refer to ATA 32_1 for the Landing Gear Control Function of the LGSCU.*

NOSE WHEEL STEERING CONTROL

Pilots steering commands are made via transducers mounted on the pedals, one on each side. The rudder pedals are mechanically linked, therefore the transducers provide the same inputs to the LGSCU.

The LGSCU:

- Provides electrical commands such that hydraulic power is provided through the steering servo valve,
- To the steering actuators.

Steering commands depend on pedals command and airplane speed:

- Maximum steering angle (60°) is provided at low speed ,
- At higher speeds, the available steering angle is reduced in order to provide a smooth transition of directional control from the NWS to the rudder flight control.

In case airplane speed is not available, maximum steering authority is limited to 5°.

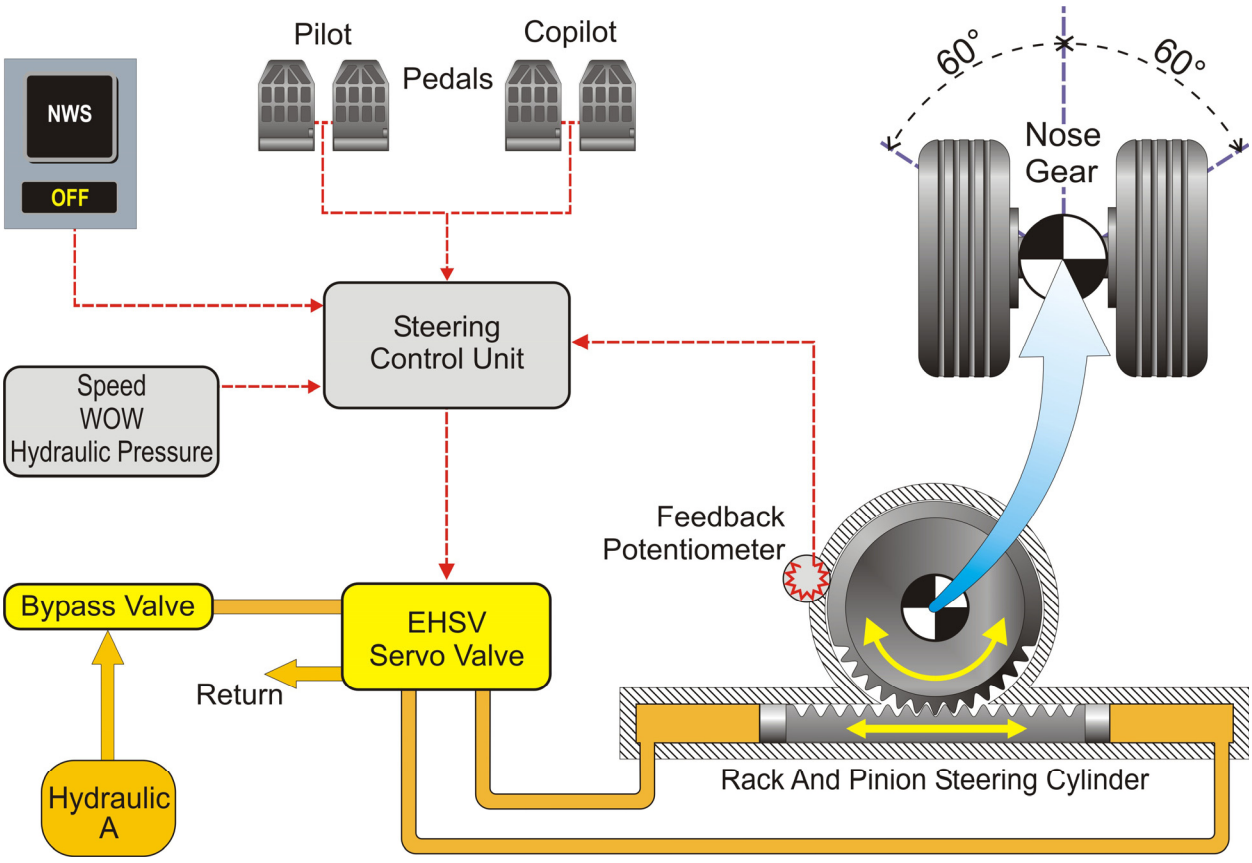


FIGURE 02-32_3-10-01 - NOSEWHEEL STEERING SYSTEM - PRINCIPLE DIAGRAM

In the air mode, the nose wheels are maintained in a centered position. The nose landing gear also incorporates mechanical centering cams to ensure that the nose wheel is centered when the shock strut is extended.

