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Zagreb, 22 December 2023

F I N A L R E P O R T

ON ACCIDENT OF THE AIRCRAFT
CIRRUS SR 20, REGISTRATION PH-YMC

20 MAY 2023,
MALA KAPELA MOUNTAIN

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For all further information contact AIA.

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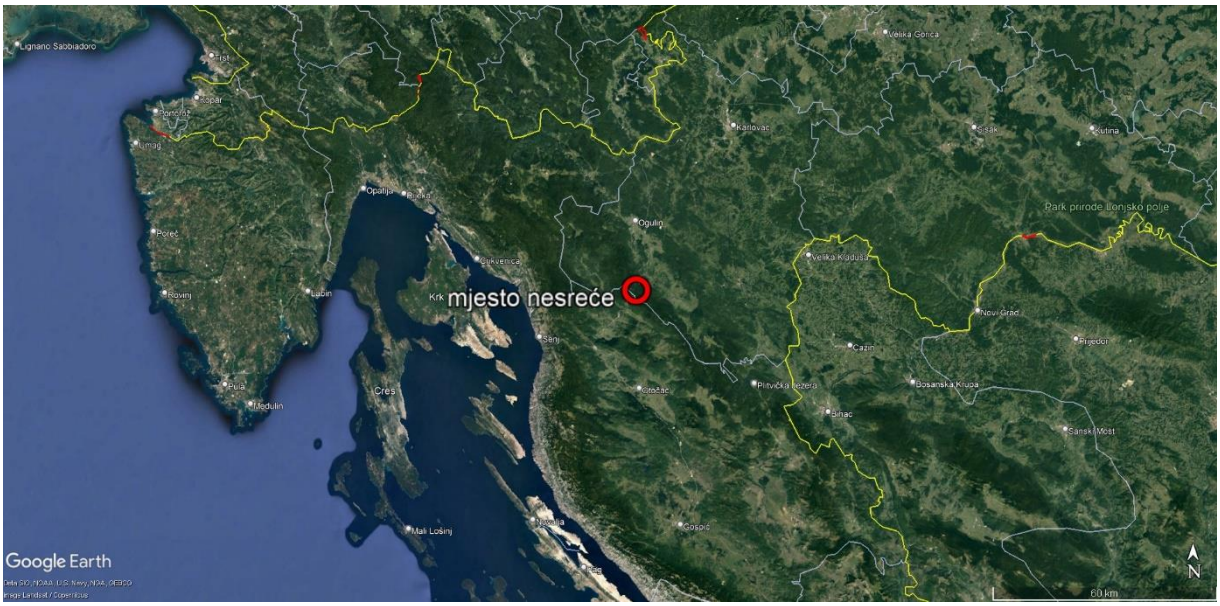
CONTENT

OCCURRENCE INFORMATION

Type of occurrence:	Accident
Date:	20 May 2023
Local time:	12:30
Place:	Mala Kapela mountain
Type of the aircraft:	Aeroplane
Manufacturer / model:	Cirrus SR20
Registration:	PH-YMC
Owner:	YouFly BC
Operator:	YouFly BC
Number of persons on board:	3
Injuries:	3 fatalities
Damage to the aircraft:	Destroyed



Picture 1 – the place of the accident, marked with a red circle

INVESTIGATION

The Air, Maritime and Railway Traffic Accident Investigation Agency (AIA) received information on the accident from the Operatinal Communication Centre of the Ministry of the Interior (OKC – MUP) and Croatia Control and opened a Safety Investigation.

The safety investigation determined that the cause of the accident was a flight into the terrain in conditions without the necessary visibility.

AIN hasn't issued safety recommendations.

SUMMARY

On May 20, 2023, in the morning hours, a group of small planes carrying Dutch citizens took off from the Maribor Airport (LJMB) in Slovenia. Their destination was Pula Airport (LDPL) in Croatia. The subject aircraft, registration number PH-YMC , took off at 11:22 LT (LT - local time).

The mentioned planes were flying from Maribor to the west through Slovenia. In the area of Gorski Kotar, they crossed into the Croatian airspace and continued to fly along the eastern coast of Istria to Pula. The planes in the mentioned group did not fly together in formation. The aircraft in question turned south earlier than the other aircraft in the group and continued to fly south across the eastern part of Gorski Kotar to the Mala Kapela mountain, where it hit a little below the ridge of the hill. The plane was found in the forest area of Mala Kapela, completely destroyed, mechanically and by fire. All three people who were on the plane were killed.

1. FACTS AND INFORMATION

1.1. FLIGHT INFORMATION

The aircraft in question flew with a group of aircraft to Maribor Airport on May 19, 2023 in the afternoon. The mentioned group flew from the Austrian airport Wiener Neustadt (LOAN) in Austria and consisted of 8 smaller planes. One aircraft had a US registration, while all others had Dutch registrations. In the mentioned planes were pilots and passengers, Dutch citizens, who were together on a multi-day recreational flying tour. All the pilots were long time acquaintances and participated together on recreational flying tours in Europe several times.

