

# **FINAL REPORT**

**on**

**investigation of an accident, realized on 09.05.2020 with a JA 600 aircraft (SKYLEADER 600), registration marks LZ-ACS, operated by a pilot owner, during landing on the Lesnovo Airfield**

**2020**

## **Purpose of the report and level of responsibility**

In accordance with Annex 13 to the Convention on International Civil Aviation of 7 December 1944, Regulation 996/2010 of the European Parliament and the Council on the investigation and prevention of accidents and incidents in civil aviation, and Ordinance 13 of 27.01.1999 of the Ministry of Transport, Information Technology and Communications, the objective of the aviation occurrence investigation is to establish the causes that have led to its realization in order these to be eliminated and not allowed in future without apportioning blame or liability

## CONTENTS

01. LIST OF ABBREVIATIONS .....	4
1. Introduction .....	5
2. Factual information.....	5
2.1. Flight history .....	5
2.1.1. Flight number, type of operation, last point of departure, destination point .....	5
2.1.2. Preparation and description of the flight .....	6
2.1.3. Location of aviation occurrence .....	7
2.2. Injuries to persons .....	7
2.3. Damages to Aircraft .....	7
2.4. Other damages .....	7
2.5. Personnel information .....	8
2.5.1. Aircraft commander .....	8
2.6. Aircraft information .....	8
2.6.1. Airworthiness information .....	8
2.6.2. Short information on aircraft technical characteristics .....	9
2.6.3. Fuel .....	9
2.7. Meteorological Information .....	10
2.8. Navigation .....	11
2.9. Communications .....	11
2.10. Aerodrome information .....	11
2.11. Flight data recorders .....	11
2.12. Wreckage and impact information .....	11
2.13. Medical and Pathological Information .....	11
2.14. Fire .....	12
2.15. Survival Aspects .....	12
2.16. Tests and Research .....	12
2.17. Additional information .....	14
3. Analysis .....	14
4. Conclusion .....	17
4.1. Findings .....	17
4.2. Causes .....	18
5. Safety recommendations .....	19

## 01. LIST OF ABBREVIATIONS

AC – Aircraft;  
Af – Airfield;  
AMRAINB - Air, Maritime and Railway Accident Investigation National Board;  
AO - Air operator;  
AOM - Aircraft Operation Manual;  
ATC - Air Traffic Control;  
ATC - Air Traffic Controller;  
ATC SE - Air Traffic Control State Enterprise;  
CA - Civil Aircraft;  
CAA - Civil Aviation Act;  
CAA - Civil Aviation Authorities;  
CCAU - Coordination Center of Airspace Use;  
EASA - European Air Safety Agency;  
FIC - Flight Information Center;  
ICAO - International Civil Aviation Organization;  
MB - Management Board;  
DG CAA – Directorate General of Civil Aviation Authority;  
MI - Ministry of Interior;  
MM - Maintenance Manual;  
MO - Maintenance organization;  
MO - Maintenance program;  
MT - Ministry of Transport;  
MTITC - Ministry of Transport, Information Technologies and Communications;  
OR - Overhaul Reconditioning;  
p. – page;  
POH - Pilot Operating Handbook;  
RD - Regional Department of the Ministry of Interior;  
ROC - Release to Operation Certificate;  
RWY – runway;  
SG - State Gazette;  
SN - Since New;  
SOP - Standard Operating Procedures;  
TLB - Technical Logbook;  
UAC – Ultra-light aircraft;  
UTC - Coordinated Universal Time.

## 1. Introduction

Date and time of accident: 09.05.2020, 1:21 PM h local time (10:21UTC).

Notified: Air, Maritime and Railway Accident Investigation National Board of Republic of Bulgaria, Directorate General "Civil Aviation Administration" (DG CAA) at the Ministry of Transport, Information Technology and Communications of the Republic of Bulgaria (MTITC); European Commission; European Air Safety Agency (EASA); Air Accident Investigation Institute of Czech Republic.

On the grounds of the provisions of Article 9, Para1 of Ordinance No 13 dated 27.01.1999 on Investigation of Aviation Accidents; the Aviation Transport Unit at AMRAINB of the MTITC classified the occurrence as an accident. The materials on the aviation occurrence have been filed in case No 03/09.05.2020 in Aviation Transport Unit archives at AMRAINB.

In accordance with the provisions of Article 5, Para 4 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, Para1 of Ordinance No13 of the MT dated 27.01.1999 on the Investigation of Aviation Occurrences, on the grounds of item 8, Para1, of Article 6 of the Rules for the Activity, structure and organization of AMRAINB, by Order No RD-08-10/20.05.2020 President of Managing Board of AMRAINB, a Commission was appointed for investigation of the accident.

The difference between the local time and UTC is +3 hours. All times in this report are in local time, except when marked by UTC.

At 13:17 local time, a JA 600 aircraft (SKYLEADER 600), registration marks LZ-ACS, operated by a pilot owner, took-off from runway 28 at Lesново Airfield in the direction to Rila Lakes. When in the air, the pilot reported irregular engine operation and decided to return to the Lesново Airfield. During a landing made on RWY10, at 13:21 h, the aircraft, making low-speed turn to correct the trajectory, stalled and fell on the runway at first with the right semi-wing and after that on the fuselage of the aircraft. The plane suffered severe damages, and the pilot was hospitalized with low back pain.

On the basis of the circumstances set out in this report and the analysis performed, the Commission pointed out as a **main reasons for realization of the accident**:

1. Wrong decision taken by the pilot owner to conduct a flight after the expiration of validity of the his Pilot License, prolonged interruption of piloting and insufficient flight experience.

2. Wrong decision made by the pilot owner for returning and landing on the Lesново Airfield after the establishing of abnormal engine operation associated with power loss.

3. Violation by the pilot owner of the technique of landing approach, the technology for configuring the aircraft for landing and performing a maneuver at an inadmissible low altitude at low speed.

The Investigation Commission indicates also the following accompanying reasons contributing to the occurrence:

1. Disruption of the normal engine operation, caused by enrichment of the air-fuel mixture due to incomplete and incorrect implementation of the maintenance plan of the aircraft by a person holding a Certificate for Maintenance.

2. The reduced control of the inspectors from the Airworthiness Department of the CAA, regarding the updating and implementation of the Aircraft Maintenance Plan and the keeping of the technical documentation of the aircraft.

## 2. Factual information

### 2.1. Flight history

#### 2.1.1. Flight number, type of operation, last point of departure, destination point

**Flight number:** flight LZ-ACS.

**Type of flight:** Entertaining.

**Last point of take-off:** Lesново Airfield.

**Time of take-off:** 13:17 h.

**Planned landing point:** Lesново Airfield.

### 2.1.2. Preparation and description of the flight

The description of preparation and the flight was made on the basis of the explanations given by the pilot of the aircraft, who realized the event and eyewitnesses located at the Lesново airfield during the time of flight.

On May 9, 2020, around noon, the pilot owner, accompanied by his wife and son, arrived at the Lesново Airfield with the intention to perform an entertainment flight on a route around Musala peak to Rila lakes and back. The pilot took the plane out of the hangar where it was stored, performed, according to him, a thorough pre-flight inspection of the plane, found that the tires were not inflated enough and inflated them. During the fuel check he found the presence of 25 liters in each tank (according to him, the plane has not flown since November 2019). According to his confession, the pilot-owner does not keep records of the time flown and the work performed in the maintenance of the aircraft. The pilot checked the oil and rotated the engine shaft using the propeller, then he entered the cockpit and started the engine. He was impressed that the ignition of the engine was after a longer rotation than usual. After the initial start-up, the engine run normally. While the engine was warming up, the pilot decided that he could complete a longer route, including a flight over Pirin Mountain, which will require more fuel. After stopping the engine, he add 20 liters of fuel in each tank. The pilot restarted the engine. The second start of the engine was trouble-free. The pilot waits 8-10 minutes with the engine running, for the oil temperature to reach 80°C and checked the operation of the engine by forcing it to a speed of 5500 min<sup>-1</sup>, checking the magnets and the carburetor heating. He didn't detect any problems in the operation of the carburetor and took-off from RWY28. His wife and son remained at the airfield.

Maybe at about a minute after the takeoff, the pilot smelled gasoline and strong vibrations in the engine area. According to him, the vibrations lasted about ten seconds and were followed by deterioration of the engine run - sneezing, loss of power. The pilot was thinking about a problem with the fuel system, which may have occurred when replacing the fuel filters located under the pilot's seat. He tried to put the engine into a stable operating mode, looking for speeds at which it should work steadily. When he attempted to increase the engine speed, the things get worse and the engine almost stopped. At reduced engine speed the engine run was better, but the sneezing and interruptions didn't stop. The pilot turned on the carburetor heating in order to eliminate the possibility of icing. There was no effect of this.

The pilot announced on the radio the Lesново Airfield that he had a problem with the engine and was returning for a forced landing. He was allowed by the tower to conduct an approach to land at his discretion, and another aircraft in training circling flight was sent on a western heading for distancing. According the pilot's description of the event, he has chosen the shortest way to the airfield - perpendicular to the runway, on the side of RWY10, with a back wind of about 2 kt. In his opinion, for landing on RWY28, against the wind, the chances of reaching the runway were small. Due to the significant amount of fuel on board, he was afraid of fire in case of landing outside the runway.

In order to avoid the possibility of a problem with the piping from the fuel tank, the pilot changed the tank from which fuel was drawn using the selector valve, but no changes followed in the engine run. After that he switched off the electric fuel pump to eliminate its influence, but this action was without any consequences in the engine run, and then he switched on the electric pump again. The engine run at minimum rpm, sneezing and with interruptions. The carburetor heating was switched off, as it further reduced the engine speed. The pilot maintained a speed of 50... 60 kt all the time. The flaps were retracted. According to the pilot, he extended the landing gear just before the airfield (without specifying what exactly this meant, according to eyewitnesses - when flying over the fence of the airfield). After the extending the landing gear, the speed was 50 kt and everything was under control, but the plane was not directed along the runway axis. The final direction along the axis of the runway was made at a low height by a right-hand turn. When exiting the turn, according to eyewitnesses, the plane was visible at low speed, at which the coordinator of the airfield advised him to reduce the pitch angle with the remark "low your nose", to which there was no answer. In the next moment the plane

stalled from a height of 5...10 m, touching the runway first with the right-hand and then with the left-hand semi-wing. The plane rotated and with the left-hand landing gear retracted and nose and right-hand struts bent slide along the runway to the place of its final stop, the right-hand half of the concrete runway, opposite the control tower.

After the occurrence the pilot commented that he was surprised by the fact that the wing hooked the ground, according his assessment there was the necessary height and the turn he made was with a small bank. After landing, the pilot turned off the magnets and fuel supply. He didn't smell the fuel, which he said was not disappeared throughout the flight.

An eyewitness called 112 and immediately went with the person in charge of SAR works to the place where the plane stopped. Officers from the Elin Pelin Police Department arrived at the scene. The pilot was taken for examination by ambulance to Pirogov Hospital in Sofia.

**2.1.3. Location of aviation occurrence**

The accident was realized after an attempt for forced landing on the Lesnovo Airfield. The location of the first collision of the aircraft with the ground was at 105 m from the threshold of RWY10 on the Lesnovo airfield with coordinates 42°38'02" N and 23° 38'39"E. The place of final stop of the aircraft was at 177 m from the threshold of RWY10 on the Lesnovo Airfield with coordinates 42°38'01"N and 23°38'48"E. Elevation 556 m (1827ft)

The occurrence was realized during the day time – 1:21 PM (10:21 UTC).

**2.2. Injuries to persons**

Injuries to persons	Crew	Passengers	Total	Other persons
<b>Fatal outcome</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Serious</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Mean</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>

**2.3. Damages to Aircraft**

As a result of contact with the ground, the aircraft suffered significant structural damage, including:

- destruction of the propeller blades;
- deformations of the propeller spinner;
- deformations and destruction of the engine jacket;
- deformation of the engine mounting frame;
- deformation of the fire wall;
- ripped diffuser of engine air intake;
- bending and destruction of the nose wheel landing gear;
- bending and destruction of the right-hand main landing gear;
- the right-hand wing has a reverse V-shaped break in the middle of the aileron;
- deformations and abrasions at the rear edge of the right-hand wing;
- right aileron was torn off;
- deformation and bending of the casing of the right-hand wing in the area of the inner edge of the flap;
- destruction of the glazed part of the cockpit canopy;
- deformations and abrasions at the bottom surface of the left-hand wing;
- displacement of pipelines from the hot gas exhaust system;
- burn-out of a drainage pipe from the drain fuel cuvette of the right-hand carburetor.

The above can be seen in Fig. 2, 3, 5, 6, 7, 8, 16, 17, 18, 20 and 23 of Enclosure 1.

**2.4. Other damages**

Not established.

## 2.5. Personnel information

### 2.5.1. Aircraft commander

Aged 50, male.

The aircraft commander possesses Pilot License, issued according Part FSL on 30.06.2017. According this License he has SEP (land) qualification, valid till 30.06.2019. There is no confirmation of qualification after this date. The flight in which the occurrence took place was performed after the expiration of the date for confirmation of the pilot's qualification.

The aircraft commander possesses Medical Certification Class 2, valid till 09.10.2020 and LAPL till 09.10.2020. As to the time of realization of the accident, the medical certificate was valid.

Flight experience:

Total flight time 104:50 hrs;

On the aircraft type - more than 52 hrs.

Last flight before realization of the occurrence was on 09.11.2019, 1:24 flight hours.

## 2.6. Aircraft information

### 2.6.1. Airworthiness information

JA 600 (SKYLEADER 600) aircraft, serial No 6244266U, registration marks LZ-ACS, was made in June 2015 by JIHLAVAN airplanes, Czech Republic.

Certificate of Registration No 2561 of the aircraft was issued on 17.11.2017. In this certificate, a private person as an owner was recorded and that this person will operate the aircraft as a pilot-owner. A certificate of airworthiness No 2561 was issued for this aircraft on 11.07.2015. In this certificate the maximum take-off, mass of the airplane 472.5 kg is written. As a category of the aircraft it is recorded as "Private". The certificate indicates the last period of validity from 18.06.2019 till 17.06.2020.

