AIR ACCIDENTS INVESTIGATION INSTITUTE

of the Czech Republic

Ref. No. CZ-10-534

FINAL REPORT

Investigation into the air accident of aircraft type Z-126, registration mark OK-JGL, at LKMO aerodrome on 20th October 2010

Prague
March 2011

Abbreviations used

ACR	Acrobatic rating
AFIS	Aerodrome flight information service
AGL	Above ground level
AK	Aeroclub
AMSL	Above mean sea level
ATPL	Airline Transport Pilot Licence
BKN	Broken
CPL (A)	Commercial Pilots License
CU	Cumulus
E	East
FI (A)	Flight Instructor
FO	First Officer
GO	Overhaul
GPIAA	Gabinete de Prevenção e Investigação de Acidentes com Aeronaves
IZS	Integrated rescue system
JAR-FCL	JAR on Flight Crew Licensing
LKMO	Aerodrome Most
MTOM	Maximum Take-Off Mass
MEP	Multi Engine Piston
NIL	Nothing, no information
PAR	Parachute licensing
QNH	Altimeter sub-scale setting to obtain elevation when on the ground
RZS	Rapid health service
RWY	Runway
SC	Stratocumulus
SEP	Single engine piston
SET	Single engine turbine
SYNOP	Report of surface weather observation from a land station (in meteorological code)
TOW	Glider Licensing
TCU	Towering cumulus
UTC	Coordinated Universal Time
ÚCL	Civil aviation authority
ÚSL ÚVN	Medical Jurisprudence Office Central Military Hospital
AAII	Air Accident Investigation Institute of the Czech Republic
PIC	Pilot-in-command
VLP	Chief of air operations
VN	High voltage

Units

°C	Temperature in degrees C
h	Hour
kPa	Kilopascal
kg	Kilogram
km	Kilometre
kt	Knot (airspeed unit – 1.852 $km.h^{-1}$)
$km.h^{-1}$,	Airspeed unit
min	Minute
m	Metre
sec	Second

A) Introduction

Operator:	Aero Club Most
Manufacturer and aircraft model:	Moravan Otrokovice n.p., Zlin aircraft, type Z 126
Registration mark	OK-JGL
Site	LKMO (Aero Club aerodrome)
Date and time	20th October, 2010, 10:35 UTC (all times are UTC)

B) Synopsis

On 20th October 2010, AAII was notified of an air accident involving a Z 126 aircraft. The plane crashed when in the climbing phase, following a touch and go landing, its shutdown engine it fell down. The crew of the crashed plane consisted of a PIC (further referred to as pilot) and a foreign pilot (further referred to as "another person"). As the plane hit the ground it was destroyed and the pilot along with another person suffered fatal injuries.

A witness reported the accident to the Police of the Czech Republic. AAII commission arrived at the accident site on the same day.

The AAII commission set up to look into the accident cause was made up of:

Chairman of commission:	Ing. Lubomír Stříhavka
Members of commission:	Ing. Stanislav Suchý
	MUDr. Václav Horák, ÚSL ÚVN Praha

The final report was issued by:

Air Accident Investigation Institute
Beranových 130
199 01 Praha 99
Czech Republic

On 7th March 2011

C) The report includes the following main parts:

1) Factual information
2) Analysis
3) Conclusions
4) Safety recommendation

1 Factual information

1.1 History of the flight

The flight history has been established a witness´s statement and information provided by people working at the LKMO airport.

1.1.1 Circumstances preceding the critical flight

Both the pilot and another person were rated. The pilot, who acted as an instructor, had been retraining another person for a PAC 750 XL turboprop, registration mark OK-SKV. On October 20, 2010 they made two flights totalling 55 minutes. According to the aircraft operator, the training took place outside ATZ LKMO airport with the exception of takeoff and landing.

In the morning before the critical flight, pilots of Most Aero Club made training flights on a Z 126 aircraft reg. mark OK-JGL to refine their performance. These flights were not recorded in the logbook; the total flight time on October 20, 2010 was entered into the airplane book. A total of 11 flights were made, lasting 1 h 01 min. The aircraft showed no malfunctions after these flights, according to what previous crews reported to the deputy chief of air operations.

The flights had been finished with regard to actual weather and approaching showers. After landing, the PAC 750XL aircraft was fuelled and put into a hangar. The Z 126 aircraft still stood in front of the hangar. The deputy chief of air operations said that the pilot had asked him at about 9:30 to be allowed to fly Z 126 with another person on board. The deputy chief of air operations met the pilot´s demand, the pilot being a member of the Most Aero Club and properly rated. Then the pilot took over the plane.

1.1.2 Critical flight

According to the deputy chief of air operations, who was the only witness, the pilot took off from RWY 20 at about 10:00. The witness was behind the hangar building. He said he could not see the plane direct from his position however, he did hear the plane´s engine. Most probably, the plane was flying in the circuit and he heard it land and continue taking off. Then he heard a sound of impact and the engine running irregularly. Shortly after that the engine began to run normally.

