



Air Accident Investigation Unit Ireland

FACTUAL REPORT

**Serious Incident
Cessna 177A, N707XJ
Dunsany, Co. Meath**

21 January 2017



**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 13¹ to the Convention on International Civil Aviation, Regulation (EU) No 996/2010² and Statutory Instrument No. 460 of 2009³, 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 this 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.

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

² **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.

³ **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 21 January 2017, appointed Mr Paul Farrell as the Investigator-in-Charge to carry out an Investigation into this Accident and prepare a Report.

Aircraft Type and Registration:	Cessna 177A, N707XJ	
No. and Type of Engines:	1 x Lycoming O-320	
Aircraft Serial Number:	17701340	
Year of Manufacture:	1969	
Date and Time (UTC)⁴:	21 January 2017 @ 15.42 hrs	
Location:	Dunsany, Co. Meath	
Type of Operation:	General Aviation	
Persons on Board:	Crew - 1	Passengers - 2
Injuries:	Crew - Nil	Passengers - Nil
Nature of Damage:	No damage	
Commander's Licence:	Private Pilot Licence (Aeroplane) issued by the Irish Aviation Authority (IAA)	
Commander's Age:	28 years	
Commander's Flying Experience:	211 hours, of which 7 were on type	
Notification Source:	Shannon Airport Duty Air Traffic Control Officer (DATCO)	
Information Source:	AAIU Report Form submitted by the Pilot, AAIU Field Investigation	

⁴ **UTC:** Co-ordinated Universal Time. All timings in this report are quoted in UTC which was coincident with local time on the event date.

SYNOPSIS

The Pilot reported that while in the cruise at a height of approximately 1,500 ft, the aircraft suffered a sudden loss of power. A successful forced landing was carried out into a grass field. No injuries were reported and there was no damage. The engine power loss was subsequently found to have been caused by fuel starvation.

NOTIFICATION

The AAIU was notified of the event by the Shannon Airport DATCO, and the AAIU Inspector-on-Call (IOC) established telephone communications with the Pilot.

1. FACTUAL INFORMATION

1.1 History of the Flight

The aircraft was returning to Navan Airfield (EIHH) from Shannon Airport (EINN) where there had been a general aviation gathering earlier in the day. The return routing involved two legs, EINN to Weston Airport (EIWT) and EIWT to EIHH.

The Pilot informed the Investigation that prior to departing EINN for the return journey he used the dipstick provided in the aircraft to determine the aircraft fuel load. The Pilot determined that there were 26 US Gallons (USG) of fuel on board, comprised of 14 USG in the left wing tank and 12 USG in the right wing tank. The Pilot stated that he estimated the aircraft's fuel burn rate at 9 USG per hour and was therefore satisfied that he had sufficient fuel for the journey from EINN to EIHH. The Pilot also informed the Investigation that the left hand fuel gauge was inoperable and that he *"didn't trust the right hand one"*.

The first leg of the journey, from EINN to EIWT, lasted approximately one hour and 20 minutes. One passenger alighted from the aircraft at EIWT and the remaining occupants departed EIWT for EIHH.

The Pilot reported that while in the cruise north of Clarkestown Mast in Co. Meath, at a height of approximately 1,500 ft, the aircraft suffered a sudden loss of power and the propeller *"began windmilling"*. The Pilot said that on completion of his emergency drills he concluded that engine power could not be restored. He transmitted a MAYDAY call on 118.5 MHz and proceeded to select the most appropriate field to conduct a power-off landing. With the aircraft losing height, the Pilot selected a field and *"positioned for left base immediately and chose to take the tailwind component and land downhill in fear of losing/not making the field"*. The Pilot reported that *"touchdown was fast and a number of bounces followed as I fought the significant downhill slope. I applied right rudder in order to maximise ground run available and took a diagonal tack"*. The aircraft came to rest and all occupants exited the aircraft. There were no injuries and no damage to the aircraft. The Pilot contacted Shannon Air Traffic Control (ATC) by phone to advise them of the situation.



1.2 Post Event

The EINN DATCO informed the AAIU IOC of the event and the IOC telephoned the Pilot. The Pilot had by this time determined that the contents of the tanks had been exhausted and thus the cause of the power loss was fuel starvation. The Pilot was arranging for fuel to be brought to the aircraft to re-fuel and fly the aircraft to EIHH.

The IOC suggested to the Pilot that until he was certain of the reason for fuel starvation it would be unwise to take-off again. In subsequent conversation between the Pilot and the IOC it became clear that the dipstick used to check the contents, which was the dipstick located in the aircraft, was not appropriate for that aircraft type but was actually for a Cessna 172. The Pilot subsequently satisfied himself regarding the serviceability of the aircraft, refuelled and flew the aircraft back to EIHH without further incident.

1.3 Event Follow-up

Two AAIU Inspectors subsequently visited EIHH to meet with the Pilot and view the aircraft. There was no evidence of aircraft damage. The Pilot carried out a phased filling of the aircraft fuel tanks and manufactured a wooden dipstick for future use with the 177A aircraft. A comparison between the wooden dipstick (denominated in litres) and the Cessna 172 dipstick (denominated in USG) can be seen at **Photo No. 1**. The Investigation noted that the 177A (wooden) dipstick was non-linear in the lower range i.e. the depth of fuel corresponding to the 10 litres at the bottom of the tank, is more than twice the depth of fuel corresponding to a 10 L increment between 20 L & 30 L, 30 L & 40 L, etc. The effect of this non-linearity can be appreciated by noting that the 172 dipstick would indicate the presence of 5 USG (in excess of 20 L) when the Aircraft's tank would only actually contain approximately 5 L.

