

HELLENIC REPUBLIC
MINISTRY OF INFRASTRUCTURE & TRANSPORT

AIR ACCIDENT INVESTIGATION AND AVIATION SAFETY BOARD
(AAIASB)

ACCIDENT INVESTIGATION REPORT
INVOLVING THE AIRCRAFT HA-TAH
AT AXIOS RIVER, 2NM SOUTHWEST OF POLYKASTRO,
ON 22nd MARCH 2015

01 / 2018

ACCIDENT INVESTIGATION REPORT

01/2018

involving the Aircraft HA-TAH

at Axios River, about 3 nm southwest of Polykastro, District of Kilkis

on 22nd March 2015

The accident investigation was carried out by the Air Accident Investigation and Aviation Safety Board in accordance with:

- **ICAO Annex 13;**
- **Regulation (EU) No 996/2010;**
- **Hellenic Republic Law No 2912/2001.**

‘In accordance with Annex 13 to the Convention on International Civil Aviation, Regulation (EU) No 996/2010 and Law No 2912/2001, the purpose of investigations into aviation accidents and incidents is not to apportion blame or liability. The sole objective of the investigation and its findings is the prevention of accidents and incidents.

As a result, use of the findings for any purpose other than the prevention of future accidents could result in erroneous conclusions.’

The Air Accident Investigation and Aviation Safety Board

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OPERATOR : OLYMPUS AVIATION ACADEMY
OWNER : BEST FLY KFT
MANUFACTURER : CESSNA AIRCRAFT CO., USA
MODEL : CESSNA 172N (TECHNIFY)
NATIONALITY : Hungarian
REGISTRATION : HA-TAH
PLACE OF OCCURRENCE : 3 nm southwest of Polykastro,
District of Kilgis
DATE & TIME : 22/03/2015 14:35 h
Note : All times are Greece local time
(local time = UTC + 2h)

SYNOPSIS

The Cessna 172N aircraft under registration number HA-TAH with three (3) persons on board [one (1) instructor and two (2) trainees] was flying from the Airfield of Kilgis/Nea Kavala Polykastrou, Municipality of Paionia, to the International Airport of Thessaloniki. During the flight and with the instructor being the pilot flying, the aircraft struck Public Power Corporation overhead power lines. Immediately after such striking, the aircraft crashed in a nearby islet within the stream bed of Axios river, about 3 nm from the Airfield of Nea Kavala, near the village Rizia in the municipality of Paionia, Kilgis. All three occupants of the aircraft were injured.

The Air Accident Investigation and Aviation Safety Board, having been notified of the accident by means of document AAIASB/483/23.03.2015, appointed an Investigation Team and a Technical Adviser. The Board supplemented the Investigation Team by means of document AAIASB/1943/12.07.2016.

1 FACTUAL INFORMATION

1.1 History of the Flight

On 22/03/2015 a Cessna 172N aircraft, registration number HA-TAH, took-off from 'Makedonia' International Airport of Thessaloniki (LGTS) with one instructor and two student pilots onboard, for performing visual flight rules (VFR) flights to and back from the Airfield of Nea Kavala (Annex 1, Map 2) located 4.5 km to the east of the city of Polykastro.

In all flights the trainees were seated in the front left seat and one of the two rear seats and the instructor was seated in the front right seat.

The aircraft, with the instructor being the pilot flying, took off from 'Makedonia' International Airport of Thessaloniki (LGTS) at 10:56 h.

After takeoff, the aircraft following the route through the reporting points AGELO, KRATIA, GALA, APOLO, LAGADA PIKRO (Annex 1, Maps 1 and 2) landed at 12:00 h. at the Airfield of Nea Kavala.

While the aircraft remained in the area of the Airfield of Nea Kavala, training flights were performed around the Airfield, as well as several touch-and-goes. In the said training flights the two trainees alternated in flying the aircraft, with the instructor seated in the front right seat of the aircraft.

Training flights continued until 13:58 h., when the aircraft contacted for the last time Air Traffic Control at the Airport of Thessaloniki reporting that in 10 min they would initiate the flight plan of return from the Airfield of Nea Kavala to the Airport of Thessaloniki.

Takeoff was at about 14:30 h with the instructor flying the aircraft, from runway eighteen (18) of the Airfield of Nea Kavala headed south to Thessaloniki. The aircraft initially climbed to 1000 ft and then descended lower until it struck overhead medium voltage power lines that ran across the stream bed of Axios river. After striking the power lines, the aircraft continued uncontrolled on its course for about 100 m until it crashed in the stream bed of Axios river, onto a mudflat (river island) with coordinates 40° 55'10.34''N 022° 36'40.17''E (Pictures 1 and 2).



Picture 1. Nea Kavala Airfield, crash site, projected course



Picture 2. The aircraft crash site

At 14:42 h Police Authorities contacted Air Traffic Control at Thessaloniki Airport and advised that a light plane had crashed in Axios river. In the said time interval, there was no communication between the aircraft and the Approach service of Thessaloniki Airport.

The three occupants, even though injured, were able to exit the wreckage. The two trainees sustained milder injuries and the instructor, more seriously injured, vacated the aircraft aided by the trainees. The aircraft occupants remained on the river island, next to the wreckage. The instructor was transported by Hellenic Air Force helicopter to the military hospital of Thessaloniki; the two trainees, assisted by the Fire Service Disaster Response Unit¹, were taken initially on the river bank and then, by ambulance, to the General Hospital of Kilkis and then to a Hospital in Thessaloniki.

1.2 Injuries to Persons

Injuries	Crew	Passengers/other
Fatal	----	----
Serious	3	----
Minor/none	--/--	--/--

1.3 Damage to the Aircraft

The impact of the aircraft on the power lines was so strong that the metallic surfaces on the upper part of the cockpit were torn almost horizontally from front to back, the wings had almost detached and folded rearward hitting hard and causing deformation on the right and left to the horizontal stabilizer elevators.

More specifically, the external visual inspection of the wreckage revealed the following (Photos 1, 2):

- The wings had detached and had folded near the fuselage;

¹ Greek acronym: EMAK



Photo 1. Aircraft wreckage

- The horizontal stabilizer elevators, located to the left and right of the vertical stabilizer, were crushed, distorted and torn from their leading edges almost all through to their trailing edges;



Photo 2. Aircraft wreckage

- The vertical stabilizer and the rudder had an almost horizontal tear at their upper surface, from the former's leading edge to the latter's trailing edge, resulting in the whole upper extremity of the empennage being missing;
- The empennage together with part of the fuselage had almost detached aft of the cabin, they were twisted and bent relative to the aircraft's longitudinal axis;
- The fuselage section making up the roof of the cockpit was totally severed almost horizontally, all windows and the windshield were destroyed, the cabin's right-hand door, the main landing gears were completely detached from the fuselage and the front right seat was detached from its rails.

1.4 Other Damages

The three overhead power transmission lines, which were in a horizontal configuration, were destroyed. One of the three, the middle one, was completely severed (Annex 2, Photos 1, 2) while the other two sustained serious damage (Annex 2, Photo 3).

1.5 Personnel Information

1.5.1 Pilot, Flight Instructor

The instructor was a 58-year old male of Greek nationality, holding an Airline Transport Pilot License –ATPL(A) under No. GR-001520 issued by the Hellenic Civil Aviation Authority, originally issued on 20.05.1996, conforming to the standards of the International Civil Aviation Organization-ICAO and the Joint Aviation Requirements-Flight Crew Licensing (JAR-FCL) and valid through 23.07.2018. Under his license, at the time of the accident the pilot had the following aircraft class rating and license endorsements:

- *Single Engine Piston-SEP Airplanes (land), valid until 29 April 2015;*
- *Single Engine Piston-SEP Airplanes (sea), valid until 2 July 2015;*
- *Multi Engine Piston-MEP Airplanes (land), valid until 5 November 2015;*
- *Aerobatics (SEP), valid until 26 March 2015;*
- *Instrument Rating-IR(A)/Single Pilot-SP/Single Engine-SE, valid until 5 November 2015;*
- *Instrument Rating-IR(A)Single Pilot-SP/Multi Engine-ME, valid until 5 November 2015.*

He also held the following National Type Ratings which, however, were not in effect at the time of the accident:

- *Douglas DC-3, valid until 28 March 2005;*
- *Instrument Rating-IR/Multi Pilot-MP, valid until 20 September 2005;*
- *De Havilland Canada DHC-3 Otter, valid until 18 December 2011.*

Furthermore, the above named pilot was also a flight instructor holding the following ratings which were in effect at the time of the accident:

- *Class Rating Instructor Airplane-CRI(A), valid until 29 April 2016;*
- *Flight Instructor Airplane-FI(A), valid until 29 April 2016;*
- *Instrument Rating Airplane-IR(A), valid until 29 April 2016*

He held a Medical Certificate Class I & II, valid until 11/06/2015, with the following limitation:

“Have available corrective spectacles for near vision and carry a spare set of spectacles.”

He also held:

- *Certificate of Authorization Examiner, issued by the Hellenic Civil Aviation Authority, which was not in effect at the time of the accident. The said Certificate was valid until 14 June 2014;*
- *Flight Instructor Instructors (A) Authorization, for single-engine aircraft, which was not in effect at the time of the accident. The said Authorization was valid until 14 June 2011.*

As stated by the instructor, his flying experience as a pilot and instructor amounted to a total of about 15,500 flying hours.

