

FINAL REPORT

from

the investigation to a serious incident occurred on September 17, 2017 with involved a MXP140, registration marks YU-A019, at landing at Slivnitsa airfield.



2018

Purpose of the report and level of responsibility

In accordance with Annex 13 of the Chicago Convention on International Civil Aviation of December 7, 1944, Regulation 996/2010 of the EP and the Council on the investigation and prevention of accidents and incidents in civil aviation and Ordinance 13 of January 27, 1999, of the Ministry of Transport, Information Technology and Communications, the objective of the aviation occurrence investigation is to ascertain the causes that have led to its realization in order to eliminate and not repeat them in the future, **without seeking anyone's fault or responsibility.**

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01 LIST OF ABBREVIATIONS

AO	- Air Operator
AS	- Airspace
AC	- Aircraft
DG CAA	- Directorate General of Civil Aviation Authority
SG	- State Gazette
SE ATC	- State Enterprise Air Traffic Control
F/C	- Flight Crew
CAD	- Civil Aviation Directorate
AMRAIU	- Air, Maritime and Railway Accident Investigation Unit;
ACC	- Aircraft Commander
RESA	- Runway End Stop Area
SWY	- End Safety Area (stopway)
MTITC	- Ministry of Transport, Information Technologies and Communications
RWY	- Runway
TRY	- Taxiway
MO	- Maintenance Program
AOM	- Aircraft Operation Manual
AAIU	- Air Accident Investigation Unit
TWY	- Taxiway
TLB	- Technical Logbook
TO	- Maintenance
ROC	- Release to Operation Certificate
EASA	- European Air Safety Agency
FI(M)	- Flight Instructor
FM	- Flight Manual;
ICAO	- International Civil Aviation Organization ;
LAPL	- Light Aircraft Pilot License;
MTOW	- Maximum Take-Off Weight;
NPPL(M)	- National Private Pilot License (M) of Ultra-Light Aircraft
SEP	- Single Engine Piston Aircraft;
UTC	- Universal Coordinated Time

1. INTRODUCTION

Date and time of occurrence: 17.09.2017, 15:00 h local time (12:00h UTC).

Notified: AMRAIU Directorate and General Directorate of Civil Aviation Authority at MTITC of Republic of Bulgaria, European Commission, European Air Safety Agency (EASA) and the Center for Investigation of Accidents in Transport of Republic of Serbia.

On the grounds of the provisions of Article 9, para.1 of Ordinance No 13 of January 27, 1999, on Investigation of Aviation Accidents, the occurrence was classified as a serious incident by the Aircraft Accident Investigation Unit (AAIU) at AMRAIU Directorate at the MTITC. The materials on the aviation occurrence have been filed in case No 07/17.09.2017 in AAIU archives.

In accordance with the provisions of Article 5, Para 1 of Regulation (EU) No 996/2010 on investigation and prevention of accidents and incidents in civil aviation, Article 142, Para2 of the Civil Aviation Act of the Republic of Bulgaria dated 01.12.1972 and Article 10, Para 1 of Ordinance No 13 of the MT dated 27.01.1999 on the Investigation of Aviation Occurrences, by Order No RD-08-389/29.09.2017 of the Minister of Transport, Information Technology and Communications a Commission was appointed to investigate the serious safety incident..

The difference between the local and Universal Coordinated Time is +3 hours. All times pointed out in this report are local.

On September 17, 2017, at about 15:00 hrs, an ultra-light MXP140 aircraft with registration marks YU-A019 operated by a pilot-owner performed flights in the area of Slivnitsa airfield. After landing on RWY08, the aircraft left the runway to the left-hand side and stopped at 75 m from the runway edge at the airfield perimeter fence. The aircraft suffered minor damages after running outside the RWY and the collision into the peripheral fence. There were no consequences for the pilot and the on board passenger.

As a result of the conducted investigation, the commission states as a reason for the serious incident: An error was made by the pilot in piloting procedure during the landing stage associated with an inadequate decision for intensive braking demonstration and a sudden failure of the braking system.

2. FACTUAL INFORMATION

2.1. History of the flight

2.1.1. Flight number, type of operation, last point of departure, time of departure, destination point of intended landing:

Flight number: YU-A019.