They spent the night in Maribor and in the morning of the next day they flew from Maribor to Pula Airport. They did not fly in formation, but individually, and the plan was to all meet in Pula.

1.1.1. Flight preparation

For the flight of the plane in question, as well as for the flights of all other planes from the group, flight plans were duly submitted. The flight plan of the PH-YMC aircraft announced a VFR flight along the route from Maribor to point ALIVO, which is one of the entry points on the border of Slovenia and Croatia, located in the area of Gorski Kotar, then towards city of Rijeka and further south-west along the east coast of Istria towards Pula.

Although they were a group, the planes did not fly in formation. Each pilot filled out and submitted the flight plan individually and took care of navigation and everything necessary for flight preparation.

Always before the flight, which was the case this time as well, the pilots gathered for a briefing to consider the conditions on the route and the available information. They concluded that they would fly in the direction of Portorož and after Ilirska Bistrica (ILB VOR) head south. Regarding visibility, they considered that there was enough open space among the low clouds for VFR flying, and according to the information they had, the conditions for landing in Pula were even better.

The planes from the group had the possibility of communicating with each other in the air via radio link, on a separate frequency. According to mutual agreement, they used this communication minimally, only for necessary information.

Picture 2 – the flight route that was reported by the Flight Plan with the planned landing place (green line) and the actual flight path (red line)

1.1.2. Take-off and flight through Slovenia

The plane in question took off from Maribor Airport at 11:22 LT. The approved altitude was 2000 ft, and at 11:26 LT the pilot requested an altitude of 2500 ft. After about twenty minutes of flight, the plane passes through CTR Ljubljana and continues in the west direction, towards Divača.

After about thirty minutes of flight, the pilot turned the plane to the southeast and informed the air traffic control that he has changed direction due to the weather conditions in the area he has reached.

Four planes of the group climbed to an altitude of 5,500 ft or more to fly above the clouds in the area mentioned, while the other planes flew below the clouds, following the valleys.

The plane in question continues its flight first in the southeast direction, which is almost in the opposite direction than planned, and then south towards Croatia.

1.1.3. Flight through Croatia

The plane crossed the Slovenian-Croatian border at 12:22 LT near Severin on Kupa, which is about 37 km east of the point ALIVO, which was reported and predicted as the point of entry into Croatia in the flight plan. The pilot established communication with the Croatian air traffic control, which provides him with air pressure information and altitude instructions up to 1000 ft AGL (above the ground).

After entering Croatia, the plane soon flies over the A3 Zagreb-Rijeka highway 3 km west of the Bosiljevo interchange, where the A1 and A3 highways separate. It continues to fly over the A1 motorway heading south. The plane followed the A1 road until the road entered the 'Mala Kapela' tunnel. There the plane starts to climb and shortly after that, at 12:33 LT, it disappears from the radar.

The pilot did not inform the control about possible difficulties. The subject aircraft's last communication with control was at 12:24 LT. The flight lasted 1 hour and 11 minutes.

The diagram below (Figure 3, based on radar data) shows the flight altitude of the plane in question and the height of the ground below it. In the last two minutes of the flight, the ascent of the terrain on the plane's path is visible, as well as the intense climb of the plane in question.