The aircraft maintenance must be performed on the basis of the JA 600 Aircraft Maintenance Plan (SKYLEADER 600), serial No 6244266 U, approved by the DG CAA on 21.08.2015. This plan has not been updated after the change of aircraft owner and there is no signed declaration of its implementation by the new owner. After the change of owner, there are no records of the maintenance work performed and the time flown in the aircraft log book. In the engine logbook there is a record only for two annual inspections performed on 25.09.2017 and 07.05.2019, and in the DG CAA copy of the ROC and the working cards are stored for the second inspection only. This inspection was not carried out according the working cards given in Enclosure 5 of the Maintenance Plan. These cards have been drawn up in accordance with the requirements of the Engine MM, Edition 3, Revision 2, of February 2015. The cards used by the technical person during the inspection are in accordance with Engine MM, Edition 3, Revision 1, of January 2013. As result, the point that requires a check of the mass of the carburetor floats was not fulfilled. After the inspection performed, a ROC was issued according the working package No 0002/07.05.2019 by a technical person holding a permit No BG.66.A.00535-10886.

Para4.6. "Maintenance during Storage" defines what work should be performed on the engine, provided that no flights were performed for a "longer period of time". It is not specified what does mean the conception "longer period of time", but as a procedure to be implemented is indicated the following: „... 6. Emptying the carburetor float chambers; 7. Applying oil to all moving parts of the carburetor; ... “. There are no records in the technical documentation of the aircraft for the implementation of such a procedure. In addition, there is no record for the replacement of the fuel filters, which are a live-limited units and according to the pilot-owner have been replaced by the technical person. There are no records for pre-flight inspections and minor repairs. Because of the lack of such records, the Commission accepts that the DG CAA has illegally certified the airworthiness of the aircraft and the pilot owner has not maintained it in accordance with the requirements of the Maintenance Plan.

Immediately before the flight, the pilot-owner performed a pre-flight inspection of the aircraft, inflating the tires, refueling, starting, and testing the engine, without reflecting these activities in the

aircraft documentation. Until this flight, the aircraft has flown 142:12 hrs in accordance with the record in the memory of the navigation monitor.

### 2.6.2. Short information on aircraft technical characteristics

JA 600 aircraft, registration marks LZ-ACS, is a single-engine, two-seater ultra-light monoplane, low wing, metal construction. Its tricycle landing gear is retractable.

The aircraft is equipped with Rotax 912ULS piston engine, serial No 6 784 233 and an air propeller SR3000/2N/1730/R/T/CS/W serial No 26055.

The maximum take-off mass of JA 600 aircraft, registration marks LZ-ACS, according the Certificate of Airworthiness, is 472.5 kg. Based on a report from the weighing and determination of the center of gravity of the aircraft from 12.06.2019, the mass of the empty aircraft was determined to be 324 kg. During the inspection of the aircraft after the occurrence realized, 100 l of fuel were found, which allows us to assume that at take-off there was about 105 l of fuel, which at a specific fuel mass of 0.7662 kg/l (determined by fuel test) means that the mass of fuel on board was 80.4 kg. With a pilot mass of 70 kg, the take-off mass of the aircraft was 474 kg. Given the error that could be made in fuel measuring, the Committee considered that this mass was equal to the maximum allowable one.

Some typical speeds and limitations are given below in accordance with the JA Aircraft Operation Manual.

Never Exceed speed  $V_{NE} = 143\text{kt}$  (264 km/h);

Cruising speed  $V_C = 124\text{kt}$  (230 km/h);

Maneuvering speed  $V_A = 84\text{kt}$  (155 km/h);

Maximum landing gear extended speed  $V_{LO} = 81\text{kt}$  (150 km/h);

Maximum extended flap speed  $V_{FE} = 60\text{kt}$  (110 km/h);

Stalling speed:

in landing configuration  $V_{S0} = 30\text{kt}$  (56 km/h);

in configuration with flaps up  $V_{S1} = 34\text{kt}$  (62 km/h);

In the POH, paragraph 3.3. it is indicated that the most favorable speed for gliding in case of engine failure is 54... 60 kt (100...110 km / h);

Minimum mass of the pilot = 60 kg;

Maximum mass of the pilot = 120 kg;

Positive vertical acceleration = +4 g;

Negative vertical acceleration = -2 g;

Operational limitations:

- no flights are allowed in headwinds exceeding 23.3 kt (12 m/s), and with lateral wind components exceeding 15.6 kt (8 m/s).

In Chapter 2 of POH the following limitations of engine parameters are given:

- Rotational speed at take-off mode =  $5800\text{min}^{-1}$ , for 5 min maximum;
- Rotational speed at maximum unlimited mode =  $5500\text{min}^{-1}$ ;
- Rotational speed at idling mode =  $1400\text{min}^{-1}$ ;
- Oil pressure: max 102 psi, min 12 psi, normal 29... 73 psi;
- Oil temperature: min  $50^{\circ}\text{C}$ , max  $130^{\circ}\text{C}$ , normal 90...  $110^{\circ}\text{C}$ ;
- Cylinder heads temperature: max  $135^{\circ}\text{C}$ ;
- Exhaust gas temperature: max  $880^{\circ}\text{C}$  at take-off, max  $850^{\circ}\text{C}$  in flight.

Fuel tanks volume = 120 l.

Unusable fuel residue = total 3 l.

Part 3 of the POH provides cards with the aircraft emergency procedures. No such cards were found in the cockpit. There is no record of approval by the DG CAA on the pilot's POH copy and the DG CAA does not have a copy of the JA 600 POH.

### 2.6.3. Fuel

There was no record of the fuel available on board for the flight in which the accident took place. During the inspection of the aircraft after the occurrence realized, 100 l of fuel were found, which allows us to assume that at take-off there was about 105 l, which allows us to assume that the accident

realized was not a lack of fuel on board. During the inspection, a sample of 2 liters of gasoline (which corresponds in color to A100 gasoline) was taken from the aircraft and 1 liter from a tank from which the aircraft was refilled. The samples were tested in the Chemical Testing Laboratory at Sofia Airport EAD. The results of the test are given in protocols No 177 and No 178 dated 25.05.2020. The protocols are stored in the case of investigation of the accident. No deviations from the technical requirements were recorded in Protocol No 177 concerning fuel on board the aircraft. In Protocol No 178 relating to the fuel of refueling tank a presence of mechanical impurities in the fuel was indicated.

## 2.7. Meteorological Information

For assessment of the meteorological situation in the area of the accident, the Commission used a report on the meteorological conditions in the area of Lesnovo Airfield for the period from 09:00 to 12:00 UTC on 09.05.2020, issued by the Meteorological Service of the ATC SE. The report is attached to the case with materials of the investigation.

The synoptic situation was as follows: The country was under the influence of a high baric ridge, which carried dry, continental air from the Northwest, which prevented cloud formation and determined the stable stratification of the atmosphere. The ground pressure field above the country was of low gradient, the gradient did not exceed 3hPa. Around noon, formation of a weak baric depression was observed over the Danube plain, along which a weak, at the beginning of the period under consideration, undirected, and later westerly and temporarily northwesterly wind was observed. At 11 UTC, the maximum wind gusts measured at Sofia Airport reached about 16 knots.

The METAR meteorological data, broadcasted for Sofia Airport in the period from 09:00 to 12:00 UTC on 09.05.2020 are as follows:

METAR LBSF 090900Z VRB03KT CAVOK 18/06 Q1018 NOSIG=
METAR LBSF 090930Z VRB03KT CAVOK 19/05 Q1017 NOSIG=
METAR LBSF 091000Z VRB04KT CAVOK 21/07 Q1017 NOSIG=
METAR LBSF 091030Z 33007KT 270V020 CAVOK 22/06 Q1016 NOSIG=
METAR LBSF 091100Z 29009KT 250V350 CAVOK 22/05 Q1016 NOSIG=
METAR LBSF 091130Z 26010KT 220V290 CAVOK 23/04 Q1016 NOSIG=
METAR LBSF 091200Z 32006KT 270V020 CAVOK 24/03 Q1015 NOSIG=

Information for wind speed and direction:

The information is according to wind data calculated at a height of 10 m from the local weather forecast system BULATSA WRF, valid from 06:00 UTC on 09.05.2020, for a model point with coordinates 42°38'N and 023°38'E, which is the closest model point to Lesnovo Airfield.

UTC	Wind direction	Wind speed
9:00	306°	2 kt
09:30	347°	2kt
10:00	260°	2kt
10:30	291°	8kt
11:00	281°	6kt
11:30	282°	8kt

12:00	295°	6kt
-------	------	-----

There are no meteorological phenomena that could play a decisive role in the realization of the accident.

## 2.8. Navigation

Standard aids to navigation of the aircraft.

## 2.9. Communications

Standard communication equipment of the aircraft.

## 2.10. Aerodrome information

Upon realization of the accident the aircraft took-off and then forcibly landed on Lesnovo Airfield. The RWY of the airfield is with asphalt concrete pavement. The RWY directions are 103°/283° (magnetic heading). The length of RWY is 910 m, the width is 24 m. The geographical coordinates of RWY referent point are (LAT/LONG) 42°38'4,2"N; 023°38'47,2"E. The elevation is 556 m (1827 ft)

## 2.11. Flight data recorders

Records from the memory of the standard navigation equipment, storage device on the left-hand monitor of the aircraft "MASTER SKYVIEW" were used to evaluate the flight parameters. The downloaded database for the flight on 09.05.2020 is attached to the materials of the investigation in electronic format.

Enclosure 2 to this report presents an Analysis of the flight parameters of the LZ-ACS aircraft for 09.05.2020 on the basis of the downloaded database.

## 2.12. Wreckage and impact information

The trajectory of the aircraft at the last stage of the flight is shown in the two figures on page 18 of Enclosure 2, constructed on the basis of the database referred to in paragraph 2.11. The aircraft flew almost perpendicular to runway 10 in continuous descend. The pilot extended the landing gear in the immediate vicinity of the runway and tried to steer it along the runway axis. From a height of about 7 m (according to eyewitness information), the plane stalled to the right-hand wing, and touched down on this wing the RWY10 at 105 m from the threshold at a point with coordinates 42°38'02"N and 23° 38'39" E. The traces of touching are shown in Fig. 1 of Enclosure 1. At touchdown the landing gear of the aircraft was not completely extended, the right-hand semi-wing lost its structural integrity, breaking at a distance of about two-thirds of its base, as shown in Fig. 3 of Enclosure 1. The right-hand landing gear bended towards the outer edge of the semi-wing, and the nose landing gear was also bended. According with paragraph 3.3 of the POH, the landing gear extending time is 20s. The aircraft suffered the damages as described in paragraph 2.3 and stopped at 177m of the threshold of RWY10, a point with coordinates 42°38'01"N and 23°38'48 E, elevation 556 m (1827ft). The plane glided 72 m along the runway. These distances are indicated on the diagram shown in Fig. 27 of Enclosure 1

The controls in the cab were in normal position, the throttle lever was in end forward position, the flaps were in the retracted position. The clock stopped at 13:20, all screens, lamps and instruments went out.

## 2.13. Medical and Pathological Information

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

As a result of the event, the pilot owner received a moderate bodily injury, a fracture of the first lumbar vertebra.

## 2.14. Fire

No fire appeared.

## 2.15. Survival Aspects

The use of seat belts, the aircraft construction, the deformation of which absorbs significant part of the impact energy, were the factors for life saving of the pilot. Timely shutdown of the engine and electrical system of the aircraft prevented a fire.

The emergency rescue team at the Lesnovo Airfield arrived at the scene in about 15 seconds. The signal to telephone No 112 was given at 13:22 am.

In connection with the occurrence in the area of Lesnovo Airfield were sent:

- Patrol car and team of the Regional Directorate of the Ministry of Interior - Elin Pelin;
- Ambulance and team of Emergency Medical Aid from Pirogov Hospital.

## 2.16. Tests and Research

For the purposes of the safety investigation the following was done:

1. Inspection of airplane JA 600 (SKYLEADER 600), serial No 6244266 U, registration marks LZ-ACS, at the place of final stop after impact on the runway surface.
2. Inspection of the area of the Lesnovo Airfield and the place of contact of the aircraft with the runway surface.
3. Interview with the pilot owner.
4. Talks with eyewitnesses of the event.
5. Re-inspection of the aircraft and examination of the engine condition.
6. Downloading the data from the memory of the navigation equipment and their analysis.
7. Laboratory analysis of fuel from the aircraft tanks and fuel from the refueling tank at the Lesnovo Airfield.
8. Investigation and analysis of operational documentation of the AC;
9. Evaluation of the flight and operational performance of the AC;
11. Logical-probabilistic analysis of possible causes of accident.

For Item 1, the results of the on-site inspection of the aircraft are given in Para2.3 and Para2.12.

For the Item 2, the results of the inspection of the area of Lesnovo Airfield and the place of impact on the runway are set out in paragraphs 2.1.2, 2.1.3, 2.10 and 2.12.

For Item 3 the results of the interview and written explanation of the pilot owner are given in Para2.1.2, Para2.6 and Para2.12.

For Item 4, the results of interviews are given in Para 2.1.2, 2.12 & 2.15.

For Item 5, in order to determine possible reasons for the irregularity of the engine operation and the reducing of the engine rpm in flight, the condition of the power plant was assessed in following sequence:

- general condition of the propeller and engine;
- condition of the air intake ducts;
- inspection of the condition of the engine rotor;
- condition of the ignition system;
- condition of the engine control system;
- condition of the cooling system;
- condition of the oil system;
- condition of the engine fuel supply system.

The cover of the engine cowling was removed after the contact with the ground in order to break the battery circuit and not fitted thereafter. The aircraft suffered significant damages to the nose part including destruction of the propeller blades, bending of the nose wheel landing gear, partial loss of stability of the engine mounting frame, and deformation of the firewall to which the frame was attached. No ruptures of pipelines was noticed in the engine compartment and at the time of the inspection there were no leaks. Displacement has been found as a result of the impact on of pipelines

of the gas exhaust system and burn-out of a drainage pipe of the drain fuel cuvette of the right-hand carburetor. The above can be seen in Fig. 8, 16, 17, 18.20 & 23 of Enclosure 1. The engine serial number 6784233 is written on the Rotax ULS 412 engine identification plate.

