FINAL REPORT

AAIU Report No: 2010-018
State File No: IRL00910076
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In accordance with the provisions of SI 460 of 2009, the Chief Inspector of Air Accidents, on 12 August 2010, appointed Mr. Leo Murray as the Investigator-in-Charge to carry out a Field Investigation into this Accident and prepare a Report. The sole purpose of this Investigation is the prevention of aviation accidents and incidents. It is not the purpose of the Investigation to apportion blame or liability.

Aircraft Type and Registration:	Mooney M20J, D-EKGL
No. and Type of Engines:	1 x Lycoming IO-360-A3B6D
Aircraft Serial Number:	24-3232
Year of Manufacture:	1991
Date and Time (UTC):	12 August 2010 @ 14.56 hrs
Location:	Kerry Airport, Co. Kerry
Type of Flight:	Private
Persons on Board:	Crew – 2 Passengers – 0
Injuries:	Crew – Nil Passengers – Nil
Nature of Damage:	Significant
Commander's Licence:	JAA Private Pilot Licence (Germany)
Commander's Details:	Male, aged 62 years
Commander's Flying Experience:	570 hours, of which 250 were on type
Notification Source:	Kerry Air Traffic Services
Information Source:	AAIU Field Investigation and Accident Report Forms

SYNOPSIS

The aircraft was engaged on a private flight from Guernsey (EGJB), in the Channel Islands to Kerry Airport (EIKY) operating under visual flight rules (VFR). The Pilot made a long straight-in approach to Runway (RWY) 26, the active runway, and completed the 'landing check' at 3 nautical miles (nm) on final approach. The aircraft touched down without the landing gear extended. When the aircraft came to a halt the Pilot turned off the fuel switch, the main switch and the alternator before evacuation. The occupants were uninjured and there was no fire. The landing gear warning horn failed to operate.

1. FACTUAL INFORMATION

1.1 History of the Flight

Both occupants were members of a flying club which owned the aircraft. The pilots had commenced their trip from Leutkirch (EDNL) in Germany, and had made overnight stops in France and Guernsey prior to commencing the flight leg to Kerry. As the aircraft is certified for single pilot operation, the pilots took turns to act as the Pilot-in-Command (PIC) on alternate legs of the trip, with the pilot-not-flying assisting with navigation and radio duties. The PIC subsequently stated to the Investigation that the stall warning horn was checked for function during the preflight inspection at Guernsey and that the warning horn was audible.

The flight from Guernsey was uneventful until the approach phase at Kerry. The aircraft was set up for a long straight-in approach to RWY 26. First radio contact was made with Kerry Air Traffic Control (ATC) at a distance of 31 nm. A position report was made at 20 nm at which time an approach check was carried out by the PIC. A further report was made to ATC at 10 nm and clearance to land was received at 5 nm. Weather conditions were as follows: wind from 340 degrees at 6 kts, visibility in excess of 10 km, scattered cloud at 2,600 ft, with an outside air temperature of 17° C. At 3 nm distance the landing checklist was completed. The aircraft contacted the runway with the landing gear in the retracted position. The outboard sections of the propeller blades disintegrated as the aircraft settled on the runway. The aircraft came to rest on the centreline. The PIC secured the aircraft and both occupants evacuated through the passenger door. The airport RFFS[1] attended the scene. The AAIU was advised of the accident, and as the aircraft was blocking the runway, permission was given to recover the aircraft to the hangar area.

1.2 Aircraft Information

1.2.1 General

The Mooney M20J is an all-metal high-performance four-place touring aircraft. The M20J is fitted with a fuel-injected Lycoming IO-360-A3B6D and a constant speed McCauley propeller. The type features a low wing with access to the cabin through a single entry door on the right hand side; a small baggage door is situated aft. All variants have electrically operated, retractable landing gear. The aircraft was registered to the flying club on 8 May 2001. The Certificate of Airworthiness was issued on 29 January 1992, with the Airworthiness Review Certificate issued on 26 March 2010. A 50-hour maintenance check was carried out on 20 July 2010. At the time of the accident, the aircraft had flown a total of 2,962 hours and the engine had accumulated a total of 1,126 hours since overhaul.