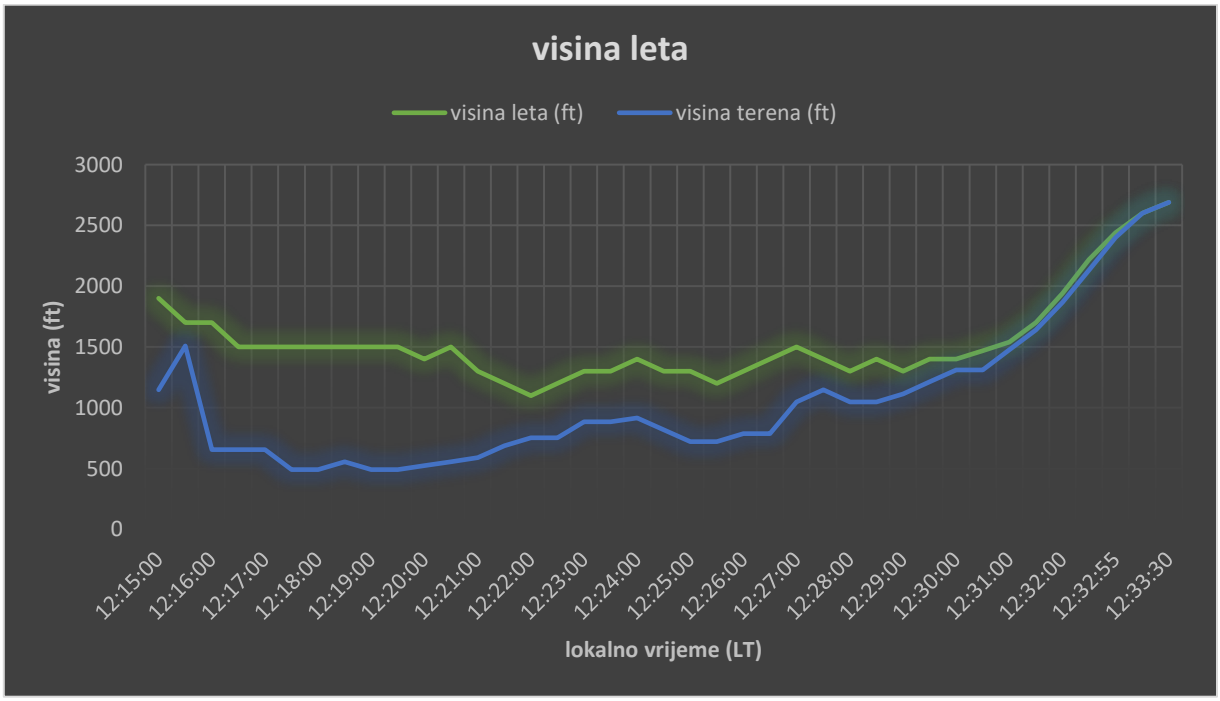


Figure 3 – the altitude (ASL) of the PH-YMC plane in the last 18 minutes of the flight (green line) and the height of the terrain over which the plane flew (blue line)

1.2. INJURIES

Injuries	Crew	Passengers	Other
fatal	1	2	0
serious	0	0	0
minor / none	0	0	0

1.3. DAMAGE TO THE AIRCRAFT

The plane was completely destroyed. As a result of passing through the treetops, there were breaks and separation of parts of the plane. As a result of hitting the ground, there was a complete mechanical destruction of the main part of the plane. A fire broke out, due to which the plane's fuselage was completely burnt at the ground.

1.4. OTHER DAMAGE

At the accident site, there was damage to the vegetation in the form of breaks in several smaller trees and branches from the crowns of the trees through which the plane passed. Traces of burning are also visible on the vegetation at the crash site.

1.5. PERSONAL INFORMATION

1.5.1. Pilot

Male person, Dutch citizen born in 1958.

He had a PPL license issued in 1993 by the Civil Aviation Authority Netherlands. At the time of the accident, the license was valid and was valid for SEP-land (Single Engine Piston) types of aircraft until September 30, 2024.

At the time of the accident, the pilot had a valid medical certificate related to a PPL license valid until November 1, 2023. and until 01.11.2024. year for the LAPL.

Until the day of the accident, the pilot had a flying experience of 30 years with over 1,300 flying hours on small planes. Since 2014, i.e. for the last 10 years, he has been renting the Cirrus SR20 aircraft in question for the purpose of private flights. During that period, he spent a total of about 390 hours on it. During the year 2023, until the day of the accident, the pilot flew for 14 hours on the previously mentioned Cirrus SR20 type airplane.

The pilot did not have an IR rating for instrument flying entered in his license.

1.5.2. Passenger 1

Adult male person, Dutch citizen. He was a long-time acquaintance of the people from the group and took part in flight tours with them as a passenger several times. He wasn't a pilot.

1.5.3. Passenger 2

Adult male person, Dutch citizen. Although he was not piloting an airplane on this flight, he was an experienced glider pilot, and in addition he had some experience on general aviation single-engine airplanes.

1.6. AIRCRAFT DATA

1.6.1. Aircraft Cirrus SR20 data

Type of aircraft:	Aeroplane
Country of manufacture:	USA
Manufacturer / model:	Cirrus / SR20
Empty weight:	964 kg
MTOW:	1383 kg
Engine:	Continental IO-360-ES
Propeller:	Hartzell PHC-J3YF-1RF

Cruise speed:	287 km/h (155 kn)
Stall speed:	104 km/h (56 kn)
Service ceiling:	17.500 ft (5.300 m)
Rate of climb:	781 ft/min (3,97 m/s)

The Cirrus SR 20 is an American-made low-wing aircraft with four or five seats. The fuselage and wings are made of composite materials, and the propulsion unit consists of one Continental IO-360-ES piston engine, with a power of 150 kW, and a three-bladed propeller. The landing gear is non-retractable, tricycle type.

It is equipped with a parachute that is used for safe descent of the plane in case of loss of control over the plane, mid-air collision or some other gross structural damage.

This type of aircraft is equipped with Garmin Cirrus Perspective avionics with dual 10 or 12-inch screens, one primary and one multifunctional.

The plane has been in production since 1999, and by the beginning of 2021, about 8,000 SR series planes have been produced, which makes it one of the best-selling general aviation planes.

1.6.2. Aircraft Cirrus SR20, PH-YMC information

Owner:	YouFly B.V.
Operator:	YouFly B.V.
Serial number:	1539
Year of manufacture:	2005
Total flight hours (totalizer)	2160

The aircraft in question is registered in the Dutch civil aircraft register, and all the necessary documentation related to airworthiness and maintenance exists for it. The owner and operator of the aircraft is the Dutch company "YouFly B.V.". At the time of the accident, the aircraft was leased to a private individual for the purposes of a private flight.

