

FINAL REPORT

on

investigation of an aviation occurrence with Cessna 150L aircraft, reg. LZ-ASF, operated by AIR SCORPIO Ltd. air operator, realized on the 17.04.2006 during a training flight at Gorna Oryakhovitsa Airport



2006

The materials have been classified under state file number 04/17.04.2006 in the archives of the Air Accident Investigation Unit (AAIU).

Air Operator (AO): Air Scorpio Ltd with main office in Sofia, 50 Krichim Str. and Air Operator Certificate, issued on 15.09.2000, reissued on 19.09.2005 and period of validity till 19.09.2007.

Aircraft Manufacturer: CESSNA AIRCRAFT COMPANY- USA.

National and Registration Marks: LZ-ASF according to the Certificate for Registration No 1994, issued on 01.06.2005 by the Civil Aviation Administration.

Place and Date of the Air Occurrence: Field at the area of the town of Dolna Oryakhovitsa, about two kilometers from the Gorna Oryakhovitsa Airport runway; 17.04.2006

Notified: Air Accident Investigation Unit (AAIU) with the Ministry of Transport, CAA of Republic of Bulgaria, International Civil Aviation Organization (ICAO), National Transport Safety Board (NTSB) of the Manufacturer State – USA.

Type of Flight: Training flight

CESSNA 150L aircraft, reg. LZ – ASF, took-off for the execution of a training circling flight from Gorna Oryakhovitsa Airport at 15:10 local time. During the execution of the last (5th) circling flight on reverse course just before the turn into base leg an engine flameout occurred. After an unsuccessful attempt for an in-flight engine start up the aircraft commander decided to land on a chosen from the air landing ground and informed the air traffic controller at ATC-Tower of Gorna Oryakhovitsa Airport. The landing on the chosen from the air landing ground, a field at the turn into base leg area, about two kilometers from Gorna Oryakhovitsa Airport runway, was without consequences for the commander and the aircraft.

In accordance with Para.3 of the Additional Provisions of Regulation 13/27.01.1999 of the Ministry of Transport about aircraft accident investigation, the aviation occurrence has been classified as a serious incident. A commission for the investigation of the occurred with the aircraft C 150L, reg. LZ-ASF serious incident was appointed by an order RD-08-189/18.04.2006 of the Minister of Transport.

1. Factual Information

1.1 History of Flight

The flight assignment was given on the base of Air Scorpio manager's order No 108/03.04.2006.

1.1.1 Flight Number: SCU 606.

1.1.2 Preparation and description of the flight:

On the base of an individual flight training program on April 04th 2006 the pilot should perform three flight missions: first mission was a flight in training flying area and two circling flights with instructor; the second mission was five solo circling flights and the third mission was again five solo circling flights.

Preflight training for the above-mentioned missions was conducted on the 17.04.2006 from 09:00 till 11:50. There was a plan elaborated for the preflight training, but it was prepared formally. In

the flight exercises elaboration section there was only one emergency case described – emergency landing. The instructor’s conclusions consisted in a signature only.

The flights were started at 13:20. The first two missions were fulfilled without any remarks by the instructor. At 15:10 the trainee pilot started for the third mission. During the fifth, last landing approach, after the turn on downwind leg at an altitude of 800 ft the pilot noticed irregular engine behavior, put the enrichment mixer at maximum and increased engine speed. The engine parameters were in the green sector, the fuel gauges showed ¼ for the left-hand tank and 0 for the right-hand tank. Engine stalling progressed, interrupted by engine speeding up to 2500 rpm. The pilot proceeded the flight with a light descend in order to keep the speed, looked over the area and checked the magneto functioning. At an altitude of 400 ft he reported to the flight controller the engine problem and informed him about the decision made for an emergency landing in a field north from the airport. At an altitude 90 ft he extended the flaps in full and landed in a weal field. The landing was successful, without any consequences for the pilot and the aircraft, at 15:47 local time.

The emergency team from Gorna Oryakhovitsa Airport arrived eighteen minutes later along with a representative of the air operator.

