

Technical report

ULM A-019/2022

Accident on 12 July 2022, involving a TECNAM P-92-ECHO-S, registration EC-DG4, at Bétera (Valencia, 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.

FOREWORD

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) n° 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.

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ABBREVIATIONS

° ‘ “	Degrees, minutes, seconds
°C	Degrees Celsius
AD	Airworthiness Directive
AEMET	State Meteorological Agency
AESA	Spain's National Aviation Safety Agency
AGL	Above ground level
AIS	Aeronautical information service
ANR	Air navigation race
CAVOK	Visibility conditions of 10 km or more, no clouds below 5000 ft, absence of cumulonimbus and turbulocumulus clouds and no significant meteorological phenomena.
CTR	Control zone
DGAC	Spain's Civil Aviation General Directorate
EASA	European Union Aviation Safety Agency
ft	Foot (feet)
FH	Flight hours
h	Hour (s)
hPa	Hectopascal (s)
kg	Kilogram (s)
km	Kilometer (s)
km/h	Kilometres per hour
kt	Knot (s)
l	Litre(s)
LAPL	Light aircraft pilot license
LEBT	IACO code for Valencia/Bétera military heliport
m	Metre (s)
m ²	Square meter(s)
MAF	Multi-axis fixed-wing
METAR	Aviation routine weather report (in aeronautical meteorological code)
MHz	Megahertz (s)
N	North or northern latitude
nº	Number
OFF	Closed
ON	Open
PPL(A)	Aircraft private pilot licence
QNH	Altimeter sub-scale setting to obtain elevation when on the ground (pressure setting to indicate elevation above mean sea level)
RD	Royal Decree
R/TC	Spanish radiotelephony rating

SEP(land)	Single-engine piston land rating
SP	Single pilot rating
SB	Service Bulletin
TULM	Ultralight aircraft pilot license
ULM	Ultralight motorised aircraft
UL	Ultralight motorised aircraft
UTC	Coordinated universal time
V _A	Maneuvering speed
V _{FE}	Maximum flap extended speed
V _{NE}	Never exceed speed
V _{NO}	Maximum structural cruising speed
VFR	Visual flight rules
W	West or western longitude

Technical report

ULM A-019/2022

Owner:	Private
Operator:	Private
Aircraft:	TECNAM P-92-ECHO-S, EC-DG4 (Spain)
Date and time of the accident:	12 July 2022, 20:37 h ¹
Site of the accident:	Jaime I Military Base, Bétera (Valencia)
Persons on board:	1 (crew)
Type of flight:	General aviation - Private - Local
Phase of flight:	Landing – Landing roll – off runway
Type of operation:	VFR
Date of approval:	March 19, 2024

Synopsis

Summary:

On Tuesday, 12 July 2022, a TECNAM P-92-ECHO-S aircraft, registration EC-DG4, was involved in an accident while making a local flight. The pilot was the only person on board.

While trying to compensate the fuel tanks, the pilot closed the fuel valve of the right tank without opening the left valve, and the engine shut down in flight due to lack of fuel supply. The pilot headed towards the Jaime I Military Base, intending to land there, but was unable to reach it and had to make an emergency off-airfield landing.

The pilot was unhurt, but the aircraft suffered significant damage.

The investigation has revealed that the accident was caused by improper fuel management and the incorrect management of the emergency in that the flaps

¹ Hora local. Para obtener la hora UTC es necesario restar 2 h a la hora local. Salvo indicación en contra, todas las horas del presente informe se expresan en hora local.

were fully extended before the landing was assured, resulting in an off-airfield landing.

The following factors are thought to have contributed:

- A lack of adherence to the available engine failure procedure.
- The note on fuel compensation in the cruise checklist of the *Aircraft Manual* does not provide sufficient information for the procedure to be completed.

Two recommendations are issued to the aircraft manufacturer to complete normal and emergency procedures, one recommendation is issued to the aircraft owner to reverse the modification to the initial certified configuration regarding the fuel valve, and finally, a recommendation is issued to AESA to consider the issuance of an airworthiness directive to make mandatory the service bulletin SB 090 - UL of June 8, 2022 issued by TECNAM.