Type of operation: Entertaining.

Last point of departure: airfield Slivnitsa.

Time of departure: about 2:50 PM.

Destination point of the intended landing: airfield Slivnitsa.

2.1.2. Flight preparation and description of the flight

On September 17, 2017 the pilot-owner, acting as a/c Commander, planned to perform an entertainment flight with his son in the area of the Slivnitsa airfield. The pilot refueled 12 liters of A-95 gasoline into the tank of the right half-wing, performed a pre-flight inspection defining the aircraft as in order, performed all procedures accordingly to the Airplane Operation Manual and took-off from RWY08 at 14:50 h. After a flight implemented in the area of the Slivnitsa airfield, the pilot undertook a landing approach at a speed of about 55 kt and landed at approximately 15:00 h. According to the pilot's explanation, the touchdown on the runway was at a speed of 45 kt and a/c continued the landing run at a speed of 35 to 40 kt until about 100 m before the end of RWY08 with intention to demonstrate stopping by using the brakes. In the subsequent attempt to use the brakes, the pilot found out that the brakes did not operate synchronously. The pilot re-used the brakes, where the airplane rolled 45 degrees to the left, left the runway, and stopped at the peripheral fence of the airfield at 75 m from the RWY26 threshold.

In the pictures in Fig. 1 and 2 of Appendix 1, the airplane is shown at its final position, turned 180°. Breaking tracks of a 39 m length ending at 49 m from the end of RWY 08 have been found during the asphalt coating inspection. At the end of the stopping track, it was found a trace of a working fluid spillage (possibly braking fluid) of 5 m length. On the airplane's trajectory, 5 m before the end of RWY 08 there is a second trace of working fluid spilling with a length of 5 m as well.

The end of RWY08 is located 60 m from the perimeter fence of the flight site. Fig. 16 shows a photo of the fence at the airplane stop.

2.1.3. Location of aviation occurrence

The event occurred while the aircraft was landing on RWY08 at Slivnitsa airfield with geographical coordinates N 42°50'38", E 023°00'51" and elevation of 616 m. The aircraft stopped in the peripheral fence of the airfield at 75 m northeast from the threshold of RWY26 at a spot with coordinates [42°50'41.637"N 23°01'03.775"E](#).

The event occurred during daylight at about 3:00 pm.

2.2. Injuries to persons

Injuries	Crew	Passenger	Total number of occupants	Others
Fatal	0	0	0	0
Serious	0	0	0	0
None	1	1	2	0
Total	1	1	2	0

2.3. Damage to aircraft

The inspection conducted by the safety investigation commission revealed that the aircraft had suffered minor damages as shown in Figures 2 through 15 in Appendix 1. These damages include:

- Damaged leading edge of the propeller periphery part, as about 2 cm of one of the two blades were broken off (Fig. 3, Appendix 1);
- Bruises and warping on the right-hand side of the engine cowling (Fig. 2, Appendix 1);
- Damage to the lacquer coating and scratches on the upper bonnet of the engine (Figures 3 and 5 of Appendix 1).
- Deformed wheel frame of the nose landing gear; (Fig. 12 of Appendix 1).
- Deformation in the controlling fork of the nasal wheel.
- Scratches and cracks on the windscreen of the cockpit (Fig. 4 and 5 of Appendix 1).
- Leakage of brake fluid from the brake packing of the right-hand main gear (Fig. 14 and 15 of Appendix 1).
- Deformations of the left-hand wing bracing strut; (Fig. 6 of Appendix 1);
- Bruises on leading edge of leading edge slat of the left-hand half-wing; (Fig. 4 and 7 of Appendix 1).

2.4. Other damage

The barbed wire of the peripheral fence torn out at the point of contact with the aircraft.

2.5. Personnel information

2.5.1. Airplane crew of MXP140 with registration marks YU-A019;

The aircraft Commander

Male - 51 years old;

Flight Certificate - PPL (A) - issued on 19.02.2013;

Qualification records: SEP (land) valid until 30.04.2019

National license for ultra-light aircraft pilot - NPPL (M) - issued on 26.11.2015

Qualification records:

- A - valid until 28.02.2019

- A FI(M) - valid until 31.07.2019.