A review of the aircraft's technical documentation did not reveal any irregularities or inconsistencies.

1.7. METEOROLOGICAL INFORMATION

For the investigation, a precise meteorological report was obtained based on data from the relevant meteorological stations of the Croatian Meteorological and Hydrological Service (Ogulin and Gospić), radar and satellite data, and a reanalysis of the meteorological situation using a numerical model.

Synoptic situation

The area where the accident occurred was at the boundary of a large anticyclone centred over the Scandinavian Peninsula and a shallow cyclone centred over the central Mediterranean. The warm front of the previously mentioned cyclone brought cloud cover and very light rain to the area of the accident. The air pressure was falling from the northeast to the southwest.

Clouds and wind

Along the flight path through Slovenia, low clouds were present that partially covered the sky (up to 1/8 coverage). There was also partial medium-high cloud cover.

In the mountainous area of Gorski kotar, as well as in the mountainous area of southwestern Slovenia, it was greater amount of low clouds.

At the Ogulin meteorological station, located 18 km north of the accident site, the sky was completely covered with low clouds from the morning until 13:00 LT. The base of the cloud was at an altitude of 300 to 600 m above the ground. In the afternoon, the clouds thinned out, but only to 7/8. The same or very similar situation existed around the area of the accident. Low clouds covered the peaks of the mountains of Gorski kotar, and in some places they descended to the foothills and reached a height of about 1500 m.

The wind was weak, from the north.

Air pressure on the flight path

As already mentioned, the air pressure decreased from the northeast to the southwest, as indicated by the data from the meteorological stations. Thus, during the flight of the plane in question, the air pressure was reduced to sea level, at the weather station Brnik near Ljubljana in Slovenia it was 1017.1 hPa, while the pressure at the weather station Ogulin was 1014.8 hPa.

Conclusion of the analysis of the meteorological situation

There was low cloud cover over the area of the accident that completely covered the sky, as well as the peaks of Gorski kotar and which reached a height of about 1500 m. The wind was weak, from the north. Air pressure was falling along the flight path of the plane in question.

1.8. COMMUNICATION

During taxiing, take-off and flight, the pilot communicated via radio link with the competent flight controls, first in Slovenia and then in Croatia. By listening to communication, it is heard that during taxiing, take-off and flight, the communication took place as usual. The pilot did not report any difficulties. At the end of the recorded communication, the controller calls the plane in question several times, without response.

Communication during the flight in the airspace of the Republic of Slovenia

11:10 LT - the pilot established contact with control at Maribor Airport (TWR MB) in order to prepare for take off. Communication was normal, the controller gave the pilot information about the runway in use (runway 32), air pressure (1019) and taxing to the holding point,

11:15 LT - a flight altitude of 2000 ft was defined,

11:21 - the pilot received permission to take off and the controller gave him information about the wind - 10° and 13 kt,

11:26 - the plane was in the air, the pilot gave information about the position and asked to climb to 2500 ft and switched to communication with 'Ljubljana info' (FISO),

11:28 - the controller gave information about the continuation of the flight and the air pressure (1018 hPa),

11:32 - the pilot informed about the approach to CTR Ljubljana,

11:33 - the FISO controller established telephone communication with control at Ljubljana Airport (TWR LJ) and informed about the arrival of the aircraft in question, which should pass through the CTR. The communication was usual and related to the coordination of traffic through the previously mentioned CTR,

11:35 - the FISO controller informed the pilot of the aircraft in question about the situation and that due to the traffic in the CTR, he can expect a certain delay in entering and passing through the CTR,

11:39 - the FISO controller informed the pilot about switching communication to TWR LJ and gave him the frequency,

11:41 - the pilot reported to the TWR LJ controller. The pilot received from the controller instructions for passing through the CTR and pressure information (QNH 1018),

11:51 - after leaving the CTR, the pilot re-established communication with FISO. The controller gave him instructions to continue the flight towards the ALIVO point and pressure information (QNH 1018),

12:03 - the pilot informed the control about directing the plane towards Trebnje, due to meteorological conditions,

12:20 - the pilot requested switching to the frequency of Zagreb info (ZAG FIC),

12:21 - a telephone communication followed between the controllers ZAG FIC and FISO for the purpose of informing about the arrival of the plane in question in the Croatian airspace and taking over the further control of the plane by the Croatian Control.

