Technical report
A–035/2021

Accident on 22 July 2021 involving a CESSNA FR172K aircraft, registration EC-DCP, in Almoguera (Guadalajara, Spain)

Please note that this report is not presented in its final layout and therefore it could include minor errors or need type corrections, but not related to its content. The final layout with its NIPO included (Identification Number for Official Publications) will substitute the present report when available.

GOBIERNO DE ESPAÑA
MINISTERIO DE TRANSPORTES, MOVILIDAD Y AGENDA URBANA
SUBSECRETARÍA
COMISIÓN DE INVESTIGACIÓN DE ACCIDENTES E INCIDENTES DE AVIACIÓN CIVIL

NOTICE

This report is a technical document that reflects the point of view of the Civil Aviation Accident and Incident Investigation Commission (CIAIAC) regarding the circumstances of the accident and its causes and consequences.

In accordance with the provisions in Article 5.4.1 of Annex 13 of the International Civil Aviation Convention; and with articles 5.6 of Regulation (UE) nº 996/2010, of the European Parliament and the Council, of 20 October 2010; Article 15 of Law 21/2003 on Air Safety and articles 1 and 21.2 of Regulation 389/1998, this investigation is exclusively of a technical nature, and its objective is the prevention of future civil aviation accidents and incidents by issuing, if necessary, safety recommendations to prevent from their reoccurrence. The investigation is not pointed to establish blame or liability whatsoever, and it's not prejudging the possible decision taken by the judicial authorities. Therefore, and according to above norms and regulations, the investigation was carried out using procedures not necessarily subject to the guarantees and rights usually used for the evidences in a judicial process.

Consequently, any use of this report for purposes other than that of preventing future accidents may lead to erroneous conclusions or interpretations.

This report was originally issued in Spanish. This English translation is provided for information purposes only.

CONTENTS

ABBREVIATIONS

AEMET ..... Spain’s State Meteorological Agency
CRS ..... Certificate of return to service
ft ..... Feet
gal ..... Gallon
GPS ..... Global positioning system
h ..... Hour
LT ..... Local time
HP ..... Horsepower
IR(A) ..... Instrument Rating (aircraft)
kg ..... Kilogrammes
kt ..... Knots
l ..... Litre
KIAS ..... Knots indicated airspeed
LECU ..... ICAO code for Madrid-Cuatro Vientos Airport
m ..... Metre
min ..... Minutes
POH ..... Pilot Operating Handbook
PPL(A) ..... Private pilot license (aircraft)
RPM ..... Revolutions per minute
SEP(land) ..... Single-engine piston rating (land)
TBO ..... Time between overhauls
VFR ..... Visual Flight Rules

Technical report

A-035/2021

Owner and Operator:	PRIVATE
Aircraft:	CESSNA FR172K, registration EC-DCP
Date and time of accident:	22 July 2021; 19:45 LT[1]
Site of accident:	Municipality of Almoguera (Guadalajara)
Persons on board:	1 pilot,1 passenger, unharmed
Type of flight:	General aviation - Private
Phase of flight:	Landing – emergency landing
Flight Rules	VFR
Date of approval:	February 23, 2022

SYNOPSIS

Summary of the accident

On 22 July 2021, a CESSNA FR172K aircraft, registration EC-DCP, suffered an accident while making an emergency landing in the municipality of Almoguera (Guadalajara). Following an in-flight loss of power, the crew decided to land on a crop field with uneven terrain, which caused the aircraft to flip over. Both occupants were unharmed, but the aircraft sustained significant damage.

The investigation has determined the cause of the accident was the performance of an off-airfield emergency landing due to a loss of engine power.

.

[1] All times used in this report are local time

1.- THE FACTS OF THE INCIDENT

1.1.- Overview of the accident

On Thursday, 22 July 2021 at 19:45 h, a CESSNA FR172K aircraft, registration EC-DCP, suffered an accident while making an emergency landing in the municipality of Almoguera (Guadalajara).

