



Christopher MCGREGOR

Director, Flight Safety

A320 landing gear downlock

1. Introduction

A prelude to two runway excursions was a spurious landing gear not downlocked indication on the landing gear indication panel. The spurious indication led to unnecessary application of the LDG WITH ABNORMAL L/G QRH procedure.

This article summarizes the correct interpretation of landing gear downlock indications to prevent re-occurrence.

2. Landing gear position status

2.1. Landing gear control and indication architecture

The Airbus A320 utilise two Landing Gear Control and Indication Units (LGCIU1 and LGCIU2). The LGCIUs provide the inputs and feedback necessary to control the landing gear. In addition to the control inputs, the LGCIUs provide the system parameters for the flight deck display and fault annunciation. System redundancy is reflected by LGCIU1 and LGCIU2 (**fig1**).

LDG GEAR CTL panel receives landing gear position feedback from **LGCIU1 ONLY**

LGCIU1

LGCIU2

ECAM WHEEL Systems Display (SD) page displays the landing gear position feedback from both **LGCIU1 and LGCIU2**



Figure 1
Landing gear control and indication architecture

This article will utilise the EIS 1 display for the illustrations. However the article is applicable to both EIS 1 and EIS 2 displays.

Figure 2
EIS 1 versus EIS 2 WHEEL Systems Display Page



2.2. Gear selected DOWN / No sensor failure / Normal landing gear downlocked indications

Following gear selection and downlock, the flight crew will observe the green downlock lights on the landing gear panel and two green triangles per landing gear position on the ECAM WHEEL Systems Display (SD) page. This provides confirmation that the gear is properly downlocked (fig 3).



Figure 3
Normal landing gear panel and WHEEL Systems Display landing gear downlocked indications following gear down selection

2.3. Gear selected DOWN / Sensor failure / Spurious landing gear not downlocked indications

The LGCIU1 proximity sensors located on the each landing gear strut provides the lock/unlock signal to the landing gear indication panel. Failure of one of these sensors could generate a spurious main landing gear not downlocked (“UNLK”) red light and a single red triangle on the SD WHEEL page (fig 4).

note

In the event of a genuine landing gear strut detected as not downlocked by both LGCIU1 and LGCIU2 sensors, the “L/G GEAR NOT DOWNLOCKED” ECAM warning will be triggered, along with associated warnings:

- ▶ Continuous Repetitive Chime audio warning, and MASTER WARN light
- ▶ UNLK red light on the LDG GEAR CTL panel
- ▶ On the ECAM WHEEL SD page, both red lights are displayed on the affected landing gear strut
- ▶ RED ARROW on the LDG CTL lever panel
- ▶ ECAM memo “LDG LDG GEAR DN” (blue).

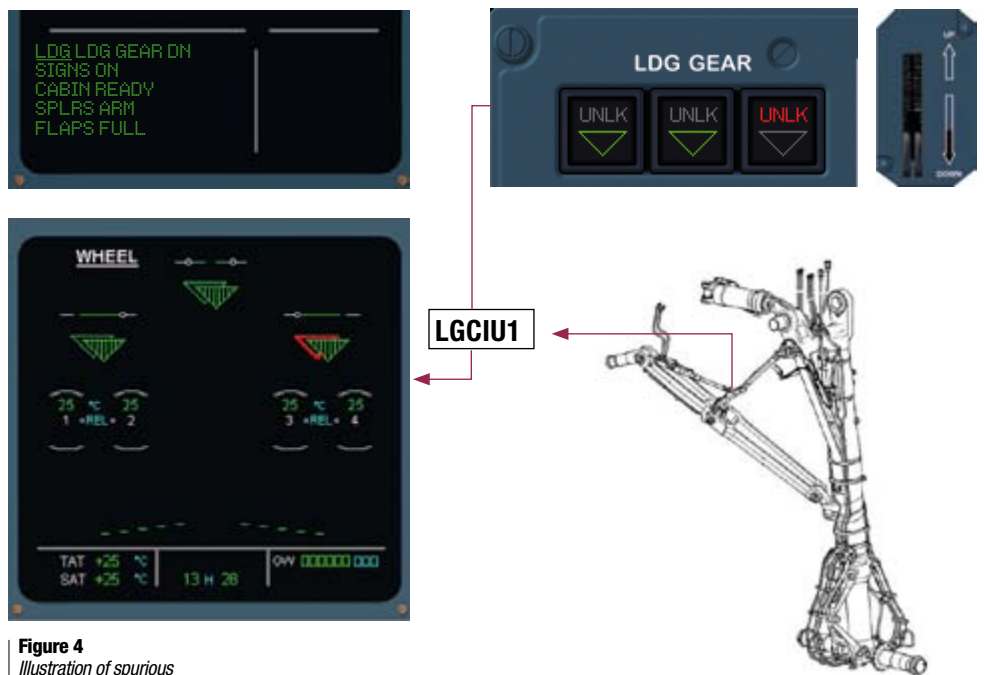


Figure 4
Illustration of spurious landing gear not downlocked indication

On gear selection, one green triangle on the ECAM SD WHEEL page and the green “LDG LDG GEAR DN” memo on the E/W D is sufficient to confirm the landing gear is down and locked.