Medical Certificate:

- Medical certificate Class 1 - valid until 14.02.2018;
- Medical certificate Class 2 - valid until 14.02.2018;
- LAPL Medical certificate - valid until 14.02.2019.

Flight experience:

Total flying hours on ultralight a/c - 477:50 hrs;

On the type on a/c - 260:00 hrs

- Commander - 442:50 hrs;
- Instructor - 35:00 hrs;
- On the type of a/c - 08:29 hrs.

Hours flown:

- during the last 24 hrs – 00:10 hrs;
- during the last 30 days – 3:19 hrs;
- during the last 90 days – 8:29 AM hrs;

Rest time before duty: According to the pilot, he had a rest of more than 12 hours before the flight.

The Commission accepts that the pilot had a qualification and medical fitness for execution of the flight.

2.6. Aircraft information

2.6.1. Airworthiness information

Ultra-light airplane MXP 140 Tumako, registration marks YU-A019, serial number 101122-AEE-0070, produced in May 2012 by Aero East Europe, Republic of Serbia, has Certificate of Registration No 019 issued by the Civil Aviation Directorate of the Republic of Serbia on 09.04.2014. The aircraft has been owned by Iztochni Sistemi EOOD (Eastern Systems Ltd) company with office address at 5 Ivan Yonchev Str., 4th floor, Krasno Selo area, Sofia since 24.07.2017, according a sale and purchase contract with Mag plastic d.o.o., registered in the Republic of Serbia, signed on 24.07.2017. An electronic copy of the contract was attached to the materials of the investigation. The aircraft is subject to registration in the register of the Republic of Bulgaria. To the moment of the occurrence, the owner had not filed application for re-registration of the aircraft.

The aircraft has Airworthiness Review Certificate No. EA-019 issued on 27.04.2017 by the CAD of the Republic of Serbia with validity until 21.04.2018. On re-registration into the Republic of Bulgaria's register, it will be necessary such certificate to be issued by the DG CAA.

Total flying time since to the day of air occurrence: the aircraft has flown 931:22 hrs according the readings of engine service hours meter.

Airplane maintenance was performed in accordance with the "Maintenance Program" developed by "Aero East Europe" d.o.o.

The aircraft has a Release to Operation Certificate after an annual inspection conducted on 27.07.2017 at 918 hrs flight time. A copy of the certificate is attached to the investigation papers.

The aircraft has a ROTAX 912 ULS 100 H aviation piston engine, serial No. 6779191. To the moment of air occurrence the engine has accumulated 931:22 flight hours.

The aircraft has mounted a KASPAR air propeller of KA-2/2-PA type, serial No. 619/13/08. To the moment of air occurrence, the propeller has accumulated 931:22 working hours.

Immediately before the flight a pre-flight inspection of the airplane was carried out by the pilot-owner. The inspection results were recorded in the aircraft log on page 00026. No faults were detected or removed during the inspection.

There were no remarks in relation to the airplane's behavior during the flight, at which the occurrence was realized and during the previous flight.

Taking into account information given in this paragraph, the Commission accepted that before the last flight, the aircraft was prepared in accordance with the requirements for continuing airworthiness and was loaded with enough fuel and working fluids to carry out the flight.

2.6.2. Aircraft information

MXP 140 Tumako is a two-seater airplane, used of for training and tourism. It is designed as a single-engine airplane with a high-mounted wing and non-retractable tricycle landing gear. There are two seats abreast in the cockpit. The maximum take-off weight (MTOW) of MXP 140 Tumako airplane, serial No. 101122-AEE-0070, is 450 kg, and the weight of an empty airplane according the weighing protocol issued by the manufacturer on 26.04.2012 is 316 kg. At the time of take-off, according to the record in the technical logbook, the plane had 50 liters of fuel and two people on board. At the stated weight of an empty airplane, the weight of the payload (passengers and fuel) was limited to 134 kg. At a fuel density of 750 kg/m³, the weight of the fuel onboard was 37,5 kg. The presence of two persons on board with a total weight of not less than 160 kg means that the take-off weight of the aircraft is 513,5 kg and exceeds the maximum take-off weight of 450 kg.

Some typical speeds and limitations are given below in accordance with the MXP 140 Tumako Aircraft Operation Manual. There is no aviation authority's approval of the copy of the airplane's AOM.