1. FACTUAL INFORMATION

1.1. History of the flight

On Tuesday, 12 July 2022, the pilot of the TECNAM P-92-ECHO-S aircraft, registration EC-DG4, arrived at the aerodrome at 19:00 h to carry out a local flight.

The aircraft took off at 19:30 from Olocau Aerodrome to head towards the coast and fly over it. On the way back inland, the tanks were slightly out of balance, so the pilot decided to carry out a tank compensation. As he was flying with both tanks open, he closed the fuel valve on the emptier (left) tank. On his return to the airfield, he encountered a traffic in training and decided to make a low-level overflight of the Olocau runway and return to the coast.

At 20:34, the pilot closed the fuel valve on the right tank without opening the left tank, and moments later, the engine began to sputter. The pilot declared an emergency and headed towards the heliport at the Jaime I military base.

According to the pilot, the engine cut out at 20:35 when the aircraft was at 1200-1400 ft. The pilot extended the flaps fully but then realised he wouldn't reach the runway and decided to head for a clear area inside the base. During the landing roll-off runway, the left leg of the landing gear broke off, and the left wing dragged along the ground for approximately 20 m. The tip of the left wing hit a bush, causing the aircraft to spin around before finally coming to a stop.

1.2. Injuries to persons

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Total in the aircraft</i>	<i>Others</i>
Fatal				
Serious				
Minor				
None	1		1	
TOTAL	1		1	

1.3. Damage to the aircraft

The aircraft sustained significant damage to its landing gear, left wing, elevator and fuselage.

1.4. Other damages

There were no additional damages.

1.5. Personnel information

The 45-year-old pilot had an ultralight aircraft pilot license (TULM) issued by Spain's National Aviation Safety Agency (AESA) on 16 November 2016, with multi-axis fixed wing (MAF) and Spanish radiotelephony operator (R/TC) ratings, valid and in force until 30 September 2023 and indefinitely, respectively.

In addition, the pilot held a private pilot licence (PPL(A)) issued by EASA on 12 June 2015 with a single-engine piston and single-pilot rating (SEP(land)/SP) valid until 31 December 2023.

He had a class 2 medical certificate and LAPL, valid until 16 March 2023.

His total and recent experience both on the type of aircraft involved in the accident and in total on other types is shown below:

	Last 24 h (h)	Last 7 days (h)	Last 90 days (h)	Total (h)
Hours in type	01:14	03:28	24:51	35:14
Total	01:14	03:53	27:21	192:32

He had 71:27 hours of experience on ultralight aircraft.

According to the pilot, he had rested for 8 hours the night before.

1.6. Aircraft information

1.6.1. General information

The aircraft with registration EC-DG4 is a single-engine, twin-seat, strut-braced rectangular high-wing aircraft and fixed main landing gear with a steerable nose wheel. The aircraft is constructed of metal and has a two-bladed wooden propeller. The aircraft's specifications are as follows:

- Make TECNAM
- Model P-92-ECHO-S
- Year of manufacture 2001
- Serial number P-92-ES-011

• Empty weight	256 kg
• Maximum take-off weight	450 kg
• Engine type	ROTAX 912 ULS
• Engine serial number	4427154
• Information about the owner and operator	Private

At the time of the accident both the aircraft and engine had accumulated 1995:47 h.

1.6.2. Dimensions and specifications

Section 1 of the aircraft's *Flight Manual*² provides the following dimensions and specifications:

• Wingspan	9.3 m
• Length	6.4 m
• Height	2.5 m
• Wing surface	13.02 m ²
• V _{NE}	260 km/h
• V _{NO}	200 km/h
• V _A	150 km/h
• V _{FE}	110 km/h

1.6.3. Airworthiness status

The aircraft had a registration certificate issued by AESA on 15 December 2020 with registration number 733.

It had a restricted airworthiness certificate – number 733 – in the PRIVATE - 3 - NORMAL³ category issued by the Spain's Civil Aviation General Directorate (DGAC) on 15 June 2001, valid indefinitely as long as the conditions specified in the certificate are maintained.

² 3rd edition – 14th April 2008 r.1 of 18th March 2015.

³ Categories: PRIVATE (type of flight performed by the aircraft); 3 (Aircraft suitable for visual flight only); NORMAL (Authorised to perform normal flight, excluding any aerobatic manoeuvres)

On 28 March 2022, when the aircraft had 1873:27 h, the last engine and airframe maintenance check, corresponding to the 200 h overhaul, had been performed. The flow meter was also changed.