The diffuser through which air enters the engine was ripped from the casing of the engine hood when hitting the ground. The condition of the air ducts was good, without tears and without the presence of any contamination. The air filter was in good condition. The above can be seen in Fig. 18 of Enclosure 1. There is no reason to believe that the condition of the intake system may be a prerequisite for abnormal engine operation.

The engine rotor was turned by hand, the cylinders showed compression when rotating.

To assess the condition of the ignition system, all spark plugs in the upper circuit of the ignition system were removed and photographed. The spark plugs were smoked, but they had the recommended clearance between the electrodes. One of these spark plugs is shown in the photo in Fig. 21 of Enclosure 1. When the rotor of the spark plug electrodes was rotated, there was current in both circuits of the ignition system. It could be assumed that there was no abnormal engine operation due to ignition system causes.

The engine is controlled by a throttle control lever in the cockpit. In the picture Fig. 10 of Enclosure 1, made immediately after the landing of the aircraft, this lever was in the extreme forward position corresponding to the maximum engine mode. The lever is connected by a steel wire to the two carburetors. The movement of the carburetor throttle levers follows the movement of the engine control lever and when it is in the extreme forward position, the levers are in position of fully opened throttle valve. No problems were found with the operation of the choke. The control wires are in good condition, when the lever is released, a spring returns the choke to its initial position. The left- and right-hand carburetors are shown in the pictures in Fig. 17 and Fig. 20. In the pictures in Fig. 22 it is visible, that the carburetor heating control button is in closed position. In the pictures in Fig. 9 it can be seen that the switches of the two magnets are in the on position, the electric fuel pump is also on. The engine is controlled from the cock pit properly and responds to impacts.

On the Fig. 18 of Enclosure 1 shows a picture of the cooling system tank. No coolant leak was observed.

On the Fig. 16 of Enclosure 1 shows a picture of the oil tank and the dipstick, which shows the presence of oil in the tank. There is no oil leak in the engine compartment, and when rotating the rotor, it rotates without feeling any seizure. 1 liter of oil was drained for testing. There are no shavings or other mechanical impurities in the oil.

The condition of the fuel system was checked. In both fuel tanks there was approximately, according to the fuel dipsticks on the tank caps, about 50 liters of fuel in each. At the time of the inspection, there was no fuel leak, both from the tank and from the fuel supply pipelines. The condition of the fuel filters from the fuel tanks to the engine, located under the seats in the cabin, and the electric fuel pump, was checked. They are shown in the photos in Fig. 24 and 25 of Enclosure 1. There was no fuel leakage from the connecting pipes, there was no visible contamination of the filters, but both filters have a certain amount of air. The diaphragm of the fuel pump was removed, and it was found that the rod, spring and diaphragm of the same are in good condition, which means that it could send fuel to the engine.

An inspection of the float chambers of the two carburetors was made, and both of them were filled with pure gasoline. The floats have a plastic shell. The mass of the floats was measured as follows:

- left-hand chamber - 5.3 g and 6.7 g;
- right-hand chamber - 3.2 g and 3.9 g.

The total mass of the floats in each of the chambers must not exceed 7.0 g.

The exhaust pipe is black on the inside.

The results of the execution of point 6 "Downloading and analyzing of the data from the memory of the navigation equipment" are shown in paragraph 2.11.

For item 7, Laboratory analysis of fuel from aircraft tanks and fuel from the Lesnovo Airfield refueling tank, the results are shown in paragraph 2.6.3.

For item 8, Examination and analysis of aircraft operating documentation, the results are set out in paragraph 2.6.1.

For item 9, Assessment of aircraft flight and operational characteristics, the results are set out in paragraph 2.6.2.

Logical and probabilistic analysis of the possible causes for realization of the accident has been made in Part 3 of this Report.

### 2.17. Additional information

During the annual inspection of the aircraft engine on 07.05.2019, as noted in paragraph 2.6.1, the point that requires checking the mass of the carburetor float chambers was not fulfilled.

For engines with the formation of the fuel-air mixture by means of carburetor with a float, the raising of the float is connected with the termination of the access of fuel in the float chamber. However, if the mass of the float is greater than the allowable, this is accompanied by an increase in the level of fuel in the chamber and a change in the composition of the mixture in direction of its enrichment. Significant enrichment of the mixture is associated with uneven engine operation and a noticeable reduction in power. The unevenness of the work is due to the contamination of the spark plugs as a result of the accumulation of carbon. The accumulation of carbon occurs because too rich mixture reduces the temperature in the cylinder and prevents the combustion of fuel. Such conditions can occur when the mass of the floats increases as a result of fuel seeping into the plastic shell of the carburetor floats. The result of measuring the mass of the carburetor floats is set out in paragraph 2.16.

Significant irregularity in the operation of the engine, expressed in fluctuations in the speed of rotation of the motor shaft, can be seen in the graphs on page 14 and page 15 of Enclosure 2 in the periods 10:18:37... 10:19:30 and 10:20:50... 10:21:10 UTC. From these graphs it can be seen that in the period from 10:19:48... 10:20:52 UTC the temperature of EGT1 was in the range from 233°C to 100°C, which in practice means the absence of a working process in the pair of cylinders, after which the working process was restored and in 10:21:18 UTC the temperature was 398°C.

## 3. Analysis

In Chapter 2 of this report are set out the circumstances in regard the accident involving a JA 600 aircraft, registration marks LZ-ACS.

As a result of an analysis of these circumstances, this chapter identifies the dominant factors that led to the realization of the occurrence. Determining these factors will lead to an indication of the cause/s of the accident.

In this case, the dominant factors will be considered in groups:

- group of factors, related to the design features and technical condition of the aircraft;
- group of factors related to the qualification, training and physiological condition of the pilot;
- group of factors related to the course of the flight and the piloting technology;
- group of factors related to the influence of external factors, meteorological conditions, natural phenomena, etc.

The circumstances related to the first group of factors - related to the design features and technical condition of the aircraft are set out in paragraphs 2.1.2, 2.1.3, 2.6.1, 2.6.2, 2.6.3, 2.11, 2.12, 2.15, 2.16 & 2.17. The occurrence of irregularity in the operation of the engine, accompanied by a power loss proves to be decisive for the appearance of conditions endangering the safety of the flight from the ones described in these paragraphs. Following the records of the engine shaft speed set out in Enclosure 2, it can be seen that this irregularity appears at 10:18:37 h, i.e. 1min and 19s after take-off. After unsuccessful attempts to remedy the problem described in paragraph 2.1.2, the pilot decided to return to the Lesnovo Airfield and notified the tower. During the return flight, a significant decrease of exhaust gas temperature was recorded, and decreasing in EGT 1 was more rapid. At the beginning of the decrease at 10:19:18 UTC EGT 1 was 233°C, and EGT 2 - 688°C. At 10:20:52 UTC EGT 1 decreased to 100°C and began to grow, reaching 398°C in 10:21:18, the moment of contact with the

earth's surface. This means that for the period 10:19:18 - 10:20:52 UTC one pair of engine cylinders didn't work. What causes this irregularity in the engine operation?

In examination of the engine, the Commission found, as noted in paragraph 2.16:

Float chambers of the two carburetors were full with pure gasoline. The floats have a plastic shell. The mass of the floats was measured as follows:

- left-hand chamber - 5.3 g and 6.7 g;
- right-hand chamber - 3.2 g and 3.9 g.

The total mass of the floats in each of the chambers must not exceed 7.0 g.

The exhaust pipe is black on the inside. The spark plugs were smoky, black.

The mass of the floats on the left-hand chamber is 12 g, on the right-hand chamber is 7.1 g. The mass of the floats of the left-hand chamber significantly exceeds the allowable. Excessive float masses are associated with enrichment of the fuel-air mixture. The consequences of such enrichment are given in paragraph 2.17. Given these consequences, the pilot's decision to abort the flight was correct.

In order to ensure trouble-free operation of the engine during the flight, the maintenance plan of the aircraft provides 100-hrs and annual inspection of the engine. To carry out these inspections, working cards are provided in Enclosure 5 of the maintenance plan. These cards have been drawn up in accordance with the requirements of the Engine MM, Edition 3, Revision 2, dated February 2015. The cards used by the technical person during the inspection are in accordance with Engine MM, Edition 3, Revision 1, dated January 2013. As result, the point that requires checking of the mass of the carburetor floats, was not fulfilled. When certifying the airworthiness of the aircraft, the DG CAA official did not pay attention to this fact.

In Para4.6. "Maintenance during Storage" defines what maintenance work should be performed on the engine, provided that no flights were performed for a "longer period of time". It is not specified what does mean the conception "longer period of time", but as a procedure to be implemented is indicated the following: „... 6. Emptying the carburetor float chambers; 7. Applying oil to all moving parts of the carburetor; ... “. There are no records in the technical documentation of the aircraft for the execution of such procedures, but their non-implementation is a contributing factor for the occurrence of abnormal engine operation.

From the records of the engine parameters in the memory of the navigation equipment it was evident that before the flight the pilot made two unsuccessful attempts to start the engine, but no records for additional inspection in this regard and measures taken to eliminate possible faults were made. Given the fact that the last flight of the aircraft was on 09.11.2019, i.e. between the two flights there was an interval of 6 months.

It follows from the above that the main contribution to the realization of the air accident related to this group of factors is:

1. Disruption of the normal operation of the engine caused by over-enrichment of the fuel air mixture, associated with an increase in the mass of the float chambers, not checked during the maintenance of the aircraft.
2. Incomplete and incorrect implementation of the aircraft maintenance plan.
3. The reduced control of the inspectors from the Airworthiness Department of the DG CAA, regarding the updating and implementation of the Aircraft Maintenance Plan and the keeping of the technical documentation of the aircraft.
4. Lack of traceability of the maintenance performed on the aircraft due to non-keeping of the technical documentation by the pilot owner.

Circumstances related to the second group of factors, related to the qualification, training and physiological condition of the pilot are set out in paragraphs 2.1.2, 2.2, 2.5.1 and 2.13.

In accordance with paragraph 2.5.1., the pilot holds a Pilot License, issued in accordance with Part-FSL on 30.06.2017. With this certificate the aircraft commander has a qualification SEP (land) valid until 30.06.2019. The flight during which the accident took place was performed on 09.05.2020 and at that moment the pilot had no right to perform a solo flight with the aircraft owned by him.

It should be noted as a factor the relatively small flight experience of the pilot, 104:50 flight hours, combined with the fact that the flight was made after a six-month interruption.

There is no information that any physiological factors or losses of capacity have influenced the pilots' capacity for work. At the time of the flight, the pilot-owner had a valid certificate for medical fitness. The dominant factors related to this group are as follows:

1. Wrong decision taken by the pilot owner to conduct a flight after the expiration of validity of the Pilot License, prolonged interruption of piloting and insufficient flight experience.

2. Little flying experience of the pilot owner

Circumstances related to the third group of factors, related to the course of the flight and the piloting technology are set out in paragraphs 2.1.2, 2.6.2, 2.10, 2.11, 2.12, 2.15 & 2.16.

After making, as mentioned above, an incorrect decision to conduct the flight, the pilot-owner performed a pre-flight inspection of the aircraft, removing (without recording in the flight documents) the discrepancies found in the technical condition of the aircraft, but didn't perform the activities given in the plan for maintenance in case of prolonged period of storage.

Paragraph 4.1 Pre-flight inspection POH ends with the raised inscription "Record the results of the inspection in the airplane logbook"

In accordance with paragraph 4.3 of the POH, the pilot made two unsuccessful attempts to start the engine, on the third attempt he started it and performed the engine tests recorded in paragraph 4.4, in which he didn't find any deviations from the technical requirements. After the engine test, the aircraft was refueled and at 10:08 UTC the engine was started again and at 10:17:18 UTC the aircraft took-off from RWY 28. After the take-off, during the climb, significant irregularity in the operation of the engine, expressed in fluctuations in the speed of rotation of the motor shaft, could be seen in the graphs on page 14 and page 15 of Enclosure 2 in the periods 10:18:37... 10:19:30 UTC and 10:20:50... 10:21:10 UTC. After identifying the above problems in the operation of the engine, which led to loss of engine power, probably due to the extinction of the working process in two of the cylinders, the pilot decided to abort the flight and return for landing at Lesnovo Airfield. In its first part, this decision was correct. But it was associated with an inaccurate assessment of the possibility to return to Lesnovo Airfield.

Part 3 of the POH provides check cards with the aircraft emergency procedures. No such cards were found in the cockpit of the aircraft after the flight, and no copy of the POH was found. According these procedures, in event of engine failure or irregular operation, a forced landing shall be made on a site selected by the air, specifying the flight parameters to be observed in making such a landing.

Due to the incorrect assessment, the aircraft flew to RWY 10 of the Lesnovo Airfield at a low altitude with the landing gear and flaps not extended and with a need to adjust the course along the runway axis.

On page 40 of POOH is written, that the landing gear extending time is 20s. At a minimum speed of final approach, specified on page 41 of POH, equal to 54 kt, a distance of 556 m is required, and at a stall speed in landing configuration of 30 kt, a distance of 309 m is required. The landing gear was released when the aircraft flew over the fence and at the moment of touching down on the runway, as described in paragraph 2.12, it was not in locked extended position. The pilot's attempt to steer the airplane along the axis of RWY 10 resulted in a stall to the right-hand wing and subsequently to the destructions, described in paragraph 2.3.

The dominant factors in this group are:

1. Wrong decision taken by the pilot owner for return and landing on the Lesnovo Airfield.
2. Violation of the technology in constructing a landing approach by the pilot owner.
3. Violation of the technology for putting the aircraft in landing configuration by the pilot owner.
4. Execution of a final turn at an unacceptably low height in process of changing the configuration, led to a loss of speed and subsequent stall.

Circumstances related to the fourth group of factors, related to the influence of external factors, meteorological conditions, natural phenomena.

There are no natural phenomena to influence the occurrence. During the approach of the aircraft for the forced landing in the area of Lesnovo Airfield, in accordance with the set out in Annex 2, the

wind direction was of 354° and a speed of 13 kt (6.7 m/s). In accordance with paragraph 2.6.2, the crosswind limit is 15.6 kt (8 m/s).