1.2.2 Landing Gear Operation

The landing gear is of the tricycle type, with the gear legs manufactured from heat-treated chrome-molybdenum steel. Rubber discs in all gear leg assemblies absorb shocks from landing and during taxiing. A manual emergency landing gear extension system is provided for use in the event of an electrical failure.

[1] **RFFS**: Rescue and Fire Fighting Services.

The landing gear is normally electrically extended and retracted by means of a landing gear selector switch. Landing gear position is indicated on an annunicator panel by means of condition lights: Gear Down (green) and Gear Unsafe (red). The position of the landing gear is also indicated on a Gear Position Indicator, situated on the floorboard aft of the fuel selector valve.

Moving the landing gear selector switch (**Photo No. 1**) to the lower detent operates the landing gear actuator relay and lowers the landing gear. A down limit switch stops the gear actuating motor when sufficient force has been exerted to hold the landing gear down. Bungee springs preload the retraction mechanism in an overcentre position to assist in holding the landing gear in the down position. The green 'Gear Down' light will illuminate on the annunicator panel and the landing gear position indicator (on the floorboard) will indicate a green decal. The green annunicator light illuminates continuously when the landing gear is fully extended.

Photo No. 1: Landing Gear selector switch and Gear Safety Bypass switch

Moving the landing gear selector switch to the upper detent will raise the landing gear. However, an airspeed safety switch is incorporated to prevent landing gear retraction while on the ground and until a safe take-off speed is reached (approximately 60 kts indicated airspeed). An up limit switch stops the landing gear actuating motor when the landing gear is in the retracted position. When the landing gear is retracting, the red 'Gear Unsafe' light will illuminate on the annunicator panel. When the landing gear has fully retracted, the red 'Gear Unsafe' light extinguishes and the landing gear position indicator will indicate a red/white decal (**Photo No. 2**).

A landing gear safety bypass switch is positioned next to the landing gear selector lever, to be used in case the landing gear fails to retract. Depressing and holding the switch bypasses the airspeed safety switch and allows the landing gear to retract (**Photo No. 1**).

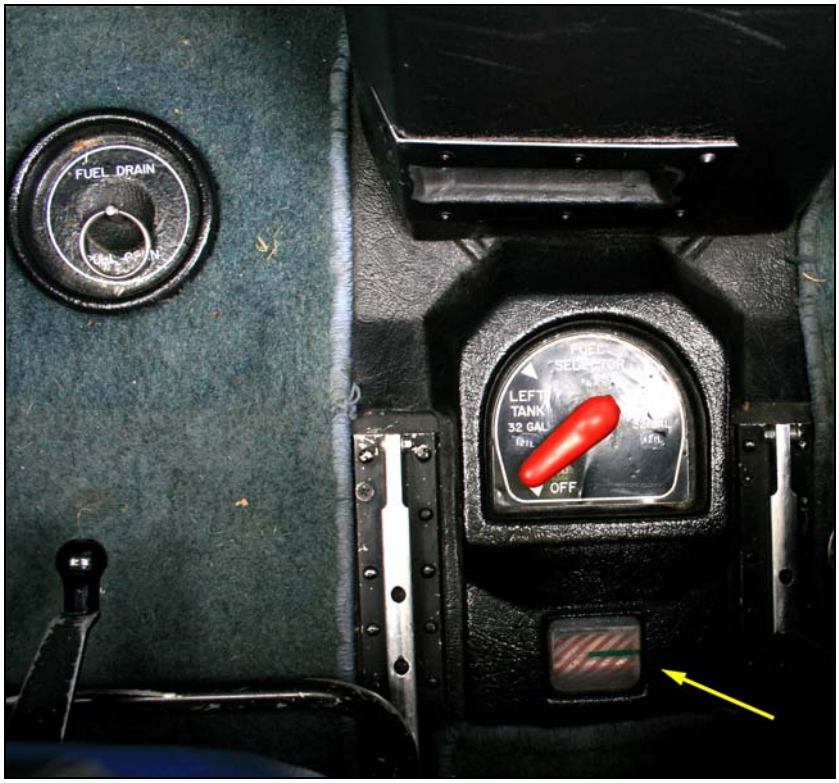

Photo No. 2: Gear Position Indicator (shows retracted position)

1.2.3 Landing Gear Warning System

The landing gear warning system consists of landing gear condition lights as described above and an aural warning horn in the cabin, which activates with an intermittent tone when the landing gear is not down and locked and the throttle is approximately 1/4 inch from the idle position. When the throttle is closed to this position, a detent on the throttle-control sleeve activates a microswitch, which closes the landing gear warning horn circuit, producing an intermittent tone, if the landing gear is not down and locked.