In case of failure, the NWS can be deactivated using the NWS pushbutton of the overhead panel.

When hydraulic pressure is removed from the steering, for example if the steering is disarmed or inoperative, shimmy damping is provided by the steering system.

LANDING GEAR AND STEERING CONTROL UNIT

The LGSCU is dual channel:

- One channel is the active channel (in control),
- The other channel is in stand by.

The stand by channel performs the same functions as the active channel. If the active channel fails, the stand by channel automatically takes over the control. This transfer is performed without any pilot action.

The active channel is the first channel powered. The active and stand by channel alternate during the flight, after gear retraction.

DESIGN PRINCIPLES

The Nose Wheel Steering system was designed with the following design principles.

WITH REGARD TO TECHNOLOGY

Since operation is electrically controlled, cinematic command linkage is eliminated allowing system simplification and a weight decrease.

WITH REGARD TO ARCHITECTURE

The dual channel control computer allows maintaining an operational steering even after the loss of one electrical bus or computer channel.

A steering angle authority of 5° is maintained even if airplane speed reference is lost.

WITH REGARD TO SAFETY

Shimmy damping is maintained even after hydraulic failure.

EQUIPMENTS LOCATION

The LGSCU is located in the underfloor

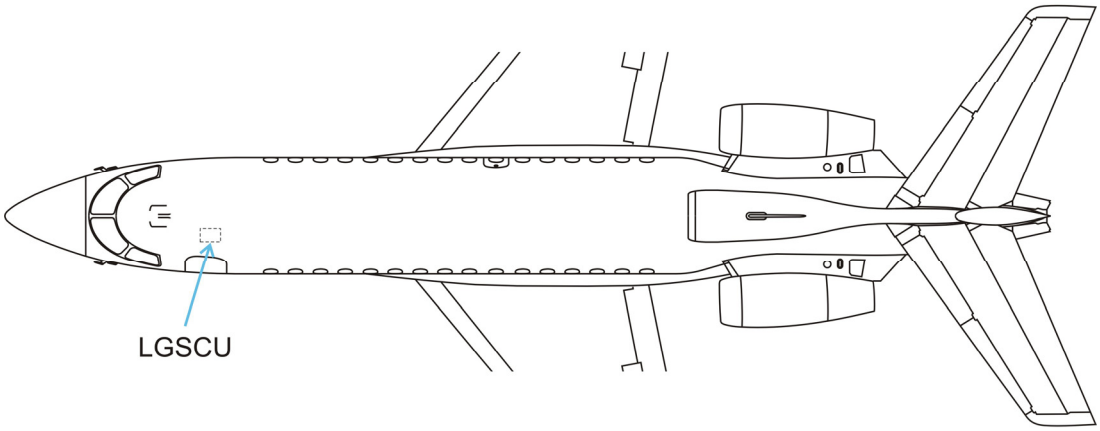


FIGURE 02-32_2-15-00 - LANDING GEAR AND STEERING CONTROL MODULE (LGCU)

ELECTRICAL POWER SOURCES

The following paragraph describes the power supply of the different equipment of the Nose Wheel Steering system.

Electrical protection is provided:

- Either by Solid State Power Controllers (SSPC) ,
- Or by Circuit Breakers (CB).

➢ *Refer to ATA 24 – ELECTRICAL POWER for additional information.*

EQUIPMENT	POWER SUPPLY	TYPE OF PROTECTION
LGSCU channel 1	LH and RH essential buses	CB
LGSCU channel 2	LH and RH main buses	CB

NOSE WHEEL STEERING CONTROL - DETAILED DESCRIPTION

AIRPLANE SPEED

Airplane speed used by the steering system is the anti skid reference speed, provided to the LGSCU by the Braking Control Unit.

NOSE WHEEL STEERING AUTHORITY

Following figure shows that, for a maximum command on pedals, the Nose Wheel steering angle:

- Is maximum (60°) up to 10 kt,
- Decreases from 60° to 8° between 10 and 30 kt,
- Decreases slightly from 8° to 2° between 30 and 120 kt.

In this figure, "Maximum" means that the pilot commands maximum deflection on the pedals.