In view of what has been stated so far in this chapter, the Commission of investigation indicates as the main reasons for the realization of the accident:

1. Wrong decision taken by the pilot owner to conduct a flight after the expiration of validity of the his Pilot License, prolonged interruption of piloting and insufficient flight experience.
2. Wrong decision made by the pilot owner for returning and landing on the Lesново airfield after the establishing of abnormal engine operation associated with power loss.
3. Violation by the pilot owner of the technique of landing approach, the technology for configuring the aircraft for landing and performing a maneuver at an inadmissible low altitude at low speed.

The Investigation Commission indicates also the following accompanying reasons contributing to the occurrence:

1. Disruption of the normal engine operation, caused by enrichment of the air-fuel mixture due to incomplete and incorrect implementation of the maintenance plan of the aircraft by a person holding a Certificate for Maintenance.
2. The reduced control of the inspectors from the Airworthiness Department of the CAA, regarding the updating and implementation of the Aircraft Maintenance Plan and the keeping of the technical documentation of the aircraft.

## 4. Conclusion

### 4.1. Findings

As a result of the investigation, the Commission concluded:

1. JA 600 (SKYLEADER 600) aircraft, serial No 6244266U, registration marks LZ-ACS, was made in June 2015 by JIHLAVAN airplanes, Czech Republic.
2. The aircraft has a Certificate of Airworthiness No 2561, issued on 17.11.2017 by the DG CAA of the Republic of Bulgaria.
3. In the Certificate of Registration, LZ-ACS is recorded with national and registration marks of the aircraft, and a private person is also registered as an owner, who is also indicated as an operator.
4. A certificate of airworthiness No 2561 was issued for this aircraft on 11.07.2015. In this certificate the maximum take-off mass of the airplane 472.5 kg is written. As a category of the aircraft it is recorded as "Private". The certificate indicates the last period of validity from 18.06.2019 till 17.06.2020.
5. During the flight in which the accident took place, the take-off mass of the aircraft was 474 kg.
6. Total flying time since new to the day of accident the aircraft has flown 142:12hrs.
7. The maintenance of the aircraft is performed on the basis of the JA 600 Aircraft Maintenance Plan (SKYLEADER 600), serial No 6244266 U, approved by the DG CAA on 21.08.2015.
8. The aircraft maintenance plan was not updated after the change of aircraft owner.
9. After the change of owner, there are no records of the maintenance work performed and the time flown in the aircraft log book.
10. There are entries in the engine logbook for only two annual inspections performed on 25.09.2017 and 07.05.2019.
11. The performed annual inspection on 07.05.2019 was not according to the working cards included in the Maintenance Plan, and as a result the procedure for checking the mass of the floats in chambers of the carburetors wasn't performed.
12. During the inspection, the Commission found an increased mass of carburetor floats.
13. There are no records in the technical documentation of the aircraft for works related to periods of prolonged storage of the aircraft.
14. No records were kept for replacement of life-limited units and minor repairs.
15. The pre-flight inspection for the flight in which the accident took place, was not reflected in the aircraft documentation, although such a requirement was recorded in the aircraft flight manual.

16. The pilot-owner doesn't possess an approval for maintenance of the aircraft, issued by DG CAA, as indicated in p.1 of Para1, Art. 81 of N-1 Ordinance.

17. There is no record of approval by the DG CAA on the pilot's POH copy, and the DG CAA does not have a copy of the JA 600 POH.

18. The validity of the Pilot License held by the pilot-owner has expired on 30.06.2019.

17. The last flight by the plane was performed by the owner pilot on November 9, 2019, and until that date he flew without a valid Pilot License since June 30, 2019.

18. The analysis of the flight parameters set out in Enclosure 2 to this report is made on the basis of records from data storage device of the left-hand monitor of the aircraft "MASTER SKYVIEW".

19. The pilot has made two unsuccessful attempts to start the engine, on the third attempt he started it and during the test run he didn't find any deviation of the parameters from the technical requirements.

20. After the engine test, the aircraft was refueled and at 10:17:18 UTC the aircraft took-off from RWY 28.

21. During the climb an irregularity of engine run arose, expressed in fluctuations in the frequency of rotation of the motor shaft and power loss.

22. After establishing these problems, the pilot decided to abort the flight and return to the Lesnovo Airfield.

23. Due to the pilot's incorrect assessment, the aircraft flew to RWY 10 of the Lesnovo Airfield with the landing gear and flaps not extended and with a need to adjust the course along the runway axis. All criteria for a safe approach were completely outside the norms for a stabilized approach.

24. The required distance for extending the landing gear is 556m. The landing gear was extended when the aircraft flew over the fence and at the moment of touching down on the runway it was not in the locked extended position.

The pilot's attempt to steer the airplane along the axis of RWY 10 resulted in a stall to the right-hand.

26. The time of contact of right-hand semi-wing of the aircraft with the runway surface was 10:21:18 UTC at 105m from the threshold of RWY10.

27. The plane slid 72 m along the runway and suffered heavy damages.

28. As a result of the event, the pilot owner received a moderate bodily injury, a fracture of the first lumbar vertebra.

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

30. The weather features were related to the presence of the wind with a direction of 354° and a speed of 13 kt (6.7 m/s).

31. The emergency rescue team at the Lesnovo Airfield arrived at the scene in about 15 seconds.

#### 4.2. Causes

On the basis of the circumstances set out in this report and the analysis performed, the Investigating Commission pointed out as **main reasons for realization of the accident**:

1. Wrong decision taken by the pilot owner to conduct a flight after the expiration of validity of the his Pilot License, prolonged interruption of piloting and insufficient flight experience.

2. Wrong decision made by the pilot owner for returning and landing on the Lesnovo airfield after the establishing of abnormal engine operation associated with power loss.

3. Violation by the pilot owner of the technique of landing approach, the technology for configuring the aircraft for landing and performing a maneuver at an inadmissible low altitude at low speed.

The Investigation Commission indicates also the following accompanying reasons contributing to the occurrence:

1. Disruption of the normal engine operation, caused by enrichment of the air-fuel mixture due to incomplete and incorrect implementation of the maintenance plan of the aircraft by a person holding a Certificate for Maintenance.
2. The reduced control of the inspectors from the Airworthiness Department of the CAA, regarding the updating and implementation of the Aircraft Maintenance Plan and the keeping of the technical documentation of the aircraft.

### 5. Safety recommendations

Taking into account the causes of the accident realized and the deficiencies found during the investigation, the Commission recommends the following safety measures to be implemented:

**BG.SIA-03/2020/01.** Within the quality management system, DG CAA should perform an inspection of the quality of functioning of the Airworthiness of Civil Aircraft Department when establishing and certifying the airworthiness of ultralight aircraft of the Register of the Republic of Bulgaria.

**BG.SIA-03/2020/02.** DG CAA's Flight Operations and LAP Department within the Aviation Safety System to plan activities related to the prevention of the possibility pilots with expired Pilot License to perform flights.

**BG.SIA-03/2020/03.** Airworthiness of Civil Aircraft Department of DG CAA to inspect the activities related to the performance of maintenance of a licensed technical person No BG.66.A.00535-10886.

**BG.SIA-03/2020/04.** Airworthiness of Civil Aircraft Department of DG CAA should require, upon submission of the Super Light Aircraft Maintenance Plans, to reflect in them which maintenance activities might be performed by the owner- pilot and whether he has the relevant rights.

**BG.SIA-03/2020/05.** Airworthiness of Civil Aircraft Department of DG CAA to require the owners of ultra-light aircraft powered by Rotax engines to adjust their maintenance plans in the event of a change in the wording of the maintenance manuals applicable to specific engines.

**BG.SIA-03/2020/06.** Airworthiness of Civil Aircraft Department of DG CAA to require the owners of ultra-light aircraft powered by Rotax engines the works, related with long periods of storage to be subject to specific deadlines.

On the grounds of Art. 18, § 5 of Regulation 996/2010, the safety measures instructed shall be recorded in the centralized European System of Safety Measures.

Follows: Enclosure 1 end Enclosure 2, which are an integral part of this Report.

*The Investigation Commission reminds all organizations, to which flight safety recommendations are sent that, on the grounds of Article 18 of Regulation (EU) 996/2010 on Investigation and Prevention of Accidents and Incidents in Civil Aviation and Article 19, paragraph 7 of Ordinance No. 13 on the Investigation of Aviation Accidents are obliged to notify the Air, Maritime and Railway Accidents Investigation National Board in writing of the action taken on the recommendations made.*

### **COMMISSION ON INVESTIGATION OF THE SERIOUS INCIDENT**

Sofia, 19 October 2020

**Air, Maritime and Railway Accidents Investigation National Board**

ENCLOSURE 1



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.



Fig. 6.



Fig. 7.



Fig. 8.



Fig.9.



Fig. 10.



Fig. 11.



Fig. 12.



Fig. 13.



Fig. 14.



Fig. 15.



Fig. 16.



Fig. 17.



Fig. 18.



Fig. 19.



Fig. 20.



Fig. 21.



Fig. 22



Fig. 23.



Fig. 24.

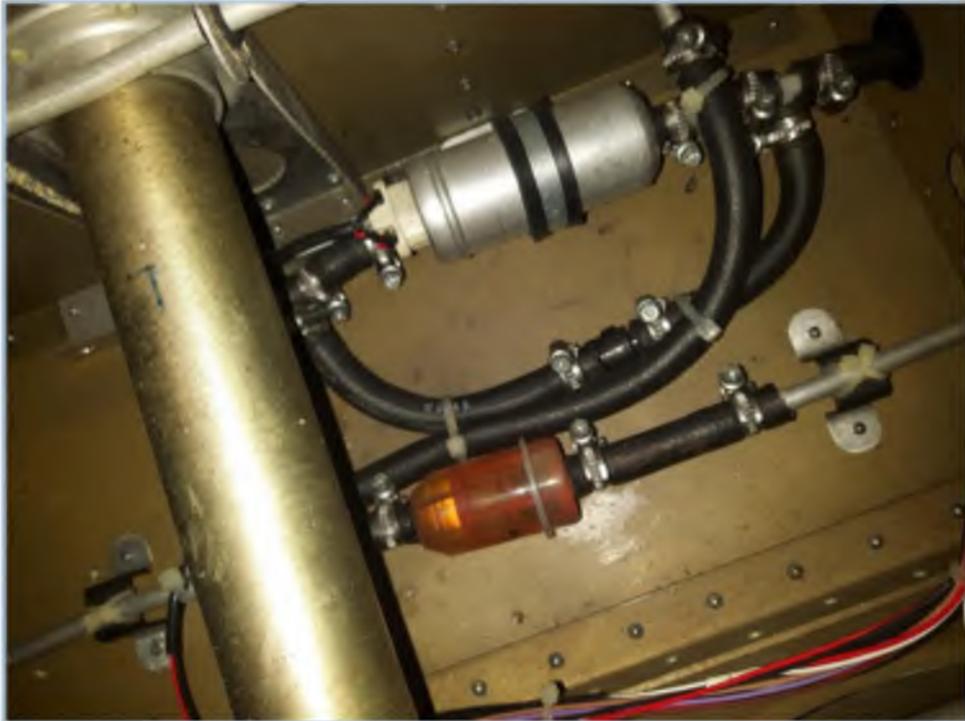


Fig. 25



Fig.26

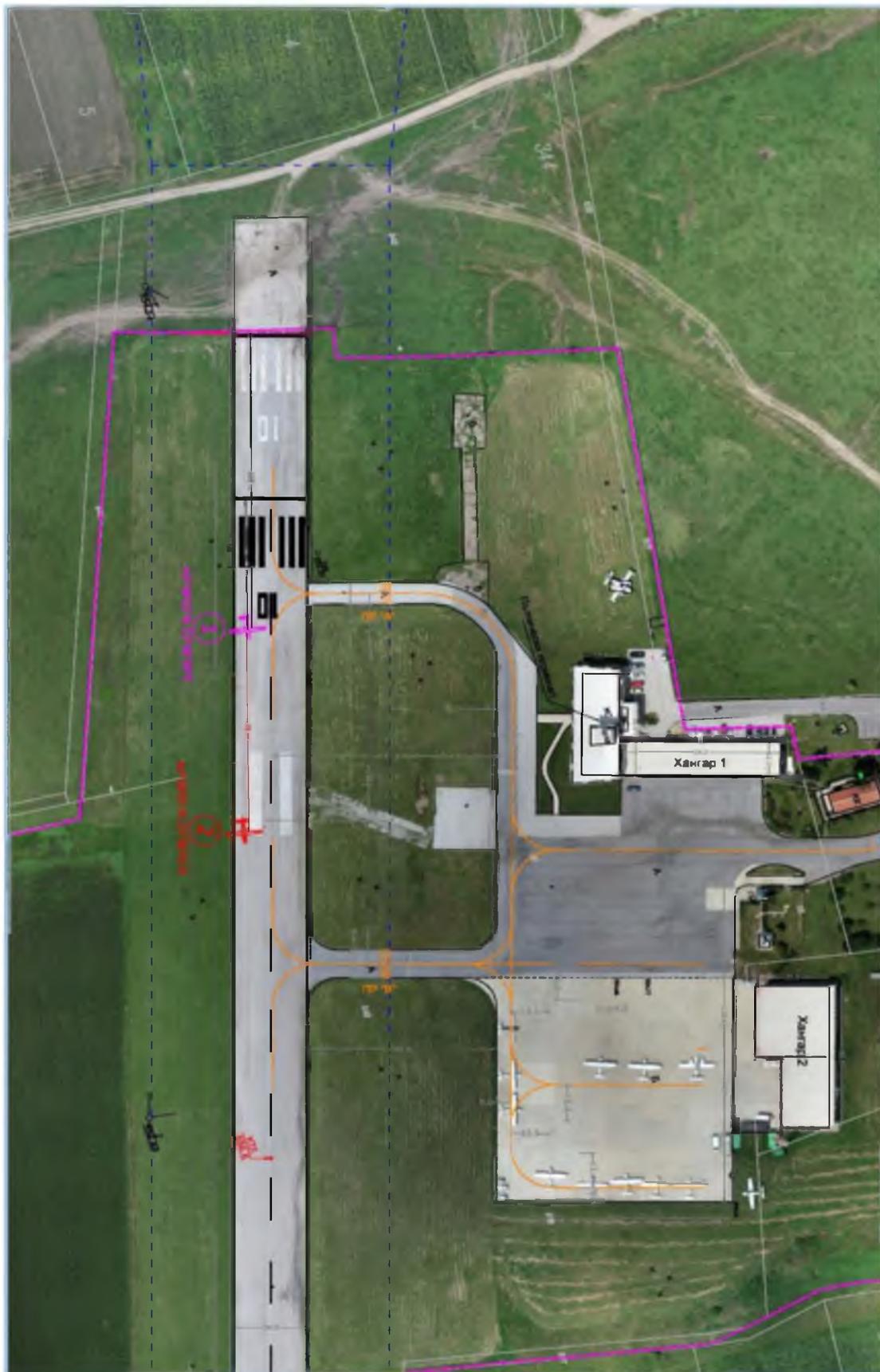


Fig. 27.

