



CHALLENGER 350

BD-100-1A10

LANDING GEAR

STUDY GUIDE · CARD SYSTEM

A flashcard-style study reference for the CL350 ATA 32 Landing Gear system. Each card targets one examinable fact — tricycle geometry, normal/MRS extension, proximity sensing, brake architecture, and EICAS messages. Know the numbers before the oral.

ATA 32 · LANDING GEAR

Section LG · Revision: Original

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01

FIVE THINGS YOU MUST KNOW

The five highest-value facts for the oral. Memorize numbers cold.

Left HYD	Normal extension & retraction power source
Right HYD	MRS auxiliary actuators — main gear emergency extension
$\pm 65^\circ / \pm 7^\circ$	NWS authority — handwheel / rudder pedals
28 seconds	PSEU gear transit timeout → GEAR DISAGREE (C)
1,200 psi	PK/EMER BRK PRESS LO caution threshold (accumulator)

TIP Five baseline facts about the landing gear: two hydraulic systems, the proximity sensor unit, and the alternate extension cable. The cards drill each subsystem in detail.



02

SYSTEM ARCHITECTURE · STUDY CARDS

GEAR CONFIGURATION

What type of gear system does the CL350 use?

- Retractable tricycle configuration
- Two MLG assemblies + one steerable NLG
- Each assembly has dual wheels and tires

NORMAL POWER SOURCE

What powers normal gear extension and retraction?

- Left hydraulic system — both normal extension and retraction
- Electrically controlled, hydraulically operated selector valve
- Right system supports MRS only — not normal ops

SEQUENCING UNIT

What component sequences and monitors gear operation?

- Proximity Sensing Electronic Unit (PSEU)
- Processes 'near' and 'far' signals from proximity sensors
- Controls selector valves; outputs to EICAS

KEY COMPONENTS

Name the six primary system elements.

- MLG × 2 (trailing link), NLG × 1 (steerable)
- PSEU (sequence/monitor), Selector valve (E/H operated)
- MRS handle (emergency), BCU (brake management/antiskid)

GEAR DOOR DESIGN

How do main gear doors operate?

- Mechanically linked to MLG — move with gear
- Clad-aluminum alloy construction; nylon brush seal
- Main wheel bins isolate wheels and prevent debris damage

03

MAIN LANDING GEAR - STUDY CARDS

MLG STRUCTURE

Key structural elements of the MLG?

- Main fitting attached to wing structure
- Side brace actuator with internal segmented locking mechanism
- Nitrogen gas/oil shock strut; trailing arm assembly

UPLOCK MECHANISM

How is the MLG uplock released?

- MLG uplock assembly — separate mechanical lock retains gear in retracted position. (Note: the latch-lever / hook-and-roller mechanism described elsewhere is the NLG uplock, not MLG.)
- Released hydraulically during normal extension
- Manual release via MRS cables — cable movement releases lock

DOWNLOCK SYSTEM

How does the MLG downlock work?

- Hydraulically and mechanically engaged
- Internal to the side brace actuator (segmented mechanism)
- Maintained without hydraulic pressure once locked

HEAT PROTECTION

What heat protection is on each main wheel?

- Four fusible plugs per main wheel
- Melt at preset temperature — allow controlled tire deflation
- MLG bay single-loop overheat detection wire per wheel bin

BRAKE WEAR CHECK

How and when are brake wear pins checked?

- Two pins per brake assembly — visual wear indication
- Must check with brakes APPLIED
- Both left and right hydraulic systems must be pressurized



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NOSE LANDING GEAR · STUDY CARDS

NLG STRUCTURE

Key structural elements of the NLG?

- Upper/lower drag braces; N2/oil shock strut; torque links
- Dual wheels with chine tires (deflect water from engines)
- Forward and aft doors; door retraction actuator

NLG UPLOCK

How does the NLG uplock work?

- NLG uplock — latch lever and hook engage a roller; the hook holds the NLG in the retracted position.
- Released during normal extension via hydraulic pressure
- MRS: gravity and spring forces extend NLG — no hydraulics needed

NLG RETRACTION

In which direction does the NLG retract?