1.1.3 Location of the Occurrence

Weal field within the area of the town of Dolna Oryakhovitsa, at about two kilometers to the north from the Gorna Oryakhovitsa Airport with coordinates : N – 43°10’25”; E – 025°46’11”, elevation 162 m, local time 15:47 h, day light. The place of the emergency landing is shown on Figure 1 in Enclosure 1.

1.2 Injures to Persons

No injures.

1.3 Damage to Aircraft

No damages.

1.4 Other Damages

No other damages

1.5 Personnel Information

1.5.1 Commander – male, aged 26.

Trainee pilot. He was permitted for training by an order of Air Scorpio Air Operator manager according an Individual Program for Flight Training for acquiring a professional pilot licence CPL(A), approved by CAA. He possess a Medical Certificate from CAA, Class 1, valid till 12.01.2007.

1.5.2 Instructor – male, aged 53, licensed instructor pilot, with a valid medical certificate.

1.6. Aircraft information

1.6.1. Airworthiness information

CESSNA 150L, serial number 15075078, registered LZ-ASF, manufactured in 1974 by CESSNA AIRCRAFT COMPANY- USA, possesses Registration Certificate No1994, issued by CAA on 01.06.2005 and Certificate of Airworthiness No 1994, issued by CAA on 25.07.2005 and valid till 25.07.2006.

The aircraft has accrued since new till 17.04.2006 6420:42 hrs. The airframe was on-condition maintained according an Aircraft CESSNA 150L Maintenance Program of Air Scorpio, approved by CAA on 12.08.2005. On 19.09.2005 an 200-hrs check was certified at a total flying time of 6341 hrs. The check was performed at General Aviation Service-Smederevo”, Serbia. On 07.03.2006 a 50-hrs check was certified at the same workshop at a total flying time of 6394:24hrs and a Certificate of Release to Service was issued. At the moment of occurrence there were 20:18 flying hours before the next workshop check.

The aircraft is powered with a Continental O-200A engine, serial No 213425-71A, installed on the aircraft on 04.01.1974 (since the beginning of aircraft operation). The engine has time between overhauls of 1800 hrs. The engine has accrued since new 6420:42. The last engine overhaul was certified on 08.05.1984 at 5388 hrs flying hours since new. There is an annual check on 19.05.2005 at 953 hrs after the overhaul; a 50-hrs check is certified on 07.03.2006 at 1006 hrs after the overhaul. The time between overhauls was 767:18 hrs left at the moment of occurrence.

A propeller MCM 6948, Type 69, manufacturer McCaulley with serial on the hub G 11892 was installed on the aircraft. The last repair of the propeller was performed on 20.07.2005. Time between overhauls of the propeller is 1800 hrs. The propeller has a 50-hrs check certified at 98 hrs flying time after the repair. The time between overhauls was 1675:18 hrs left at the moment of occurrence.

From the abovementioned, the conclusion might be done that the airframe, engine and propeller of the C 150L aircraft, reg. No LZ-ASF had the necessary lifetime for flight mission on 18.04.2006.

Aircraft line maintenance is conducted by the air operator. For the three flight missions planned and performed on 17.04.2006 two aircraft technical log sheets were completed with numbers 00547 and 00548 respectively. The first was for flight No SCU 601, the second was for flight No SCU 604 and for the flight No SCU 606 there was no aircraft technical log sheet completed. On the last eight sheets of the aircraft technical log there were no signatures to certify the person who performed aircraft preflight check.

On the base of aforementioned, the conclusion might be done there was no document to certify the preparation for the flight, during which the occurrence was realized.

The aircraft technical log sheets were signed by a pilot’s acceptance of the aircraft.

1.6.2. Aircraft performance

According the Weight and Centre of Gravity Data Circular Bulletin, certified on 25.05.2005&

- Maximum take-off weight 726 kg;
- Maximum landing weight 726 kg;
- Aircraft empty weight.

With standard pilot weight and unusable remaining fuel at the moment of occurrence emerging aircraft weight was 567 kg.

The aircraft is equipped with two standard fuel tanks of 13 US gallons or total 26 US gallons (98.4 litres), unusable fuel in the tanks is 1.75 US gallons each or total 3.5 US gallons (13.25 l). Maximum usable fuel on board is 22.5 US gallons (85.15 litres).