## ENCLOSURE 2

## ANALYSIS OF FLIGHT PARAMETERS OF LZ-ACS AIRCRAFT dated 09.05.2020

**Flight data recorders:**

For the analysis of flight parameters of the LZ-ACS SN7975 aircraft dated 09.05.2020, flight data downloaded in .CSV format from the on-board navigation system Sky View were used.

**Files:**

2011-01-01-LZACS-SN7975-12.2.0.2950-2020\_05\_09-ALERT\_DATA.csv

2011-01-01-LZACS-SN7975-15.2.0.4389-2020\_05\_09-ALERT\_DATA-PART\_02.csv

2011-01-01-LZACS-SN7975-15.2.0.4389-2020\_05\_09-BLACK\_BOX\_LOG\_DATA.csv

2011-01-01-LZACS-SN7975-15.2.0.4389-2020\_05\_09-USER\_LOG\_DATA.csv

All times are Universal Coordinated Time (UTC)

**UTC 09:39:34**

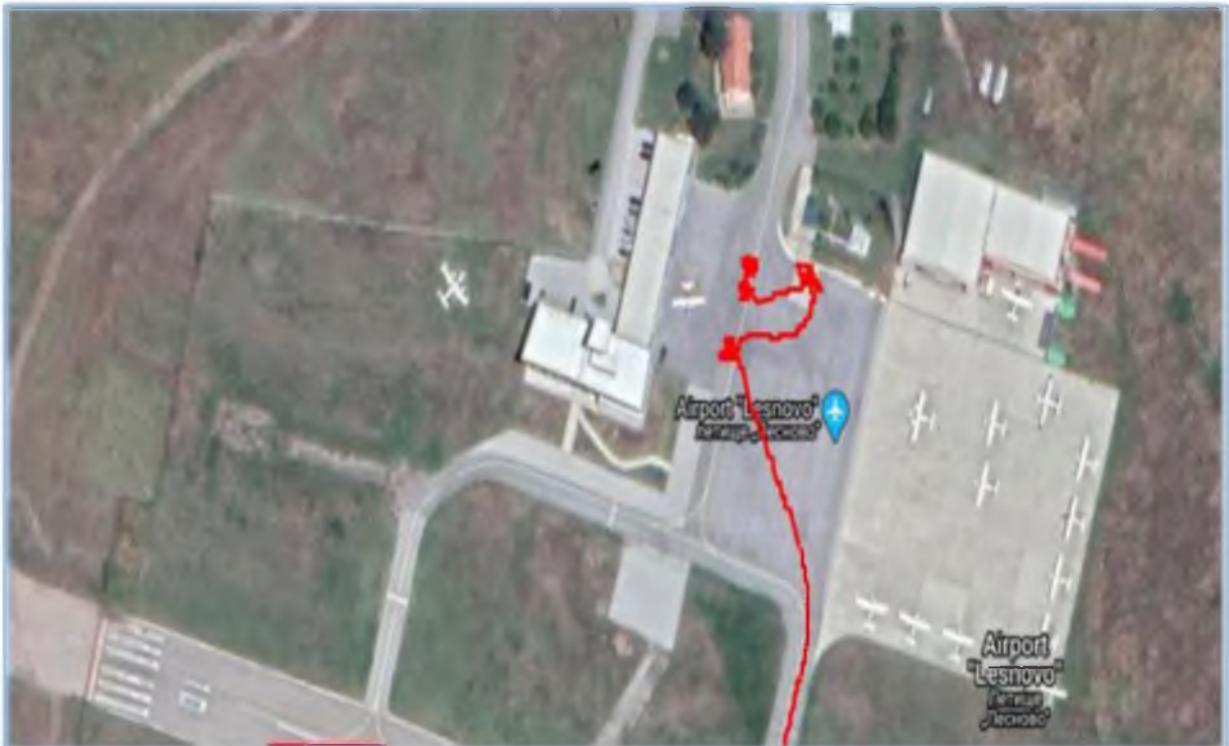
Start of recorded flight parameters dated 09.05.2020.

Tach Time: 142.2

Pressure Altitude 1675

Magnetic Heading 158.5

Aircraft location in GPS coordinates. Longitude 23.64572/ Latitude 42.63506 (apron of maneuvering area of Lesnovo Airfield)