1.5.2 Student Pilots

At the accident flight two student pilots were onboard. The more experienced of the two shall hereinafter be referred to as “trainee A” and the other shall be referred to as “trainee B”.

1.5.2.1 Trainee A

Trainee A was a 25-year old male of Italian nationality. At the time of the accident he had more flying experience than the other trainee. As he himself and his instructor stated, he had accumulated about 14 flying hours at the said training Organization. He had also conducted a solo flight, on a Cessna C152. For the said pilot this was essentially an informative training flight for transition from Cessna C152 to Cessna C172 for the purpose of him becoming familiar with the said aircraft, its control panels, limitations, etc. When the accident occurred he was seated in the left rear seat of the aircraft. He also held a Glider Pilot License issued by the Italian Civil Aviation Authority under No. I-GL-027845; the said license was issued on

07/11/2008 and was in effect until 06/10/2014. His logbook shows that he had accumulated about 32 hours of flying experience in gliders.

He held a Medical Certificate class I & II, valid as follows:

- *In respect of Class I, valid until 22/01/2016;*
- *In respect of Class II, valid until 22/01/2020.*

1.5.2.2 Trainee B

Trainee B was a 29-year old male of Italian nationality. At the time of the accident he had less flying experience than the other trainee. As he himself and his instructor stated, he had accumulated about 7 flying hours. When the accident occurred he was seated in the front left seat of the aircraft.

He held a Medical Certificate class I & II, valid as follows:

- *In respect of Class I, valid until 18/02/2016;*
- *In respect of Class II, valid until 18/02/2020.*

1.6 Aircraft Information

1.6.1 General



Photo 3. Photograph of the HA-TAH aircraft

This was a metallic, four seat, high wing, single-engine aircraft with a tricycle landing gear (main wheels and nose wheel), designed as a general purpose aircraft.

Manufacturer	: CESSNA AIRCRAFT CO., USA
Model	: CESSNA 172N (TECHNIFY)
Manufacturer's serial No.	: 172-73091
Year of manufacture	: 1981
Registration Certificate	: Registered in the Aircraft Registry of Hungary National Transport

Authority-Aviation Authority since
03/12/2012, registration number HA-
TAH.

Airworthiness Certificate : In effect (issued on 03/12/2012)

Airworthiness Review Certificate : In effect, at the time of the accident
(expiration: 16/05/2015)

Aircraft Radio Station License : 33955-2/2014. Valid start date:
07/01/2015, expiration: 31/08/2017

Total Flight Hours accrued by the aircraft since new and up to the last flight
prior to the accident (Time Since New –TSN) : 7,901.2 flight hours.

The aircraft was covered by certificate of insurance No. 149.850. The said
certificate covered “BEST FLY KFT” as the owner, “AVIA RENT KFT” as
the user and “OLYMPUS AVIATION ACADEMY” as co-insured for third
party liability (civil liability of the aircraft and damage to other aircraft) and
for liability in respect of passengers for accidents that would occur
involving the aircraft, in conformance with EC regulation 785/2004.

1.6.1.1 Aircraft performance

The aircraft’s handbook ‘*Supplement Pilot’s Operating Handbook Cessna
172N with engine TAE 125-02-99*’ (Issue 3, Revision 5, May 2013) states:

‘**Climb.** (1) Airspeed – 70 to 85 KIAS, (2) Thrust Lever – Full forward’

‘**Cruise.** (1) Power – maximum load 100% (maximum continuous power),
75% or less is recommended. ...’

‘**CRUISE PERFORMANCE, RANGE AND ENDURANCE with standard
tanks at 1043 kg (2300 lbs)**

Conditions:

Take-off weight 1043 kg (2300 lbs),

Flaps Up,

Zero wind’

The table below shows that in a straight and level flight at sea level at 50%
engine power, airspeed is 82 kt, at 60% it is 91 kt and at 70% airspeed is 98
kt, whereas at 2000 ft and 50% engine power airspeed is 83 kt, at 60%
engine power airspeed is 92 kt and at 70% engine power airspeed is 99 kt

Therefore, at 1000 ft for 50% engine power the respective airspeed value is estimated at 81.5 kt, at 60% engine power the estimated airspeed is 91.5 kt and at 70% engine power the estimated airspeed is 98.5 kt.

Press. Alt.	Load	Speed	
[ft]	[%]	[KTAS]	[mph]
SL	100	115	132
SL	90	110	126
SL	80	104	120
SL	70	98	113
SL	60	91	104
SL	50	82	95
2000	100	117	134
2000	90	111	128
2000	80	106	122
2000	70	99	114
2000	60	92	106
2000	50	83	96

In respect of 'maximum glide', the '*Pilot's Operating Handbook Cessna model 172N*' gives the following chart (Maximum Glide) to calculate the glide distance in case of engine failure. As per the said chart, it is calculated that at a speed of 65 kt the glide ratio is 9:1 meaning that the aircraft travels 1.5 nm per 1000 ft height above terrain.

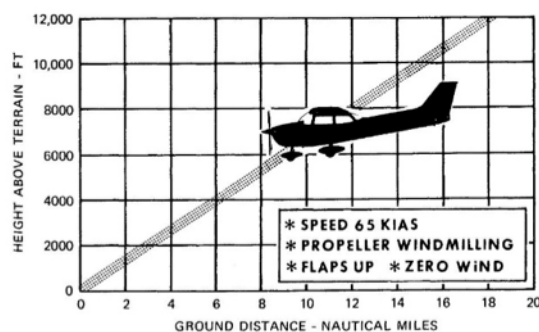


Figure 3-1. Maximum Glide

The training organization had established, among others, the following checklists for this aircraft in the context of Normal procedures (Normal Check List):

‘NORMAL TAKEOFF CHECK LIST

1. *Wing Flaps – 0° or 10°*
2. *Thrust Lever – FULL FORWARD*
3. *Speed Alive*
4. *Engine Instruments – GREEN*
5. *Rotation – LIFT NOSE at 55 KIAS*
6. *Climb Speed – 65 to 80 KIAS*

AFTER TAKEOFF CHECK LIST

1. Altitude about 300 ft, Airspeed more than 65 KIAS –
Wing Flaps – **RETRACT**
2. Climb Power – **SET**
3. Electrical Fuel Pump – **OFF**

CLIMB CHECK LIST

1. Airspeed – 70 to 85 KIAS
2. Thrust Lever – Climb Power

CRUISE CHECK LIST

1. Cruise Power – **SET** (65-75%)
2. Elevator trim and Rudder trim – **ADJUST**
3. **FREDA CHECK**
4. FADEC and Alternator Warning Lights – **MONITOR**

Whereas the Emergency Procedures comprised the following checklist for Emergency Landing:

‘EMERGENCY LANDING

- Speed 65 kts.
- Fuel Shut-Off Valve **CLOSED**
- Engine Master Switch **OFF**
- Doors Unlatched
- Flaps As Required
- Alt. Circuit Breaker **PULL**
- Battery Switch **OFF**
- Touch-down – slightly nose up attitude
- Brake firmly’

Furthermore the training organization for student information purposes with regard to the said aircraft had drafted a presentation: ‘Description and Operation of the Aircraft and its systems’, stating, among others:

‘The ‘clean’ stalling speed is 44 kt without flaps and the stall speed with full flaps (landing configuration) is 33 kt.’

The instrument panel of the aircraft is shown in the photo below.



The engine power, in rpm, as well as the respective % value are digitally displayed on CED (Compact Engine Display), an instrument located below the ‘Vertical speed indicator’, between the steering-wheel and the ‘Course Deviation Indicator’ and in this particular case the reading is 2040 rpm and 69% respectively.

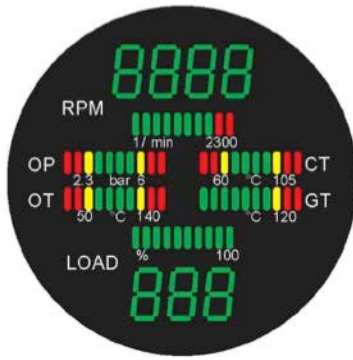
In respect of the aircraft performance, in the chart ‘*Engine Power over Altitude*’ (Annex 4) for an altitude of 1000 ft and according to the engine’s rotational speed, we get corresponding power ratings as shown below:

Revolutions per minute (rpm)		Engine Power	
(0-2300)	% (0-100)	PS (horsepower)	%
1750	25	43	32
1880	50	73	54
1960	65	93	68
2030	75	100	73
2180	90	126	93
2300	100	135	100

1.6.2 Engine

TAE 125-02-99 is a common rail, turbo charged, direct diesel injection engine; the engine’s operation is controlled by a FADEC (Full Authority Digital Engine Control) system – thus achieving better engine efficiency, fuel utilization and performance.

All information with respect to the engine is displayed on the multi-function instrument CED 125 (Compact Engine Display). (see below)



Potentiometers within the throttle lever transmit to FADEC the load value selected by the pilot.