NOSEWHEEL ANGLE VS PEDAL COMMAND

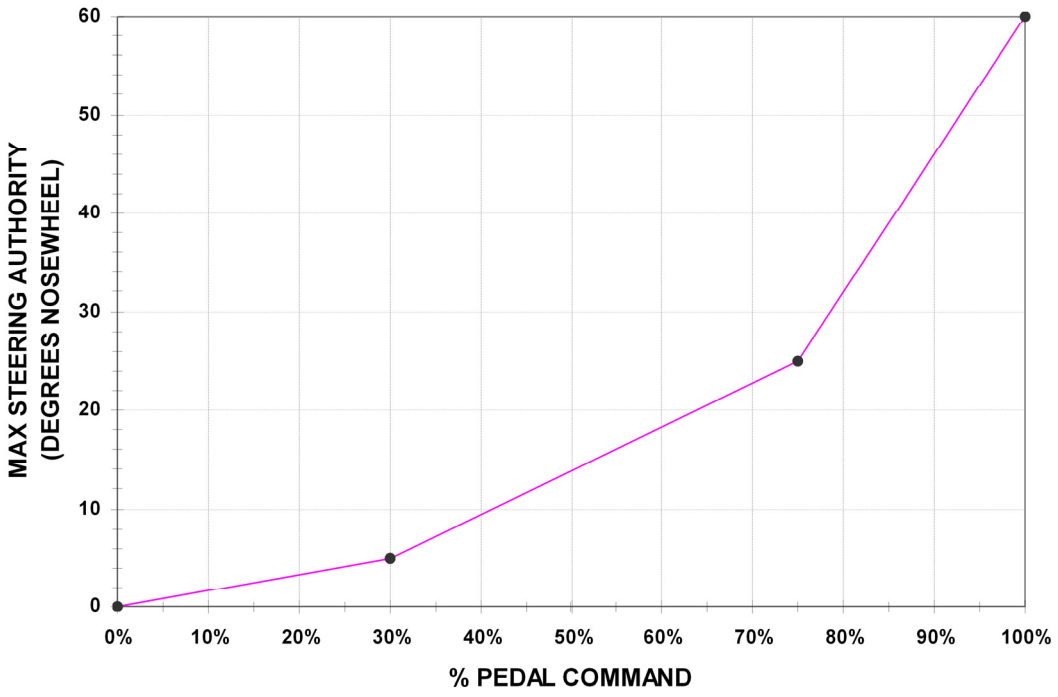


FIGURE 02-32_3-15-00 -MAXIMUM NOSE WHEEL ANGLE DEPENDING ON AIRPLANE SPEED

Following figure shows that, between 0 and 10 kt, the steering angle will depend on pilot command on pedals:

- 50% pedal deflection will only provide an angle of 8°,
- The angle will then increase form 8° to 60° for rudder deflection between 50% and 100%.

In this figure, the airplane speed is considered to be between 0 and 10kt. At higher speed, steering angle is reduced (refer to previous figure).