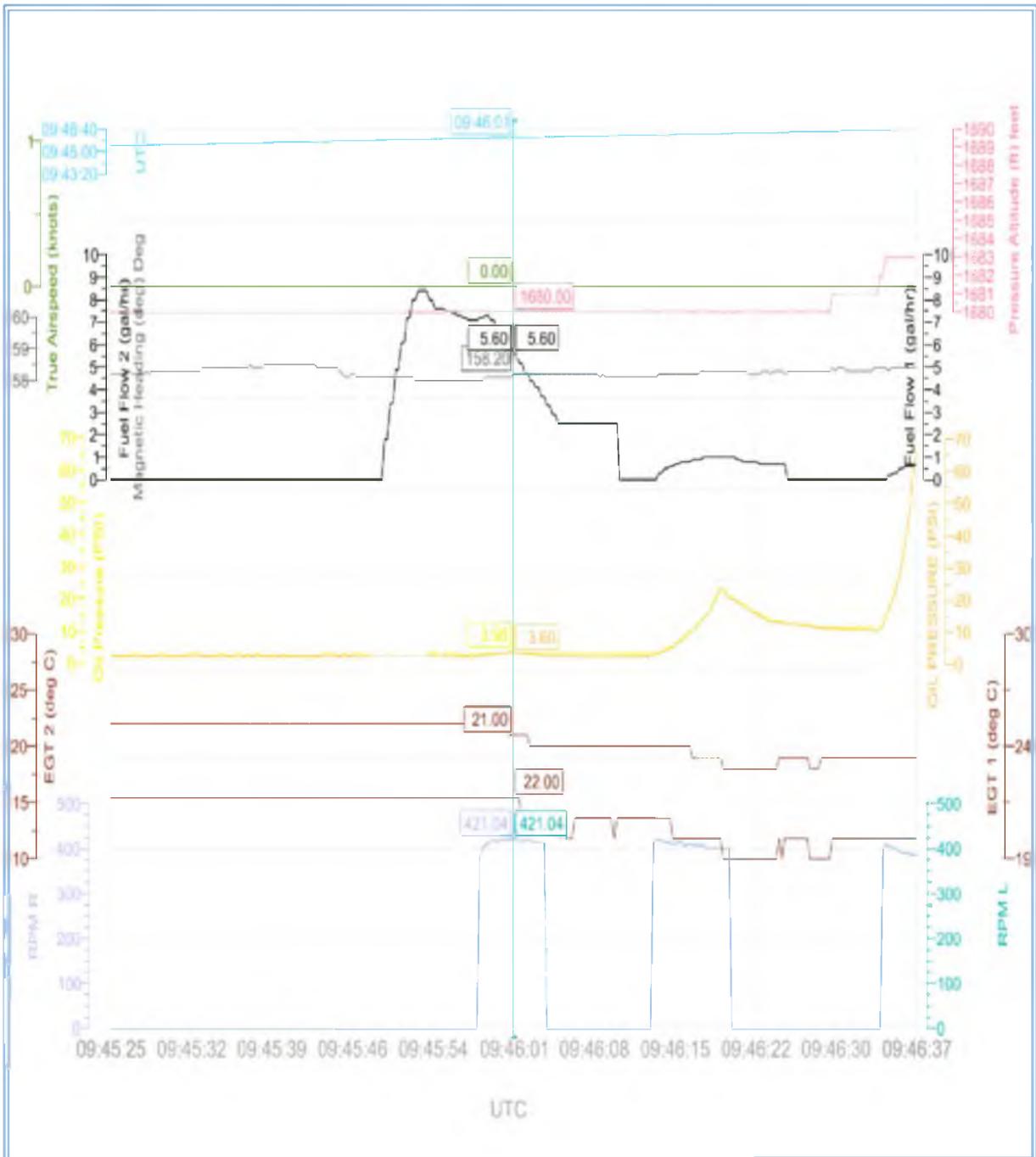
UTC 09:45:58 till 09:46:04

Engine cold spin up

Fuel Flow 1, 2 7.2 – 3.7 gal/hr

RPM L/ RPM R: 381- 414

EGT 1, EGT 2: 19-21 deg C



UTC 09:46:13 till 09:46: 20

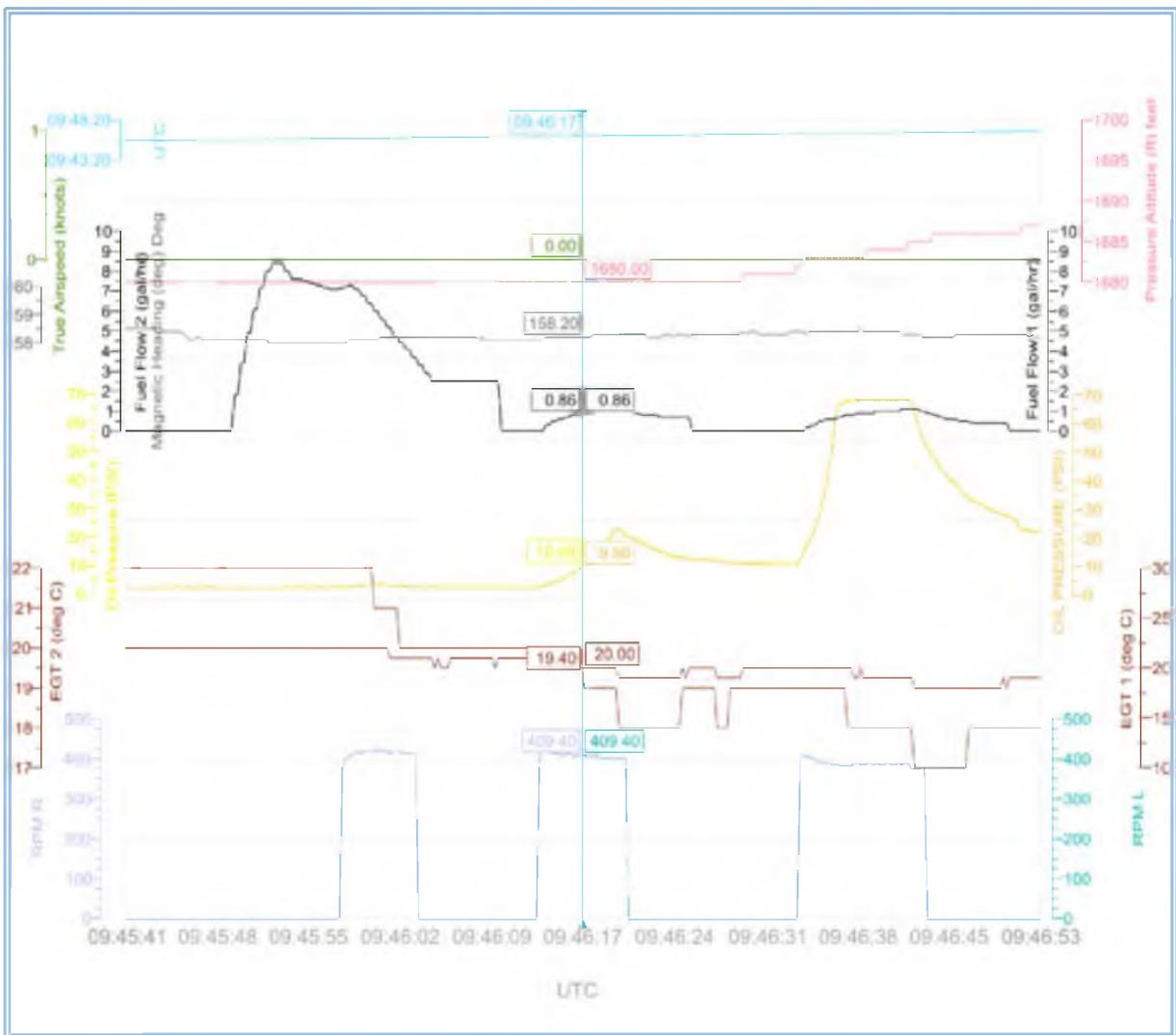
Engine cold spin up

RPM L/ RPM R: 401-422

Fuel Flow 1, 2: 0.3 – 0.9 gal/hr

EGT 1, EGT 2: 19-21 deg C

Oil Pressure rise up to 23 PSI



UTC 09:46:34 till 09:46:44

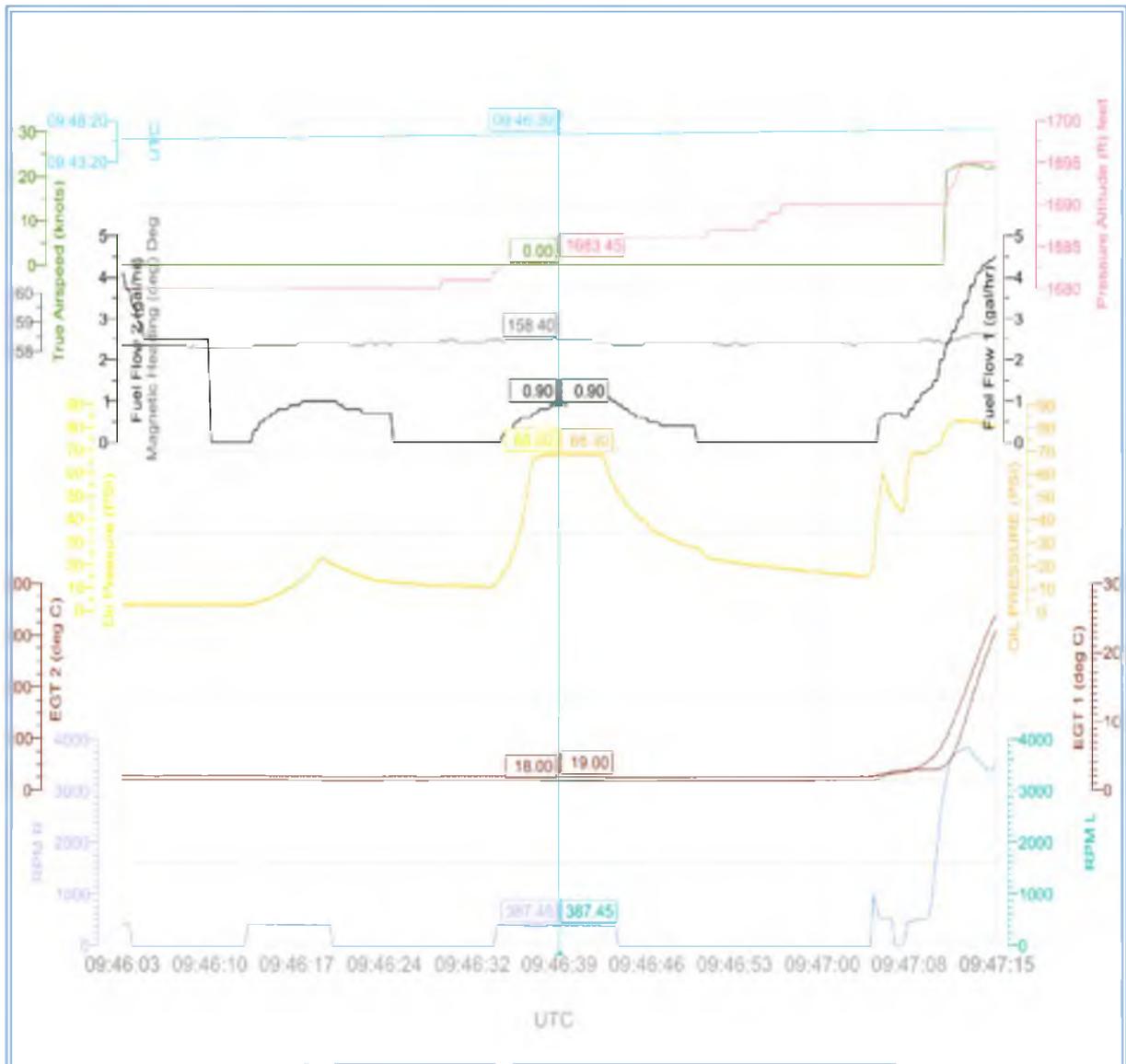
Engine cold spin up

RPM L/ RPM R: 375-408

Fuel Flow 1, 2: 0.2 – 0.9 gal/hr

EGT 1, EGT 2: 19-21 deg C

Oil Pressure rise up to 68 PSI



UTC 09:47:05

Beginning of engine start up

Pressure Altitude: 1690 ft

Magnetic Heading: 158.3

EGT 1: 20 deg C

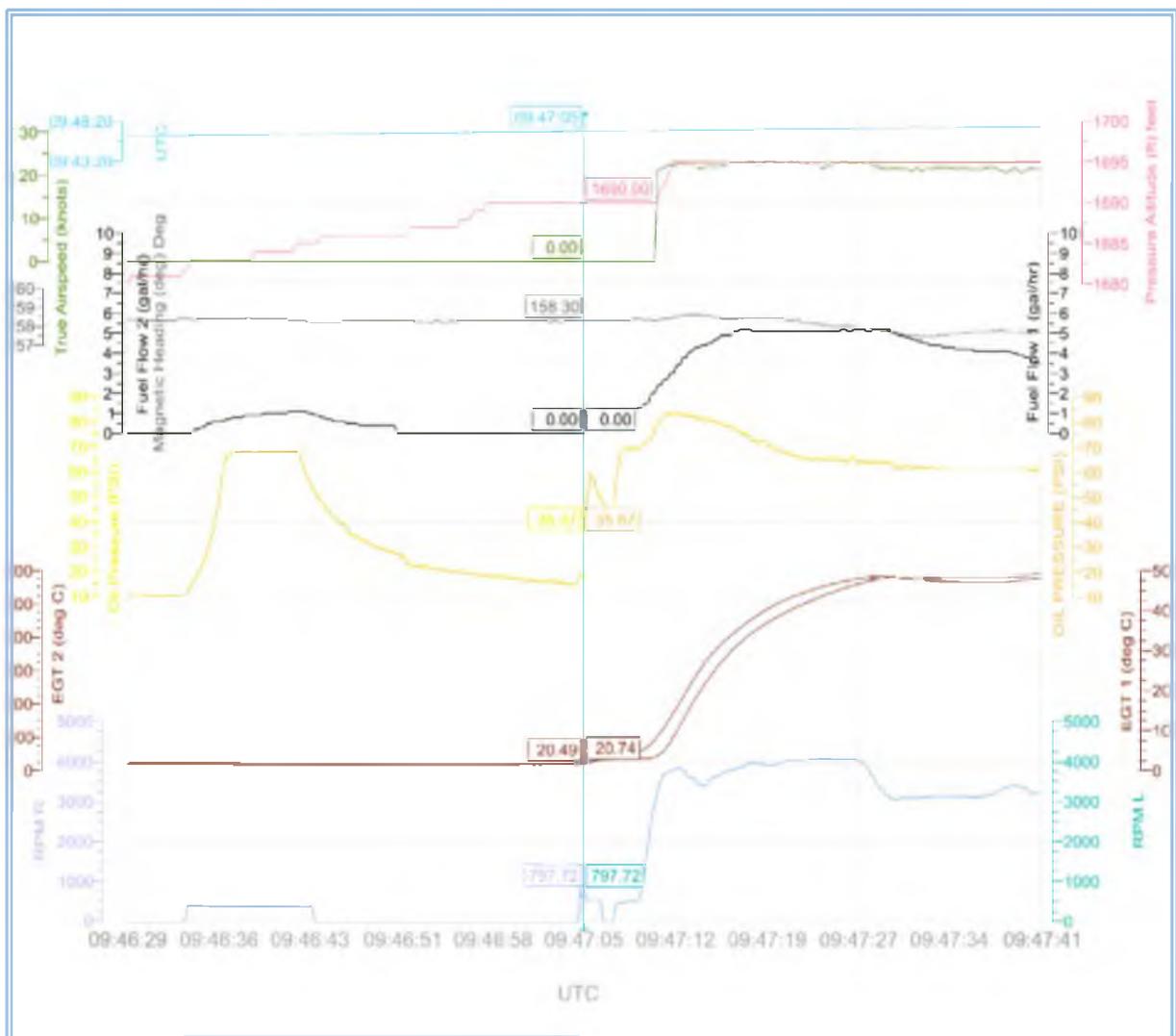
EGT 2: 20 deg C

RPM L: 798

RPM R 798

Fuel Flow 1, 2: 0 gal/hr and starts to rise up

OIL PRESS: 35 PSI



UTC 9:47:06

EGT 1: 23 deg C

EGT 2: 27 deg C

RPM L: 523

RPM R 523

Fuel Flow 1, 2: 0.7 gal/hr

OIL PRESS: 58.5 PSI

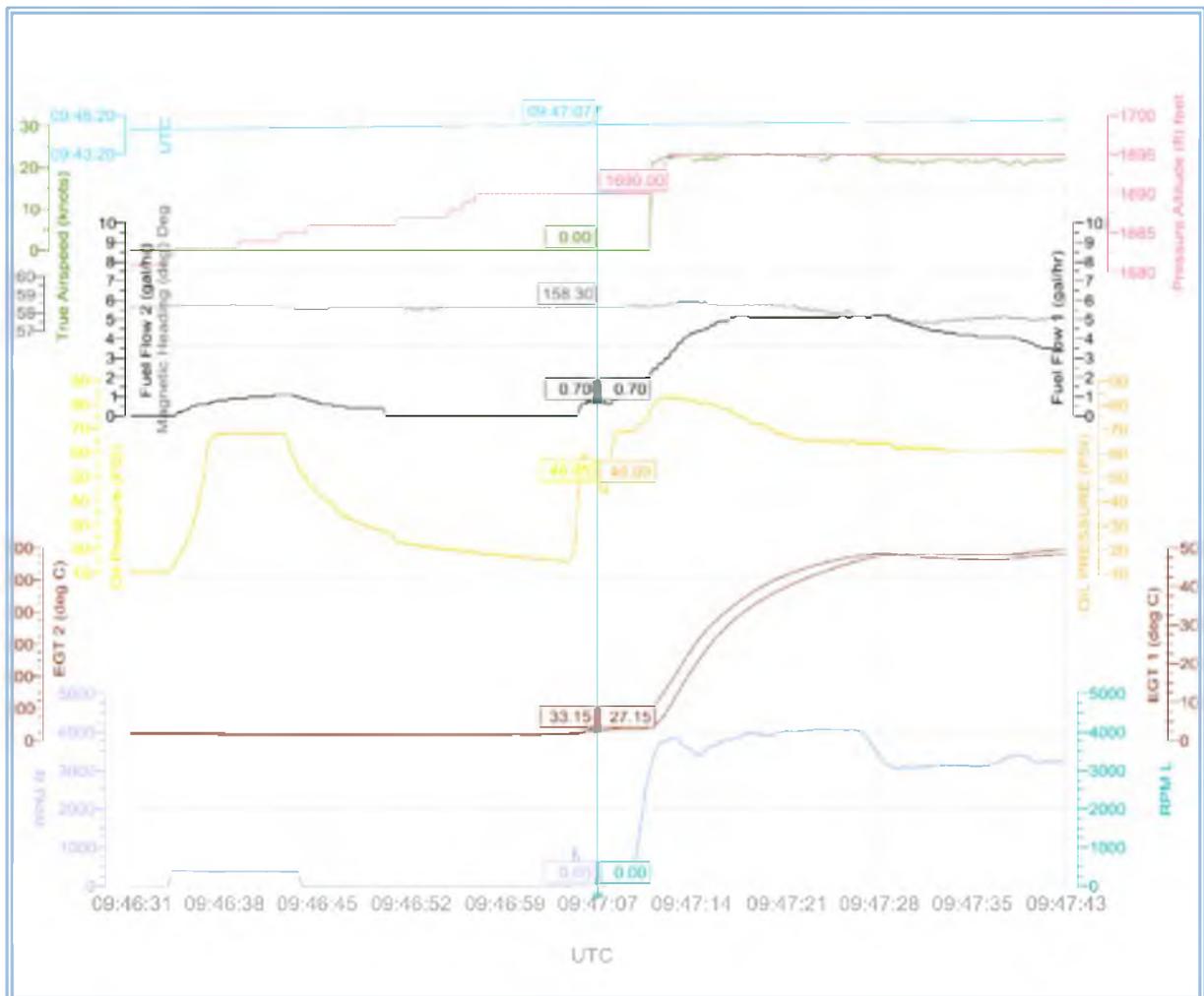
During the engine start the parameter Oil Press doesn't change.