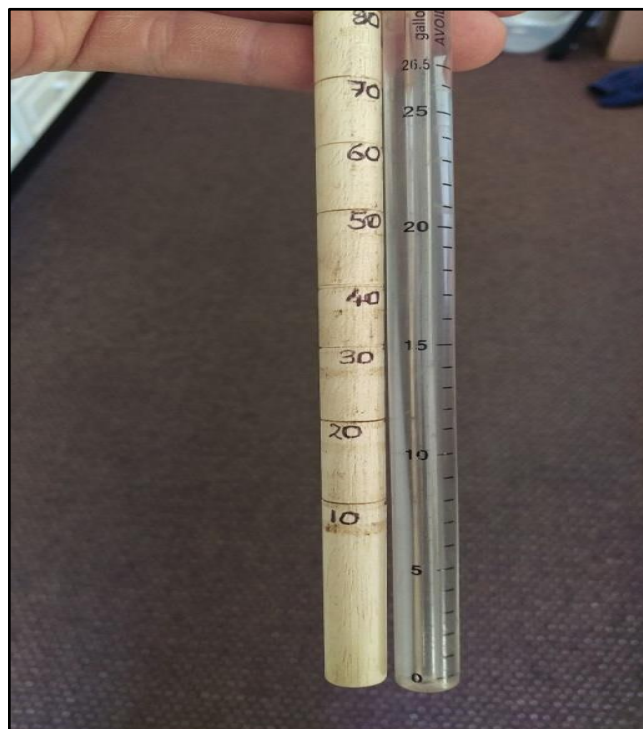


Photo No. 1: Comparison of dipsticks (left 177A, right 172)

To directly compare the two dipstick indications, the Investigation converted the Litre denominated readings to USG and plotted a comparison (**Figure No. 1**) between the indicated fuel contents (using the 172 dipstick) and the actual fuel contents (using the 177A dipstick). **Figure No. 1** indicates that the left fuel tank, which the dipstick indicated contained 12 USG (red line), actually contained 5.2 USG; the right fuel tank, which the dipstick indicated contained 14 USG (green line), actually contained 7 USG. Thus, the total fuel load aboard the aircraft departing EINN was actually 12.2 USG. With an actual fuel load of 12.2 USG, which was less than half the indicated fuel load of 26 USG, the Aircraft's endurance was also less than half that which was expected on departure from EINN.

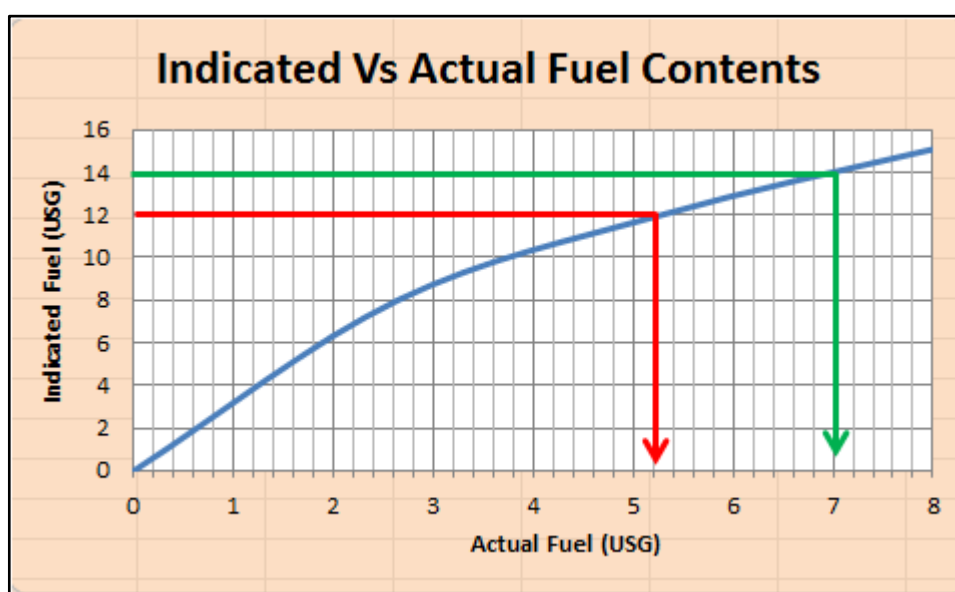


Figure No. 1: Comparison of indicated and actual fuel loads

2. AAIU COMMENT

Accurate fuel management is essential for safe operation of aircraft. The Pilot was aware that the left hand fuel gauge was inoperable and he considered the right hand one to be unreliable. He therefore relied on a physical dipping of the fuel tanks to accurately estimate the fuel contents. In this case, because the dipstick used was not the correct dipstick for the aircraft type, an erroneously high estimate of the aircraft's fuel state was obtained. This led to the over-estimation of the aircraft's endurance.

The Pilot's actions following the loss of power demonstrated good presence of mind.

This event should serve as a reminder to general aviation pilots of the importance of effective fuel management and of checking the compatibility of ancillary equipment with their specific aircraft.

- 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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