1.2.4 Stall Warning System

The Stall Warning System consists of a vane-actuated switch installed in the left wing leading edge, which activates the aural warning horn in the cabin with a continuous tone at 5-10 kts before the actual stall is reached and remains on until the flight attitude is changed towards a non-stalled condition. The stall warning system uses the same horn as the landing gear warning system.

1.3 AAIU Field Investigation

Two Inspectors of Air Accidents arrived the following morning to inspect the aircraft and the area of the runway where touchdown was made. The runway surface showed initial contact marks by the aircraft propeller followed by scrape marks to where the aircraft came to rest. The aircraft maintained the centreline during deceleration. Debris from the propeller blades and an antenna were recovered by the Airport Authority from the runway.

To make the runway available for operations, the aircraft had been lifted by straps and transported to the apron area adjacent to the hangar. Damage was observed to the propeller blades, with extensive scraping to the underside of the fuselage. The lifting operation had resulted in some additional damage to the fuselage frame aft of the baggage area and to the wing trailing edge root fairings. The landing gear lever was noted in the 'down' position, however all three landing gear were fully retracted with the landing gear visual indicator showing a red/white decal (**Photo No. 2**). The landing gear selector lever was positioned to 'up' prior to powering the electrical system to prevent damage to the aircraft. All circuit breakers relating to the landing gear[2] and stall warning were all in the normal position (closed).

With the aircraft temporarily supported clear of the ground, the battery switch on and the throttle retarded to idle, the 'Gear Unsafe' warning light was illuminated but no warning horn was evident. When the landing gear selector lever was positioned to 'down' all three landing gear extended and locked without difficulty, and the green 'gear down' light illuminated. The aircraft was then lifted and positioned normally on its landing gear.

Manual activation of the stall warning vane did not produce an audible warning from the horn. An inspection was made of the landing warning horn circuit. The microswitch positioned above the throttle control was found to have the common (COM) terminal disconnected from the wiring (**Photo No. 3**).