- NLG retracts forward
- NLG extends rearward during normal extension
- Restrictor in up hydraulic line controls retraction speed

CHINE TIRES

Why does the NLG use chine tires?

- Deflect water/spray away from engine intakes
- Critical during wet runway takeoff and landing
- No brakes installed on nose wheels

NWS STEER-BY-WIRE

How does nose wheel steering work?

- Steer-by-wire — no mechanical connection to wheel
- Steering Control Unit (SCU) + electro-hydraulic steering valve
- Free-castering when system OFF or failed

05

NOSE WHEEL STEERING · STUDY CARDS

HANDWHEEL AUTHORITY

What is the handwheel NWS authority?

- $\pm 65^\circ$ at the nose wheel — full authority
- Pilot station handwheel; steer-by-wire signal to SCU
- Combined rudder pedal input is also possible

RUDDER PEDAL AUTHORITY

What is the rudder pedal NWS authority?

- $\pm 7^\circ$ at the nose wheel — limited authority
- Provides directional control during normal landing roll
- Combine with handwheel for greater authority when needed

CROSSWIND WITHOUT NWS

What is the crosswind limit without NWS?

- 15-knot maximum crosswind component (takeoff AND landing) when NWS is inoperative
- Free-castering mode only — limited directional control
- NWS ON/OFF switch on landing gear panel

TOWING LIMITS

What is the towing rotation limit?

- Maximum $\pm 120^\circ$ rotation with torque links connected
- Exceeding 120° trips limit switch → **NWS LIMIT EXCEEDED** (C)
- Indicator pins yield at $\pm 123^\circ$ — visual maintenance flag

TORQUE LINK DISCONNECT

When may torque links be disconnected?

- Hangar ops — allows unlimited rotation for positioning
- Minimum 3.50 inches of chrome showing on shock strut required
- NWS switch must be OFF; reconnect per AMM before flight

NWS AT A GLANCE

- Handwheel: $\pm 65^\circ$ (full authority) — for tight turns on the ground
- Rudder pedals: $\pm 7^\circ$ (limited authority) — landing roll alignment
- Free-castering: NWS OFF or failed — 15 kt max crosswind (takeoff AND landing)
- Towing limit: $\pm 120^\circ$ with torque links; $\pm 123^\circ$ pins yield as visual flag
- Torque links disconnected → unlimited rotation; min 3.50 in chrome required



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EXTENSION & RETRACTION · STUDY CARDS

NORMAL EXTENSION SEQ

Describe the normal gear extension sequence.

- Handle DN → PSEU energizes selector valve to extend
- Hyd pressure releases MLG uplocks; NLG overcenter releases
- Downlocks hydraulically and mechanically engage when locked

NORMAL RETRACTION SEQ

Describe the normal gear retraction sequence.

- Handle UP (weight-off-wheels required)
- BCU commands 350 psi brake pressure for 4 seconds to stop rotation
- Downlocks released; uplocks mechanically engage when fully retracted

TRANSIT TIMEOUT

What happens if gear transit takes too long?

- PSEU monitors a 28-second transit timeout
- Exceeding 28 s → GEAR DISAGREE (C) posted on EICAS
- Trigger for MRS use if normal extension fails

POSITION INDICATIONS

What do the EICAS gear symbols mean?

- Green = down and locked
- White = up and locked
- Amber = in transit (approximate / per FCOM diagram — image-based, not explicitly text-confirmed); Red = unsafe/disagree condition

WEIGHT-ON-WHEELS

How is WOW status determined?

- Dual proximity sensors per landing gear for WOW redundancy
- WOW used to enable/disable NWS, ground spoilers, gear retraction
- PSEU processes 'near' and 'far' sensor signals

07

MANUAL RELEASE SYSTEM - STUDY CARDS

MRS OVERVIEW

When and why is the MRS used?