Then the witness heard a second hollow bang coming from the end of RWY 20. He immediately got into his car and went to the end of RWY 20 where he saw the wreckage of Z 126 aircraft. Then the witness reported this air accident to the integrated rescue system through emergency call.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others (inhabitants, etc)
Fatal	1	1	0
Serious	0	0	0
Light/no injury	0/0	0/0	0

1.3 Damage to aircraft

The aircraft was destroyed by forces due to impact onto the ground.

Position A/C after crash

1.4 Other damage

There was no other damage on the crash site.

1.5 Personnel information

Pilot - personal data:

- man aged 38 years,
- holder of ATPL,
- valid type ratings A320/IR, PAC 750XL, SEP (land),
- MEP (land) rating was valid till August 31, 2010 and it was not prolonged,
- valid ratings FI(AS), ACR, TOW, PAR,
- valid medical 1st class.

Flight experience:

- the pilot had practice as FO on A320. In addition to that, he recently had flown other airplane types (Cessna 172, Z 126, Z 226, Z 142, Z 43, L 200, and PAC 750XL). On March 25, he passed a test to prolong his FI(A) rating on Z 142 type.

In the pilot´s log book, his flying practice was recorded continually till June 7, 2010. From this date on there was no record in the log book. It follows from the data provided by various aircraft operators, for which he recently flew, the following total flight time up to October 20, 2010:

- Total on all types 4,926 h 18 min
- In the last 90 days 196 h 19 min
- In the last 24 h 55 min

Recent experience:

- out of the total flight hours in the last 90 days (from 23 July), the decisive part was as FO on A320s.

- in 2010 he made 11 flights on Z 126 (always on OK-JGL) as follows:
  - on April 18, 7 flights - 1 h 39 min
  - on April 24, 2 flights - 20 min
  - on May 22, 1 flight - 13 min
  - on August 15, 1 flight - 5 min

It follows from the flight time experience recorded that in the last 90 days he made one circuit flight as FI(A) on Z 126. In addition, he made two flights on Z 43 as a flying pilot totalling 19 min.
From May 22, to October 20, he made 61 flights, flying 32 h 20 min of which 18 h 40 min as instructor.

“Another person” on board-personal data:

- man aged 25 years, foreign citizen,
- holder of CPL(A),
- valid ratings IR(ME), MEP(land), SEP(land), FI(A),
- valid medical 2nd class.

Flight experience:

It follows from information from Portuguese GPIAA, based on flying log books, that as of January 24, 2010 he had flown 533 h 20 min, with 985 takeoffs. Flight hours from January 24, 2010 to January18, 2010 could not be found.
It followed from the log books that at the turn of the years 2009/2010 he flew mainly Cessna 182 and Piper Cub J3C types.

He arrived at the LKMO aerodrome on October 16, 2010 and was accommodated there. On October 18, 2010 he began a retraining course on PAC 750XL. As of October 20, 2010 he had flown 8 h 45 min on this airplane type, the operator said.

In the morning before the air accident he made two flights on PAC 750XL, totalling 55 min. He was interested in the Z 126 as soon as he arrived at the LKMO aerodrome. When he learned that his instructor also flew this plane, he asked him for a common flight.

Both pilots communicated in English.

1.6 Aircraft information

General:

- the Z 126 is a single-engine, low-wing, tandem-seat monoplane with fixed undercarriage and tail wheel. It is designed for basic training and aerial work. The airplane is controllable from both the front and aft seats. If both of the seats are occupied, the flying pilot always takes the front seat. Board instruments to control flight, basic navigational aids and engine controls are analogue type.

Type:	Z 126
Registration mark:	OK-JGL
Manufacturer:	Moravan Otrokovice n.p., Czech Republic
Year of manufacture:	1955
Serial number (s/n):	801

Airworthiness certificate: valid
Total flight time: 4,436 h 40 min
Total flight time since
the last annual inspection: 18 h 37 min
Total flight time since
the last overhaul: 836 h 40 min
Damage insurance policy: valid

Engine – type/serial number: Walter Motor 4III, s/n 24327
Manufacturer: Motorlet Praha, Czech Republic
Total flight time: 1,286 h 40 min
Total flight time since
the last overhaul: 836 h 40 min
Propeller: wooden, two-blade, fix-pitched

Aircraft operation:

- the last one hundred/annual aircraft inspection took place on July 14, 2010. On that date the engine accumulated 50 hours and its oil charge was changed. Over the last 30 days of aircraft operation no failures were reported to the operator.

The plane was filled full tanks with aviation gasoline AVGAS 100LL on October 18, 2010. After the flights made before the critical flight the fuel was not replenished. At the takeoff, the total amount of fuel in tanks was about 55 liters. The calculated takeoff mass including the pilots was 750 kg. The MTOM for Z 126 aircraft s/n 801 was set at 765 kg.