1.6.4. The aircraft's fuel system

The aircraft has a 35-litre fuel tank on each wing.

Each tank has an independent valve on the side of the cabin frame that cuts off the fuel flow to the rest of the system. The following figure shows the position of the valves (both in the open position) after the accident.



FIG. 1 POSITION OF FUEL VALVES AFTER THE ACCIDENT

The fuel valves had ON/OFF markings to indicate their position for the left valve (LH) and for the right valve (RH):

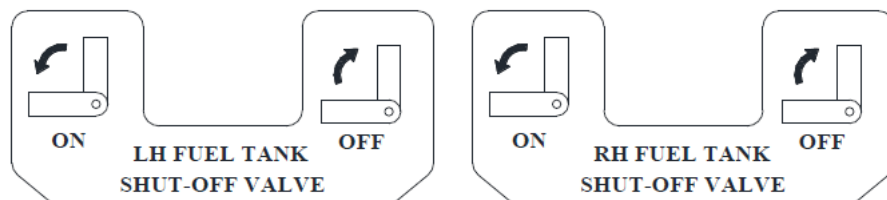


FIG. 2 VALVE POSITION INDICATION MARKING

When the valve lever is aligned with the frame of the cabin structure, the valve is open. If the lever is rotated 90° with respect to the frame, the valve is closed.

It should be noted that the system included an auxiliary electric fuel pump.

The pilot had refuelled the aircraft with 40 litres of fuel before the flight. At the time of the accident, the aircraft had approximately 24 litres of fuel remaining.

1.6.5. Emergency procedures

The following procedures for engine failure and forced landing can be found in Section 3 of the *Aircraft Manual*⁴, Emergency Procedures:

ENGINE FAILURE

Depending on the case that may apply, the emergency procedure should follow the guidelines listed below.

ENGINE FAILURE DURING TAKEOFF RUN

1. Throttle: *idle* (fully out)
2. Brakes: *apply as needed*
3. Magnetos: *OFF*
4. Flaps: *retract*
5. Master switch: *OFF*
6. Fuel shutoff valves: *OFF*

ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF

1. Set glide speed to optimal value of 110 km/h
2. Locate landing area
3. Throttle: *idle* (fully out)
4. Fuel shutoff valves: *OFF*
5. Magnetos *OFF*
6. Flaps: *as needed*
7. Master switch: *OFF*
8. Land with wings level

⁴ Point 1 of the procedure for engine failure immediately after take-off was modified in Version 3 revision 2, dated 11 August 2022, 20 days after the accident.

FORCED LANDING

EMERGENCY LANDING WITHOUT ENGINE POWER

1. Set glide speed to optimal value of 110 Km/h
2. Select terrain area most suitable for emergency landing, possibly upwind
3. Fuel shutoff valves: *OFF*
4. Magnetos: *OFF*
5. Tighten safety belts, release door safety lock and unlatch doors
6. Flaps: *as needed*
7. When ready to land, Master switch: *OFF*

POWER-ON FORCED LANDING

1. Adjust descent slope
2. Extend flaps as needed
3. Select terrain area most suitable for emergency landing and flyby checking for obstacles and wind direction
4. Tighten safety belts, release door safety lock and unlatch doors
5. Before touchdown: fuel shutoff valves *OFF*
6. Flaps: *extended*
7. After touchdown: Magnetos: *OFF*, Master switch: *OFF*

The *Aircraft Manual* for the P-92-ECHO-S with type certificate of airworthiness no. 231-I/1 does not contain an in-flight engine start procedure. The following procedures, among others, can be found in Section 3 of the *Aircraft Manual* for the Tecnam P-92-JS⁵ aircraft with EASA type certificate A.412(SO/A-340):

- Engine failure:
 - Engine failure during take-off run
 - Engine failure immediately after take-off
 - Engine failure during flight:
 - Irregular engine RPM
 - Low fuel pressure
 - Low oil pressure
- Air start
- Glide
- Landing emergencies
 - Forced landing without engine power
 - Power-on forced landing
 - Landing with flat nose tyre
 - Landing with flat main tyre

These procedures indicate when the electric fuel pump is to be switched on or off.

