



THE REPUBLIC OF CROATIA

**Air, Maritime and Railway Traffic Accident Investigation Agency**

**Air Traffic Accident Investigation Department**

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## **FINAL REPORT**

### **ON ACCIDENT OF THE AIRCRAFT Flight Design CT-SW, registration D-MVPP**

**31 March 2023  
Pula Airport**



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## OCCURENCE INFORMATION

Type of the occurrence:	Accident
Date:	31 March 2023
Local time:	12:27
Place:	Pula Airport (LDPL)
Type of the aircraft:	Aeroplane
Manufacturer / model:	Flight Design CT-SW
Country of registration:	Germany
Registration:	D-MVPP
Owner:	Private ownership
Operator:	Private ownership
Number of persons on bord:	2
Injuries:	2 fatalities
Damage to the aircraft:	Destroyed



Picture 1 – crash site (red mark) at Pula Airport



## INVESTIGATION

The Air, Maritime and Railway Traffic Accident Investigation Agency (hereinafter referred to as AIA) received information about the aircraft accident from Pula Airport, the Croatia Control and Ministry of the Interior (OKC MUP).

AIA issued a notification about the accident and the opening of the investigation, and the field investigation was carried out at the accident site on the same day.

30 days from the day of the accident, AIA issued a 'Preliminary Report' in which the information about the event and the findings obtained in the early stages of the investigation were stated.

Upon completion of the investigation, this Final Report was issued.

## SUMMARY

On 31 March 2023, the said aircraft was supposed to make a flight from Pula Airport (LDPL) to Portorož Airport (LJPZ) in Slovenia.

Meteorological conditions at Pula Airport were favourable for visual flight (VFR) and, after communicating with air traffic control, the pilot received permission to take off. After a short run-up, the aircraft took off and soon thereafter turned to the left and fell on the grassy area next to the runway. Immediately after hitting the ground, a fire broke out in which most of the aircraft was burnt.

Both people who were on board the aircraft were killed.

The investigation determined that the cause of the accident was the aircraft stalling during take-off.

AIA issued no safety recommendations.

## 1. FACTS AND INFORMATION

### 1.1. FLIGHT HISTORY

#### 1.1.1. Arrival at Pula Airport

On 24 March 2023, the subject aircraft flew from Klagenfurt Airport (LOWK) to Pula Airport, where it landed at 13:45 LT (LT - Local Time, i.e. 13:45 local time).

According to the information received from Pula Airport employees, no problems were observed during the acceptance of the aircraft.

After landing, the pilot asked the service controller for MOGAS fuel, but was informed that Pula Airport does not offer the requested type of fuel. The pilot decided to find the appropriate fuel outside Pula Airport and refuel the aircraft by himself, since AVGAS, which was offered, is not intended for that type of the aircraft.



### 1.1.2. Fuel supply

On 25 March 2023, the day after landing at Pula Airport, around 15:15 LT, the pilot of the subject aircraft came to Pula Airport accompanied by a female person to refuel the aircraft.

The employees of the security service, who on that day performed the inspection on the official passage "A", confirmed that the pilot of the aircraft had brought two canisters of 25 litres of fuel into Pula Airport through the official passage.

In accordance with the prescribed airport procedure, the pilot and the mentioned female person were led to the aircraft and, in the presence of the service controller and the fireman on duty, poured the fuel from the canister into the aircraft.

The mentioned two persons of the airport service state that during their stay at the parking position, they noticed no defects on the aircraft.

### 1.1.3. Flight preparation

On 31 March 2023 in the morning hours, the pilot and the passenger came to Pula Airport to perform the necessary preparation for the flight.

According to the submitted flight plan, the aircraft was supposed to land at Portorož Airport (LJPZ) in Slovenia.

Rescue and fire service employees as well as security service employees stated that the pilot and the passenger remained around the aircraft longer than usual before the take-off.

### 1.1.4. Take-off and crash

Shortly after take-off, during the climbing phase, the aircraft turns south and crashes next to the runway.

According to eyewitnesses' statements, after a short run-up (150 to 200 m), the aircraft took off and started climbing. The eyewitness further stated that the aircraft climbed to an altitude of about 30 m above the runway. Then it seemed to him as the aircraft stopped in the air, after which it began to turn left and continuously lose altitude. The engine was running the whole time.