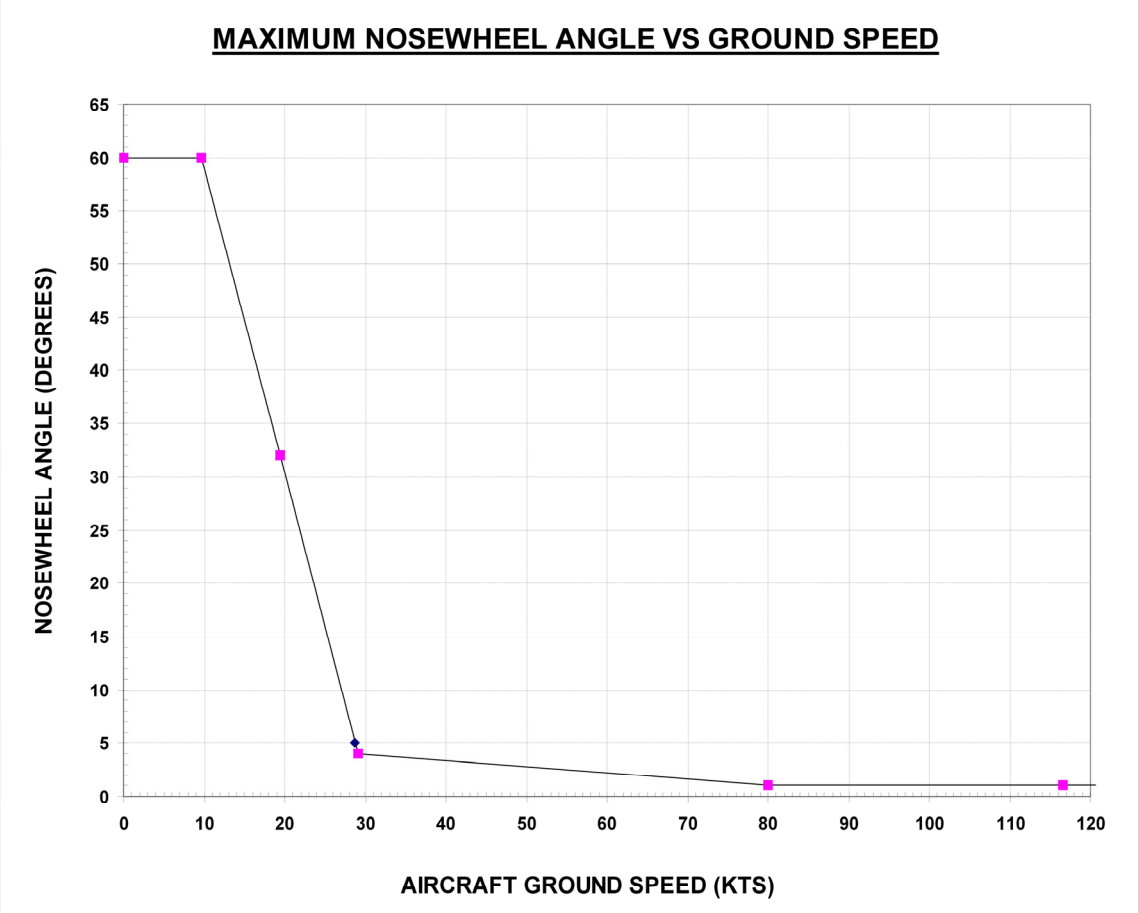


FIGURE 02-32_3-15-01 - MAXIMUM NOSE WHEEL ANGLE DEPENDING ON PEDALS DEFLECTION

SHIMMY DAMPING

When hydraulic pressure is removed from the steering, for example if the steering is disarmed or inoperative:

- Both steering actuators are connected together hydraulically via a steering compensator,
- A small pressure is maintained at the level of the actuators.
- The resulting increase in nose wheel steering stiffness provides effective shimmy damping of the Nose Wheels.

CONTROLS

The crew control of steering system is performed via:

- Pedals which are mechanically linked to each other,
- A Nose Wheel Steering disarm switch on the Overhead Panel, to disable the Nose Wheel Steering.

PEDALS

FIGURE 02-32_3-20-00 PEDALS

Pedals on the LH and RH side are mechanically linked.

LH pilot / RH pilot steering commands are made via rudder pedal transducers mounted on the LH / RH rudder pedals, one on each side. The rudder pedals are mechanically linked; therefore the transducers provide the same inputs to the SCU.

NOSE WHEEL STEERING DISARM SWITCH

CONTROL	FUNCTION	TO ACTIVATE TO DEACTIVATE
	NWS pushbutton when pressed deactivates NWS system	Unlighted on 
		OFF 

INDICATIONS

No indication related to the Nose Wheel Steering System is available on synoptic pages.

Cockpit indications related to the Nose Wheel Steering system are displayed:

- On the ENG-CAS window for CAS messages,
- On the STATus synoptic / FAULT tab for fault messages.

No supplementary information to be provided on Controls and Indications at present time.

SYSTEM MONITORING

Following parameters are monitored:

- Power-up and continuous monitoring of internal LGSCU functions,
- Steering selector / by-pass valve,
- Rudder pedal RVDT,
- Position feedback RVDT,
- Electro-hydraulic servo-valve,
- Pressure switch,
- Availability of ARINC buses.

➢ *Refer to CODDE 2 for a complete list of CAS messages.*

ACTIVE PROTECTIONS

NOSE WHEELS CENTERING

During take off when the "air mode" is established, the LGSCU replaces command signal by a straight-ahead reference signal, thus ensuring that the nose wheels maintain a centered position before retraction, to prevent any interference.

No supplementary information to be provided on Protections at present time.

Nose Wheel Steering system does not require any ground operation.