With the engine master switch (respectively ‘IGN’) switched ON, the ignition switch is activated by FADEC and the glow plugs are supplied with electrical power; when switched OFF, the injection valves are not fed by FADEC and they remain closed.

The details of the aircraft’s engine are as follows:

Manufacturer	: Technify Motors GmbH.
Type	: TAE 125-02-99
Engine Line Number	: 02-02-03461
Performance	: 135hp (99kw) at 2300 RPM
Total Flight Hours accrued by the engine since new and up to the last flight prior to the accident (Time Since New –TSN): 205.6 flight hours.	

1.6.3 Propeller

Manufacturer	: MT-Propeller Entwicklung GmbH.
Model	: MTV-6-A/187-129
Type	: Constant Speed
Propeller Line Number	: 02479
Number of blades	: 3
Diameter	: 1.87 m.

Total Flight Hours accrued by the propeller since new and up to the last flight prior to the accident (Time Since New –TSN): 399 flight hours.

1.6.4 Maintenance

The continuing airworthiness of the aircraft was being monitored/reviewed by the Hungarian Continuous Airworthiness Management Organization

(CAMO-Part M) under Reg. No. HU.MG.0112, hereinafter referred to as the ‘CAMO’. Aircraft maintenance was conducted by a Greek Maintenance Organization (Part F & Part 145), initially by the organization under Reg. No. EL.MF.0003 and then under Reg. No. EL.145.0078, hereinafter referred to as EL.MF and EL.145 respectively.

Pursuant to information extracted from the Aircraft Technical & Journey Log, the work orders issued by CAMO and the relevant CRS², the main maintenance operations performed on the aircraft since its engine was replaced in March 2014 and up until the accident occurred, are set out in detail in Annex 3.

The last Certificate of Release to Service was issued by EL.145, under No. CRS/15-039, on 16/03/2015.

On the day of the accident there were no open remarks entered in the aircraft’s Aircraft Technical & Journey Log.

1.7 Meteorological Information

The Airfield of Nea Kavala Polykastro, Municipality of Paionia, is located 4.5 km east of the city of Polykastro and 59.3 km N-NW of ‘Makedonia’ International Airport of Thessaloniki (LGTS). No weather reports are issued at the said airfield. The closest airport generating weather reports (METAR) to pilots is ‘Makedonia’ International Airport of Thessaloniki (LGTS).

The METAR issued by LGTS at 10:50 h on 22/03/2015, shortly before the departure of the aircraft from the airport of Thessaloniki, was as follows:

‘METAR LGTS 220850Z 28005KT CAVOK 10/03 Q1021 NOSIC=’.

In more detail, wind was blowing from 280° at 5 kt, prevailing visibility was greater than 10 km, clear weather, and weather conditions of minor significance for aviation, temperature 10°C and dew point 3°C, QNH pressure 1021 hPa and no significant change was expected to the reported conditions.

Further, the METAR from LGTS at 14:20 h on 22/03/2015 shortly before

² CRS: Certificate of Release to Service

the accident was as follows:

‘METAR LGTS 221220Z 17008KT 9999 FEW035 SCT080 OVC170 15/03 Q1018 NOSIC=’

Wind was blowing from 170° at 8 kt, prevailing visibility 10 km or greater, few clouds (1/8-2/8) at 3500 ft, scattered clouds (3/8-4/8) at 8000 ft, overcast (8/8) at 17000 ft, temperature 15°C, dew point 3°C, QNH pressure 1018 hPa and no significant change was expected to the reported conditions.

1.8 Aids to Navigation

Not applicable.

1.9 Communications

The last contact that the aircraft had with ATCO at LGTS was by phone at 13:58 h, when the instructor reported that in 10 min he would initiate the return flight plan.

No other communication during the accident flight has been recorded.

1.10 Information on the Airfield of Nea Kavala

The Airfield of Nea Kavala Polykastro, in the Municipality of Paionia, is located 4.5 km east of the city of Polykastro and 59.3 km N-NW of ‘Makedonia’ International Airport of Thessaloniki (LGTS). The coordinates of the Airfield Reference Point are: 40°59’07’’N, 022°37’23’’E. Runway size: length 972 m, width 23m, and the runway strip is of a length of 1032 m and width 40 m. The runway direction is 18/36 and its surface is paved with asphalt. The above information is extracted from the Airfield’s License No. HCAA/D3/17237/4061 (Government Gazette issue No. 1362/bulletin B/16.06.2011).

Discrepancies are observed between the details contained in the Airfield’s License and the details contained in AIP GREECE ‘AD 1.6.13 KILKIS / NEA KAVALA POLYKASTRO, 28 JUN 2012.’. More specifically, AIP GREECE indicates a length of 860 m and a width of 50 m versus 972 m and 23 m respectively.

Moreover, pursuant to the Chart posted in the website of the airfield, the

said airfield has a runway 1049 m long (Annex 1, map 4)³.

1.11 Flight Recorders

The radar at the Airport of Thessaloniki had recorded the flight from LGTS to the Airfield of Nea Kavala; the recordings establish that:

- At 10:56:32 h the aircraft had taken off and was at an altitude of 800 ft in the area of ‘Makedonia’ International Airport of Thessaloniki (LGTS);
- At 10:58:20 h the aircraft was at an altitude of 800 ft near AGELO point;
- At 11:16:00 h the aircraft was at an altitude of 1300 ft near KRATIA point;
- At 11:17:42 h the aircraft was at an altitude of 2900 ft near GALA point;
- At 11:25:42 h the aircraft was at an altitude of 2800 ft near APOLO point;
- At 11:39:01 h the aircraft was at an altitude of 2900 ft near LAGADA point;
- At 11:50:36 h the aircraft was at an altitude of 2900 ft near PIKRO point;
- At 11:55:17 h the aircraft was at an altitude of 800 ft at the limits of the LGTS terminal area, and
- At 12:00 h the aircraft had landed at the Airfield of Nea Kavala Polykastro.

For the said aircraft there are no other radar recordings, neither during the touch-and-go circuits at the Nea Kavala Airfield nor for the return flight, this being the accident flight.

1.12 Wreckage and Impact Information

1.12.1 General

After it struck the power lines, the aircraft continued its course uncontrolled and crashed in the stream bed of Axios river on a mudflat (river island) at 40° 55′ 10.34″N, 022° 36′ 40.17″E. The mudflat was relatively shallow, so there are no impact marks on the ground. The following photos show the

³ <http://www.aelpo.gr/index.php/sample-sites-2/73-polikastro-chart>

scattering of the wreckage in the stream bed of the river, as viewed from the Air Force helicopter and from the river bank on the day of the accident.



Photo 4 From the rescue helicopter



Photo 5 – From the west bank

1.12.2 Loss of the wreckage

Upon being advised of the accident, AAIASB was continuously in contact with the local Police Authorities and in general with all parties involved. AAIASB arrived at the accident site on 01/04/2015 assisted by the Fire Service Disaster Response Unit (EMAK), for the purpose of approaching the wreckage as closely as possible and collecting evidence for the investigation of the causes of the accident and for the recovery of the wreckage. However, due to the morphology of the stream bed of Axios river, the elevated water level as well as the strong current, the effort to recover the wreckage was extremely difficult. AAIASB made repeated efforts to recover the wreckage, requesting also the assistance of the Hellenic National Defense General Staff (HNDGS), but these proved

unsuccessful due to the challenging terrain morphology and the high level of river water. Eventually the said operation was, on HNDGS proposal, postponed for the summer months, as it was estimated that water level would have reached normal levels by then and the terrain would present better consistence characteristics. In the time period since this decision was made, AAIASB, having made constant reminders towards expediting the wreckage recovery operation, was on 09/07/2015 notified by HNDGS that the wreckage had been stolen from the accident site, even though AAIASB had required that the site be secured by Police Authorities. The event was confirmed by an AAIASB team that promptly went to the site, following which local Police and Public Prosecution authorities as well as EASA and the Hellenic Civil Aviation Authorities were notified in order to proceed with appropriate action.

1.13 Medical Information

The instructor was flown by Hellenic Air Force helicopter to 424 General Military Hospital of Thessaloniki where he underwent a whole-body CT scan. He was diagnosed with multiple pelvic fractures and was taken to the operating room.

On 27/04/2015 the instructor was submitted to toxicology screen tests ordered by 424 General Military Hospital. The tests, performed at Aristotle University of Thessaloniki, identified the substance Tramadol (present in the serum and urine); however, according to the medical certificate issued by 424 General Military Hospital, this substance had been intravenously administered to the instructor, after the accident, due to the intense pain he experienced.

Moreover, blood tests for all three occupants of the aircraft were negative for the presence of alcohol.

1.14 Fire

Not applicable.

1.15 Survival Aspects

The three occupants of the aircraft were injured but managed to exit unharmed the almost completely destroyed aircraft. The instructor was the

one who was the more seriously injured of the three, he was unable to move, whereas the two trainees sustained milder injuries. Due to the morphology of the stream bed of Axios river it was hard to approach the crash site, even though police resources from the Police Department of Axioupoli/Kilkis were the first to locate the site of the crash. It took a combined effort and assistance by the Disaster Response Unit (EMAK) of the Fire Service Department of Goumenissa and Kilkis, the Hellenic Rescue Team (EOD) and the National Emergency Medical Aid Center (EKAB) as well as an Air Force Super Puma helicopter to finally be able to rescue and transfer the aircraft occupants away from the crash site. The instructor was transferred by the helicopter to 424 General Military Hospital of Thessaloniki, and the trainees were initially transferred by EKAB ambulance to the General Hospital of Kilkis and then to the private hospital “Aghios Loukas” in Thessaloniki.