The aircraft crashed on a landscaped grassy area inside the airport fence, 70 m to the south, i.e. to the left of the runway in terms of the take-off direction and 753 m before the western end of the runway, i.e. threshold 27.

According to the on-duty traffic coordinator's report, the aircraft crashed at 12:27 LT (10:27 UTC).

## 1.2. INJURIES

Injuries	Crew	Passengers	Other
fatal	1	1	0
serious	0	0	0
minor / none	0	0	0

### 1.3. DAMAGE TO THE AIRCRAFT

The aircraft was destroyed. After the crash, a fire broke out in which the aircraft's fuselage and left wing were burned completely, while the vertical and left horizontal stabilizer were burned significantly. The outer part of the right wing and the right horizontal stabilizer remained unburnt.

In addition to the described fire damage, there was also mechanical damage: the propeller cone was deformed and pressed into the ground, and the propeller fell apart. The nose leg broke and was found under the forward section of the fuselage, and the main landing gear legs were found broken and lying to the left and right of the fuselage.



Picture 2 - The wreckage of the D-MVPP aircraft at the crash site

### 1.4. OTHER DAMAGE

The grass burned on and in the immediate vicinity of the crash site. There is no ground damage that would indicate the aircraft's stopping path.



## 1.5. PERSONAL INFORMATION

Further below are information about the persons on board the subject aircraft:

### 1.5.1. Pilot

Male person, German citizen born in 1954. Since 2010 he had a valid SPL (Sport Pilot Licence) issued by the aviation authorities of the Federal Republic of Germany.

### 1.5.2. Passenger

Female person, German citizen born in 1962.

## 1.6. AIRCRAFT INFORMATION

### 1.6.1. Flight Design CT-SW – general aircraft information

Manufacturer:	Flight design
Type:	CT-SW
Capacity:	1 pilot and 1 passenger
Aircraft mass:	322,0 kg (710 lb)
MTOW:	472,5 kg (1042 lb) (BFU/LTF-UL)
Engine:	Rotax 912 ULS 100 hp
Propeller:	Neuform Novaprop TXR 2-65 2-blade
Maximum speed:	120 kt IAS (222 km/h)
Cruise speed:	110 kt IAS (205 km/h)
Minimum speed:	40 kt IAS (72 km/h)
Rate of climbing:	980 fpm (4.9 m/s)
Maximum altitude:	4,572 m
Run-up length:	186 m
Aircraft dimensions:	length – 6.22 m wingspan – 8.53 m height – 2.16 m

Flight Design CT-SW is a high-wing, single-engine sports recreational aircraft class 1. The landing gear of the aircraft is of tricycle type. The CT series has a fully composite construction, the primary material being carbon fibre mixed with Kevlar added for reinforcement. The fuselage is not pressurized and has one door on each side for the entry and exit of pilot and passenger. This aircraft model has two seats installed. Two fuel tanks are integrated into the wings and have a total capacity of 130 litres, of which 124 litres are usable.

The purpose of this aircraft is multiple. It is used for sports and recreational purposes as well as for education. The CT series has been produced since 1997 and the CT-SW is a version with a smaller wingspan and redesigned wingtips resulting in a higher cruise speed while maintaining the same stall speed.

The maximum permissible crosswind speed at take-off for this type of aircraft is 16 kt.



Picture 3 – Aircraft Flight Design CT-SW, registration D-MVPP

#### 1.6.2. Information on the subject aircraft registration D-MVPP

Owner: private ownership  
Year of manufacturing: 2005  
Total flight hours TT: 1145 hours (recorded during the last aircraft inspection on 7 January 2023)  
Aircraft serial number: 05-04-11  
Propeller serial number: 5644882

There is proper documentation for the subject aircraft in accordance with all prescribed requirements.

Upon inspection of the technical documentation, it was determined that on 7 January 2023, the annual inspection of the aircraft was performed at a total of 1145 flight hours. No additional technical defects were found during the inspection.