⁵ Issue 3, revision 5 dated 12th July 2022.

Specifically, the air start and glide procedures consist of:

AIR START

1. Altitude: *preferably below 4000 ft*
2. Carb heat: *ON*
3. Fuel shutoff valves: *both ON*
4. Electric fuel pump: *ON*
5. Throttle: *middle position*
6. Generator switch and Master switch: *ON*.
7. Magnetos: *BOTH*.
8. Ignition key to *START*
9. If engine restarts, keep an eye on instrument readings and land as soon as possible, otherwise see procedure for: *Forced landing*

GLIDE

1. Flaps: *retract*
2. Speed at: **600 kg 69KIAS**
550 kg 66KIAS
450 kg 60KIAS
3. Glide ratio is **12.2** therefore with 1000ft elevation it is possible to cover ~3.8 km (~2 *nautical miles*) in zero wind conditions.

1.6.6. Cruise procedure

A cruise checklist with a note referring to compensating asymmetrical fuel consumption can be found in Section 4 of the *Aircraft Manual*, Normal Procedures:

CRUISE

- I. Reach cruising altitude
- II. Set power and engine rpm's for cruise.
- III. Check engine parameters

	912 UL	912 ULS
Oil temperature	90° - 110° C	
Temperature cylinder heads	< 135° C	
Oil pressure	2.0 – 5.0 bar	

- IV. Carburetor heat as needed, see paragraph on carb heat in Section 3.

NOTE

Compensate unpredicted asymmetrical fuel consumption between left and right fuel tanks by shutting off appropriate fuel tap located inside cabin

The P92-JS *Aircraft Manual* differs from accident aircraft's manual in that the note recommends acting only on the left selector to avoid erroneously closing both valves and the engine instrument checklist specifies the required fuel pressure:

CRUISE

- I. Reach cruising altitude
- II. Set power and engine rpm's for cruise.
- III. Check engine instruments
 - Oil temperature 90°-110 ° C.
 - Temperature cylinder heads 90° ÷ 135 °C or Coolant temperature 90° ÷ 120°
 - Oil pressure 2 - 5 bar.
 - Fuel pressure 2.2 – 5.8 psi or 2.2 – 7.2 psi
- IV. Carburetor heat as needed, see paragraph on carb. heat in Section 3.

NOTE

Compensate unpredicted asymmetrical fuel consumption between left and right fuel tanks acting, if possible, only on LH fuel selector appropriately to avoid erroneous closing of both fuel valves.

While in the P92 ECHO Super *Aircraft Manual*⁶, the warning highlights the need to ensure that one tank is feeding the engine at all times and the need to check the fuel pressure during the procedure:

6.2.1.9 CRUISE

Reaching cruise altitude:

Throttle:..... SET (5500 RPM Max)

Engine instruments:..... CHECK

- Oil temperature: 90°-110 ° C
- Cylinder head temperature: 90° - 135 °C
- Oil pressure: 2 - 5 bar
- Fuel pressure: 0.15 – 0.40 bar

CAUTION

Normal position of the fuel selectors is both on. Check fuel balance and fuel pressure. If necessary, shut off the higher reading tank using the appropriate fuel shutoff valve. Check fuel pressure again. **BE SURE THAT ONE TANK IS FEEDING THE ENGINE AT ALL TIMES!**

NOTE

Check fuel gauges frequently with one tank shut off to prevent fuel starvation.

1.7. Meteorological information

The METAR for the Jaime I military base in Bétera at 18:30 UTC was as follows:

METAR LEBT 121830Z AUTO 11005KT 050V160 CAVOK 30/13 Q1019=

I.e., the average wind in the preceding 10 minutes was 5 kt coming mainly from the east (110°), with variable direction extremes ranging from 50° to 160°. The visibility was 10 km or more, no clouds below 5000 feet, absence of

⁶ Revision number 2.04, dated 8 December 2007, US-LVA.

cumulonimbus and towering cumulus and no significant meteorological phenomena. The temperature was 30°C and the QNH was 1019 hPa.

According to the information provided by the pilot, the conditions were clear and calm on the day of the incident. He also confirmed that he used the WINDY weather application.