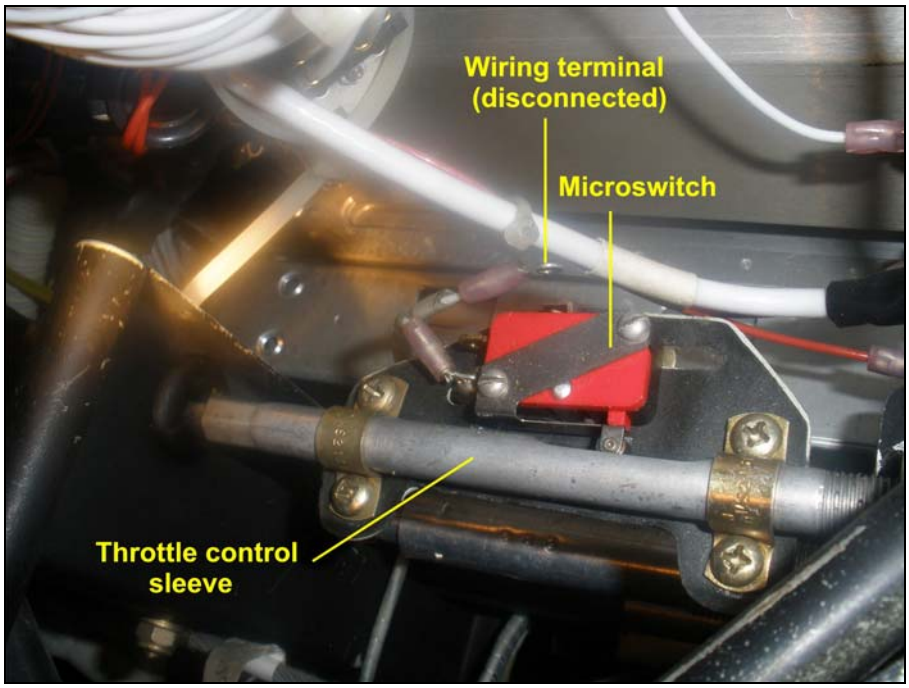

Photo No. 3: Landing Gear warning system microswitch

The attachment screw was not recovered. The stall warning/landing gear warning horn was tested using a voltmeter with manual activation of the stall warning vane; although a voltage was observed across the horn terminals, no tone was produced.

[2] **Circuit Breakers**: Gear Actuator, Gear Relay, Gear Warning

1.4 Licensing

Both pilots were properly licensed. The PIC held a JAA Private Pilot Licence (Aeroplane) issued in the Federal Republic of Germany, and valid until 31 July 2013, with a Single Engine (Piston) Rating valid to 31 July 2011, a Night Flying Qualification and Class 2 Medical Certificate valid until 1 September 2011.

The right seat occupant (pilot-not-flying) also held a JAA Private Pilot Licence (Aeroplane) issued in the Federal Republic of Germany, valid until 6 July 2013, with a Single Engine (Piston) Rating valid to 6 July 2011. He also held Ratings for Touring Motor Glider (TMG) and Air Tow flights. His Class 2 Medical Certificate was valid until 19 March 2011.

2. ANALYSIS

A light crosswind existed at the time of landing. The Investigation found the landing gear to be in the fully retracted position. No faults were found with the landing gear extension or retraction system when the aircraft was temporarily supported and the system function tested.

When flying a standard circuit pattern a pilot has certain cues for completion of approach and landing checks as the aircraft is positioned on downwind, base and final legs prior to landing. In this case the long straight-in approach carried out did not provide such cues. The Pilot stated that he completed the landing check at a distance of 3 nm from the runway. However, as no faults were found with the landing gear extension or retraction system, it is probable that although the checklist may have been completed, the landing gear was not extended. It is also apparent to the Investigation that neither the landing gear visual indicator nor the annunciator panel (landing gear condition lights) were checked to confirm the landing gear position prior to touchdown. The Pilot correctly stated to the Investigation that the landing gear warning should have activated with the landing gear not down, but testing has shown that the landing gear warning system was unserviceable.

The landing gear warning system had developed two separate faults. The microswitch had been open-circuited due to a wiring terminal lug becoming detached from the switch (COM) connection. It is possible that the fixing screw may have worked loose over time due to vibration. This fault rendered the circuit permanently open, and the microswitch function inoperative. This function is to provide the aural warning if the throttle is closed to near idle and the landing gear is not fully down. The aural warning horn itself was also unserviceable and as the two systems use a common warning device, it also made the stall warning system inoperative. With the Battery switched to ‘ON’ it is possible to test the stall warning manually during the pre-flight checks. The Pilot subsequently stated to the Investigation that the horn functioned during the preflight inspection prior to flight. However, as there is no facility to check the landing gear warning system on the ground, the wiring disconnection fault and the unserviceability of the landing gear warning system would not have been apparent to the PIC.

3. CONCLUSIONS

(a) Findings

1. No faults were found with the landing gear extension or retraction system.

2. The landing gear warning system was unserviceable due to (a) an open circuit in the wiring and (b) an unserviceable aural warning horn.

3. The stall warning was unserviceable.

4. Following the initial propeller strike, the aircraft settled on to the runway incurring significant damage to the underside of the fuselage.

5. When the aircraft came to a halt the aircraft was evacuated without delay.

(b) Probable Cause

Landing gear not extended prior to landing.

(c) Contributory Factors

1. No check was made of the Gear Position indicator or the Landing Gear Condition Lights during completion of the landing check.

2. The Landing Gear Warning System was inoperative.

4. SAFETY RECOMMENDATIONS

This Investigation does not sustain any Safety Recommendations.

- END -