Communication during the flight in the airspace of the Republic of Croatia

12:22 LT - the pilot of the aircraft in question established contact with ZAG FIC and requested flight information. The controller gave him information about the pressure (QNH 1017) and the instruction to continue the flight visually up to a height of 1000 ft AGL. When asked what his next destination is, the pilot answered that it is Pula,

12:23 - the FIC controller informed the Pula APP controller by phone about the incoming plane,

12:24 - the FIC controller instructed the pilot to switch to the Pula APP frequency, after which the pilot established contact with Pula APP. The Pula APP controller provided the pilot with pressure information (QNH 1014),

12:30 - the ZAG FIC controller informed his Slovenian colleague at FISO by phone that the plane in question is in contact with the Pula radar (LDPL APP),

12:34:54 - the Pula APP controller called the aircraft in question because he can no longer identify it on the screen,

12:35 and at 12:38 - the controller repeated calls to the aircraft in question, with no response,

12:41 - the controller called Pula Airport staff for help. The following was a telephone communication between the controllers of Pula APP, Pula TWR and staff of Pula Airport. It was about obtaining the mobile phone number of the pilot in question, which will be given to them by one of the pilot's

colleagues who recently landed at Pula Airport, and through which they tried to establish a communication with the pilot of the aircraft in question,

At 12:43, the Pula APP controller once again tried to establish contact with the aircraft in question via radio link, but there was no response.

1.9. AIRPORT INFORMATION

Airport of departure

The plane in question took off from the Maribor airport - Letališče Edvarda Rusjana Maribor (LJMB), which is located in the north-east of Slovenia near the city of Maribor. The airport is the second largest in Slovenia and is equipped for international air traffic. It has two parallel runways - asphalt 2500 m long and grass 1200 m long. The altitude of the airport is 267 m.

Planned destination

The planned destination was Pula Airport (LDPL) in Istria in north western Croatia. It is the fourth airport in Croatia in terms of volume of traffic. It serves international and domestic air traffic. Most of the traffic takes place in the summer months, while, thanks to reduced traffic and favourable weather conditions, training flights of various European operators take place here in the winter months. The runway is asphalt, 2950m long. The altitude of the airport is 84 m.

1.10. SEARCH AND RESCUE

The last communication between the control and the subject aircraft was at 12:24 LT. At 12:34:54 LT the aircraft disappeared from radar. Control then tries on several occasions to establish contact with the aircraft in question, first by radio link and then by cell phone, but unsuccessfully.

After unsuccessful attempts to establish contact with the aircraft in question, control forwards information about the disappearance of the aircraft in order to initiate the search and rescue process.

Search and rescue service have not received any reports from citizens that would help locate the aircraft. There was testimony from the employees/firemen of the Centre of Croatian Highways who heard a sound similar to the sound of an airplane engine around 12:30 LT, which would correspond to the time and location of the passing of the plane in question. The area was covered in fog and low clouds.

For the purpose of search and rescue, police officers, members of the Croatian Mountain Rescue Service, firefighters, and employees of Civil Protection went to the field. A no-fly zone was temporarily opened in the area of the search, so that the search could also be carried out from the air. The base of the operation was established in the base of the technical unit of Croatian Highways near the "Mala Kapela" tunnel. A total of about 150 people participated in the search. The fog had cleared somewhat, but the tops of the surrounding mountains were still covered in low clouds.

At 18:55 LT the same day, the missing aircraft was found at the location of Mali Makovnik, in the forest at 900 m above sea level. The plane was completely destroyed and burned, and the people inside did not survive.

The crash site was found by searching the terrain on foot. The treetops covered the crash site, so it would have been almost impossible to see the remains of the plane or damage to the vegetation from the air.

The police secured the scene of the accident. In the morning of the next day, an investigation was started by the police, the state attorney's office and AIN investigators.

1.11. DESCRIPTION OF THE ACCIDENT SITE

The place of the accident is in the forest area of Mala Kapela mountain. The terrain on which the plane fell is a gently slope, and the plane approached it approximately along the isohypse. The forest is mixed - coniferous and beech, and the trees are up to twenty meters high. The soil itself is earthy and stony, covered with dry leaves, conifer needles and dry branches fallen from trees and some fallen trees.

1.12. CRASH AND WRECKAGE INFORMATION

1.12.1. Remains of the aircraft and traces on the crash site

The plane hit the forest slope of Mala Kapela mountain. The slope of the slope at the crash site was gentle, and the angle of the plane's incoming path was small and approximately on the isohypsis.

Just before touching the ground, the plane flew about seventy meters through the treetops, causing major mechanical damage. Parts of the wings and stabilizers were torn off and scattered along the path the plane took through the forest. Also, along the previously mentioned path, traces of burning were visible, which occurred due to the spilling of fuel from the tank as a result of damage to it after parts of the wings were separated during contact with the trees.

The plane's fuselage was found turned on its back and rotated 90° in relation to the incoming trajectory. The point of contact of the body with the ground is ten meters in front of the place where the body stopped. From the traces in the ground and vegetation, it can be seen that the angle of arrival of the plane was low. The hull was completely burnt. Aluminium parts melted in the fire. Some steel parts, such as the engine head and the engine block, were somewhat preserved from the fire, but mechanically significantly damaged.

The damage to parts of the plane that fell off on the path of the plane's passage through the treetops is mostly of a mechanical nature, although some of them also have minor traces of burning. The vertical stabilizer separated from the fuselage and remained somewhat preserved.