1.16 Tests and Research

1.17 Simulated flight

According to the instructor, while he was at 1000 ft and as soon as he realized he was experiencing engine power loss, he tried on the radio to advise the approach service of Thessaloniki about the problem; but, according to his statement, it was essentially a ‘*blind*’ transmission given that the area around the airfield is a ‘*dead communication area*’ for Thessaloniki. However, in their statement the two trainees report that they were not aware of the instructor making such a communication. In order to establish whether communication was possible from the specific area with the approach service in Thessaloniki, a simulated flight was conducted in the area of the airfield and the area of the accident on 05/07/2016, when continuous test transmissions were made to Thessaloniki at different altitudes, starting from 1000 ft and reaching down to 500 ft. In all transmissions and all altitudes, reception was excellent (5/5).

1.18 Organizational and Management Information

1.18.1 The Training Organization

Olympus Aviation Academy is a Training Organization approved by the

Hellenic Civil Aviation Authority by virtue of Certificate No. GR-ATO-123-HCAA/D2/B/12290/4886/02.05.2013, in conformance with Regulation (EU) 1178/2011. The said Organization provided training courses for the Airline Transport Pilot License (ATPL), Commercial Pilot License (CPL), Private Pilot License (PPL), etc. For the training of aircraft pilots the said Organization operated the following aircraft for training purposes:

- *one CESSNA C152 Aerobat, registered HA-WAK;*
- *one CESSNA C152M, registered HA-TOK;*
- *one CESSNA C152R, registered HA-WIN;*
- *one CESSNA C172N, registered HA-TAH;*
- *one Piper Arrow, registered HA-WRB;*
- *one Piper Seminole (PA-44) with a glass cockpit, registered:...*
(unknown)
- *one Piper Seminole (PA-34-220T), registered 5B-CJX.*

1.19 Interviews

1.19.1 Instructor's Interview

The information provided by the instructor during the interview he had with the Investigation Team are as follows:

Prior to takeoff in the morning of 22/03/2015, both trainees had a detailed briefing that lasted forty five (45) minutes, about the scheduled activities during the flight. The aircraft took off on Sunday morning, 22/03/2015, at 11:40 h from 'Makedonia' International Airport of Thessaloniki (LGTS), "*we followed, I think*" the route passing through the compulsory reporting points PANORA, KORA, LAGADA, PIKRO (Annex 1) and then entered to landing circuit of the Airfield Nea Kavala Polykastro (Annex 1, map 1). After they arrived at the Airfield of Nea Kavala Polykastro they landed, bringing the aircraft to a full stop, and the less experienced of the two trainees disembarked. Then, the instructor together with the more experienced trainee (Trainee A) took off in order to practice landings and takeoffs. They carried out around 10 touch-and-go landings and then, after they landed, trainee A disembarked and the other trainee, the less experienced one (Trainee B), boarded the aircraft. They took off and

practiced two circuits above the Airfield, just for the trainee to see the circuit turn points, i.e. takeoff leg/crosswind leg, 180° leg/downwind leg, base leg, final leg, etc. Completing this leg of the flight, they landed coming once more to a full stop. Trainee A boarded the aircraft and took a seat in the rear left seat of the aircraft, and trainee B remained in the front left seat of the aircraft. Following the above, return from the Airfield of Nea Kavala Polykastro to 'Makedonia' International Airport of Thessaloniki (LGTS) was initiated. The aircraft took off at about 13:30 h, as stated by the instructor, from runway eighteen (18) of the Airfield of Nea Kavala Polykastro (Annex 1) headed south (180°) to Thessaloniki. At first the instructor reported that the first indication that the engine was not operating correctly was at 1000 ft, about 3 nm south of the airfield. He then reported that such first indication was given after 'Kolios' factory which is located about 1 nm south of the airfield, where after he leveled the aircraft at 1000 ft he executed the level flight Checklist. Furthermore, the instructor reported that at that stage in the flight he advised the two trainees that they were experiencing power loss and, if needed, they would execute an emergency landing. The said malfunction indications were, at first, a sudden RPM drop from 45% to 65% over a few seconds, then a second drop from 30% to 45% and finally a drop from 13% to 30%. The engine remained at this state with constant RPM fluctuations between 13% and 30% and consequent thrust fluctuations. Experiencing this problem and not being able to keep the aircraft on a level flight or make a turn to return to the airfield, he changed course to about 240° to 250° for the purpose of locating a suitable level surface for the forced landing. And this is the reason, according to the instructor, that he headed towards the river, since usually to the left and the right side of rivers and lakes there are suitable flat areas where an emergency landing may be executed with satisfactory safety. At another point in his interview, the instructor reports that the course deviation was about 45°, i.e. a course at 225°. Having diverted the aircraft from the scheduled course he flew towards the river in order to execute an emergency landing near the river banks, he flew over a clump of trees and suddenly the medium voltage power lines were in front of them, and the strong impact followed. *'At that point the plane kind of rolled off to the*

right, after the impact, the engine died, that is the low descending power, the partial power I had, right? the propeller was instantly immobilized and turned the plane to about 120°, more than 90°. So in my effort to restore it, I restored it at around 20° with roll to the right, and it is there that the crash happened’.

1.19.2 Trainee Interviews

The information provided by the two student pilots during their interviews is as follows:

The aircraft took off from ‘Makedonia’ International Airport of Thessaloniki (LGTS), with the less experienced trainee (trainee B) seated in the front left seat, the instructor seated in the front right seat and the more experienced trainee (trainee A) seated in the rear left seat, for the purpose of the said trainee flying a training flight at the Airfield of Nea Kavala Polykastro (Annex 1). Then, the same trainee, upon arrival to the Airfield did two to three landings and takeoffs. The two trainees, after a full stop was executed, changed seats as follows: the less experienced trainee (trainee B) took the rear left seat and the other, trainee A, the front left seat. After trainee A conducted about 10 touch-and-go landings, they once more landed bringing the aircraft to a full stop. The two trainees changed seats, trainee A took the rear left seat and trainee B the front left seat, for the purpose of the less experienced trainee conducting a return flight to ‘Makedonia’ International Airport of Thessaloniki (LGTS).

The two trainees in their interviews state that the instructor did not inform them about any problem with the aircraft, about a power loss or that it might become necessary to do an emergency landing. The two trainees state, in their first interview, that they were not aware of any malfunctioning of the engine.

Subsequently, the less experienced trainee (trainee B) stated, expressing himself in the first-person plural form, that they (the two trainees) noted that they flew at partial engine power, without noting any other obvious problem with regard to the engine. He also states ‘*We thought that was normal as the instructor ... was in the control of the aircraft. We were losing altitude*

and suddenly we heard a big noise and flashing light and in less than one second we were already crashed in the river. After the crash, I found myself more or less 15 meters away from the aircraft, even though I was with the seat belt fastened, I was just smashed away from the impact'

With respect to the accident flight, trainee A states that after all pre-takeoff checklists had been carried out normally, trainee B performed the take off assisted by the instructor, from runway 16 (he did not recall the runway direction but he thought it was runway 16) destined towards Thessaloniki. Takeoff was carried out uneventfully and the aircraft was on the climb headed south. At some point he heard the instructor saying '*my control*' and trainee B replied '*your control*'. Having full control of the aircraft, the instructor told them that he would show to them the area around Polykastro so that they would be '*confident*' in their knowledge of the area, given that all the other times they had been there, to Polykastro, they practised landings and takeoffs and had learnt the turn points around the airfield and not the wider area. After a while, flying at 1000 ft as usually, and while he was observing the outside area given that the instructor had told them that this was not a training flight but rather it served the purpose of them becoming familiar with the area, he realized that they were gradually losing altitude without hearing any '*big noise*' and without the instructor telling them that some problem was encountered. He was not alarmed because he had confidence in his experienced instructor. The loss of altitude was not steep but rather consistent with the loss in a '*landing pattern*' and was a steady loss of altitude. He saw that they were flying low but did not hear anything that sounded like an '*engine failure*', the noise coming from the engine was the same as the one he was hearing when, after takeoff, at 300 ft they reduced engine power, the propeller was rotating in a normal way and also, if the instructor had realized that there was some problem with the aircraft he did not state to them that they would execute an emergency landing, '*force landing*'. As far as he was concerned this was a normal flight and he was looking at the wider area, even though they flew low, because the instructor knew what he was doing. Shortly after, he heard a '*bang*' and a couple of seconds later he found himself within the aircraft strapped at his seat without the aircraft wings above. After he unfastened his seat belt he

exited the aircraft, the water was about 20 cm high, and he saw trainee B outside the aircraft in a state of shock but not panic – for a period of about ten minutes he failed to respond to what he was telling him, like he was not hearing, then he told him that he was ejected from the aircraft even though he was strapped in his seat. The instructor was in his seat, with the seat belt fastened, he was in pain and his face was bleeding. He also realized that he had broken his left arm because he was unable to move it. He did not remember whether he had unfastened the instructor's seatbelt or whether the instructor had done so himself; a short while, about ten minutes, later he took him out of the aircraft aided by the other trainee and placed him on a strip of land nearby. He contacted by phone another instructor located at the airport and informed about the accident, stating that they had an accident, they had sustained injuries to varying degrees but were alive and reported that they were in the middle of the river '*probably two, three miles south of Polykastro airport*' and asked him to arrange for a helicopter to come and pick them up promptly.

