



# Air Accident Investigation Unit Ireland

**FACTUAL REPORT**

**SERIOUS INCIDENT**

**Diamond DA42 Twin Star, G-SERE**

**Cork Airport**

**18 May 2019**



**An Roinn Iompair  
Turasóireachta agus Spóirt**  
Department of Transport,  
Tourism and Sport

## Foreword

This safety investigation is exclusively of a technical nature and the Final Report reflects the determination of the AAIU regarding the circumstances of this occurrence and its probable causes.

In accordance with the provisions of Annex 13<sup>1</sup> to the Convention on International Civil Aviation, Regulation (EU) No 996/2010<sup>2</sup> and Statutory Instrument No. 460 of 2009<sup>3</sup>, safety investigations are in no case concerned with apportioning blame or liability. They are independent of, separate from and without prejudice to any judicial or administrative proceedings to apportion blame or liability. The sole objective of this safety investigation and Final Report is the prevention of accidents and incidents.

Accordingly, it is inappropriate that AAIU Reports should be used to assign fault or blame or determine liability, since neither the safety investigation nor the reporting process has been undertaken for that purpose.

Extracts from the Final Report may be published providing that the source is acknowledged, the material is accurately reproduced and that it is not used in a derogatory or misleading context.

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<sup>1</sup> **Annex 13:** International Civil Aviation Organization (ICAO), Annex 13, Aircraft Accident and Incident Investigation.

<sup>2</sup> **Regulation (EU) No 996/2010** of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation.

<sup>3</sup> **Statutory Instrument (SI) No. 460 of 2009:** Air Navigation (Notification and Investigation of Accidents, Serious Incidents and Incidents) Regulations 2009.



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In accordance with Annex 13 to the Convention on International Civil Aviation, Regulation (EU) No 996/2010 and the provisions of SI No. 460 of 2009, the Chief Inspector of Air Accidents on 18 May 2019, appointed Mr Leo Murray as the Investigator-in-Charge to carry out an Investigation into this Serious Incident and prepare a Report.

<b>Aircraft Type and Registration:</b>	Diamond DA42 Twin Star, G-SERE	
<b>No. and Type of Engines:</b>	2 x Thielert TAE 125-02-99	
<b>Aircraft Serial Number:</b>	42.314	
<b>Year of Manufacture:</b>	2007	
<b>Date and Time (UTC)<sup>4</sup>:</b>	18 May 2019 @ 16.30 hrs	
<b>Location:</b>	Cork Airport (EICK)	
<b>Type of Operation:</b>	General Aviation (Training)	
<b>Persons on Board:</b>	Crew - 3	Passengers - Nil
<b>Injuries:</b>	Crew - Nil	Passengers - Nil
<b>Nature of Damage:</b>	Significant	
<b>Commander's Licence:</b>	Commercial Pilot Licence (Aeroplanes) issued by the Irish Aviation Authority (IAA)	
<b>Commander's Age:</b>	31 years	
<b>Commander's Flying Experience:</b>	2,378 hours, of which 244 were on type	
<b>Notification Source:</b>	Airport Duty Manager, Cork Airport	
<b>Information Source:</b>	AAIU Report Form submitted by the Commander	

<sup>4</sup> **UTC:** Co-ordinated Universal Time. All timings in this report are quoted in UTC; Local time is UTC +1 hour

## SYNOPSIS

While on a multi-engine training exercise, the Student Pilot conducted an approach to Runway (RWY) 34 at Cork Airport (EICK) where a go-around was performed, followed by a left-hand circuit. The final part of the exercise required simulating an engine failure following climb-out, completing the necessary drills and continuing the circuit for a full-stop landing. The landing gear was not extended and the aircraft came to rest on the runway, incurring damage to the propellers and exhausts. There were no injuries to the three occupants on board. There was no fire.

## 1. FACTUAL INFORMATION

### 1.1 History of the Flight

The aircraft departed EICK on a multi-engine air exercise with an Instructor and two students on board. The Instructor occupied the right seat and one Student occupied the left seat (Pilot Flying, PF). The second Student occupied the rear seat and observed the pilot's flight for the purposes of training. The aircraft routed to Shannon (EINN) as part of its training detail, following which it returned to EICK. The aircraft completed an approach to RWY 34, from which a two-engine go-around was carried out to join a left-hand circuit. On the downwind leg, the Instructor simulated an engine failure by retarding power to idle on the left engine. This condition activated the landing gear audible warning. After the Student completed the required actions for the simulated engine failure, the Instructor partially restored the power on the left engine to simulate the left engine's propeller in a feathered<sup>5</sup> condition as per procedure. When the aircraft turned onto final approach, the speed was approximately 110 knots (kts); this speed was higher than normal and required reduction. Flaps were selected as required for a 'single-engine' landing.