1.8. Aids to navigation

Not applicable. The flight was operating under visual flight rules.

1.9. Communications

Any relevant communications made by the pilot are included in section 1.11.

1.10. Aerodrome information

Not relevant to the investigation.

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.

However, the aircraft did have a GARMIN AERA 796 device, which was recording flight data. The data recorded by this device and provided to the investigation corresponded to the section of the flight that took place from 20:31:31 to 20:32:46.

In addition, the entire flight was recorded by a camera in the cockpit. The following information has been extracted from that video:

Time [hh:mm:ss]	Observations from the video
19:22:40	Engine start-up, with both fuel valves in the ON position.
19:25:29	Taxi to the holding point at the head of runway 15 at Olocau. Correct magneto check at holding point.
19:30:06	Take-off from runway 15.

Time [hh:mm:ss]	Observations from the video
19:31:25	Pilot reports leaving Olocau circuit via E corridor, at 1400 ft of altitude with QNH 1019, with intentions to fly the coastline in a southerly direction.
19:36:56	Aircraft leaves E corridor to fly over the coastline heading south towards Cullera. Both fuel valves remain in the ON position.
19:58:00	Aircraft returns northwards following the coastline.
20:17:00	Aircraft turns to the south following the coastline.
20:19:00	Aircraft turns inland, leaving the coastline.
20:19:39	Pilot contacts Bétera on reaching PUZOL, will join E corridor with intentions to return to Olocau, with 1100 ft and QNH 1019.
20:20:04	In E corridor, pilot closes right fuel valve without activating electric fuel pump.
20:21:14	Pilot realises that he has closed the wrong tank to equalise consumption, reopens the right tank and closes the left tank.
20:27:08	Aircraft leaves E corridor and pilot informs Olocau of his intention to use the W corridor, but another aircraft flying an ANR asks him not to do so; the pilot agrees to the request and makes a low altitude overflight over runway head 15.
20:32:09	Aircraft performs overflight at low altitude. The windsock indicating a headwind of approximately 10 km/h is visible.
20:33:38	Pilot reports entering E corridor at 1400 ft, with QNH 1019, with intentions to fly over the coastline and return to the airfield.
20:34:12	In E corridor, pilot sets the right fuel valve to OFF without switching the left fuel valve to ON while stating out loud that, as the tanks are equalised, he is opening the tank.
20:35:03	The engine sputters and the emergency management starts.
20:35:15	The fuel pressure alert is displayed on the GARMIN device.
20:35:35	The pilot declares MAYDAY on the Bétera frequency ⁷ .
20:35:44	The engine stops completely, and the pilot communicates his intention to land on the Bétera runway. The aircraft is flying at maximum range speed.
20:35:48	Pilot flies the aircraft at maximum range speed and deploys the flaps to T/O (15°).
20:35:54	Pilot extends the flaps fully.
20:37:20	The impact with the ground occurs just a few metres from the Bétera runway.
20:37:21	Aircraft rolls over unprepared terrain.
20:37:25	Impact with bushes and a tree, damage to the left leg and wing at minimum.

⁷ The heliport's air traffic service is provided during the airport's operating hours, i.e. in the mornings.

Time [hh:mm:ss]	Observations from the video
20:37:29	The aircraft comes to a stop.
20:37:34	Pilot secures cockpit, cuts power and turns both fuel valves to ON. The pilot is unharmed.

1.12. Wreckage and impact information

The aircraft came to rest in a field adjacent to the Bétera heliport runway at 39°37'32.8" N, 0°28'20.9" W and at an elevation of 130 m.

The approximate distance from threshold 09 to the accident aircraft was 143 m in a direction parallel to the runway centreline. The distance from the aircraft to the extension of the runway centreline was 140 m.

The following images were provided to the investigation. They show the aircraft with its left wing resting on the ground. The nose of the aircraft was facing north, perpendicular to the runway centreline.





FIG. 3 CONDITION OF THE AIRCRAFT AFTER THE ACCIDENT

The detached left main gear leg can be seen. There was drag damage to the tip of the left wing and the lower part of the fuselage. The elevator was detached from its mounting point to the fuselage.

1.13. Medical and pathological information

Not applicable.

1.14. Fire

No fire broke out.