1.19.3 Interviews of eye witnesses

According to testimony provided by witnesses on the ground (farmers), the aircraft was flying quite low and at a considerable speed. At first they thought that it would pass under the power lines; however, when the aircraft reached them its upper part struck the power lines that snapped causing it to crash in Axios river. Also, the sound of the engine was normal and they did not notice anything strange or out of the ordinary about it.

2 ANALYSIS

2.1 Flight preparation

In respect of the preparation of the flight, a 'General Declaration' had been filed with the Hellenic Civil Aviation Authority. The Declaration indicates LGTS/POLY as the departure aerodrome and LGTS as the destination aerodrome. For the two flights that were to be performed, two general declarations ought to have been filed, one with LGTS indicated as the departure aerodrome and POLY indicated as the destination aerodrome and

another one with POLY as the departure aerodrome and LGTS as the destination aerodrome. Moreover the abbreviation used, 'POLY', is not the correct one, normally the designation ZZZ is used together with the name 'Nea Kavala Polykastro'.

The document indicates the names of the occupants of the aircraft and their role/duties in the flight. The instructor is mentioned as CFI, trainee B as TRM and trainee A (in a different handwriting) is mentioned without a designation relating to his role (duties) in the flight, e.g. passenger or pax. The term 'TRM' given in the document is not some known designation, it was probably erroneously inserted instead of the correct one TRN (trainee).

The document does not indicate the type of the flight, and in the 'total of persons' space the document indicates one person as crew and one person as instructor.

According to the occupants of the aircraft, prior to the flight a briefing took place by the instructor concerning the flight and the scheduled activities at the Airfield of Nea Kavala. Moreover, all pre-flight Checklists were executed and no problem was identified.

2.2 Weather conditions

The weather conditions prevailing at the destination airport, LGTS, at 14:20 h, shortly before the accident, were as follows: the wind blew from the south from 170° at 8 kt – slightly increasing. Visibility was at 10 km and/or better – i.e. visibility was very good. There were few clouds at 3500 ft, scattered clouds at 8000 ft and it was overcast at 17000 ft which would not be a problem given that the flight altitude of the aircraft for its return to 'Makedonia' International Airport of Thessaloniki (LGTS), according to the airport's VFR routes, would have been at 1000 ft. The temperature was 15°C, the dew point 3°C, pressure 1018 hPa (30.06 inHg) and no significant change was expected to the reported weather conditions.

The weather conditions prevailing were not contributing factors to the accident.

2.3 Flights prior to the accident

2.3.1 Flight from LGTS to the Airfield of Nea Kavala

The aircraft, after taking off from the International Airport of Thessaloniki (LGTS), at 10:56 h and according to the radar recordings, following the VFR route passing through the points: AGELO, KRATIA, GALA, APOLO, LAGADA and PIKRO, within the terminal area of the Airport of Thessaloniki, landed at 12:00 h in the Airfield of Nea Kavala. The flight lasted a little more than one hour.

According to the instructor, even though he states that he thinks that they followed, after taking off, the route PANORA, KORA, LAGADA, PIKRO, they landed in Polykastro, at the Airfield of Nea Kavala, after a flight of 30 minutes. In actual fact, the instructor did not remember the exact times during his interview and he was trying to calculate them having regard to the time that the accident took place. The notes he had been taking about the times of takeoff and landing were lost following the accident, when the aircraft disintegrated. Such discrepancy in the route and the time had no bearing on the accident.

According to the flight plan filed, and according to the statements of the trainees, in this flight leg the front left seat of the aircraft was taken by trainee B and the right front seat by the instructor, whereas trainee A sat in the rear left seat. According to the instructor this was not a training flight, however according to the trainees this was a training flight to be flown by the less experienced trainee, trainee B. Also, according to the trainees, upon their arrival at the airfield and prior to landing, trainee B executed two to three touch-and-go landings.

In actual fact, in order for a flight to be designated as a training flight a condition, among others, is that the instructor and the trainee must be the only occupants of the aircraft. Therefore, the instructor correctly states that this was not a training flight. The different perception about the type of the flight between the trainees and the instructor shows that the instructor, in the pre-flight briefing, had failed to advise in detail the trainees about the flight in order for the trainees to understand why this could not be a training

flight and that this would simply be a flight to go from Thessaloniki to Polykastro (Airfield of Nea Kavala) where the training would take place.

No problem occurred during the said flight.

2.3.2 Flights at the Airfield of Nea Kavala

Following its landing at the Airfield of Nea Kavala, the aircraft was brought to a full stop and according to the instructor trainee B disembarked and trainee A sat in the front left seat. This was designated a training flight, for the trainee's transition from Cessna 152, that he had been flying until then, to Cessna 172. The trainee had attended ground school for Cessna 172 and, for the purpose of his transition to and familiarization with the aircraft, he would performed exercises in the airfield circuit with touch-and-go landings. During the flight, about ten touch-and-go landings were executed. They then landed and the aircraft was brought to a full stop in the airfield.

According to the trainees during the flight trainee B did not disembark but just changed seat, from the front left to the rear left seat, and trainee B sat in the front left seat, as also stated by the instructor.

The instructor also states that after the ten touch-and-go landings, trainee A disembarked and trainee B boarded the aircraft, with whom they did two circuits of the airfield in order for trainee B to see the circuit and the turning points in the various legs (crosswind, vertical, downwind, base and final leg). They then brought the aircraft to a full stop in the area of the airfield.

From the above it can be seen that there is a diverging perception of the facts between the trainees and the instructor. If both trainees were onboard the flight, the flight cannot be designated as a training flight. Naturally, we have no reason to doubt what the trainees say. The instructor's statement that one trainee disembarked and the flight was conducted with the other trainee only, was made in order to document that this was a training flight.

Also, if the instructor wanted to make trainee B familiar with the airfield circuit and the turn points of the various legs he could have done so when they reached the airfield with trainee B in the left seat as the pilot flying, as stated by the trainees, and without executing a full stop. It is more likely that the instructor stated so in order to document that the specific exercise

was done within the context of a training flight and not in the initial segment, Thessaloniki-Airfield of Nea Kavala, which was not a training flight.

No problem occurred during the said flights.

2.4 The accident flight

The accident flight was a flight destined from the Airfield of Nea Kavala to the Airport of Thessaloniki. During this flight trainee B was seated in the front left seat, the instructor was seated in the front right seat and trainee A was seated in the rear left seat.

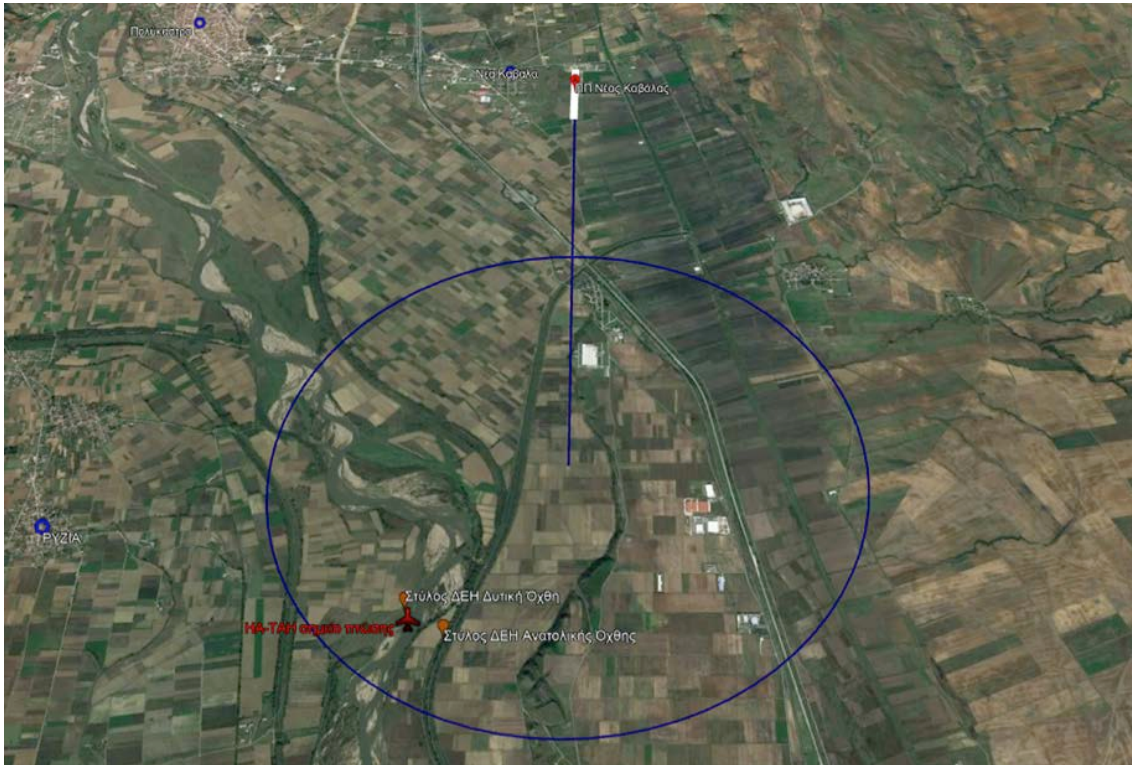
Weather conditions prevailing at the airfield area, given that there was no variability observed in the area, would be much similar to those at LGTS, namely wind from 170° at 8 kt and temperature 15°C, i.e. southerly light wind.