As the aircraft was flared for landing, the reduction in power on both engines activated the landing gear audible warning. However, this was mistaken by both pilots for the stall warning. The aircraft touched right-wing low and the right propeller blades contacted the runway. The Instructor immediately took control realising that the landing gear had not been lowered just as the left propeller blades contacted the runway. The Instructor kept the aircraft under control as it decelerated to a stop, shut down both engines and alerted Air Traffic Control (ATC). An immediate evacuation was carried out. There was no fire and the occupants were uninjured.

#### 1.1.1 Commander Statement (Flight Instructor)

The Flight Instructor submitted a written statement to the Investigation. He described that the final exercise, on returning to EICK from EINN, required a 'single-engine' landing from a circuit to land. Having being briefed by the Instructor, the Student (PF) performed a two engine go-around followed by a 'simulated engine failure' before joining a left downwind in the circuit pattern for RWY 34. The Instructor reduced the power on the left engine which activated the audible landing gear warning.

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<sup>5</sup> **Feathered:** Positioning the propeller blades at the angle which will provide the greatest reduction in drag on a failed or stopped engine.



The Instructor waited for the Student to complete the required procedure before resetting the power to simulate a feathered propeller. The Instructor gave the Student additional support throughout the remainder of the circuit and turn onto finals. In the process he *'became distracted'* by the indicated approach speed which, at approximately 110 kts, he stated was *'much higher than usual'*. Flaps were selected as required for a single-engine landing.

As the Student brought the aircraft into the flare, and reduced the engine power to idle, the landing gear audible warning sounded but was mistaken for the stall warning. The aircraft landed with the right side slightly lower which resulted in the right propeller making initial contact with the runway. The Instructor took control immediately and realised that the landing gear had not been extended. He focused on keeping the aircraft under control on the runway and secured both engines to reduce any risk, before notifying Air Traffic Control (ATC) and evacuating the aircraft.

The Instructor assessed that a combination of factors conspired to cause the incident; principally non-adherence to standard procedures regarding checklist use and distractions during the approach which caused the landing checks to be missed.

### 1.1.2 Damage

Aircraft damage was restricted in general to the propeller assemblies, lower engine cowlings and boarding steps (**Photo No. 1**). The runway surface had minor scoring damage.



**Photo No. 1:** Damage to aircraft

### 1.1.3 Recovery

RWY 34/16 was out of operation for approximately 90 minutes pending the recovery of the aircraft and runway inspection. A crane was used to support the aircraft while the landing gear was extended by activation of the landing gear selector in the cockpit. The aircraft was manually moved clear of the runway.

## 1.2 Personnel Information

### 1.2.1 Commander (Flight Instructor)

The Flight Instructor held a Commercial Pilot Licence (Aeroplanes), CPL (A) issued by the IAA for the following Classes: Single-Engine Piston (SEP) landplane, valid to 31 December 2019 and Multi-Engine Piston (MEP) landplane, valid to 29 February 2020. The Instructor held the following Ratings: Multi-Engine Instrument Rating (ME/IR) for Single Pilot Aeroplane (SPA) valid to 29 February 2020 and Flight Instructor (Aeroplanes), FI (A) for SEP (A) and MEP (A) valid to 31 December 2020. The Commander also held a Class I Medical Certificate valid until 11 June 2019 with no limitations. The Instructor had the following experience; all flying in the 28 days prior to the occurrence was on the DA42:

<b>Total all types:</b>	2,378 hours
<b>Total on DA42:</b>	243 hours
<b>Last 90 days:</b>	247 hours
<b>Last 28 days:</b>	60 hours
<b>Last 24 hours:</b>	8 hours

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### 1.2.2 Student (Pilot flying)

The Student was undergoing flight instruction as part of an integrated course and flying under the supervision of his Instructor. He held a Class I Medical Certificate valid until 27 September 2019. He had a total of 68 hours total time with 28 hours on the DA42.

### 1.2.3 Student (Supernumerary)

The second student was also undergoing flight training and on this flight leg was occupying one of the rear seats; observing the flight for training purposes.

## 1.3 Aircraft Information

### 1.3.1 General

The Diamond DA42 is a four-seat, low wing, utility aircraft powered by two Thielert TAE 125-02-99 turbocharged, piston engines each driving three-blade, variable pitch, constant speed MTV-6 propellers. These engines are certified to use Jet A1 or Diesel fuel.



### 1.3.2 Landing Gear operation

The landing gear on the DA42 is of the tricycle type, retractable and hydraulically operated. Hydraulic pressure for operation of the landing gear is provided by an electrically powered hydraulic pump, which is activated by a pressure switch, when the required pressure is too low. Electrically actuated hydraulic valves, which are operated with the gear selector switch, allow hydraulic pressure for the movement of the landing gear. The landing gear selector switch is located in the lower, section of the centre instrument panel. The switch must be pulled out before it is moved to 'UP' or 'DOWN' position.