Speed Limitations

Speed		km/h
V _{NE}	Maximum permitted speed	220
V _{MO}	Maximum operating speed	194
	Cruising speed 75%	180
V _{SO}	Stalling speed in landing configuration	45
V _{S1}	Stalling speed in horizontal flight	59
V _R	Maneuvering speed	97
V _{FE}	Maximum speed at extended flaps	71

Fuel tanks volume 87 l + 5 l reserve fuel;

Vertical speed at climbing (at sea level) - 6.0 m/s;

Maximum duration of flight – 5:30 h;

Maximum flight range - 990 km.

Take-off run - 30 m

Landing run - 50 m

Service ceiling - 3 660 m.

According to the table shown in paragraph 6.1 of the AOM, at an air temperature of 31°C and an elevation of 610 m, the landing distance (including air section of 15 m) is 83 m and it is 13 m (18, 6%) longer than the landing distance under standard atmospheric conditions.

The aircraft is equipped with an independent hydraulic brake system controlled by the pilot. The system shall be checked at preflight inspection for leakage and for necessity of refueling. Replacement of a brake pads and brake discs shall be made as necessary.

2.6.3. Fuel

According the technical logbook record No 00026, completed before the flight, in which the air occurrence was realized, the aircraft was refueled with 50 l gasoline. The fuel is automotive gasoline A-95. The type of fuel shall not be written in the technical logbook.

The safety investigation commission assumes that there was enough fuel on board for the aircraft to complete the flight successfully.

2.7. Meteorological information

Weather conditions in the area of Sofia Airport and Slivnitsa airfield between 14:00 and 16:00 local time on 17.09.2017:

Bulgaria was under the influence of a warm sector of shallow depression centered over the Northern Italy. At a height, there was a stream of warm air coming from South-west in front of a valley of high pressure. The temperature at 03 PM in the area of the Slivnitsa airfield was 31°C, without ground wind.

The METAR's meteorological information broadcasted for Sofia Airport between 14:00 and 16:00 and other meteorological information for Sofia Airport, and the region related to the day of the occurrence was enclosed to the case materials, and there were no data on the presence of dangerous weather conditions.

There were no meteorological phenomena that could influence upon the realization of the occurrence.

2.8. Aids to navigation

Standard aids to navigation of the aircraft.

2.9. Communications

The aircraft was equipped with a radio station with VHF DITTEL AVIONIK KRT-2 5 transmitter with 5W emitting power, 6K00A3E emission class, frequency range 117.975-137 MHz at a step of 8.33 kHz and transponder mode S FUNKWERK TRT800H, 1090/1030 MHz.

2.10. Aerodrome information

The flight where the event took place, was carried out from a certified Slivnitsa airfield. Slivnitsa airfield has Certificate for Operational suitability No 20 originally issued on 04.11.2011, validated on 14.11.2016 after inspection by DG CAA until 14.11.2017. The following irregularities were found by the DG CAA during the inspection:

- There are damages on the surface layer of the artificial pavement of TWY (A) and TWY (B) at the connection with the RWY;
- There were surface irregularities of runway shoulder, stopway (SWY) and runway end safety area (RESA).

The following corrective actions have been proposed to the manager of Slivnitsa airfield:

- To restore the surface layer of artificial pavement of TWY (A) and TWY (B);
- To align and to roll the earth surface of the runway shoulder, SWY and RESA.

Activities should be completed by 31.08.2017.

During the investigation, the commission found that the irregularities found by the DG CAA were not eliminated.

In accordance with the Management and Operation Manual, the runway at Slivnitsa airfield is with:

- GEO-079°/259°, MAG-076°/256°, numerical designation as RWY 08/ RWY 26;
- length - 485 m, width - 25 m, slope 1,25% and surface type - asphalt concrete;
- taxiways: A with a length of 44 m and width of 8 m;
B with a length of 90 m and width of 8 m;
- stopway areas (SWY) with a length of 30 m.

The airfield dimensions allow unobstructed take-off and landing for the type of aircraft with which the occurrence was realized.