The aircraft took off from runway 18 of the airfield. As reported, prior to takeoff all aircraft checks and all preflight checklists were executed, revealing no problem. Trainee B who was flying the aircraft, assisted by the instructor, executed the takeoff from runway 18. Even though this was not a training flight, it can be considered as good practice for the instructor to have the less experienced trainee execute the takeoff in order for the trainee to acquire experience even though this particular aircraft was not the one on which trainee B would do his first solo flight and his training up until that time was done on the Cessna 152 operated by the training organization.

After takeoff and in the climb to 1000 ft headed at 180° and prior to attaining the said altitude the instructor took full control of the aircraft advising trainee B accordingly, and he encouraged them to observe outside the terrain in order to familiarize themselves with the area. This was the first time for the trainees that something like that happened, previously they had training flights at the airfield circuit or they followed precisely the VFR altitudes and routes, i.e. they flew at 1000 ft initially to points FALIA, DELTA then to ANGELO and landed at LGTS, or at 1500 ft and flew the reverse route. The instructor's practice to familiarize his trainees with the geographical characteristics of the area of the flight and particularly prior to

the first solo flight for trainee A is considered to be good practice.

If aircraft performance was in conformance with the Pilot's Operating Handbook (POH) and the rate of climb was 500 ft/min and airspeed 70 kt then, after takeoff and within a time period of two minutes the aircraft would have attained a flight altitude of 1000 ft and covered a distance of 2.2 nm.



Picture 3. Distances to the aircraft crash site

The aircraft then leveled off at 1000 ft and, according to the instructor, they executed a 'level flight checklist' or, pursuant to the operating handbook of the aircraft a 'Cruise checklist'. Therefore at that point the aircraft flew at a cruise power between 65% and 75%.

At about point A, according to the instructor, they experienced the problem with the engine. At first, the engine malfunction indications were a sudden RPM drop initially for some seconds at 45% to 65%, then a second drop at 30% to 45% and finally at 13% to 30%. The engine remained at this state with constant RPM fluctuations between 13% and 30% and consequent thrust fluctuations.

Seeing such fluctuation and assessing that, based on the altitude and the engine's performance he would not be able to return to the airfield for a

forced landing he decided to make a right turn towards Axios river, where as he stated, *“I knew that in the area and around the river, and this is something I also tell my students, and in general around lakes, there are flat areas of pasture land with level surfaces suitable for a forced landing”*, in order to execute an emergency landing.

The instructor, in his assessment of inability to return to the airfield of departure, probably took into consideration that, according to the aircraft performance following the engine loss and having regard to the fact that the altitude was 1000 ft with a glide rate of 9:1, he would be able to cover a distance of 1.5 nm (see Picture No. 3). He claimed that the engine was not dead, it presented rpm fluctuations and by extension efficiency fluctuations, however it was not dead.

The instructor reported that he tried to contact air traffic control at the frequency of the terminal area and notify them of the problem he was experiencing. He then advised the trainees that *‘we have power loss, don’t worry, if necessary we shall do a forced landing’*.

The trainees state that they did not hear the *‘blind transmission’* to the approach service in Thessaloniki and that they were not informed by the instructor of the power loss and of the fact that they might have to do a forced landing, even though they had their headsets on and trainee A, as per his statement, was able to hear all internal and external communications of the aircraft.

Trainee B, seated in the front left seat and having direct visual contact with the aircraft instruments, in his initial interview states that he was not aware of an engine loss and did not hear the instructor saying that they had power loss, and in his second written report about the engine power he states *‘we were flying with partial engine power’*. Partial engine power is at between 50% and 60% of the engine’s rpm which, according to the aircraft performance, at sea level would give a speed between 82 kt and 91 kt or a normal and controlled flight for the aircraft. At this power, the aircraft would be able to fly at a safe altitude, above 500 ft from the ground, and return to land at the airfield of departure.

The instructor states that he had located an area for a forced landing, at the right (west) side of the stream bed, after the clumps of trees located at the left side of the stream bed, stating *‘we would fly over the trees and reach precisely the selected landing site that I had located’*. The said areas were, as shown in picture 3, near the point where the aircraft crashed. As part of the preparation for the emergency landing he had to execute the ‘Emergency Checklist’, one of the tasks of which would be executed by trainee B, namely the ‘Doors Unlatched’, however it seems that trainee B had not been informed of his instructor’s intentions to perform an emergency landing.

In what concerns the non-normal operation of the engine and its rpm fluctuations, the type and the level of engine noise would change and would be completely different compared to the noise of an engine that operates normally. In the presence of these indications, the instructor ought to have followed specific procedures in the context of the emergency checklist, in conformance with the aircraft’s manuals. Moreover, there would be a series of readings and signals on the instrument panel to indicate that the engine was not operating normally, such as the FADEC system which was directly visible to trainee B. It is not conceivable how the two trainees could fail to perceive all the above, despite their limited experience in light airplane flights. Furthermore, the fluctuation in the engine’s revolutions would also have been noted by witnesses on the ground who reported that the sound of the engine was normal and there was nothing strange or out of the ordinary about it.

It is clear from the above that if a problem was encountered with the engine, power loss, only the instructor was aware of it. It appears that the instructor, if decided to execute an emergency landing, failed to inform the two student pilots about his intentions. Also, if engine rpm fluctuations had occurred this should have been perceived by the trainees, which is not mentioned. Moreover, trainee B states that they were flying at partial engine power. Trainee A had not accumulated many training hours on light airplanes but he had flying experience being a licensed glider pilot, and he would be able to detect a power loss and fluctuations.

2.4.1 Impact with aerial power transmission lines

The aircraft, having flown over the clumps of trees found in the area where the accident took place along the east bank of Axios river, struck overhead power transmission lines that were suspended in a horizontal configuration on poles about 12 m or 40 ft above the ground. The estimated height of the lines above the river surface is about 50 ft to 60 ft.

The aircraft impacted the overhead power lines with force. The metallic structures on the upper part of the fuselage, making up the ceiling of the cockpit, were torn almost horizontally from front to back, by the middle one of the three overhead power lines. The wings almost detached and folded rearward hitting hard and causing deformation to the right and left of the horizontal stabilizer. Moreover, even though the overhead lines were of a large diameter and quite strong, the middle one was completely severed. The above are not indicative of an aircraft almost in stall, as claimed by the instructor, with continuous fluctuations in the engine rpm between 13% and 30% and thrust being just enough for the instructor to execute an emergency landing in a nearby pasture land.

Also, the fact that the aircraft did not hit and sever the power line that was first in the horizontal configuration, but the second one, leads to the conclusion that the aircraft was not descending but rather flying in a straight and level flight.

Finally, about the aircraft's flight and impact with the overhead power lines the witnesses on the ground state that the aircraft was flying quite low and at a considerable speed, leading them to believe that it would pass underneath the power lines, however, when it reached them it struck them with its upper part and they snapped causing it to crash in Axios river.

This impact is more consistent with a flight where the aircraft flies horizontally and is provided with power.

2.4.2 Crash in the stream bed of Axios river

After it struck the overhead power transmission lines, the aircraft continued its course almost uncontrolled until it touched the ground, the stream bed of Axios river. The limited scattering and the relatively large size of wreckage

pieces (Photos 1, 2) are consistent with a small airplane falling at a relatively small angle of impact. The extensive damage caused to the front right part of the cockpit leads to the conclusion that the aircraft had a rather large angle of roll to the right relative to its longitudinal axis at the time of impact on the ground.

The instructor in his interview states that following the impact with the overhead power lines *‘At that point the plane kind of rolled off to the right, after the impact, the engine died, that is the low descending power, the partial power I had, right? the propeller was instantly immobilized and turned the plane to about 120°, more than 90°. So in my effort to restore it, I restored it at around 20° with roll to the right, and it is there that the crash happened’*.

Following the impact with the overhead power lines the aircraft flew uncontrolled. What the instructor states as his own actions may well be his recollection of the course/attitude of the aircraft or his interpretation of the aircraft’s final position at the stream bed of the river.

The distance travelled from the point of impact with the overhead power lines up until the final point where the aircraft stopped was about 100 m (Picture 2); this fact, in conjunction with the fact that one power cable was severed and the other two sustained damage, shows that the aircraft had high kinetic energy as a result of its high speed at the time of impact and is not characteristic of an aircraft flying at a little more than stalling speed without flaps, i.e. 44 kt.