1.15. Survival aspects

The cabin maintained its structural integrity, and the harnesses performed their function correctly.

The pilot was unharmed and able to exit the aircraft without assistance after securing it, shutting down the engine and cutting the electrical supply.

The pilot thought he had cut off the fuel, however, he opened the fuel valves after landing.

1.16. Tests and research

Not applicable.

1.17. Organizational and management information

Not applicable.

1.18. Additional information

1.18.1. Map of the visual approach to Olocau Aerodrome

An unofficial visual approach chart to Olocau Aerodrome is shown below to provide a better understanding of point 1.11. Entry to and departure from Olocau Aerodrome⁸ is via the E and W visual corridors defined below, at a height not exceeding 1000 ft (300 m) AGL.

- W corridor: direction defined by Olocau Aerodrome and the CASINOS waypoint (39° 41' 40" N 000° 42' 29" W) between the aerodrome itself and the CTR boundary.
- E Corridor: direction defined by the Olocau Aerodrome and the PUZOL waypoint (39° 37' 27" N 000° 18' 12" W) between the aerodrome itself and the CTR boundary.

⁸ According to ATS Operational Chart N°6 between Olocau Aerodrome, Bétera Control Tower (Bétera TWR) and Valencia Terminal Area Control Centre (LECL).

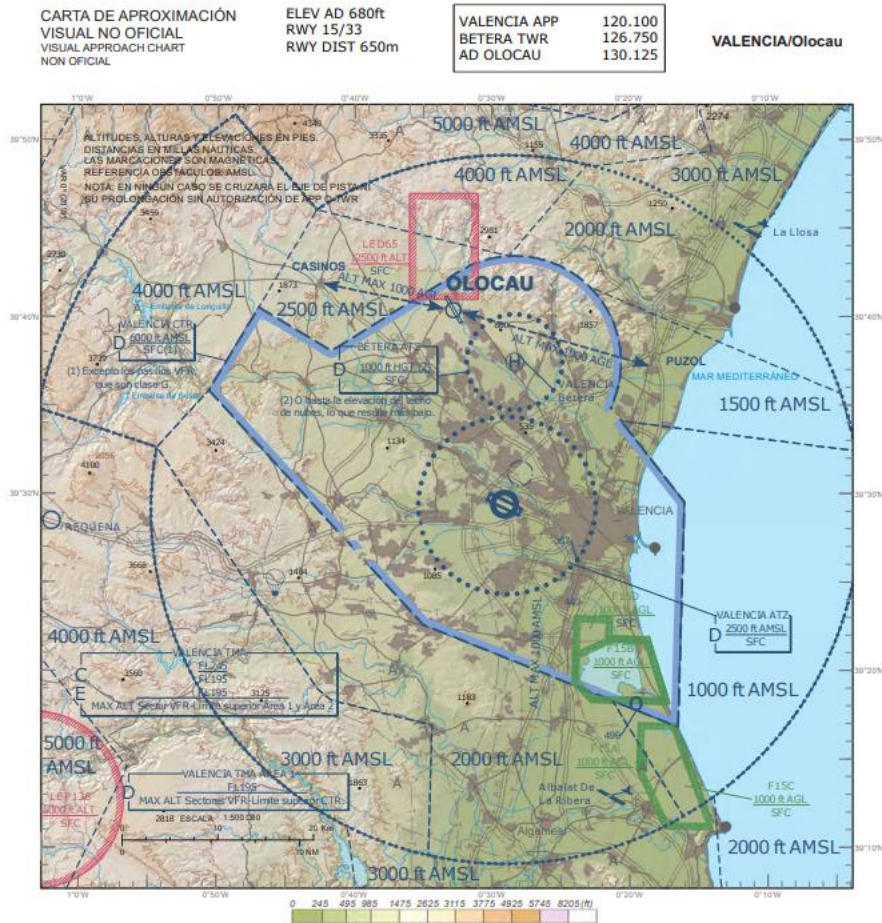


FIG. 4 MAP OF THE VISUAL APPROACH TO OLOCAU AERODROME

1.18.2. Measures adopted or proposed

After the accident, the aircraft's owner took the initiative, without the endorsement of the manufacturer or the certifying authority, to install a single fuel selector valve to avoid having two independent and visually separated valves.