UTC 9:47:07

Parameters RPM L, RPM R have value 0 for one second

Fuel Flow 1, 2: 0.7 gal/hr

OIL PRESS: 44 PSI



UTC 9:47:08

EGT 1: 29 deg C and rise up

EGT 2: 35 deg C and rise up

RPM L: 449 and rise up

RPM R: 449 and rise up

Fuel Flow 1, 2: 0.6 gal/hr

OIL PRESS: 58 and rise up

UTC 9:47:12

EGT 1 69 deg C and rise up

EGT 2 158 deg C and rise up

Fuel Flow 1, 2: 3 gal/hr

RPM L/ RPM R: rise up to 3766

OIL PRESS: 83 PSI

UTC 9:47:24

RPM L/ RPM R: rise up to 4082

Fuel Flow 1, 2: 5.1 gal/hr

EGT 1: 436

EGT 2: 548

UTC 9:47:46

Stable rpm, temperature and fuel consumption

EGT 1: 503 deg C

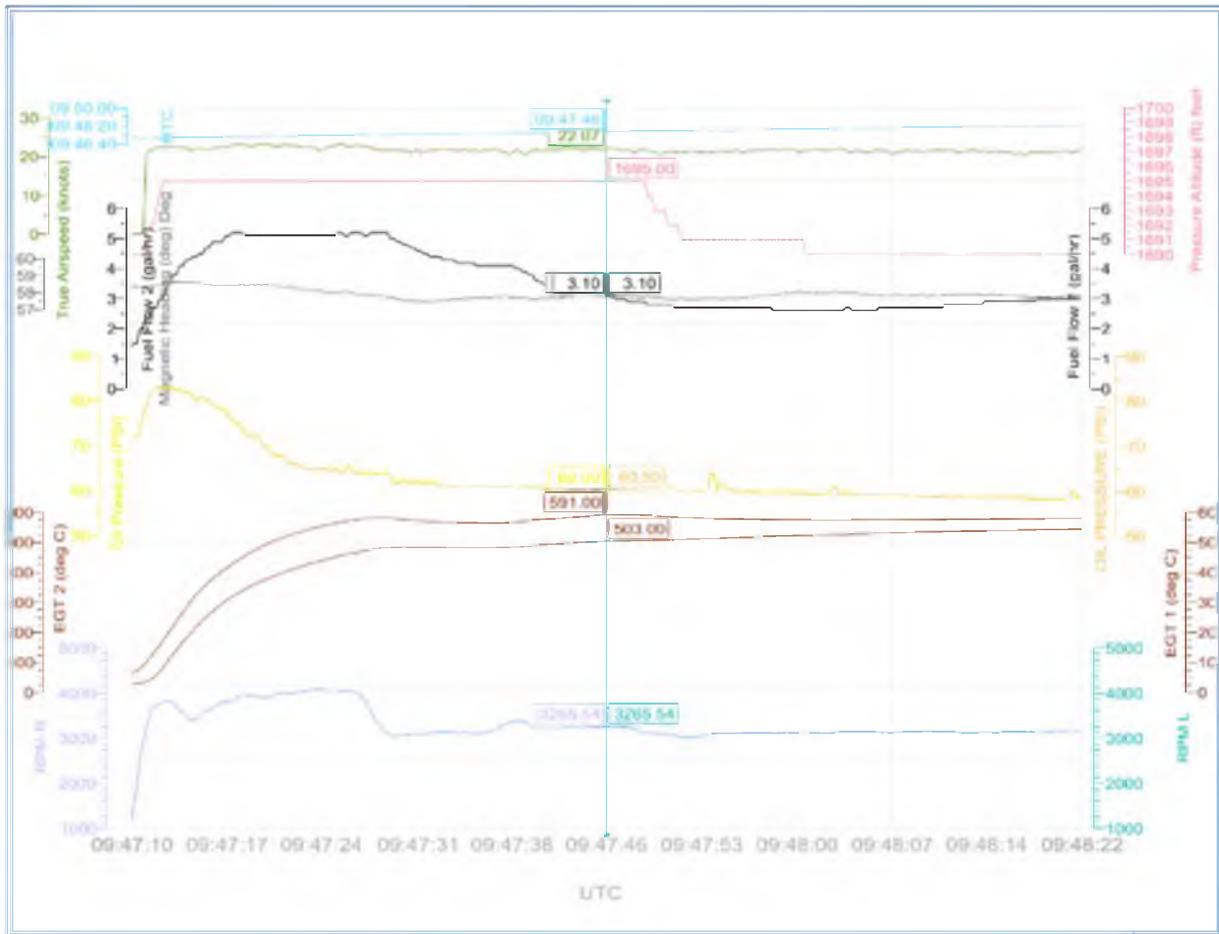
EGT 2: 591 deg C

RPM L: 3265

RPM R: 3265

Fuel Flow 1, 2: 3.1 gal/hr

OIL PRESS: 60 PSI

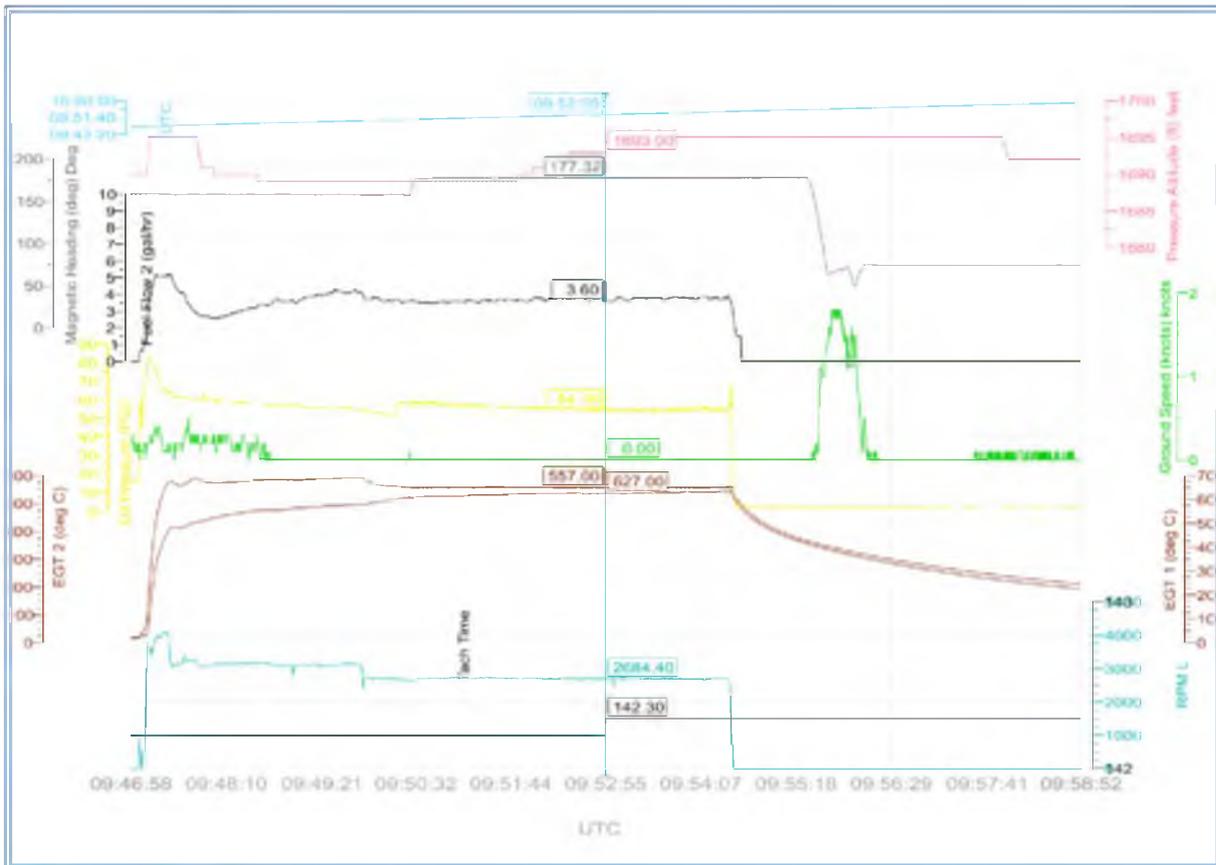


**UTC 9:50:28 till 9:50:32**

The aircraft turns on the ground from Magnetic Heading 157.6 deg. to Magnetic Heading 176 deg.  
 A small change in GPS coordinates  
 Ground Speed 0 Kts.

**UTC 9:52:55**

The parameter Tach Time rise up from 142.2 to 142.3  
 EGT 1: 627 deg C  
 EGT 2: 557 deg C  
 RPM L: 2684  
 RPM R: 2684  
 Fuel Flow 1, 2: 3.6 gal/hr  
 OIL PRESS: 54.16 PSI



UTC 9:54:37

Engine stop

EGT 1: 563 deg C and gradually decrease

EGT 2: 495 deg C and gradually decrease

RPM L: 0

RPM R: 0

Fuel Flow 1, 2: 0 gal/hr

OIL PRESS: 3 PSI

UTC 9:55:29 till 9:56:11

The aircraft turns on the ground from Magnetic Heading 177 deg. to Magnetic Heading 74 deg.

A small change in GPS coordinates Longitude is changing from 23.645700 to 23.645060

Latitude is changing from 42.635000 to 42.635040

Ground Speed 0-1.5 Kt

UTC 10:04:55 till 10:06:46

The aircraft turns on the ground from Magnetic Heading 74 deg. to Magnetic Heading 187 deg.

New coordinates: 42.634870/ 23.645650

Ground Speed 0-1.5 Kt

UTC 10:07:39 till 10:08:00

The engine is started again

Maximum value of Fuel Flow 1, 2: 4.1 gal/hr

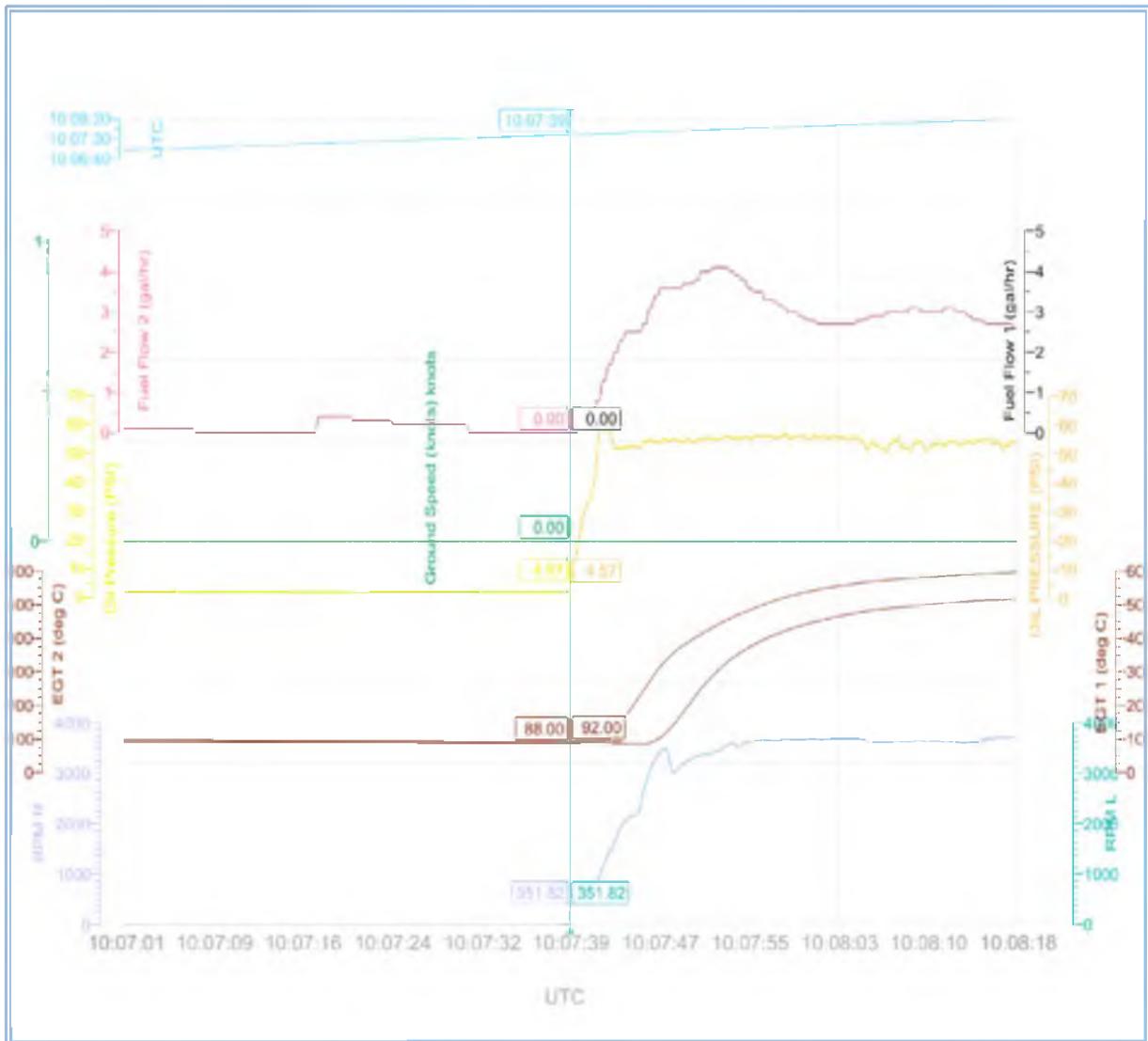
OIL PRESS: 55 PSI

EGT 1: 491 deg C

EGT 2: 575 deg C

RPM L: 3639

RPM R: 3639



UTC 10:12:45 till 10:17:15

The aircraft taxis to RWY28

Maximum taxi Ground Speed 14.65 Kt

No anomalies in the parameters of engine control instruments is notices (OIL PRESS, EGT, RPM, Fuel Flow)

UTC 10:17:18

The aircraft starts take-off run from RWY28

No anomalies in the parameters of engine control instruments is notices (OIL PRESS, EGT, RPM, Fuel Flow)

UTC 10:17:18

The aircraft takes-off from RWY28

EGT 1: 621 deg C

RPM R: 5618

Fuel Flow 1, 2: 4.86 gal/hr

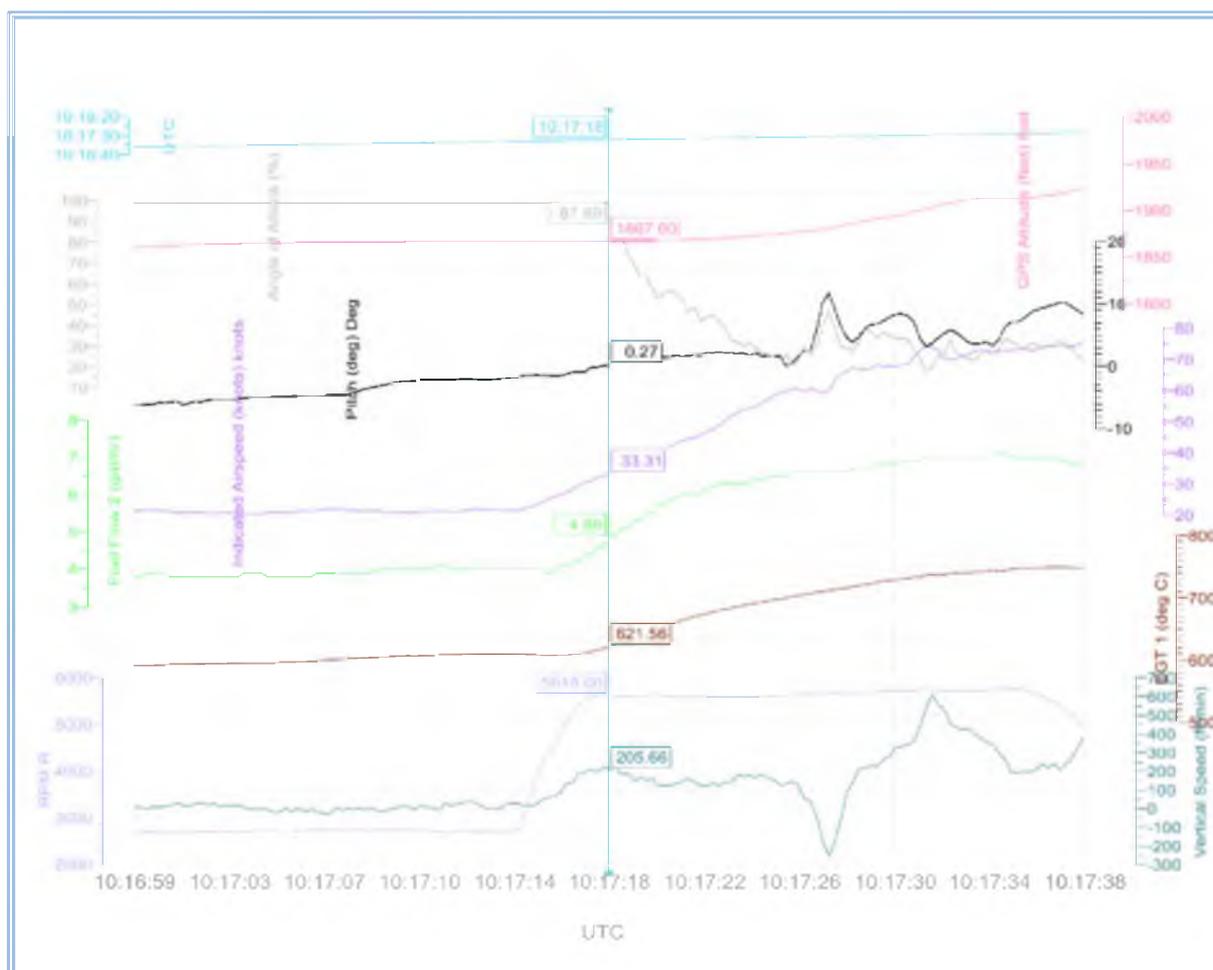
OIL PRESS: 54 PSI

Indicated Airspeed 33.3 kt

Vertical Speed 205.6 ft/min

Pitch 0.28 deg, rising up to 2 degrees

Angle of Attack 88 %



UTC 10:17:27

In one second the Vertical Speed drops sharply to -242.21 ft/min

Angle of attack 45.85 %

Pitch, 11.43 Deg

Indicated Airspeed for one second drops from 60.2 kt to 59.2 kt and after that continues to decrease smoothly.