2.4. At 750 ft RA, gear not selected DOWN / No sensor failure/ Normal landing gear indications

The “L/G GEAR NOT DOWN” ECAM warning is triggered passing 750 ft RA in approach to warn the flight crew that the landing gear is not set to DOWN while the aircraft is in the landing configuration. This alert must not be confused with the “L/G GEAR NOT DOWNLOCKED” ECAM warning that indicates that the landing gear is detected as not downlocked by both LGCIUs (fig 5).



Figure 5
Illustration of “L/G GEAR NOT DOWN” ECAM warning display – landing gear lever not selected but aircraft in landing configuration passing 750ft RA


2.5. At 750 ft RA, gear selected DOWN / Sensor failure / Spurious landing gear not down indications

However, on the A320 Family, this warning could also be triggered when the landing gear is detected as not downlocked by one LGCIU. In this case, check that at least one green triangle is displayed on each landing gear strut on the ECAM WHEEL page. This confirms that the landing gear is downlocked. Rely also on the “LDG LDG GEAR DN” green LDG memo message to confirm that the landing gear is downlocked (fig 6).



Figure 6
Illustration of spurious “L/G GEAR NOT DOWN” indication

As per SOP, following gear selection down, the PNF has to check for three landing gear indications on the ECAM WHEEL page: at least one green triangle on each landing gear strut is sufficient to indicate that the landing gear is downlocked. In addition, the E/W D “LDG LDG GEAR DN” green memo on the ECAM (before landing checklist) also confirms the landing gear is down and locked.

Selection	Landing Gear Selector down			
Gear Position	Downlocked	Downlocked	Downlocked (Passing 750ft)	Not Downlocked
Indication	Sensor failure	Sensor failure	Sensor failure	Confirmed failure
Landing gear panel				
UPPER ECAM	No ECAM warning			
ECAM WHEEL page				
Approp crew response	Continue normal descent and landing	Continue normal descent and landing	Continue normal descent and landing	Gravity extension & landing with abnormal landing gear procedures

3. In-service events

To help distinguish between a genuine and a spurious landing gear not downlocked position indication, the following in-service events are summarized (fig 7).

In the cases of spurious landing gear not downlocked indication illustrated in fig 7, the flight crew applied the L/G gear gravity extension and LDG with abnormal landing gear QRH procedures.

- As per procedure the application of these paper checklists disables:
- ▶ Anti-skid
 - ▶ Ground spoilers
 - ▶ Nose-wheel steering
 - ▶ Auto-brake

The increased workload can be appreciated, hence the need to avoid applying these procedures unless necessary.

Distinguish between L/G GEAR NOT DOWN and L/G GEAR NOT DOWNLOCKED.

4. Ongoing Development

The FCOM and QRH procedures have been enhanced to prevent unnecessary application of the L/G GRAVITY EXTENSION and LDG WITH ABNORMAL L/G procedures (A320 Family FCOM/QRH June 2010 general revision).

The revised procedures include the following caution:

Caution :
Do not apply this procedure if at least one green triangle is displayed on each landing gear strut on the ECAM SD WHEEL page. This is sufficient to confirm that the landing gear is downlocked. Disregard any possible L/G GEAR NOT DOWN ECAM warning at 750 feet RA.

As previously discussed , on A320 Family aircraft the “L/G GEAR NOT DOWN” warning may also appear at 750ft RA when the landing gear is confirmed down by only one LGCIU. Under these conditions the new Flight Warning Computer development FWC (F6) will inhibit the spurious “L/G GEAR NOT DOWN” message.

Figure 7
Summary of
in-service events

5. Conclusion

Flight crews have entered unnecessarily into the L/G GRAVITY EXTENSION and LDG WITH ABNORMAL L/G QRH procedures, whereas the landing gear was actually downlocked. This has created significant additional workload during the landing phase. To prevent re-occurrence, in all cases (and as per SOP) refer to the ECAM WHEEL SD page to check that the landing gear is downlocked. Rely also on the “LDG LDG GEAR DN” green LDG memo message during the LANDING CHECKLIST.

Do not confuse “L/G GEAR NOT DOWN” with “L/G GEAR NOT DOWNLOCKED” ECAM warning. In the case of a genuine unlocked landing gear, the ECAM will alert the flight crew and trigger a “L/G GEAR NOT DOWNLOCKED” ECAM warning after gear selection down.

On landing gear down selection, the key message is

One green triangle on the ECAM WHEEL SD page and a “LDG LDG GEAR DN” green memo on the E/WD (Before Landing Checklist) confirms the landing gear is down and locked.