The subject aircraft type had a MTOW of 472.5 kg in the Certificate of Airworthiness with an empty weight of the aircraft in the basic configuration of 299.8 kg. The stated data of the empty weight of the aircraft of 322 kg is the result obtained during the last weighing in January 2023 and the maximum weight at take-off of 472,5 kg, i.e. 150,5 kg more than the empty weight of the aircraft. From the provided documentation, it is evident that over the years the said aircraft has continuously increased the empty weight of the aircraft (in 2005, while it still had D-MAHR registration, it had 301 kg, in 2009 - 303 kg, in 2013 - 309,5 kg, in 2018 - 316,2 kg and in 2023 the empty weight was 322 kg).



The subject aircraft was equipped with a parachute for the rescue of the aircraft and the crew (BRS parachute system), which has not been activated at the time of the accident.

## **1.7. METEOROLOGICAL INFORMATION**

### **1.7.1. Meteorological conditions at Pula Airport**

The aircraft in question took off from Pula Airport at 12:26 LT, i.e. 10:26 UTC. The meteorological conditions that prevailed at Pula Airport at that time are described by the METAR report which reads:

2023-03-31 10:26:00, METAR LDPL 311030Z 18011KT 140V250 9999 FEW010 SCT016 15/11 Q1014 NOSIG=

From the METAR report it is evident that in the area of Pula Airport at the time of take-off of the subject aircraft, a wind of 11 kt was blowing from the south, the visibility was satisfactory for the requirements of visual flying, without significant cloud cover or the presence of TCU or CB type clouds (storm clouds) and without precipitation. The air temperature was 15°C, and the dew point temperature was 11°C. The pressure was 1014 hPa and no significant changes were expected in the near future.

## **1.8. COMMUNICATION**

At 12:18 LT, the pilot establishes communication with air traffic control and receives clearance to start the engine, as well as information about weather conditions and the runway in use - 09.

At 12:20 LT, the pilot reports that he is ready to taxi and, in agreement with control, chooses taxiway C for the approach to the runway.

At 12:24 LT, the pilot proposes, in view of the crosswind, to take off from runway 27, which will immediately direct him to his destination. Control approves his proposal.

At 12:24:44 LT the pilot reports that he is at holding point C and requests take-off clearance. The controller gives him an altitude instruction of up to 2500 ft and a squawk and an instruction to turn right after take-off.

At 12:25:31 LT the pilot receives the last information from the control about the direction and strength of the wind (180°; 12 kt) and approval for take-off.

From the moment the pilot confirmed he was ready to take off until the moment of the crash, there was no communication between air traffic control and the pilot.

## **1.9. FLIGHT DATA RECORDERS**

The aircraft D-MVPP was not equipped with the Flight Data Recorder (FDR) or the Cockpit Voice Recorder (CVR).

### 1.10. AIRPORT INFORMATION

Pula Airport (LDPL) is located at position 44°53'37" N; 013°55'36" E, 6 km from the city of Pula and at an altitude of 84 meters. It is equipped to serve large aircraft, as well as serve general aviation aircrafts. Most of the traffic takes place in the summer months during the tourist season.

The runway of this airport is 2946 m long and 45 m wide. It has an asphalt surface and stretches in the direction of 09/27. Parking positions are also asphalt surfaces, and general aviation aircrafts are parked near the TWR and ARO service in positions 9 and 10.



Picture 4 – Pula Airport parking positions

At Pula Airport, there is permanent air traffic control, a fire department, customs and police services, and all other services necessary for an international airport.

At the time of take-off of the subject aircraft, traffic was light.

### 1.11. OPERATOR INFORMATION

The aircraft was privately owned and operated by the pilot involved in the accident.



## **1.12. INFORMATION ON THE CRASH AND THE REMAINS OF THE AIRCRAFT**

### **1.12.1. Examination of the wreckage of the aircraft**

The examination of the remains of the aircraft at the crash site was carried out on 31 March 2023.

As a result of hitting the ground, the fire that broke out afterwards and the explosion, the aircraft was destroyed.

The fuselage of the aircraft from the fire wall to the tail, including the instrument panel with the associated instruments, was completely burned. The left wing was also completely burnt. The connection of the right wing to the fuselage was broken, and the wing, although folded to the fuselage, was found rotated around its longitudinal axis so that the leading edge of the wing was facing forward. The tail part of the aircraft was not completely burned but was also significantly damaged by the fire. The propeller was completely disintegrated.