- Maximum speed at sea level 122 mph;
- Cruising speed at 7000 ft 117 mph;
- Stalling speed with retracted flaps 55 mph
- Stalling speed with extended flaps 48 mph
- Landing run 445 ft.

1.6.3. Fuel

There was a total of 30 liters aviation gasoline type 100LL before the flight SCU 604 according the aircraft technical log sheet No 00548. For the flight SCU 606 an aircraft technical log sheet wasn't completed and therefore the fuel in the aircraft was the quantity left after the flight SCU 604 and part of it there was a total of 13.24 liters unusable remaining fuel. On Figure 2 in Enclosure 1 the fuel gauge indications are shown for the fuel quantity in fuel tanks. The reading of the right-hand indicator is on unusable fuel position and the left-hand indicator pointer is a little bit to the left (to positive values) from the unusable remaining fuel position.

Fuel samples were examined at Fuel and Lubricant Chemical Laboratory at Sofia Airport, taken from:

- the aircraft from the place of occurrence;
- from the aircraft in hangar on the day after occurrence;
- from the tanker truck of the air operator.

All three samples were inadequate with ASTM 910-2004 standard for the indicator “presence of mechanical impurities”. There were such impurities in all three samples, while the standard did not permit such presence at all. The report of laboratory examination is enclosed to the investigation materials.

The air operator provided to the commission a report for laboratory examination of the fuel lot made in a laboratory of Bourgas University named after Professor Assen Zlatarov. Absence of mechanical impurities and water was noted in the report.

A check was performed of the aircraft fuel system filter. A considerable contamination was established, but it could not lead to filtering element clogging and cessation of fuel access to the engine. On Figure 3 in Enclosure 1 a photo is shown, where filter contamination is visible. In accordance with the Maintenance Program the filter condition should be checked after every 50 flight hours.

On the base of abovementioned the presence of mechanical impurities on the inner surfaces of the tanker truck may be stated as a probable cause for mechanical impurities presence in the fuel.

1.7. Meteorological information

Weather situation at 07:00 UTC for Gorna Oryakhovitsa Airport area: cyclonic baric field, warm sector of multi-centre depression. At high altitude – area transfer. Warm and slightly non-stable air mass.

Prognosis for the period from 09 till 15 UTC: wind 5-8 m/s from 180°, visibility more than 5 km, no cloudiness with expected cloud base less than 330 m; phenomenon – short-time local rains; temperature between 19...22°C; QNH = 1008 hPa; warnings – mountain tops covered. Conditions for development of singular TCU/CB.

1.8. Aids to navigation

Standard aids for Cessna 150L.

1.9. Communications

Standard communication equipment for 150L aircraft.

1.10. Airport

The aviation occurrence emerged in Gorna Oryakhovitsa Airport area.

Airport coordinates are N 43°09'07" and E 025°42'45". Elevation 87 m. RWY 28 is 2450 m long and 45 m wide.

1.11. Flight data recorders

N/A

1.12. Wreckage and impact information

There was no impact and destruction of the aircraft.

1.13. Medical and pathological information

N/A

1.14. Fire

No fire emerged.

During the inspection of the aircraft, it was established that aircraft board extinguisher was with expired date of check (09.02.2006). The aircraft extinguisher is shown on the Figure 4 in Enclosure 1.

1.15. Survival aspects

After the examination and analysis done by the commission, the following main survival aspects may be pointed out:

- timely registration of the complicated flight conditions by the commander, caused by engine flameout;
- timely commander's decision for emergency landing;
- happy choice of landing site for emergency landing;
- elaborating of emergency landing procedure during preflight preparation;
- use of safety belts in flight.

1.16. Tests and research

For the purposes of technical investigation the following was accomplished:

- inspection of the site of the emergency landing and aircraft and engine condition;
- examination of the functioning of the fuel quantity in the tanks indicator system;
- laboratory examination for assessment of the oil compliance with the specification requirements;
- examination for adequacy assessment of fuel flow through the fuel hose end unit and fuel truck flow-meter readings;
- examination of the records in operational documentation of the aircraft;
- inspection of the documents about the preflight preparation of the trainee pilot for the flight;
- examination of the operational documentation of the air operator.