1.12.2. Storage of the remains of the aircraft and additional investigative actions

After the investigation at the accident site, the remains of the aircraft were collected and transported to Ogulin, where they were stored in a suitable area under the supervision of the police.

According to the information provided to the AIA, this plane was equipped with an RDM - Remote Data Module. It is a small electronic device for recording certain technical data about the functioning of the airplane during flight. Such a device on this type of aircraft should be located in the 'tail', i.e. the vertical stabilizer or in the wing of the aircraft on the trailing edge. Subsequently, in the area where the remains

of the plane were stored, inspections were carried out of the tail and parts of the plane's wings that were not burned in the fire. The mentioned data recording device was not found.

Given that the knowledge gained in the early phase of the investigation did not point to the possibility of a problem with the aircraft's engine, no additional investigative actions related to the aircraft's engine were undertaken. In addition, considering the degree of mechanical and thermal damage, such an examination would not give reliable results.

1.13. ADDITIONAL INFORMATION

1.13.1. Eyewitness statement

Employees/firemen of the Croatian Highway Centre who were on duty at the base of the Croatian Highway Centre located near the northern entrance to the 'Mala Kapela' tunnel, testify that around 12:30 LT they heard a sound that would correspond to the sound of an airplane engine.

Apart from the above, there are no other statements from citizens regarding this accident.

1.13.2. Statement of the representative of the group

For the purposes of the safety investigation, the representative of the group in which the plane in question was flying gave a statement and information useful for determining the circumstances that led to this accident. Some of this information has already been used in earlier chapters, and the rest are listed here:

Eight aircraft from the group, in addition to communication with flight control, also had the possibility of mutual radio communication on a separate frequency. They used this possibility of communication only to convey essential information. The pilot of the aircraft in question did not give any information on the mentioned frequency about changing the direction of the route or such intentions.

The representative of the group stated that the pilot in question was experienced and had many flying tours around Europe. He also had experience in flying in mountainous areas. He did not have an instrument rating (IR) and always flew in VMC conditions following visual navigation points (roads, railways, rivers...). He also stated that he did not have much experience with navigation devices such as the Garmin GNS430 GPS that was on the aircraft in question.

2. ANALYSIS

2.1. METEOROLOGICAL SITUATION

The meteorological situation played a significant role in this accident. For most of the route from Maribor to Pula, the meteorological parameters were favourable. The weather was stable, without strong wind, precipitation or dangerous phenomena such as storm clouds, which could endanger flying. The conditions for visual flying were satisfactory on most of the route.

However, low cloud cover was present in the hilly area of western Slovenia and north western Croatia, which made visual flying difficult. This low cloud spread in the form of a large cloud belt that covered the hilly area between coastal and continental Croatia and Slovenia. The cloud belt, just like the

mountain range between Mediterranean and continental Croatia, stretched over a large area in the direction northwest – southeast.

2.2. FLIGHT

The first part of the flight of the plane in question took place through Slovenian airspace and proceeded normally, without any unusual elements.
In the western part of Slovenia, there was a cloud layer that extended from a few hundred meters above the ground to approximately 1500 m in height, and a similar situation prevailed in Gorski Kotar area in Croatia. The planned flight route passed through that cloudy area.

When the plane passed the Ljubljana area after 41 minutes of flight, the pilot informed the control about the change of flight direction due to meteorological conditions. The pilot, however, did not give information about his further intentions in communication with the control, as well as through the internal communication of the group. He directed the plane to the southeast, which was a deviation of about 135° in relation to the current direction of flight and the planned direction of the continuation of the flight.

The pilot in question apparently changed direction because of the clouds that were over the hilly area of the southwestern part of Slovenia, probably with the idea of somehow trying to get around them. Some of the other pilots from the group solved this situation by climbing above the cloud layer and flying over them in conditions of satisfactory visibility, while others descended below the clouds and in low flight, following the valleys, continued to fly in VMC conditions.

The subject pilot, after a short flight in the southeast direction, directs the plane to the south. It follows the grassy plain that stretches between the surrounding wooded hills towards the south and after a total of one hour of flight it reaches the Kupa River and enters Croatia near the village of Rim. The aircraft entered Croatia 37 km east of the point which, according to the flight plan, was intended to enter Croatia.

Shortly after entering Croatia, the plane flies 2 km west of the traffic junction 'Bosiljevo'. At the "Bosiljevo" intersection, the A3 highway leading west to the city of Rijeka and the A1 leading south to Dalmatia, separate. The plane crossed the A3 highway and continues to fly following the A1 highway.

Obviously, the pilot chose the highway as a landmark, but it would seem more meaningful if he continued to follow the A3 highway, which would lead him in the direction of his destination, while the A1 highway took him away from the destination. This fact indicates the doubt that the pilot was fully aware of his position, as well as the possibility of a navigation error. It is possible that he mistook the A3 for the A1 and continued to follow it, believing that it would lead him to his destination.