This fact is in support of the likelihood that there was no mechanical problem with the engine but rather that the aircraft was flying very low, as indicated also in the testimonies of witnesses on the ground.

2.5 Rescue

Following the accident and after the training organization had been notified about the accident, about the condition of the aircraft occupants and the site where the accident took place, all competent authorities were mobilized for the prompt transfer of the three injured persons from the crash site, the mudflat within the stream bed of Axios river.

The whole operation for the transfer of the two persons who had less serious injuries lasted for more than 1.5 hours, for their transfer initially from the mudflat to the west river bank with the assistance of the Fire Service Emergency Response Unit and from there, after receiving first aid onsite by the paramedics of the EKAB ambulance, to the General Hospital of Kilkis.

The instructor was subsequently transferred, by a Super Puma helicopter, almost two hours later, to 424 General Military Hospital.

The above rescue times were long and are due to the difficulty encountered by rescuers in accessing the mudflat from the river bank, and also due to the fact that at the time there was no helicopter available in Thessaloniki.

2.6 Communications

According to the instructor, at 1000 ft when he realized that there was engine power loss, he immediately tried to contact the Approach Service in Thessaloniki to report the problem. However, as he himself states, this was practically a '*blind*' transmission, given that the area around the Airfield is a dead area for communication with Thessaloniki. He also states that, depending on the atmosphere at 1000 ft sometimes one can get through and sometimes not; naturally, when flying above 1500 ft one can always be heard.

However, it is not confirmed by the trainees' interviews that the instructor did make this communication, given that all persons onboard the aircraft had headsets on.

In this case no Mayday distress signal was transmitted, and no attempt was made to communicate over the aircraft emergency frequency, 121.5 MHz.

In the test flight conducted over the area of the accident, making test transmissions at different flight levels starting from 1000 ft and reaching down to 500 ft, it was established that transmission and reception in all altitudes, at that particular day, was excellent (5/5).

Furthermore, 'Makedonia' International Airport of Thessaloniki (LGTS) confirms that no such call was received, and no such call was heard either by some other aircraft flying in the area and being in the same frequency so as to inform LGTS.

2.7 Loss of the wreckage

The loss of the wreckage and the inability to examine in detail the engine and the other parts of the aircraft makes it impossible to verify the instructor's view that while he was flying at 1000 ft he experienced power loss with fluctuations; further it has not been possible to examine - if that was indeed the case - what was the cause of it.

In the context of regulation 996/2010, on 16 February 2018 a Memorandum of Cooperation was signed between the Hellenic Police and AAIASB where provision is made for the safe custody of wreckage. The said memorandum states, among others, that Hellenic Police will *'proceed with all actions necessary to secure, and to ensure controlled access to, the accident site for the purpose of preservation of evidence, the safe custody of the aircraft, its contents and its wreckage.'*

3 Conclusions

3.1 Findings

- 3.1.1** The instructor and the two trainees had the necessary legalization documents and licenses according to the applicable regulations.
- 3.1.2** The General Declaration submitted prior to the flight does not indicate the type of the flight and a single document covered both sectors of the flight.
- 3.1.3** Aircraft maintenance was conducted as prescribed and scheduled.
- 3.1.4** The weather was good and was not a contributory factor to the accident.
- 3.1.5** The two trainees, according to their statement, were not informed by the instructor about the execution of an emergency landing, and were not aware of any problem in the operation of the aircraft's engine.
- 3.1.6** The distance covered by the aircraft from the point the aircraft struck the overhead power lines up to the point it stopped was about 100 m.
- 3.1.7** The aircraft struck the overhead power lines with force and the

damage caused to the aircraft was extensive.

3.1.8 The distance covered by the aircraft from the point of impact until it crashed, in conjunction with the damage sustained, are not consistent with an aircraft flying at near stall or with a mechanical problem in the engine.

3.1.9 Witness testimonies indicate that the aircraft was flying low.

3.1.10 The simulation flight conducted has not confirmed that at the flight altitude reported by the instructor it was not possible to contact air traffic control at ‘Makedonia’ International Airport of Thessaloniki.

3.1.11 The fact that the aircraft wreckage was stolen from the site of the accident has not allowed a detailed examination of the wreckages.

3.2 Probable causes

The failure to adhere to the regulations and procedures specified for Makedonia TMA VFR Routes and, more specifically, the safety altitudes specified for the said routes.

The incorrect assessment of the risks of low flying which resulted in the aircraft striking the overhead power transmission lines.

Nea Philadelphieia, 31 / 08 /2018

THE CHAIRMAN

Athanasios Binis

THE MEMBERS

P. Vasilopoulos

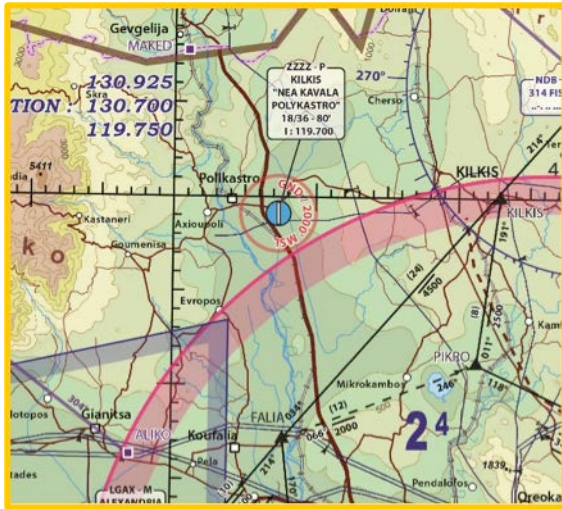
A. Tsolakis

N. Goutzouris

Ch. Tzonos-Komilis

Annex 1

Maps/Charts / Airfield of Nea Kavala and LGTS Terminal Area



Map 1 The Airfield of Nea Kavala, Polykastro



Map 2 TMA – LGTS with VFR routes, including the Nea Kavala Airfield circuit (Greek Aviation Maps)