According to the information obtained, the purpose of the flight was to complete the hours necessary for the pilot to subsequently revalidate his licence. The passenger accompanying him also held a private pilot licence and had significantly more flight experience. They took off from Cuatro Vientos airport at 18:37 h. Approximately 1 h later, at 4,000 ft over the area of Albalate de Zorita, the aircraft lost engine power, so the pilot handed over the controls to the passenger. After the initial drop in power, the engine revs rose momentarily and then dropped again. They changed the fuel selector switch from one tank to another and applied full throttle but could not restore power, so the passenger decided to make an emergency landing on farmland. During the landing, the nature of the terrain caused the nose leg to collapse and the aircraft flipped over. Neither occupant was injured during the emergency landing, and both were able to evacuate the aircraft. Once out of the aircraft, they called Cuatro Vientos Airport and the emergency number. They informed the authorities that there must have been approximately 10 gallons of fuel left in the tanks at the time of landing and that a considerable amount had subsequently spilt onto the ground.

The aircraft sustained significant damage, mainly to the landing gear, propeller and fuselage, and remained at the crash site until the following day, when it was removed and transported to Cuatro Vientos Airport.

1.2.- Injuries to persons

Injuries	*Crew*	*Passengers*	*Total in the aircraft*	*Others*
Fatalities				
Serious				
Minor				
Unharmed	1	1	2	
TOTAL	1	1	2	

1.3.- Damage to the aircraft

The accident caused the nose leg to collapse and damaged the wings, struts, vertical stabiliser, propeller and lower fuselage.

1.4.- Other damage

There was no further damage.

1.5.- Information about the personnel

The 63-year-old pilot held a PPL(A) licence issued by AESA on 16 January 2008 and a SEP(land) rating valid until 31 January 2022.

He also had a class 2 medical certificate valid until 30 September 2021. According to his statement, he had 213 h of experience at the time of the accident.

1.6.- Information about the aircraft

The FR172K aircraft, registration EC-DCP, is a single-engine, high-wing aircraft with fixed tricycle landing gear and a two-bladed metal propeller. Its empty weight is 730 kg, and its maximum take-off weight is 1,157 kg. It has serial number 0598 and was registered in the Aircraft Registry of Spain's National Aviation Safety Agency on 08 June 1978. It is equipped with a CONTINENTAL IO-360-KB 6-cylinder 195 HP engine, serial number 288832-R, and its fuel tanks have a total capacity of 52 gallons, of which 49 gallons are usable. The airworthiness review certificate had been renewed on 04 September 2020 and was valid until 29 August 2021.

According to the aircraft logbook, at the time of the accident, it had 6,958 hours of flight time, and the most recent maintenance performed was the replacement of the propeller, governor and seat belts, the corresponding CRS having been issued on 05/07/21.

According to the engine logbook, at the time of the accident, it had 4,287 hours of flight time, and the most recent maintenance tasks were the 50 and 100 h overhauls, the corresponding CRS having been issued on 22/10/2020.

According to the aircraft manufacturer, at an altitude of 10,000 ft and with a power setting of 50%, the aircraft has a range of 6.1 h, while at 6,000 ft and an 80% power setting, its range is 3.7 h.

The engine manufacturer specifies an ignition advance of 20° and a recommended TBO of 2,000 h or 12 years. At the time of the accident, there were 300 h left before the next overhaul.

After the 100 h overhaul, the engine manufacturer prescribes an operational check of the engine followed by a flight test, measuring parameters such as power delivery, cylinder temperature, fuel pressure at idle and full power, fuel flow, etc., in order to verify engine performance.

An image of the aircraft's control panel can be seen in Figure 1.

Figure 1. Control panel of the EC-DCP aircraft

According to the aircraft logbook, the aircraft was not used between 06/03/21 and 06/07/21, during which time it was parked at Cuatro Vientos Airport until the propeller and governor were replaced.

The POH states that when the aircraft is at maximum weight, it will consume 1.3 gallons during the climb to an altitude of 4,000 ft, and 10.4 gal/h for a cruise speed at 2,400 RPM and a temperature of 20°C above standard.

1.7.- Meteorological information

N/A.

1.8.- Aids to navigation

N/A.

1.9.- Communications

N/A.

1.10.- Aerodrome information

N/A.

1.11.- Flight recorders

The aircraft was not equipped with a flight data or cockpit voice recorder because they are not a regulatory requirement for this type of aircraft.

1.12.- Aircraft wreckage and impact information

The passenger landed the aircraft on farmland in the municipality of Almoguera (Guadalajara), some 60 km from Cuatro Vientos Airport. The nature of the terrain caused the aircraft to flip over after landing, as shown in the two images in Figure 2.