The reference point of airfield (in the middle of the airfield) is with the following coordinates: N 42°50'38" and E 23°00'51" (WGS-84). The elevation is 616 m (2021 ft)

The peripheral fence of airfield was in a condition that makes it difficult to carry out its main function of preventing intrusion into the territory of the airfield. It is shown in Fig. 1, 5, 6, 7 & 16 of Appendix 1.

2.11. Flight data recorders

Not applicable for this aircraft.

2.12. Wreckage and impact information

After an entertainment flight in the area of the Slivnitsa airfield, the pilot performed an approach to RWY08 and landed. According to the pilot's explanation, the touchdown on the runway was at a speed of 45 kt, after which he continued the landing run at a speed of 35 to 40 kt until about 100 m before the end of RWY08 with an intention to demonstrate the effectiveness of the brakes.

In the subsequent attempt to use the brakes, the pilot found that they had no effect. He reused the brakes where the airplane did not stop, but turned 45 °, left the runway to the left, continuing to roll over the ground and stopped in the peripheral fence of the airfield 75 m from the RW threshold. The coordinates of the point of contact with the fence are 42°50'41.637" N 23°01'03.775"E at elevation of 616 m.

Small damages to the a/c structure were found during carried out inspection. These are described in paragraph 2.3 above.

Traces of working fluid outflow from the brake cylinder were found in the brake block of the main landing gear. It was found as well as that the thickness of the brake pad was less than 3 mm.

2.13. Medical and Pathological Information

There are no consequences for the commander of the aircraft and the passenger when the occurrence was realized, due to which not any medical and pathological examinations were performed.

There is no information that any physiological factors or loss of capacity have influenced the pilots' capacity for work.

2.14. Fire

The occurrence was not related with emergence of fire before or after an aircraft contact with the peripheral fence.

The realized event is not related to the occurrence of a fire before or after an aircraft contact with the peripheral fence.

2.15. Survival Aspects

The pilot and the passenger used seat belts.

2.16. Tests and Research

For the purposes of the investigation in relation to safety, they were carried out:

- An inspection of WRY08 and the point of impact of the aircraft into the peripheral fence of the airfield;
- An inspection of MXP 140 Tumako aircraft with registration marks YU-A019 after the occurrence;
- Conversations with the pilot;
- Conversations with the manager of Slivnitsa airfield;
- Conversation with an witness of the occurrence realized;
- Inquiry and analysis of the a/c operational documentation;
- Inquiry of documents, related to the pilot's training;
- Evaluation of the flight and operational performance of the AC;
- Logical-probabilistic analysis of possible causes of the aviation event.

The results of the inspection of the place of contact of the aircraft with the ground and the results of the aircraft survey after the occurrence realized are set out in paragraphs 2.3, 2.4, 2.10 and 2.12. The results of the conversations with the pilot, the airfield manager and the witness of the occurrence are set out in paragraph 2.1.

The results of the study of operational documentation of AC are set in paragraphs 2.6.1 and 2.6.3. The aircraft flight and operational characteristics are given in paragraph 2.6.2. The findings from the inquiry of the documents related to pilot training are reflected in paragraph 2.5.

2.17. Organizational and Management Information

On 24.07.2017 it was signed a contract for purchase/sale of an ultra-light aircraft between Eastern Systems EOOD, Republic of Bulgaria and MAG plastic d.o.o., Republic of Serbia, transferring the ownership of the aircraft to the Bulgarian legal entity represented by the pilot involved into the occurrence.

2.18. Additional information

Runway end safety area (RESA) is an area located symmetrically on both sides along the centerline of RWY and adjacent to its ends areas, intended above all to reduce the risk of damage of an aircraft in case of undershoot, overshoot or excursion from the runway.

A stopway (SWY) is a rectangular area of the ground at the end of the takeoff run available (TORA), suitable for stopping the aircraft in case of rejected takeoff.

In paragraph 1.5.1 (page 10) of the Aircraft Operation Manual in a table, it is pointed out as follows:

- Stalling speed in landing configuration V_{SO} 45 km/h;
- Stalling speed in horizontal flight V_{S1} 59 km/h.

The same values are recorded in a table in paragraph 1.6 "Operational Limits" on page 12.