### **1.12.2. Traces at the accident site**

#### **Description of the terrain**

The aircraft's crash site is a well-maintained flat grassy area next to the runway.

#### **Position of the wreckage and traces on the ground**

The wreckage of the aircraft was found 70 m south of the runway, lying on its belly in a horizontal position. According to the marks on the ground and the condition of the wreckage, it is evident that the aircraft hit the ground at a small angle. The left wing was completely burned, while the right wing was laid perpendicular to the fuselage but rotated 180° around the longitudinal axis. The left side of the aircraft was more damaged in the fire, and numerous smaller parts were found on that side of the aircraft scattered on the surrounding terrain, which points to an explosion.

#### **Damage to vegetation**

The narrowest circle around the burned part of the wreckage, especially on the left side, was completely burned. In a slightly wider circle, there was no damage to the grass surface.

## **1.13. MEDICAL AND PATHOLOGICAL INFORMATION**

Both persons from the subject aircraft died immediately at the crash site due to multiple injuries sustained when the aircraft hit the ground. After that, because of the fire, the bodies suffered significant burns.

Chemical and toxicological tests revealed that both victims were sober at the time of the accident.

## **1.14. SEARCH AND RESCUE**

Considering the location of the accident, no search was necessary. Immediately after the aircraft crash, the airport's fire department started a fire extinguishing operation.



## 1.15. ADDITIONAL INFORMATION

### 1.15.1. Audio recording of the communication

Reviewing the transcript of the communication between the aircraft and the air traffic controller revealed no problems with the aircraft or in the understanding of the communication between the pilot and the air traffic controller.

### 1.15.2. Eyewitnesses' statements

During the preparation of this Report, the statements of persons who witnessed the event or came into contact with the casualties of this accident from the moment the aircraft arrived at Pula Airport until the accident itself, were taken into account.

## 2. ANALYSIS

During this investigation, no indicators were observed that would clearly point to problems with the aircraft's propulsion.

All the knowledge obtained in this investigation points to the stall and loss of control over the aircraft as the reason for the loss of altitude and the crash.

### 2.1.1. Aircraft weight

According to the information from the AIRCRAFT OPERATING INSTRUCTIONS CTSW (Flight design, Original Issue Date: 28-Feb-2005, Revision Date: 29-Apr-2008) the subject aircraft is registered in FR Germany with a maximum take-off weight (MTOW) of 472.5 kg. At the last weighing in January 2023, the empty weight of the aircraft was 322 kg. Therefore, 150.5 kg remained available for fuel, passengers, and luggage.

According to the available information, there was a minimum of 50 litres of fuel in the aircraft (if we ignore the unknown amount of fuel that was in the aircraft before the last refuelling), which with the conversion factor of 0.72 kg/L is 36 kg of fuel.

The investigation at the crash site revealed that the pilot and the passenger had luggage whose weight could not be determined because of the fire, but it was estimated at approximately 30 kg.

Considering that we did not receive information on the weight of pilot and passenger, we used various estimates of the average weight of European citizens aged 69 (man) and 61 (woman) and came to average values of 90 kg (pilot) and 70 kg (passenger).

By adding the above values, we come to the weight of 226 kg, which is 75.5 kg more than the maximum take-off weight.

### 2.1.2. Take-off and crash

The pilot of the aircraft, through communication with control, confirmed the receipt of all relevant information.

Meteorological conditions were favourable for VFR flying and within the limits prescribed for this type of aircraft. The wind was sideways, almost perpendicular to the aircraft's run-up direction and at a



speed of 11 kt, which is below the limit of the maximum permissible crosswind speed of 16 kt for this type of aircraft.

According to eyewitness' statement, the aircraft's run-up was about 150 to 200 m long, after which the aircraft took-off.

After took-off from the runway, the aircraft elevated for about 30 m above the ground, turned to the left and began to lose altitude.

Considering all knowledge and the stated facts, it can be concluded that the aircraft did not reach sufficient speed for take-off during the run-up. It took-off from the runway at insufficient speed, the angle of climb at that moment being very likely too great. The aircraft stalled.

Considering that the aircraft was in the run-up phase and started climbing, the engine was working at maximum power. A rotating propeller causes a torque that tends to turn the aircraft in the opposite direction. In this case, the propeller was turning at maximum power and clockwise, i.e. to the right. Thus, it produced a significant torque that acted on the aircraft in the opposite direction, i.e. to the left.