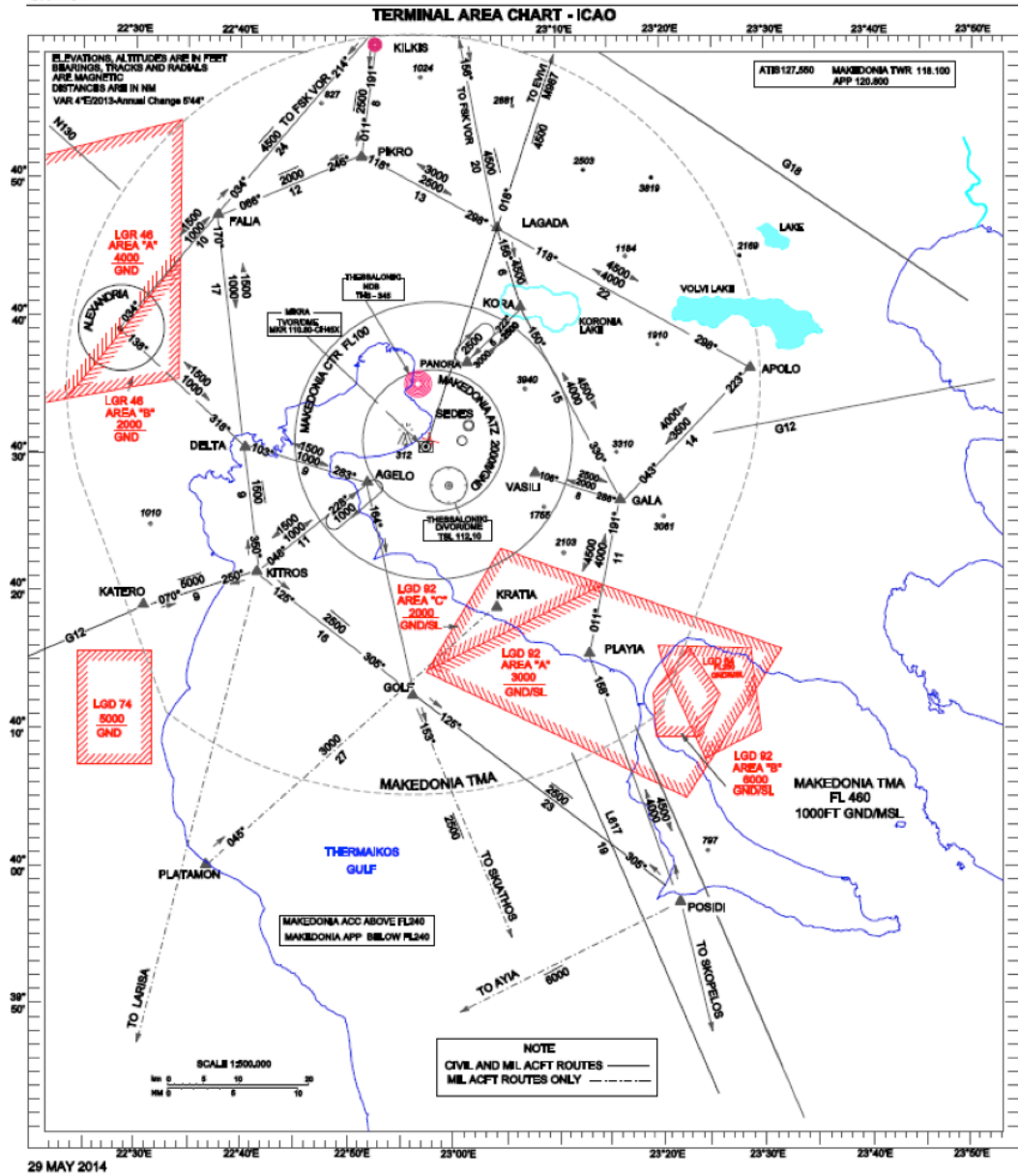


Chart 3 TMA – LGTS with VFR altitudes and routes AIP Greece

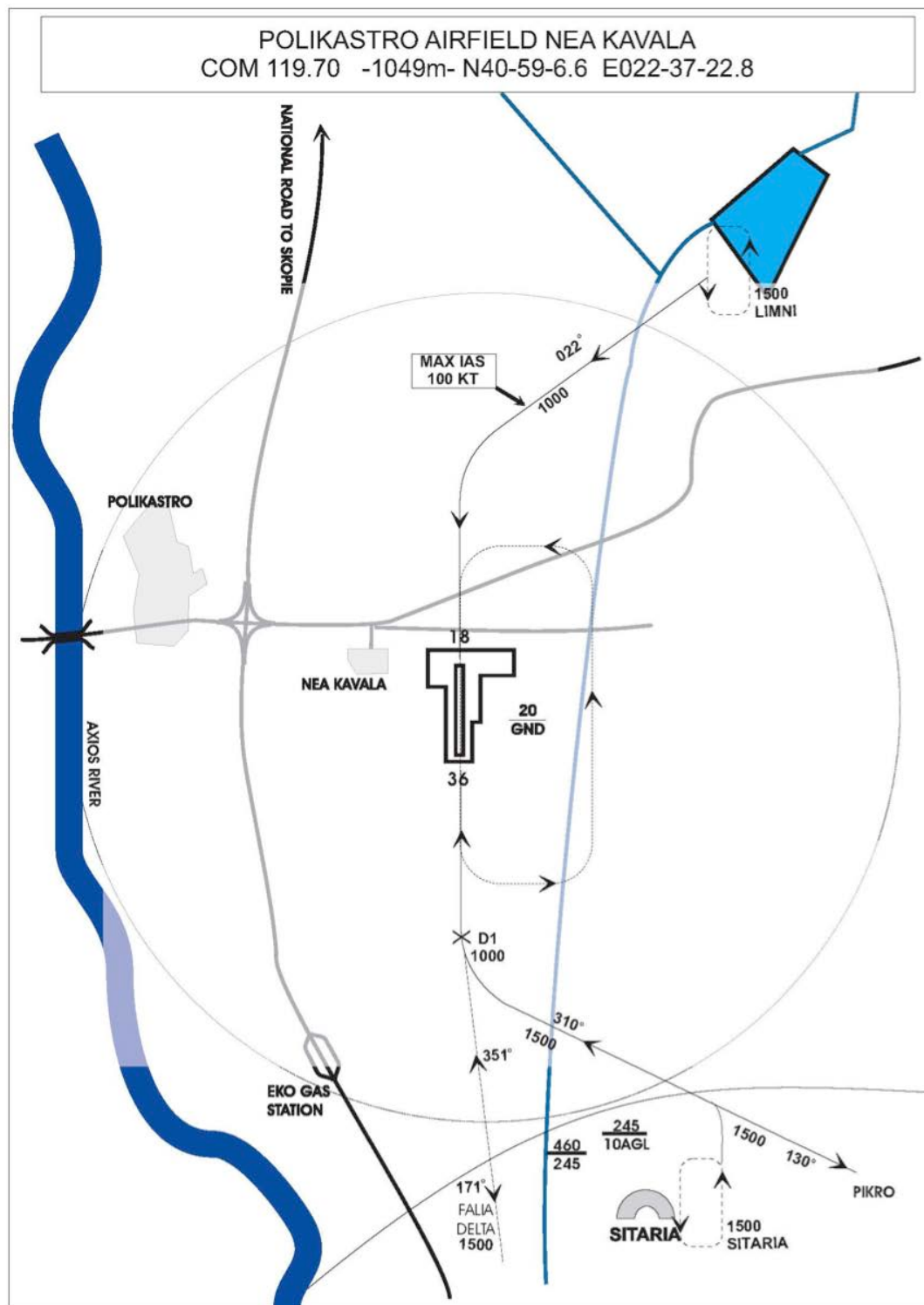


Chart 4 Polikastro Airfield Nea Kavala (website⁴ of Polikastro Aero Club, 14.10.2015)

⁴<http://www.aelpo.gr/index.php/sample-sites-2/73-polikastro-chart>

Annex 2

The Pylons on both sides of Axios river and the power lines



Photo 6. Public Power Corporation pylons, the damaged cables and the severed cable



Photo 7. Severed cable end



Photo 8. The two damaged cables

Annex 3

According to available information, the main maintenance work carried out on the aircraft from the time its engine was replaced, in March 2014, up until the time of the accident, is as follows:

- As per the Aircraft Technical & Journey Log, Entry No. 0044 dated 01/03/2014, a Test Flight was conducted following the new engine installation.
- As per the Aircraft Technical & Journey Log, Entry No. 0047 dated 04/03/2014, there was a FADEC System Malfunction.
- On 23/03/2014, CAMO issued a work order under No. TAH-2014-03-002. More specifically, CAMO instructed the Hungarian Maintenance Organization (Part 145) *Magyar Repüld Akademia KFT* (HU.145.0111) to inspect the FADEC malfunction designated as FADEC 02-7610-55003R. It also instructed that an inspection be conducted after third and sixth hour of the engine's operation, in accordance with TAE OM-02-01 for TAE 125-01 engines.
- On 02/04/2014 CAMO issued work order No. TAH-2014-04-001. More specifically, CAMO instructed EL.MF to install the repaired FADEC, under FADEC 05-7611-K000102-EASA Form1 IP0300/2014. The said order closed on 04/04/2014 and EL.MF issued Certificate of Release to Service under No. CRS/14-021 stating that the FADEC was installed (TAE 125-02 P/N 05-7611-K000102, S/N 3514), in conformance with the CAMO work order. Furthermore, the said work was carried out in conformance with OM-02-02 Issue 3, Rev. 2 and TAE RM-02-02 Issue 2, Rev. 1.
- On 03/04/2014 a Test Flight was conducted with no remarks (Aircraft Technical & Journey Log, entry No. 0048).
- On 19/09/2014 CAMO issued work order No. TAH-2014-09-001. More specifically, CAMO instructed EL.MF to perform the 100-hour inspection, before the aircraft's next flight. The said order was executed on the same day and EL.MF issued Certificate of Release to Service under No. CRS/14-079, indicating the work order No. and confirming its execution.
- On 25/12/2014 CAMO issued work order No. TAH-2014-12-001. More specifically, CAMO instructed EL.145 to perform the 50-hour inspection, before the aircraft's next flight. The said order was closed on the same day and on the same day EL.145 issued Certificate of Release to Service under No. CRS/14-004, indicating the work order No. and confirming its

execution.

- On 16/02/2015 CAMO issued work order No. TAH-2015-02-001. More specifically, CAMO instructed EL.145 to perform the 100-hour inspection, before the aircraft's next flight. The said order was closed on the same day and on 18/02/2015 EL.145 issued Certificate of Release to Service under No. CRS/15-017, indicating the work order No. and confirming its execution.
- On 18/02/2015 an entry was made in the Aircraft Technical & Journey Log, under No. 0181, that the aircraft presented RPM drop 75% with Full throttle (Drop from 45-75%).
- On 02/03/2015 CAMO issued work order No. TAH-2015-03-001, instructing EL.145 to replace the Turbocharger. The order was closed on the same day and EL.145 issued Certificate of Release to Service under No. CRS/15-034, indicating that the Turbocharger had been replaced with a new one (P/N 05-7241-K009503, S/N 14053) in execution of the work order and in conformance with: Cessna SM P/N D2065-3-13 Rev. D2065-3TR8, TAE OM-02-02 Issue 4, Rev. 1, TAE RM-02-02 Issue 3, Rev. 2.
- On 03/03/2015 a Test Flight was conducted; no remark was generated (Aircraft Technical & Journey Log, entry No. 0185).
- On 16/03/2015 an entry was made in the Aircraft Technical & Journey Log, under No. 0187, that the Glow light doesn't go on.
- On 11/03/2015 CAMO issued work order No. TAH-2015-03-002, instructing EL.145 to replace the Glow relay. On 16/03/2015 the Glow relay was replaced with a new one, P/N NE-0000-0042501, and on the same day EL.145 issued Certificate of Release to Service under No. CRS/15-039, indicating the work order No. and that the work was executed in conformance with: Cessna SM P/N D2065-3-13 Rev. D2065-3TR8, TAE OM-02-02 Issue 4, Rev. 1, TAE RM-02-02 Issue 3, Rev. 2.

Annex 4