During the inspection of the airplane cockpit, the Commission found that the measuring scale of the speedometer was given in knots, as there were shown the following marks on it:

- white arch – from 30 to 58 kt (55,6 to 107,5 km/h);
- green arch – from 35 to 78 kt (64,9 to 144,5 km/h);
- yellow arch – from 78 to 120 kt (144,5 to 222,4 km/h);
- red arch – over 120 kt (over 222,4 km/h).

On the dashboard below the speedometer there were found following inscriptions:

V_{NE} 200 km/h/125 mph;

V_F : 104 km/h/65 mph;

Item b of paragraph 3.9 "Before landing" (p.33) of the AOM states that the recommended approach speed is 50 ... 60 kt.

In accordance with Ordinance 5 on the measurement units in civil aviation of 31.08.1999, 1 kt equals 1,852 km/h. After conversion of speeds from kt into km/h at characteristic points related to the aircraft operational limits reflected on the speedometer scale, some discrepancies with the respective values on page 10 of the AOM were figured out.

During the flight the pilot is guided by the readings of the speedometer, installed on the instrument panel and by the limitations marked on the instrument.

In his explanation regarding the occurrence, the pilot expressed some doubts about possible external interference associated with eventual braking system manipulation during storage of the AC in the hangar. During the inspection of the AC, no evidence was found by the investigating commission to confirm such a suspicion.

3. ANALYSIS

The safety investigation commission considered the following main hypotheses about the possible causes that led to the serious incident:

First hypothesis. Possible adverse weather phenomenon that led to a sudden change in the trajectory of the AC and excursion from the runway during the landing;

Second hypothesis. Failure of the aircraft control system or other failure affecting the behavior of the aircraft and, in particular, its controllability in the stage of landing;

Third hypothesis. Errors in piloting procedure in the performance of landing.

With regard to *the first hypothesis*:

During the investigation, the Commission did not find any information on the occurrence of an adverse weather phenomenon, which could lead to a sudden change of the aircraft trajectory during landing. In his description of the flight, the pilot stated that he had made the landing in calm weather conditions. The high air temperature (31°C) at the Slivnitsa airfield during the realization of occurrence, as it was noted in paragraph 2.6.2, led to an increase in landing distance of 18.6% compared to standard atmospheric conditions. In a linear size this corresponds to 13 m and in view of the runway length at Slivnitsa airfield of 485 m, it couldn't lead to a premature aircraft departure from the RWY.

From the above stated it is clear that there are no facts and circumstances to ascertain the first hypothesis.

With regard to *the second hypothesis*:

During the inspection of the aircraft after the occurrence, traces were found of brake fluid leak from the brake cylinder of the right wheel of the main landing gear. No other malfunctions were identified that would lead to failures of aircraft and aircraft systems in the final landing phase. The leakage of brake fluid from the right-hand cylinder led to the lack a braking moment on the right-hand wheel and creation of dynamic forces to rotate the aircraft to the left-hand direction. These forces should be compensated by the nose wheel control system and, if the left-hand wheel brake was not released, they could cause the aircraft to roll over. From the traces of the RWY asphalt coatings described in paragraph 2.1.2, it could be assumed that during landing roll at 93 m before the end of the runway, the pilot intensively pressed brakes to stop within the runway, resulting in 39 m braking distance trace on asphalt cover of the RWY. On a part with a length of 5 m at the end of the braking distance, traces of leaked working fluid were detected. It is clear that in this area, the brake cylinder on the right wheel has dropped a brake fluid and the pilot released the brakes in order to remove the rotational moment. The speed of the aircraft was still high and, in order to avoid leaving the runway, the pilot activated the brakes again. At reactivation of brakes the brake cylinder on the right-hand wheel dropped some liquid again. As a result of effective activation of the brake of the left-hand wheel the airplane turned 45 degrees to the left, left the runway and stopped into the peripheral fence of the airfield at 75 m from the RWY26 threshold. The second trace of brake fluid spillage is 5 m long and it ends at 5 m from the end of the runway.