When the landing gear is retracted, the main wheels retract inboard into the centre wing and the nose wheel retracts forward into the nose section. Hydraulic pressure on the actuators keeps the landing gear in the retracted position. A pressurised gas container acts as an accumulator which keeps the hydraulic system pressure constant and prevents continuous operation of the hydraulic pump in flight.

Springs assist the hydraulic system in gear extension and locking of the gear in the down position. After the landing gears are down and the down-lock hooks engage, springs maintain force on each hook to keep it locked until it is released by hydraulic pressure.

### 1.3.3 Landing Gear Warnings

Three green lights directly adjacent to the landing gear operating switch illuminate to indicate that each gear is in the correct down and locked position. If the landing gear is in neither the full up nor the full down and locked position, a RED gear Unsafe Warning light on the instrument panel illuminates. A repeating '*Gear Retracted Chime Tone*' re-sounds if the landing gear is retracted while the flaps move into the landing position (LDG) or when the power lever is placed in a position below 25%; this audible warning cannot be silenced.

If installed, a 'CHECK GEAR' caution is also indicated on the Primary Flight Display with the landing gear in an unsafe configuration. G-SERE was not fitted with this option.

### 1.3.4 Stall Warning System

The lift detector on the aircraft is located on the front edge of the left wing below the wing chord line. It is supplied electrically and provides a stall warning, before the angle of attack becomes critical. The stall status is announced to the pilot by a '*continuous sound in the cockpit*'.

## 1.4 Meteorological Information

The Commander reported the actual meteorological as:

<b>Wind:</b>	340 degrees at 12 kts
<b>Visibility:</b>	10 kilometres plus
<b>Significant Weather:</b>	Nil
<b>Cloud:</b>	Scattered at 2,800 feet Scattered at 6,000 feet
<b>Surface Temp/Dew Point:</b>	Temp 15 °C, Dew Point 7 °C

## 1.5 Actions by the Operator

The Operator informed the Investigation on 24 July 2019 that it has taken a number of initiatives following the occurrence:

- Introduction of a colour-coded slider device mounted on the front panel (in full and constant view of both the Instructor and front seat student) as a visual reminder that a 'GEAR UNSAFE' condition exists (Red); or, when the landing checks are completed the slider is operated showing the acronym 'P.U.F.F.' (Props, Undercarriage, Fuel, Flaps) (Green).
- The inboard sides of the engine nacelles were fitted with convex mirrors to allow both front seat occupants to visually confirm the nose wheel is extended.
- Pre-landing procedures were amended whereby landing flaps must always be selected pre-landing (both all-engine and single-engine configurations) as this setting will activate the landing gear warning horn if the landing gear is not extended.
- Multi-Engine Instructors have been made more fully aware of the difference between the stall and the landing gear audible warnings.
- The role of student/observer occupying a rear seat has been enhanced to that of a participating crew member to exercise vigilance in monitoring the activities of the pilots particularly during critical phases of flight such as take-off and landing. Prior to each flight such student/observers are briefed to alert the pilots flying to any observed deviations, missed or incomplete checks, system failures or any other issues that may compromise the safety of the flight.

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## 2. AAIU COMMENT

This incident illustrates the importance of adherence to Standard Operating Procedures (SOPs) and effective use of checklists. The use of such standard procedures is designed to reduce workload in a busy environment especially when a non-normal situation occurs, in this case a simulated engine failure with an approach and landing.

The planned exercise culminated in a simulated single-engine circuit to a full-stop landing. In simulating the failure of an engine the Instructor brought back the power on the left engine requiring the Student (Pilot Flying) to complete the required drills.

When initially performing this exercise the Student had some difficulty performing the required tasks as the handling of the aircraft became more complex because of asymmetric thrust, together with the requirement to complete non-standard drills and checklists. This placed additional workload on the Instructor, who must not only monitor and assist the Student but also ensure that the aircraft is handled in a safe manner, on a safe flightpath, while also being aware of other traffic and complying with ATC instructions.



A higher than normal initial approach speed compounded the workload on both pilots as the aircraft was positioned onto finals. The Instructor became distracted by his efforts to assist the Student with the result that not only was the landing gear not extended but the landing check itself was not actioned and the approach and landing continued without the error being captured. The actions of lowering the landing gear and completing the landing checklist were missed by both of the pilots (Pilot Flying and Instructor) but were also not identified by the second (observing student) occupying a rear seat.

- END -

**In accordance with Annex 13 to the Convention on International Civil Aviation, Regulation (EU) No 996/2010, and Statutory Instrument No. 460 of 2009, Air Navigation (Notification and Investigation of Accidents, Serious Incidents and Incidents) Regulation, 2009, the sole purpose of this investigation is to prevent aviation accidents and serious incidents. It is not the purpose of any such investigation and the associated investigation report to apportion blame or liability.**

**A safety recommendation shall in no case create a presumption of blame or liability for an occurrence.**

Produced by the Air Accident Investigation Unit

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