On the other hand, it is also possible that the pilot had the idea to try to bypass the cloud zone by flying south. Unfortunately, that was not possible. While over the southern part of Slovenia over which the plane in question flew in the first part of the route, broken and relatively sparse cloud cover prevailed, in the southwestern hilly part of Slovenia the cloud cover was much denser. The same situation existed in the Gorski kotar area in northwestern Croatia, which is the same type of terrain as the hilly area of southwestern Slovenia and is geographically one unit. Therefore, flying over Gorski kotar, the pilot could not avoid this dense low cloud cover. It seems that the pilot did not expect this. On the contrary, when entering the increasingly higher area of Gorski Kotar, the plane could not pass under the clouds through some kind of valleys but had to climb and inevitably enter the cloud.

According to meteorological data, there was low cloud cover in this area that covered higher parts of the surrounding mountains, and the cloud base was at a height of 300 to 600 m above the ground, i.e., the valley. This means that the pilot was flying in a narrow band between the clouds and the ground, following the highway as a landmark.

On that section, the A1 highway enters an increasingly hilly area and gradually ascends, due to which the necessary visibility band between the clouds and the ground became narrower and narrower. As, due to the ascending terrain, the aircraft had to gradually climb and approach the cloud base, it can be assumed that the visibility was increasingly obstructed by the proximity of the lower parts of the cloud. In such a situation, the aircraft gradually enters the "fog" through which the ground can still be seen occasionally, but the horizontal visibility is significantly reduced. In the situation described, the pilot could probably still see the road below him as a landmark, but the question is how far he could see in front of him.

About thirty kilometers after the "Bosiljevo" intersection, the A1 highway enters the "Mala Kapela" tunnel. The tunnel is 5.8 km long, and the entrance to the tunnel is located at an altitude of 562 m.a.s.l. (1843 ft). The tunnel passes through the wooded mountain of the same name, whose peaks rise slightly above 1200 m.a.s.l.

Finding itself in front of the tunnel, the plane had to start climbing, while the highway, which was a landmark, disappeared in the tunnel. The plane entered the clouds and the pilot totally lost visibility. For the next minute, the plane climbed intensively and continuously in a low flight over the mountain slopes. However, the plane did not manage to "jump" over the mountain ridge but ran into the forest at high speed and impacted terrain.

2.3. TRACES ON AND AROUND THE ACCIDENT SITE

Traces at the accident site indicate that the plane flew into the forest at a small angle and approximately along the isohypsis of the gentle forest slope. This, together with the conclusions from the radar record, indicates that this was the so-called ‘controlled flight into terrain’ (CFIT). This means that the pilot had the airworthy plane and that the flight parameters were within the limits of the plane's normal flight.

Passing through the treetops, parts of the plane were separated. Parts were scattered along the plane's path through the forest. On that occasion, the fuel tanks were also damaged and a small amount of fuel was spilled along the route and caught fire.

While passing through the forest, the plane rotated around the longitudinal axis. It hit the ground at a relatively small angle and skidded another ten meters, where he stopped on its back.

A fire broke out in which, in addition to the fuel, all the composite material built into this type of plane, burned. The burning was very intense.

2.4. PILOT AND PERSONS ON THE PLANE

The pilot had many years of flying experience on small general aviation planes. He flew on various routes throughout Europe. His experience related to visual flying, and he was not trained for instrument flying.

He did not own his own plane, but often rented the very plane in question for his flights, with which he had flown a considerable number of hours in the last ten years. In 2022, he also flew with the mentioned plane on several occasions, and in the three days before the accident, he made three flights - from the Netherlands to Germany, then to Austria and to Slovenia. So, before the accident the pilot did not have a long break that would adversely affect his abilities.

One passenger in the plane in question was not an aviator, but he often participated in flight tours with the mentioned group, so he was not unfamiliar with this type of flying.

The other passenger on the plane in question was an airman - an experienced glider pilot with some experience on small general aviation aircraft.

Although it is the pilot, that is the commander of the aircraft, person who makes the decisions, in such a 'combination' of people on the plane, it can be expected that they at least commented on the situations and solutions among themselves.

2.5. CONCLUSION OF THE ANALYSIS

Several circumstances can be observed that led to the unfortunate end of this flight:

- On the second part of the route, the presence of a cloud obstacle that hindered visual flying,
- The pilot's decision to try to bypass the cloud belt. The pilot first turned the plane almost in the opposite direction than planned, and then, after a short time, directed it to the south. At this moment, the pilot was apparently not aware of the dimensions of the above-mentioned cloud obstacle,
- A certain ‘influence’ of the group should also be considered. Although there was no consultation with the group, it was very likely the desire of the pilot and the people on the plane to end up at the agreed place together with the whole group, and the belief that if the other planes from the group had overcome the cloud belt, they could too. Without the described ‘group influence', the pilot might have decided to return to the departure airport or direct the plane towards an alternative airport. This is by no means a transfer of -responsibility to the group, but a description of a very likely real situation,
- Entering the cloud, i.e., entering instrument flying conditions for which the pilot was not trained. For some time, the pilot was, adjusting to the terrain, passing the plane under the clouds. However, the terrain began to rise, so the pilot had to start climbing. At some point, he found himself in a situation where he could no longer turn the plane towards an area of better visibility. Pilot followed the highway as a landmark and as the terrain gradually increased in height, airplane entered layers of increasingly low visibility. Finally, the highway disappeared into the tunnel, and the pilot, apparently realizing that there was a hill in front of him, began to climb intensively. Now the plane was definitely in a cloud, without any visibility. The plane continued to climb intensively, what was, in this situation, logical and correct procedure. The question is whether the pilot was aware of how close the plane was to the hillside,
- In the end, the plane got so close to the slope that it got stuck in the treetops and sank into the forest. When the plane, flying through the clouds without the necessary visibility, got so close to the forest slope that the pilot could see it, there was probably nothing he could do to avoid it.