Materials and results of the tests and research are enclosed to the deed.

2. Analysis

According the explanation of the trainee pilot, acting as aircraft commander, the forced landing was caused by engine failure. The engine failure in flight might be caused by:

- rotor jamming;
- ignition system failure;
- insufficient fuel flow for engine operation.

The preliminary examination of the place of occurrence by Air Operator representatives and later by CAA representatives showed insufficient quantity of fuel in aircraft tanks. After check of rotor rotation and refuelling with fuel by Jerry can, the engine was started without problems. A full check was performed and it normal operation was established. As a reason for engine failure a fuel expenditure of fuel tanks was established, except unusable reminder of fuel, which was 13.24 litres for this aircraft (6.62 litres in each tank).

This result was due to errors committed in:

- pre-flight preparation of the crew;
- aircraft servicing;
- flight execution;
- design philosophy of fuel quantity in aircraft tanks indication system.

The document, completed by trainee pilot for pre-flight preparation did not permit to understand the missions during oncoming flights. There were no so-ever calculation of the necessary fuel.

Line technical servicing of the aircraft, as on the date of occurrence was done by the pilot what should be certified by a signature in aircraft technical log. In 11 aircraft technical log sheets there was a signature in the column "Pre-flight check done by" in two of them only and without the licence number written in it. According the "Aircraft C 150 Maintenance Program of Air Scorpio the volume of aircraft line servicing is different before the first flight for the day, between the flights and after the last flight. This difference wan not reflected in the flight log.

As it was noted in Para.1.61 for the planned three flight missions with the trainee pilot, who made the forced landing on 17.04.2006, only two aircraft technical log sheets were completed, with numbers 00547 & 00548 respectively. The first was for flight No SCU 601, the second for flight No SCU 604 and for flight No SCU 606 there was no technical log sheet completed. In technical log sheet No 00547 there is a refueling of 50 liters registered and total fuel quantity on board of 80 liters. From service personal explanations it was cleared up, that the refueling was performed on 11.04.2006. Two flights of total flight time of 2:14 hrs were fulfilled by two different trainees of the instructor with the same technical log sheet and registered refueling. In technical log sheet No 00548 a refueling with 30 liters was registered and total fuel quantity of 30 liters. From service personal explanations it was clarified that before this flight there was no refueling. Again two missions were fulfilled and each mission consisted of five solo circle flights of trainee pilot. 13.24 liters of stated 30 liters were unusable remainder. The usable fuel was 16.76 liters.

A test for assessment of normal functioning of the tank truck flow-meter was performed and the volume of 8 liters drawn off was measured. No deviation was established.

The maximum duration of the flight at 7000 ft with cruising speed and 22.5 US gallons is 4.1 hrs according the Aircraft Operation Manual. It corresponds to average hour fuel consumption of 20.8 liters. The time of the ten circling flights and written into the technical log on the base of engine service timer was 1 hrs. It should be taken into consideration that at such flight profile the expected hour fuel consumption should be bigger than the above mentioned for cruising speed at 7000 ft.

The stated above permits to make the conclusion, that before the start of the flight the crew should be known and especially the instructor that the fuel available is insufficient.

It should also be taken into consideration, that the fuel available in the tanks was assessed from the fuel indicators readings. The scale of these indicators is uneven, what make difficulties in reading and watching the fuel remaining. There is no marking for emergency fuel reserve.

The above mentioned facts led to a situation when both the trainee pilot and the instructor, who was in charge for the flight, to permit the aircraft to start missions with insufficient fuel reserve and during the flight the trainee pilot could not make a right assessment of the fuel available and to cease circling flights.

Pilot actions after engine self-stoppage were timely and adequate to the suddenly emerged complication in flight conditions and fast developing situation, which menaced the flight safety; they led to successful forced landing without any consequences for the crew and aircraft.