The engine parameters do not change at this time.

UTC 10:17:42

The aircraft starts to change Magnetic Heading to 195



UTC 10:19:03

The aircraft starts to change Magnetic Heading to 360, descending from

GPS Altitude 2224 ft

Pressure Altitude 2228 ft

to

GPS Altitude 2187 ft

Pressure Altitude 2065 ft

Indicated Airspeed, 55 kt

Vertical speed -115.1 ft/min

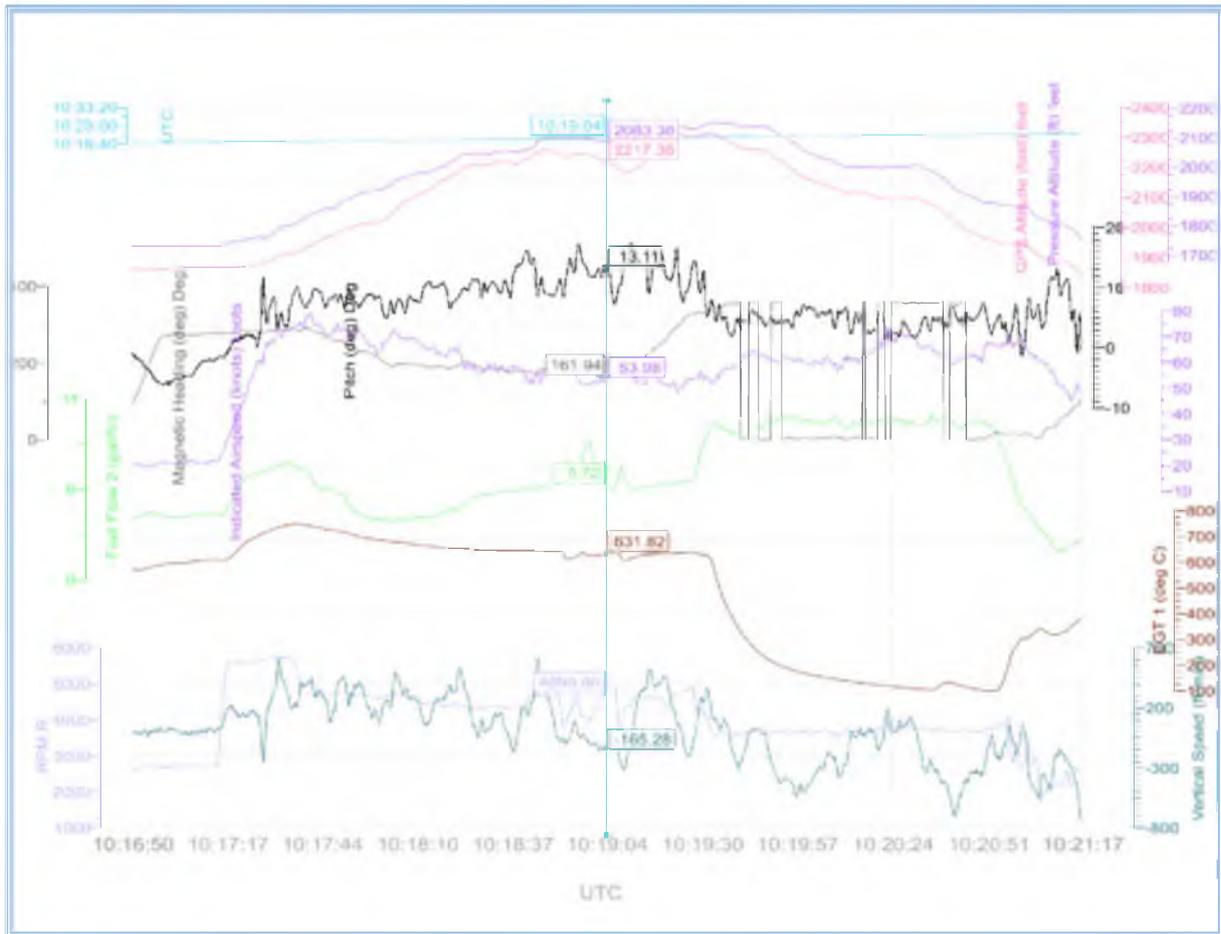
Stable engine parameters:

RPM R/ L : 4388

Fuel Flow 1, 2: 5.78 gal/hr

EGT 1: 612 deg C

EGT 2: 726 deg C



### UTC 10:19:32

At Pressure Altitude 2149 ft, indicated Airspeed 54 kt the engine parameters EGT 1, 2 and RPM L, R start to decrease. Fuel Flow 1, 2 increase.

### UTC 10:19:48

The aircraft starts to descend from Pressure Altitude 2138 ft

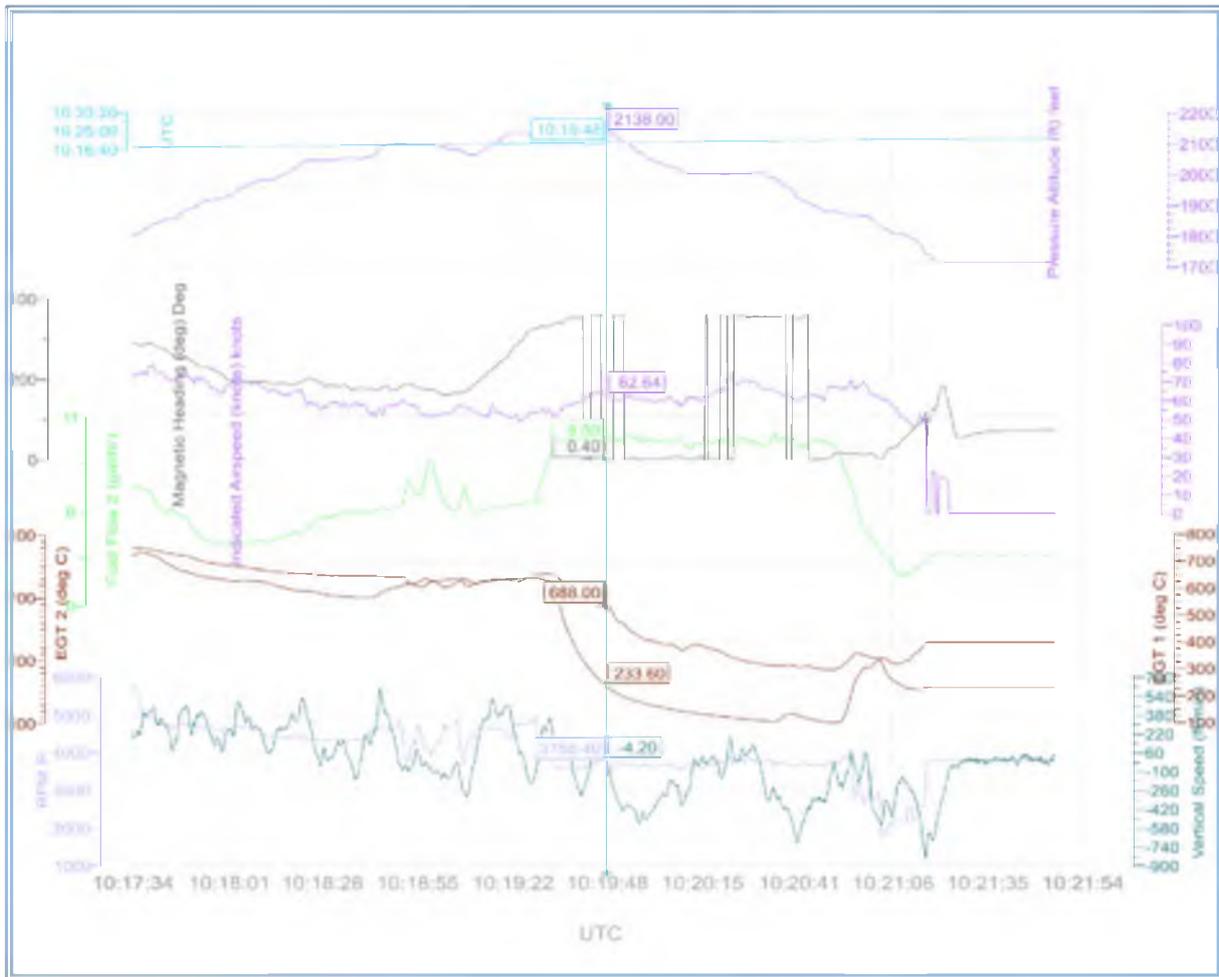
RPM R/ L : 3772

Fuel Flow 1, 2: 9.46 gal/hr

EGT 1: 233 deg C

EGT 2: 688 deg C

Magnetic heading 0 deg.



**UTC 10:20:15**

The aircraft is in horizontal flight at Pressure Altitude 2002 ft

RPM R/ L : 3606 and decrease

Fuel Flow 1, 2: 9.9 gal/hr

EGT 1: 131 deg C

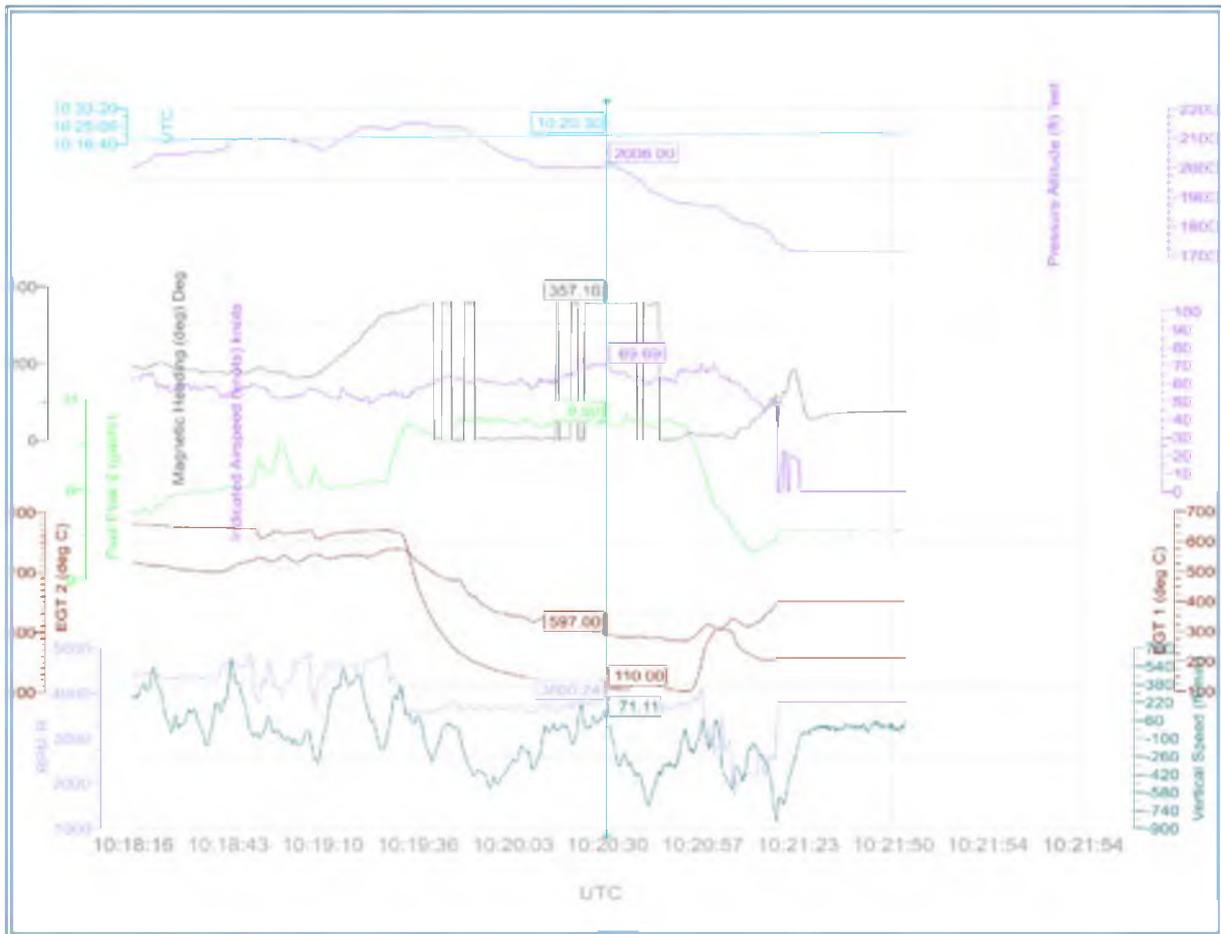
EGT 2: 623 deg C

Magnetic heading 0 deg.

**UTC 10:20:33**

The aircraft starts again to descent.

The vertical speed changes to – 672 Ft/min



### UTC 10:21:05

The aircraft began a right-hand turn to a magnetic heading of 117 degrees, heading for landing on RWY 10 of Lesnovo Airport.

The revolutions RPM R/L decrease, the temperature EGT 1, 2 rises respectively to

EGT 1: 343 deg C

EGT 2: 599 deg C

Pressure Altitude 1827 ft

Vertical Speed -552 ft/min

### UTC 10:21:18

GPS Altitude 1831 ft , Pressure Altitude 1742 ft, about 30 ft over RWY 10 at Lesnovo Airfield:

Indicated Airspeed drops sharply to 0 kt

True Airspeed drops sharply to 0 kt

The aircraft touches down on the runway with a Vertical Speed of -807 ft and a Vertical Acceleration 3.1 G.

Wind Speed at that time was 13kt

Wind Direction at that time was 354 degrees