From the above it could be concluded that the immediate reason for leaving the runway by AC was the brake fluid leakage from the brake cylinder of the right-hand wheel of the main landing gear. Having in mind the performance characteristics of the aircraft at landing referred to in paragraph 2.6.2. and the runway length of Slivnitsa airfield given in paragraph 2.10, it follows that with normal execution of the landing procedures the airplane would land without leaving the runway despite the failure of the braking system since the runway length exceeds 5.8 times the required landing roll distance of 50 m (as indicated in the AOM), and the brake usage track starts at 93 m before the end of the runway. Consequently, there were other factors contributing for the occurrence. These factors will be discussed in the third hypothesis.

With regard to *the third hypothesis*:

Committed errors in landing piloting procedure, such as late braking due to incorrect judgment, increased runway speed due to overrunning of the landing mass of the airplane, as shown in paragraph 2.6.2 above, elevated temperature of the environment and improper use of brakes that may lead to exit from the runway. A contribution to such an end of flight might be also the pilot's decision to maintain the high speed of the aircraft during the landing run in order to demonstrate intensive braking, described in his explanation of the flight and reflected in paragraph 2.1.2. According to the pilot's written explanation, the touchdown was made after the threshold of RWY08 at a speed of 45 kt and the landing run continued at a speed of 35 to 40 kt until about 100 m before the end of RWY08, with an intention to demonstrate stopping by intensive using of the brakes. In his attempt to use the brakes, the pilot found an absence of the effect needed.

It should be noted that leaving WRY08 is possible to happen, provided that the pilot has touched the aircraft down into the second half of the runway.

The pilot's inadequate decision to continue landing roll along the runway at a speed close to the speed of touch down in order to demonstrate intensive braking resulted in exiting of the RWY and stopping into the perimeter fence of the airfield after a sudden failure of the braking system.

According to its flight characteristics, the aircraft should be able to stop within the runway despite the failure of its braking system.

In view of the above stated, the Commission concluded that the aviation occurrence was originated from a combination of factors established in confirmation of both the second and the third hypotheses: An error was made by the pilot in piloting procedure during the landing stage associated with an inadequate decision for intensive braking demonstration and a sudden failure of the braking system.

4. CONCLUSION

4.1. Findings

As a result of the investigation, the Commission concluded that:

1. Ultra light airplane MXP 140 Tumako, registration marks YU-A019, serial number 101122-AEE-0070, was produced in May 2012 by Aero East Europe d.o.o., Republic of Serbia.
2. The airplane has a Certificate of Registration No. 019 issued by the Civil Aviation Directorate of the Republic of Serbia on 09.04.2014.
3. The aircraft is owned by Iztochni Sistemi EOOD (Eastern Systems Ltd) with office address 5 Ivan Yonchev str., 4th floor, Krasno Selo area, City of Sofia of 24.07.2017 г. according to a sale and purchase contract with Mag plastic d.o.o., registered in the Republic of Serbia, signed on 24.07.2017
4. The aircraft is subject to registration in the register of the Republic of Bulgaria. As to the time of the event, the owner did not file an application for re-registration of the aircraft.
5. The aircraft has an Airworthiness Review Certificate No. EA-019, issued on 27.04.2017 by the CAD of the Republic of Serbia, which is valid until 21.04.2018.
6. Since the beginning of its exploitation to the day of aviation occurrence the aircraft had flown a total of 931:22 hrs according the readings of engine service meter of the aircraft.
7. Airplane maintenance was performed in accordance with the "Maintenance Program" developed by "Aero East Europe" d.o.o.
8. The aircraft has a Release to Operation Certificate after an annual inspection conducted on 27.07.2017 at 918 hours flown.
9. The aircraft features a ROTAX 912 ULS 100 H aviation piston engine, serial No. 6779191. Until the moment of air occurrence the engine has accumulated 931:22 flight hours.
10. The aircraft features KASPAR air propeller, KA-2/2-PA type, serial No. 619/13/08. Until the moment of air occurrence the propeller has accumulated 931:22 flight hours.
11. Immediately before the flight of the airplane, a pre-flight inspection was carried out by the pilot-owner and no deficiencies were detected and removed.
12. There were no remarks about the airplane's behavior during the flight, in which the occurrence was realized and during the previous flight.
13. Before the last flight was made, the aircraft was prepared in accordance with the continuing airworthiness requirements and was refueled with enough fuel to carry it out.
14. The quantity of onboard fuel was 50 liters.
15. The maximum take-off weight (MTOW) of MXP 140 Tumako airplane, serial No. 101122-AEE-0070, is about 450 kg, and the weight of an empty airplane according the weighing protocol, issued by the manufacturer on 26.04.2012, is 316 kg.
16. For flight in which the serious incident occurred, the take-off mass of the airplane is 513.5 kg and it exceeded the maximum allowable. The maximum landing mass is also exceeded.
17. The markings of the characteristic speeds on the speedometer scale are inconsistent with the Aircraft Operation Manual, where different measuring units have been used.
18. During the flight the pilot was guided by the readings of the speedometer, installed on the instrument panel and by the limitations marked on the instrument.