1.18.3. Information on manufacturer's service bulletins and EASA's airworthiness directive

On June 8, 2022 the manufacturer of the TECNAM P92 aircraft issued the following service bulletins:

- n° SB 567 - CS - Ed 1 Rev 2 (applicable all P92-J and P92-JS aircraft (all serial numbers up to and including 151) and mandatory by EASA AD 2022-0131).
- SB 090 - UL (mandatory and applicable to all P92 UL aircraft)

Both bulletins indicate to replace the placard showing the position of the fuel valve with a new one. These placards must be installed on the next 50 FH⁹ of the aircraft or at the next inspection.

On July 4, 2022 the European Aviation Safety Agency (EASA) issued airworthiness directive number 2022-0131 based on the manufacturer's instructions in SB 567-CS for reported occurrences of unintentional closure of both fuel valves.

The aircraft flight manual in its edition 3, revision 2 of August 11, 2022 incorporated the new rotary placard to show the valve position:

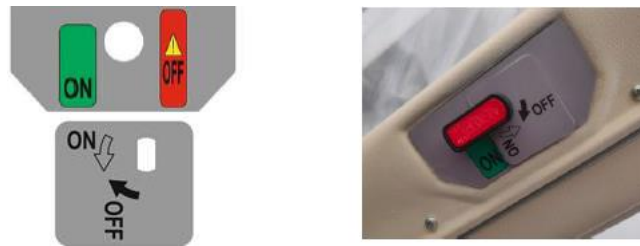


FIG. 5 NEW FUEL VALVE PLACARD

1.19. Useful or effective investigation techniques

None required.

⁹ On June 8, 2022, the aircraft had 1950:20 hrs.

2. ANALYSIS

The most relevant aspects of the accident, the operation, the aircraft flight manual and the use of checklists are analysed below.

There were no limiting meteorological conditions for the flight.

2.1. Operational analysis

On Tuesday, 12 July 2022, when aircraft EC-DG4 was flying eastbound towards the coast while conducting tank compensation with the right tank fuel valve open and the left tank fuel valve closed, the pilot closed the right tank valve, preventing fuel from reaching the engine and failing to check to see how this action affected the fuel pressure.

Fifty-one seconds after the valve closure, the engine began to sputter due to the lack of fuel. At this point, the pilot failed to check his last actions and, therefore, remained unaware of the status of both fuel valves. Once again, he neglected to check the fuel pressure.

A low fuel pressure alert appeared on the GARMIN AERA 796.

The pilot decided to make a precautionary landing, declared an emergency and headed for the heliport at the Jaime I military base. The emergency declaration was made on the base's frequency and outside the heliport's operating hours.

The engine cut out one and a half minutes after the valve closure.

The pilot focused his attention on the landing and not on the engine shutdown. Had he followed the engine failure procedure in the aircraft manual, he would have realised the fuel valves were in the OFF position and been able to correct the situation.

The video confirmed that in the first few seconds, the pilot set the speed close to the maximum range speed. However, he subsequently rushed to extend the flaps, first to the take-off setting and then fully, thus significantly reducing the aircraft's glide ratio and hindering its ability to reach the runway at Bétera.

When he realised he wasn't going to make it to the runway, he decided to carry out an emergency off-airfield landing but failed to follow the corresponding procedure (forced landing without engine power) as he did not check the fuel valves or the ignition switch. Furthermore, the video does not show him turning on the electric fuel pump, tightening his seatbelt or unlocking the doors.

The data provided to the investigation by the GARMIN AERA 796 device only covered one minute and fifteen seconds of the flight and, therefore, could not be analysed in conjunction with the other information gathered.

In conclusion, the EC-DG4 aircraft suffered an engine shutdown in cruise due to a lack of fuel when there was sufficient fuel in the aircraft, but it was not available to the engine due to mismanagement of the system.

2.2. Analysis of the aircraft's manual

The investigation found that the Tecnam P-92-ECHO-S *Aircraft Manual* does not contain procedures for an engine failure during flight, air start or glide. Furthermore, the note on the fuel compensation procedure in the cruise checklist does not go into detail on ensuring that one of the tanks supplies fuel to the engine continuously and does not address the need to check the fuel pressure (where a gauge is available) after operating the valve. Lastly, the emergency and normal procedures do not include the need to switch the electric fuel pump on or off despite the fact some aircraft of this type have one.