Figure 2. Final position of the aircraft

The first picture shows the detached landing gear leg after it collapsed during the landing.

1.13.- Medical and pathological information

Both occupants were unharmed.

1.14.- Fire

There were no signs of fire during the flight or after the impact.

1.15.- Survival aspects

The aircraft's cabin was not deformed in any way that could have endangered the lives of the crew. The safety seat belts fulfilled their restraining function, with both occupants being unharmed and able to exit the aircraft without assistance.

1.16.- Tests and research

1.16.1 Aircraft inspection

The aircraft was removed from the scene of the accident and transported to the 145 Centre responsible for its maintenance at Cuatro Vientos Airport, SINMA AVIACIÓN, S.L. (approval no. ES.145.113), to be examined. The nose leg had detached, and the vertical stabiliser, wings and propeller had been damaged during the impact, as shown in Figure 3.

Figure 3. Damage to the aircraft

The damage to the propeller suggests it was moving when the aircraft overturned. The engine cowling was removed to inspect the engine, finding that the baffles, intake pipes, air filter, exhaust ducts and electrical wiring were in good condition. No fuel leaks were found

in any of the injection system components or the gascolator filter. The oil level was low due to the spillage that resulted from the aircraft being inverted.

On rotating the propeller, the crankshaft rotated without resistance, and although there were oil stains on the engine, the governor was not leaking. However, the plug used to check the ignition advance was loose, causing the oil leak observed earlier.

The mixture knob cable's jacket was also loose, and the alternative air butterfly valve was faulty and stuck in the open position. Figure 4.

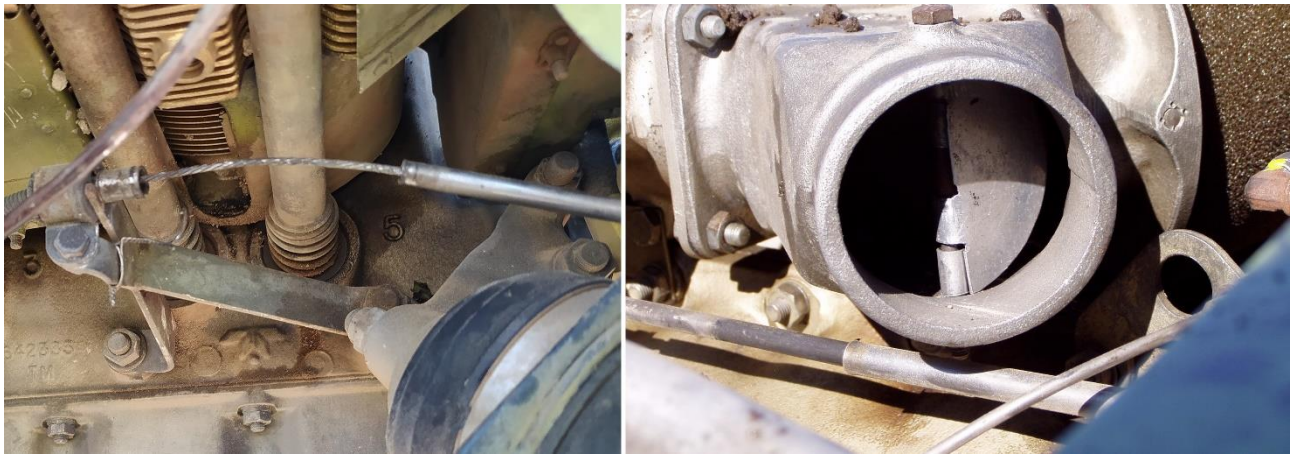

Figure 4. Mixture cable jacket and alternative air valve

The throttle, mixture and propeller pitch controls were checked to ensure they worked correctly. The gascolator filter was disassembled, and no residue was found in the filter bowl, which was clean and free of obstructions, as shown in Figure 5.

Figure 5. Magnetos check and disassembly of the gascolator filter bowl

The magnetos were checked, finding that both provided voltage and a check of the ignition advance returned values of 24° for the left magneto and 23° for the right one.

The spark plugs were removed, and it was observed that although they showed some signs of wear and lead deposits, they were able to provide a spark. Furthermore, all the cylinders produced compression when the crankshaft was rotated, operating the valves correctly.