19. The structural integrity of the aircraft has not been compromised until the impact into the fence of Slivnitsa airfield.

20. The aircraft landing roll plane was done at high speed in order to demonstrate the use of brakes.

21. During the landing roll a sudden brake system failure occurred due to leakage of the working fluid from the brake cylinder on the right-hand wheel.

22. At the end of the landing roll the aircraft exited the runway and stopped into the peripheral fence of the airfield.

23. When moving on the ground and at the impact into the peripheral fence, the airplane suffered slight damages.

24. The weather conditions have no direct impact on the realization of the air occurrence.

25. The Commission accepts that the pilot had a qualification and medical fitness for execution of the flight.

26. There are no consequences for the commander of the aircraft and the passenger when the event was realized, and because of this no medical and pathological researches were performed.

27. There is no information on physiological factors that might influence the pilot's working capacity.

28. The flight, in which the event was realized, was carried out from a certified Slivnitsa airfield. During the investigation of the air occurrence the Commission found that the instructions given by the CAA after inspection on 14.11.2016 for elimination of irregularities regarding the RWY were not fulfilled.

29. The peripheral fence of the airfield is in a condition that makes it difficult to carry out its main function of preventing intrusion into the territory of the airfield.

4.2. Causes/Contributing factors

Having in mind the said in paragraph 3, the Safety Investigation Commission indicates as a reason for the realization of the serious incident:

An error was made by the pilot in piloting procedure during the landing stage associated with an inadequate decision for intensive braking demonstration and a sudden failure of the braking system.

5. SAFETY RECOMMENDATIONS

In view of the established reasons for the serious incident and the shortcomings identified in the investigation, the Safety Investigation Commission has made the following recommendations in order to increase the safety:

BG.SIA-2017/07/01. The MXP 140 Tumako aircraft, serial number 101122-AEE-0070, shall be presented by the owner for airworthiness review by DG CAA of the Republic of Bulgaria after recovery of its damages.

BG.SIA-2017/07/02. The Civil Aviation Authority of the state issuing the airworthiness certificate to airplanes of MXP 140 Tumako type shall require unification between the scale measuring units of the speedometer described in the Aircraft Operation Manual and these of the one mounted on board.

BG.SIA-2017/07/03. The Civil Aviation Authority of the state issuing the airworthiness certificate to airplanes of MXP 140 Tumako type shall require a table to be shown permanently on the instrument panel where the fuel quantity shall be determined as a function from the total weight of the pilot and passenger without exceeding the maximum takeoff weight.

BG.SIA-2017/07/04. The manufacturer "Aero East Europe" d.o.o. to issue a Service Bulletin on the failure of the braking system that led to the serious incident.

Follows: Appendix 1, which is an integral part of this Report.

On the grounds of Art. 18, § 5 of Regulation 996/2010, the radiated safety recommendations will be recorded in the centralized European SRIS (Safety Recommendations Information System) system.

The Investigation Commission reminds all organizations to which safety measures have been sent, that on the basis of Article 18 of Regulation 996/2010 on Investigation and Prevention of Accidents and Incidents in Civil Aviation and Art19, Para7 of Ordinance No. 13 for investigation of aviation accidents, that are obliged to notify in writing the Directorate AMRAIUD of MIIIC for the actions taken on the recommendations made.

19 July 2018

BULGARIAN AIRCRAFT ACCIDENT INVESTIGATION UNIT

APPENDIX 1



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.



Fig. 8.



Fig. 9



Fig. 10



Fig. 11.



Фиг12.



Fig. 13



Fig. 14.



Fig. 15.



Fig. 16.