Although it was not in the manual, if an air start procedure had been followed, it would have led the pilot to check the fuel valves, thus preventing the off-airfield landing. For this reason, we believe this procedure should be included in the aircraft manual.

In addition, the inclusion of a glide procedure similar to that of the Tecnam P-92-JS aircraft would be desirable to facilitate the correct configuration of the aircraft in this phase.

Having analysed the various manuals mentioned in point 1.6.6, we have concluded that the *Aircraft Manual* is not sufficiently exhaustive and does not protect the pilot from making errors while carrying out the fuel compensation procedure.

Therefore, two recommendations are issued to the aircraft manufacturer in regard to including and completing the procedures not currently covered by the *Aircraft Manual*.

2.3. Analysis of the use of checklists

The video footage shows that the pilot did not use the checklist during the emergency. The use of checklists would have ensured the completion of the procedures.

2.4. Analysis on the incorporation of the service bulletin

At the time of the accident the P92-ECHO-S aircraft did not have the new fuel valve placard that incorporates the SB 090-UL, however, the aircraft had not completed the first 50 FH since the issuance of the SB nor had an inspection been performed.

On the other hand, in spite of being mandatory the incorporation of SB 090-UL by manufacturer's indication, but not normatively, it is considered convenient to reinforce its implementation with an airworthiness directive for ultralight aircraft as it has already been done for the P92-J or P92-JS aircraft to help prevent the unintentional closing of the valves, therefore a safety recommendation is issued.

3. CONCLUSION

3.1. Findings

- The note on fuel compensation in the cruise checklist of the *Aircraft Manual* does not provide sufficient information for the procedure to be completed.
- The pilot closed the left fuel valve to carry out fuel compensation, then closed the right valve without reopening the left valve.
- The engine sputtered and then cut out.
- The pilot did not complete the engine failure procedure.
- The pilot extended the flaps, decreasing the aircraft's glide ratio before the landing was assured.
- The pilot did not fully complete the procedure for a forced landing without engine power.

3.2. Causes / Contributing factors

The investigation has revealed that the accident was caused by improper fuel management and the incorrect management of the emergency in that the flaps were fully extended before the landing was assured, resulting in an off-airfield landing.

The following factors are thought to have contributed:

- A lack of adherence to the available engine failure procedure.
- The note on fuel compensation in the cruise checklist of the *Aircraft Manual* does not provide sufficient information for the procedure to be completed.

4. SAFETY RECOMMENDATIONS

During the investigation, it was found that the P-92-ECHO-S *Aircraft Manual* does not contain procedures for an engine failure during flight, air start or glide. Furthermore, the note on the fuel compensation procedure in the cruise checklist does not go into detail on ensuring that one of the tanks supplies fuel to the engine continuously and does not address the need to check the fuel pressure (where a gauge is available) after operating the valve. Lastly, the emergency and normal procedures do not include the need to switch the electric fuel pump on or off despite the fact some aircraft of this type have one. For this reason, the following safety recommendations are issued.

REC 01/24. It is recommended that Tecnam complete Section 3 on emergency procedures in the P-92-ECHO-S *Aircraft Manual* to include and complete the relevant procedures.

REC 02/24. It is recommended that Tecnam complete Section 4 on normal procedures in the P-92-ECHO-S *Aircraft Manual* to complete the relevant procedures.

In addition, given the owner's decision to modify the aircraft's configuration after the accident without the manufacturer's or authority's endorsement, the following safety recommendation is issued.

REC 03/24. It is recommended that the owner revert the modification to the fuel valve to return it to its initial certified configuration.

Finally, in spite of being mandatory the incorporation of SB 090 - UL by manufacturer's indication, but not normatively, it is considered convenient to reinforce its implementation with an airworthiness directive for TECNAM P92 ultralight aircraft to help prevent the unintentional closing of the valves as it has already been done with the P92 J and P92 JS aircraft, therefore, the following safety recommendation is issued:

REC 04/24. AESA is recommended to consider the issuance of an airworthiness directive to make mandatory the service bulletin SB 090 - UL dated June 8, 2022 issued by TECNAM.