The results of the tests recommended by the engine manufacturer after the 100-hour overhaul were requested from the aircraft maintenance centre, but no response was received, nor was any indication given as to whether they had been carried out.

1.16.2 Estimated fuel consumption after refuelling

The receipt for the last refuelling shows that it took place on 18/07/21 at Cuatro Vientos Airport. A total of 102 l (26.8 gal) of AVGAS 100LL fuel was put in, which, according to the owner, filled the tanks.

After refuelling, the following flights had been noted in the aircraft's logbook:

- 19/07/2021: LECU-LECU (40 min)
- 21/07/2021: LECU-LECU (30 min)

The last flight on the day of the accident (22/07/21) had a duration of 68 min, which means that between refuelling and the time of the off-airfield landing, the aircraft flew for 138 min (2.3 h).

According to the manufacturer, the aircraft would have consumed 1.3 gal/h climbing to 4,000 ft in each of the three take-offs and 10.4 gal/h cruising at 2,400 rpm during the 2.3 h flown. This gives an approximate fuel consumption of 27.80 gal.

Given that, according to the POH, the aircraft can hold 49 gal of usable fuel, there would have been approximately 21.2 gal of usable fuel remaining in the tanks at the time of the accident.

1.17.- Organisational and management information

N/A.

1.18.- Additional information

Aircraft manufacturer's procedure for landing with engine failure.

- Speed set to 75 KIAS.
- Ignition switch off.
- Fuel shut-off valve on.
- Fuel selector valve set to both tanks.

- Rich mixture
- Half throttle
- Auxiliary fuel pump in LOW position for 3 to 5 seconds then switched off.
- Start in BOTH position (or in START position if propeller stops).

1.19.- Special investigation techniques

None required.

2.- ANALYSIS

According to the information provided by the aircraft occupants, after approximately one hour of flight, they experienced a decrease in engine power. At that point, the passenger, who also had a pilot's licence and was more experienced than the pilot, took the controls and, given the drop in power, decided to make a precautionary landing rather than risk trying to reach the departure airport and having to make an emergency landing in an area where there were no suitable places to do so. He selected a fallow crop field for the landing. This decision is considered appropriate as it gave them more time to prepare and make a controlled landing.

According to the information provided by the passenger, the engine continued to lose power as they chose and approached the landing field, eventually failing to provide enough power to maintain flight, which meant that the precautionary landing became an emergency landing. Neither the pilot nor the passenger completed the steps on the engine failure checklist, and no evidence of any power loss prior to the accident was found in the engine. Therefore, whether engine power could have been restored or not is unknown.

The pilot approached the chosen field and landed, but as he had not taken into account the unevenness of the terrain, the aircraft flipped over as soon as the nose landing gear met with resistance.

The aircraft had flown 2.3 h since the last refuelling, which was less than the shortest range indicated by the aircraft manufacturer in the POH. However, we cannot say precisely how much fuel had been consumed during those previous flights. The occupants also indicated that a considerable amount of fuel spilled out of the tanks onto the ground.

Although present before the accident, the anomalies observed during the subsequent engine examination (loose mixture cable jacket, worn spark plugs, faulty alternative air valve, slightly maladjusted ignition advance) would not have caused a loss of power. Furthermore, although the ignition timing values differed from the manufacturer's specifications (20°), this could have caused backfiring and overheating but not a drop in rpm. Finally, the inspection did not reveal any blockages or dirt in the fuel system pipes, and as a result, we have been unable to conclusively identify the cause of the incident.

With regard to the last annual engine overhaul, it should be noted that although we contacted the maintenance centre to request the results of the tests and adjustments prescribed by the manufacturer to assess the condition of the engine after maintenance, they were not forthcoming, and, therefore, we do not know whether said tests were carried out.

3.- CONCLUSION

3.1.- Findings

- The most recent maintenance tasks carried out on the aircraft's engine were those included in the 50 and 100 h overhauls, but no records have been provided.

- Although some deficiencies were identified in the post-accident engine inspection, we have been unable to determine what caused the engine to lose power.

3.2.- Causes/contributing factors

The cause of the accident was the performance of an off-airfield emergency landing following a loss of engine power.

4.- RECOMMENDATIONS

No recommendations are issued.