Australian Government
Civil Aviation Safety Authority

# AIRWORTHINESS BULLETIN

Cessna Single Engine Electro-Hydraulic Undercarriage Retraction Systems

**AWB** 32-024 **Issue** : 1
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## 1. Effectivity

All Cessna single engine aeroplanes equipped with an hydraulically operated undercarriage retraction system powered by an electric motor (Power pack).

## 2. Purpose

Alert pilots, operators and maintainers to incidents of fire and smoke in the cockpit due to possible sparking and/or excessive heat from the electric motor as a result of electrical malfunction or loss of control of the motor, which may continue to operate after the retraction or extension cycle has been mechanically completed.

## 3. Background

In September 2012, the U.S. Federal Aviation Administration (FAA) received a report of an in-flight cabin fire in a Cessna 172 RG. The fire originated on the cabin side of the firewall and rapidly accelerated. The fire originated from the area of the landing gear hydraulic power pack and resulted in complete hull loss and injuries.

CASA supported an industry initiative to comment on the FAA Notice of Proposed Rule Making (NPRM) (Docket No. 2012 CE-033-AD) to mandate Cessna SEB-29-01 and Cessna MEB29-01, which describes procedures for inspection of the power pack system for proper installation.

In response to the FAA request to CASA for additional information on power pack malfunctions suffered in Australia as part of the NPRM process, it was found that CASA had received approximately forty (40) Service Difficult Reports (SDRs) describing defects in relation to malfunctioning and severely overheating hydraulic packs on Cessna single engine aircraft.

CASA issued Australia “Hot under the pump” (Flight Safety issue 90 Jan-Feb 2013) to alert industry to the issue of possible fire from overheating hydraulic packs while awaiting the outcome of the FAA NPRM, which has since been withdrawn.

An analysis of CASA SDRs describing ‘motor running on’ and ‘loss of control of the motor’ found ten (10) SDRs where the submitter identified that the electric motor powering the hydraulic system had continued to run at the end of the deployment or retraction cycle, due to malfunctioning micro switches or faulty wiring and had severely overheated. This included one instance of smoke in the cabin, indicating that the electric motor had reached a very high temperature.

An additional thirty (30) Instances have been reported where an up/down lock micro switch open-circuited or otherwise malfunctioned and did not shut the motor down at the end of the sequence. There was one instance where the motor did not shut down because it could not develop the required cut-out pressure due to wear in the gear pump, and another of a leaking pressure sensing bellows in the pump which prevented operation of the system maximum pressure sensing micro-switch to turn the motor off.

The Cessna 210 Information Manual and the Pilots Operating Handbook recommends that if the gear motor (hydraulic pump motor) is audible (continues to run) after a period of one minute after gear cycle completion (up or down), the Gear Pump circuit breaker should be pulled out to shut off the hydraulic pump motor, preventing overheating and thereby preventing damage to the pump and motor. (Sections 3-19/20 & 7-12 of Cessna 210 Information Manual & ATSB Investigation No. 200000148).

Leaving the hydraulic pump motor to operate for more than one minute after may not only damage the pump and motor, but also induce severe overheating and cause smoke and fire in the cabin.

Later model Cessna 210 aeroplanes have a red indicator light which comes on whenever the system pressure drops below 1000 psi, typically while the motor is operating and the gear is in transition. If the red light stays on after the gear cycle has completed, it may indicate that the pump motor is still running.

Other clues that indicate the system’s operational status include the noise the power pack makes while operating, and a momentary flicker of the ammeter needle when the pump motor shuts down.

Early Cessna 210 aircraft may not have the gear transition warning light, and may have a flush Gear Pump circuit breaker installed, which cannot be used to de-activate the pump motor.

## 4. Recommendations

In order to address the potentially unsafe condition described in this AWB, CASA recommends that pilots remain constantly familiar with the undercarriage system and its operational characteristics, and owners, operators and maintainers consider:

1. Complying with Cessna SEL-29-1 (and Cessna MEL 29-1 for applicable multi - engine Cessna aircraft).
2. Installing an indicator light to illuminate when the hydraulic power pack motor is running, if the aircraft is not already equipped with the gear in transit warning light.
3. Installing a 30Amp Gear Pump circuit breaker which can be pulled out to de-activate the motor, should a flush type 30Amp Gear Pump circuit breaker be currently installed.

## 5. Reporting

Report all defects relating to malfunctioning retractable undercarriages in Cessna aircraft to CASA via the SDR reporting system.

## 6. Enquiries

Enquiries with regard to the content of this Airworthiness Bulletin should be made via the direct link e-mail address:

AirworthinessBulletin@casa.gov.au

or in writing, to:

Airworthiness and Engineering Standards Branch
Standards Division
Civil Aviation Safety Authority
GPO Box 2005, Canberra, ACT, 2601