When the aircraft is in stable flight, the torque produced by the rotating propeller is compensated by the control surfaces of the aircraft. These surfaces, however, do not function when the flight parameters go out of certain limits, which is the case in a stalled flight.

The recovery of the aircraft from stall is possible with the correct reaction of the pilot and at the expense of a certain loss of altitude. In this case, the aircraft was about thirty meters above the ground, which was not a sufficient altitude to recover from the stall.

Also, due to the operation of the engine at high power and a large reactive torque, and due to the non-functioning of the control surfaces with which the pilot would have to compensate the mentioned torque, and which in this state no longer function, the aircraft drifted to the left and crashed to the left of the runway.

### 2.1.3. Control over the aircraft

As already mentioned, the aircraft took-off probably with insufficient speed for its total weight. Too low speed and too large angle of climb led to the aircraft stalling, probably immediately after take-off. At that moment, the pilot lost control over the aircraft, which by inertia still climbed to about thirty meters above the ground, after which, drifting to the left, it began to lose altitude and crashed.

The correct reaction of the pilot in the described situation of aircraft stall immediately after take-off, would be to try to level the aircraft. Judging by what was learned during the investigation, this did not happen, so the question is whether the pilot was even aware of the situation.



### 3. CONCLUSION

#### 3.1. FINDINGS

##### Aircraft

- No elements were found that would indicate the malfunction of the aircraft, and it can be concluded that the aircraft was in good condition;
- Empty weight of the aircraft was significantly increased above the manufacturers data.

##### Pilot

- He possessed a valid SPL (Sport Pilot Licence) issued by the aviation authorities of the Federal Republic of Germany;
- The pilot had many years of flying experience.

##### Meteorological conditions

- Favourable for VFR flying;
- Crosswind up to the permitted velocity.

##### Flight preparation

- The pilot reported a VFR flight by the flight plan;
- The pilot was familiar with the meteorological conditions;
- The pilot was probably aware of exceeding the prescribed maximum take-off weight of the aircraft, but the fact that he often took passengers on his flights indicates a possible disregard of this fact.

##### Take-off and crash

- The aircraft took off from Pula Airport without any visible problems related to the aircraft or the understanding of the communication between the pilot and the air traffic controller;
- The aircraft very likely took-off at an insufficient speed, considering the total mass and characteristics of this aircraft;
- Due to too low speed and too big angle of attack, the aircraft stalled;
- After the take-off, the aircraft still climbed to an altitude of about 30 m above the ground, and the flight speed decreased far below the minimum speed, possibly even to a stop;
- The engine was running at considerable power, probably at maximum power, all that time;
- As a result of the reactive torque that occurs due to the rotation of the propeller, the aircraft tilted and drifted to the left side;
- From the moment of take-off, the pilot began to lose control over the aircraft;
- Due to insufficient speed, which later dropped more and more, the aircraft became uncontrollable;
- At the end, the aircraft began to lose altitude;
- In those moments, the pilot was most likely not aware of the situation and what was actually happening;
- The aircraft hit the grassy area at a slight angle;
- After the crash, the aircraft caught fire and the explosion occurred. The central part of the aircraft was completely burnt;



- Both persons who were on board the aircraft died at the crash site as a result of injuries sustained at the time of the crash of the aircraft;
- The aircraft was destroyed due to mechanical damage caused by the impact and due to fire and explosion.

### 3.2. CAUSE

#### Immediate cause:

- Stalling of the aircraft and consequent loss of control over the aircraft.

#### Contributing factors

- Exceeding the prescribed maximum take-off weight of the aircraft;
- Too low speed and probably too big climbing angle when took-off;
- Very likely the lack of situational awareness and consequently the absence of the pilot's reaction to try to fix the situation.

## 4. SAFETY RECOMMENDATIONS

The factors that led to this casualty are well known in aviation practice and are also covered by existing aviation legislation. By consistently following the known and prescribed rules, this casualty would most likely be avoided.

Therefore, the Air, Maritime and Railway Traffic Accident Investigation Agency does not have a safety recommendation in this case.

Investigator in Charge

Danko Petrin