- Used when normal landing gear control circuit or left hyd fails
- Also used for **GEAR DISAGREE** (C) where gear fails to extend
- Total hydraulic pressure loss is a primary use case

MRS HANDLE LOCATION

Where is the MRS handle located?

- LG PULL handle — rear of center pedestal, copilot side
- Closed-loop cable assembly to MLG quadrants
- Activates dump valves and manual selector valve

MRS OPERATION

Describe the MRS extension sequence.

- Pull LG PULL handle → cables release MLG uplocks
- Dump valves block normal left hyd supply
- Right hydraulic system (supported by an accumulator) pressure via aux actuators extends MLG; NLG by gravity and spring force

MRS AFTER LANDING

What is the post-MRS procedure?

- Stow handle **ONLY** after landing with gear pins installed
- Do not stow handle in flight after MRS deployment
- System reset required for normal operation after stow

MRS FORCES

What forces extend each gear during MRS?

- NLG: gravity and spring forces only (no hydraulics)
- MLG: right hydraulic system (supported by an accumulator) pressure via auxiliary actuators
- All gears mechanically lock in down position

MRS — QUICK REFERENCE

- Trigger: normal left hyd failure OR **GEAR DISAGREE** (C) OR total hyd loss
- Pull LG PULL handle (rear center pedestal, copilot side)
- NLG extends by gravity + spring; MLG by right hydraulic system (supported by an accumulator)
- All gears mechanically lock DOWN — cannot be retracted in flight after MRS
- Stow handle on ground **ONLY** with gear pins installed



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BRAKE SYSTEM · STUDY CARDS

DUAL CHANNEL DESIGN

How are the brakes split between hyd systems?

- Inboard brakes — Left hydraulic system
- Outboard brakes — Right hydraulic system
- BCU uses greater of pilot/copilot input; independent electrical power

BRAKE COMPONENTS

Name the key brake components.

- Self-adjusting multi-disc carbon brakes with wear indicators
- Wheel speed transducers on all main wheels
- Brake accumulator (1,500+ psi nominal) in left hyd system

ANTI-SKID OPERATION

How does the anti-skid system work?

- Active from touchdown down to 10 kt ground speed
- Compares wheel speeds within and between brake assemblies
- Releases brake on slower wheel; reapplies when speeds equalize

ANTI-SKID FEATURES

What special anti-skid protections exist?

- Independent protection per wheel
- Locked wheel crossover protection
- Touchdown protection (spin-up override — no braking before wheel spin)

PARK/EMER BRAKE

Describe the PARK/EMER brake system.

- Hydro-mechanical backup — center pedestal handle
- Meters accumulator pressure to all four brakes equally
- No anti-skid and no differential braking available

ACCUMULATOR PRESSURE

What is the accumulator pressure caution threshold?

- Accumulator nominal: 1,500+ psi
- **PK/EMER BRK PRESS LO** (C) triggers below 1,200 psi
- Minimum 6 emergency brake applications available when charged

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PARK/EMER BRAKE FLUID TRAP - STUDY CARDS

FLUID MIGRATION RISK

Where and what type?

- If set with toe brakes depressed, right hyd engages outboard brakes
- Releasing without toe brakes traps right-system fluid in left system
- Leads to left hyd overfull and right hyd low quantity

RELEASE PROCEDURE

How does the bypass valve work?

- If set with toe brakes depressed → release with toe brakes depressed
- Matching set/release method prevents hydraulic fluid cross-contamination
- Prevents quantity imbalance between L and R systems

ANTI-SKID NOT AVAILABLE

Key temperature thresholds?

- Anti-skid is NOT available with PARK/EMER BRAKE
- No differential braking in park/emer mode
- Normal toe-brake system has full anti-skid protection

HANDLE OPERATION

What are ecology bottles?