After establishing engine stoppage the pilot checked magneto functioning, what was in contradiction with the engine stoppage procedure and might lead to engine stoppage, too.

It was established during investigation that after the aircraft inspection on the place of occurrence by Air Operator representative and CAA representatives the aircraft took-off from the place of forced landing, flown by the chief instructor of air operator. No measures were registered in the technical logbook, which were taken in order to assess aircraft condition after the forced landing

performed. In the technical log sheet No 00549 there was no signature for aircraft pre-flight check.

There is no concreteness about the range of inspections and audits, schedule for their implementation and personnel in charge for it in the developed in Chapter 3 “Quality Control System” of Flight Operation Manual of the Air Operator. The specificity of quality control of the activities in initial pilot training, which is the main activity of the operator, is not reflected. This create a precondition for omissions in flight organisation and conducting.

3. Conclusions

The technical investigation conducted, the results of examination and analysis give the grounds for the commission to make the conclusion, that the air occurrence was a result from the following

MAIN CAUSE:

Non-performed computation by the crew (trainee pilot and instructor) of the fuel quantity, necessary for the flight planned and wrong assessment of the fuel available onboard of the aircraft, what led to an omission to refuel the aircraft with the necessary quantity of fuel for flight execution.

IMMEDIATE CAUSE:

Engine stoppage in flight because of expenditure of all fuel available

During the investigation the following irregularities were also disclosed:

1. Violated quality control system of the aircraft flight preparation quality.
2. Presence of mechanical impurities in the fuel for aircraft refueling.
3. Failure to perform the next aircraft preparation for the flight.
4. Lack of perspicuity in the system for trainee’s preflight preparation reporting.
5. Non-registration of the works done in the technical log-book
6. Lack of marking for emergency fuel on the fuel tank quantity indicators.
7. Inaccurate fulfillment of procedure for engine stoppage in flight.
8. Flying crew lack of habits in control and determination of the necessary fuel quantity.

SAFETY RECOMMENDATIONS:

During the investigation the following immediate safety measures were recommended to the CAA by a letter reg. No 10-01-56/20.04.2006:

1. To check of proper functioning of the fuel meters of this aircraft type;
2. To make a calibration of fuel meters of this aircraft type and to mark in red color the minimum fuel remaining.

Having in mind the results of the investigation performed the commission recommended also the following safety measures:

1. CAA to inspect the functioning of the quality control system of Air Scorpio Air Operator and to take measures for it compliance with the requirements of JAR-OPS 1.035
 - Time – two months from the date of giving in of the report.
2. Air Scorpio Air Operator to conduct one-time inspection of inner surfaces of tank track, which is used for refueling at Gorna Oryakhovitsa Airport.

- Time – two months from the date of giving in of the report.
3. Air Scorpio Air Operator to conduct one-time inspection of inner surfaces of all extinguishers condition, which are installed onboard of aircraft operated by it.
 - Time – one month from the date of giving in of the report.
 4. Air Scorpio Air Operator to install a label in the cockpit of operated C 150L aircraft close to fuel quantity indicators with the following content: “Attention: Unusable fuel quantity 13.2 liters. Fuel reserve for the last phase of flight 15 liters”.
 - Time – one month from the date of giving in of the report.
 5. Air Scorpio Air Operator to include a paragraph about the quality control of preflight preparation of trainee pilots in it’s Quality Control Program.
 - Time – one month from the date of giving in of the report.
 6. Air Scorpio Air Operator to conduct lessons with the trainee pilots and instructor staff, in which to review their duties ensuing from the requirements of Article 40, Article 41 and Article 145 of Regulation No 6/14.06.2001 of the Ministry of Transport and Communications about aircraft operation.
 - Time – one month from the date of giving in of the report.

CHAIRMAN OF THE COMMISSION: (signed illegible) (**S. Petrov**)

- COMMISSION MEMBERS:**
1. (signed illegible) (**A. Kostov**)
 2. signed illegible) (**H. Hristov**)
 3. (signed illegible) (**T. Vassilev**)
 4. (signed illegible) (**Y. Petrov**)

Coordinated with:

..... (Daniela Nikiforova)
Deputy Minister of Transport