- No indication of uncontrolled flight. The plane flew into the forest at considerable speed and in a stable flight and impacted terrain.

3. CONCLUSION

3.1. FINDINGS

Flight preparation

- The flight plan indicated a flight from Maribor in eastern Slovenia to Pula on the northwestern Croatian coast,
- The flight plan defined several points on the route, as well as the point ALIVO, which was supposed to be the point of entry from Slovenia to Croatia,
- The pilot performed the necessary actions related to flight preparation,
- Before take-off, all participants from the group of 8 smaller aircraft held a joint briefing.

Meteorological conditions

- Significantly influenced this accident,
- In the first part of the route, they were favourable,
- In the second part of the route, a band of low cloud covered significantly and made visual flying difficult,
- The cloud layer started at a height of 300 to 600 m above the ground and reached about 1500 m above sea level,
- The clouds extended over southwestern Slovenia and spread over Gorski Kotar and further to the southeast over the mountainous area of Croatia,
- It was clear above the mentioned layer of low clouds,
- The wind was weak, there was no significant precipitation, nor other dangerous meteorological phenomena.

Terrain

- The hilly area of southwestern Slovenia and the area of Gorski Kotar in Croatia are geographically one unit and this is a mountain barrier between the Mediterranean and continental areas,
- In the mentioned area, there are medium-high hills that reach a height of about 1500 m,
- In the mentioned area, meteorological events - clouds, precipitation, are usually more intense than in the coastal area and deeper in the continental part,
- VFR routes between the coastal area and the interior of Croatia and Slovenia necessarily lead over the mentioned area.

Pilot

- He had a valid PPL license,
- He possessed a valid health certificate,
- No authorization for instrument flight,

- He had many years of flying experience on general aviation aircraft, as well as on the aircraft in question,
- He participated several times in longer flight tours around Europe,

Other participants

- Of the two passengers on the plane in question, one was a long-time glider pilot with some experience on small motor planes, while the other was an acquaintance who, as a passenger, had taken part in joint flight tours several times,
- The other participants from the group of 8 aircraft were acquaintances who participated in flight tours together several times,

Flight

- After take off, the plane flew through the airspace of Slovenia to the southwest,
- Approximately half way of the planned route, the plane deviated from the planned route due to low cloud cover,
- The plane entered Croatia 37 km east, i.e. earlier than the planned point of entry into Croatia,
- From there, the plane continued to fly south over the area of Gorski Kotar,
- The pilot, in communication with the control and his group, did not provide information about the intention or possible idea to continue the flight after changing the route
- The plane was flying low, following the A1 highway,
- The terrain gradually rose, and the plane had to gradually climb with it,
- Near the Mala Kapela mountain, the highway enters a long tunnel,
- The plane here loses the highway as a landmark and, because of the mountain in front of it, is forced to climb intensively. The plane was now in the cloud and the pilot remained out of sight,
- In the end, the plane doesn't manage to get over the mountain, but plunged into the forest and fell,
- No indication of uncontrolled flight,
- In the communication with the control, as well as the internal communication of the group, the pilot did not give information about the danger.

Crash

- The place of the crash is located on a gentle mountain slope overgrown with forest, at an altitude of 900 m above sea level,
- The plane's approach to the crash site was almost along the isohypse,
- No indication of loss of control over the plane,
- Passing through the trees caused the separation of parts from the plane,
- The impact on the ground was at a small angle, the plane skidded after the impact and stopped on its back,
- A fire broke out in which all the composite material burned. The burning was very intense,
- All three people who were on board, were killed.

3.2. CAUSE

Immediate cause

Flight into terrain in conditions without the necessary visibility.

Contributing factors

- The meteorological situation in a certain area that made visual flying difficult, even impossible,
- The decision to change the route and the choice of a new route,
- Entry of the plane into conditions without visibility (IMC),
- Pilot's incapacity for instrument flying,

4. SAFETY RECOMMENDATIONS

The factors that led to this accident are known in aviation practice and the corresponding procedures related to the mentioned factors are covered by the regulations. Therefore, the Air, Maritime and Ralway Traffic Accident Investigation Agency does not issue a safety recommendation in this case.

Investigator in charge

Danko Petrin