- Pull handle UP to increase brake pressure
- Handle latches in park position
- To release from latched position: (1) Pull handle UP first
- (2) Push and HOLD button on end of handle
- (3) Allow handle to retract DOWN



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EICAS · WARNING MESSAGES

WARNING MESSAGES

Immediate crew action required

Message	Meaning	Inhibits
PARK/EMER BRAKE ON	Park/emergency brake ON during takeoff config (TO inhibit applies).	—
GEAR	Any gear not down and locked with RA < 500 ft and thrust < 26° TLA, or flaps ≥ 27°; accompanied by aural GEAR warning	—
GEAR BAY OVHT	Main landing gear bay overheat detected by single-loop detection wire in each wheel bin	TO/LAND
NORM BRAKES FAIL	Normal brake system failure — TO inhibit. Aural: 'Normal Brakes Fail' voice message.	TO

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EICAS · CAUTION & ADVISORY

CAUTION MESSAGES

Timely crew awareness/action needed

Message	Meaning	Inhibits
CPLT BRAKE FAULT	Copilot brake system fault detected by the BCU.	TO
GEAR DISAGREE	Landing gear position disagrees with selector handle commanded position, or gear transit exceeds 28 seconds	—
GEAR SYS FAIL	Landing gear system failure — PSEU or selector valve fault detected.	TO
L (R) INBD BRAKE FAIL	Left (or right) inboard brake has failed — BCU fault on that channel.	TO
INBD BRAKE PRESS LO	Inboard brake accumulator pressure < 1,400 psi (not main hydraulic system fault)	TO
INBD BRAKES FAIL	Both inboard brakes have failed — left hydraulic channel fault.	TO
NOSE GEAR DOOR	Nose gear door not in the commanded position (open or closed disagree).	TO/LAND
NWS FAIL	Nose wheel steering system failure — SCU or steering valve fault.	TO
NWS LIMIT EXCEEDED	Nose wheel steering rotation exceeded $\pm 120^\circ$ during towing — limit switch tripped; potential structural damage; AMM inspection required	TO/LAND
L (R) OUTBD BRAKE FAIL	Left (or right) outboard brake has failed — BCU fault on that channel.	TO
OUTBD BRAKE PRESS LO	Outboard brake accumulator pressure < 1,400 psi (not main hydraulic system fault)	TO/LAND
OUTBD BRAKES FAIL	Both outboard brakes have failed — right hydraulic channel fault.	TO
PARK/EMER BRAKE ON	Park/emergency brake ON in flight / WOW off..	TO
PK/EMER BRK PRESS LO	Brake accumulator pressure below 1,200 psi; fewer than 6 emergency brake applications available	TO
PLT BRAKE FAULT	Pilot brake system fault detected by the BCU.	TO
WOW FAIL	Weight-on-wheels proximity sensor failure — PSEU cannot confirm WOW status.	TO



ADVISORY MESSAGES

Crew awareness - no immediate action required

Message	Meaning	Inhibits
BRAKE FAULT	Brake system fault detected	TO/LAND
NWS FAULT	Nose wheel steering system fault	TO/LAND
PROX SYS FAULT	Proximity sensor system fault	TO/LAND

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EICAS - STATUS

STATUS MESSAGES

Information only - no crew action required

Message	Meaning
NWS OFF	Nosewheel steering selected OFF (NWS switch in OFF position).
PARK/EMER BRAKE ON	Park/emergency brake ON, aircraft on ground.

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QUICK RECALL · NUMBERS GRID

Cover the labels and recite the number; reverse and recite the label.
Repeat until automatic.

Left HYD Normal gear operation	Right HYD MRS main gear assist	Gravity+Spring MRS nose gear extension	28 sec PSEU transit timeout
350 psi / 4 s BCU brake cmd at retraction	±65° NWS handwheel authority	±7° NWS rudder pedal authority	±120° Towing rotation limit
±123° Indicator pin yield angle	3.50 in Min chrome — torque link disconnect	15 kt Crosswind limit w/o NWS	1,500+ psi Accumulator nominal
1,200 psi PK/EMER BRK PRESS LO (C)	4 plugs/wheel Fusible plugs per main wheel	2 pins/brake Wear indicator pins per assembly	10 kt Anti-skid lower cutoff speed



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