History of aircraft operation:

- it was found out from the engine operation record that the plane had been damaged during an air accident on July 15, 1995. This information was based on the accident report Ref. No. 18/95 by Aero Club of the Czech Republic - on October 19, 1995y. the repair of the damaged plane was completed and its airworthiness renewed. Since then the plane had flown 754 h 56 min.

1.6.2 Engine technical inspection

After the accident the AAII commission checked the engine to find out its technical condition and determine a possible reason why its power had dropped or why the engine had conked out during takeoff.

The oil tank was deformed and pierced, with some oil left. The filling and oil check cover of the oil tank was closed and secured. The spar plugs removed, the engine could be turned without much resistance. All tubes and hoses were connected in accordance with documentation for the aircraft s/n 801. After dismantling the tubes, their free passage was verified.

All of the important parts of fuel installation were checked out thoroughly. The parts were operation-worn but fully operational. Fuel tanks were damaged by the crash. Gasoline was leaking from the main, connecting and gravity tanks.

M1 and M2 ignition magnets were checked visually. Both of them were flawless. The spar plugs PAL L22-09 were removed and tested on SPCT 100 device and proved functional.

The mechanical state of the timing mechanism showed flawless. During the crash the ball bearing support boss at the front engine cover was broken out. The engine worked on Total D 100 oil and aviation gasoline AVGAS 100LL.

The propeller hub and propeller were damaged in the crash and the propeller blade was broken off in the root. The propeller hub fastening bolts were integral and properly secured.

1.7 Meteorological situation

Synoptic situation:

- behind a low over Scandinavia, cold and unstable air from north-west began to stream to central Europe.

Actual situation:

- description of the meteorological situation was made out from a report by the Czech Hydro-meteorological Office gave the following assessment of the weather conditions at the accident site:

Ground wind:	250° – 280° / 10 – 15 kts with gusts up to 25 – 30 kts
Altitude wind:	2,000 ft AMSL 260° / 18 kts
Weather:	Cloudy, light rain showers possible or occasional rain, temperature +7 deg C
Meteorological visibility:	more than 10 km
Cloudiness:	BKN SC, CU, TCU, cloud base 2,000 – 3,000 ft AGL
Turbulence:	weak mechanical-thermical

SYNOP dump of October 20, from Tušimice, Ústí nad Labem, Milešovka and Doksany stations:

Tušimice

Time	Total sky cloudiness cover	Wind direction/wind speed	Visibility	Weather/Last hour phenomena	Cloudiness/cloud base	Temperature	Dew point
10:00	6	260° 10 kt	16 km	21 RERA	5 SC 2900	8.2 °C	5.7 °C
11:00	6	270° 10 kt	30 km	60RA	4 SC 3000	8.3° C	4.9 °C

Ústí nad Labem

10:00	7	250° 6 kt	60 km	21 RERA	1 ST 0400, 7 SC 2500	6.2 °C	5.2 °C
11:00	8	270° 10 kt	15 km	80 SHRA	7 CU 2200	7.1 °C	2.9 °C

Milešovka

10:00	7	280 °C 17 kt	45 km		6 SC 0500	3.3 °C	3.3 °C
11:00	7	270 °C 14 kt	45 km	15	6 CU 1600	4 °C	4 °C

Doksany

10:00	6	250° 10 kt	25 km		3 CU 2400, 6 SC 3900	9.9 °C	5.8 °C
11:00	6	240° 14 kt	25 km		2 CU 3100, 6 SC 4000	12 °C	6.2 °C

1.7.1. Description of actual situation at LKMO

According to the witness the situation was as follows:
…wind 240^{o} – 260^{o} / 3 – 6 kt, visibility more than 10km, cloudiness 5 – 6/8, *cloud base cca 900 m above ground, pressure QNH 1005 mb. Temperature +7 ^{o}C."*

He also said that: *"rain showers began to form in the mountain."*
During the accident scene examination the temperature was +3 ^{o}C as recorded by the police of the Czech Republic.

Supposedly, the pilot knew the weather situation from his previous morning flights.

1.8 Aids to navigation

Marking of the unpaved runway at the MOST aerodrome was in accordance with standards for public domestic airports.

1.9 Communications

The AFIS station was not in operation and there is no proof that the crew communicated on the frequency of AFIS controller at LKMO.
LKMO uses frequency 123.5 MHz.

1.10 Aerodrome information

LKMO is a public domestic airport with RWY 02L/20R of 1,130 x 30 m and RWY 02R/20L of 1.130 x 70 m. Runway surface is grass.

Apart from the critical flights there was no traffic or activity at the airport. The airport field surface was solid. The nearest obstacles in RWY 20 clearway were ca 300 m away from the runway end.

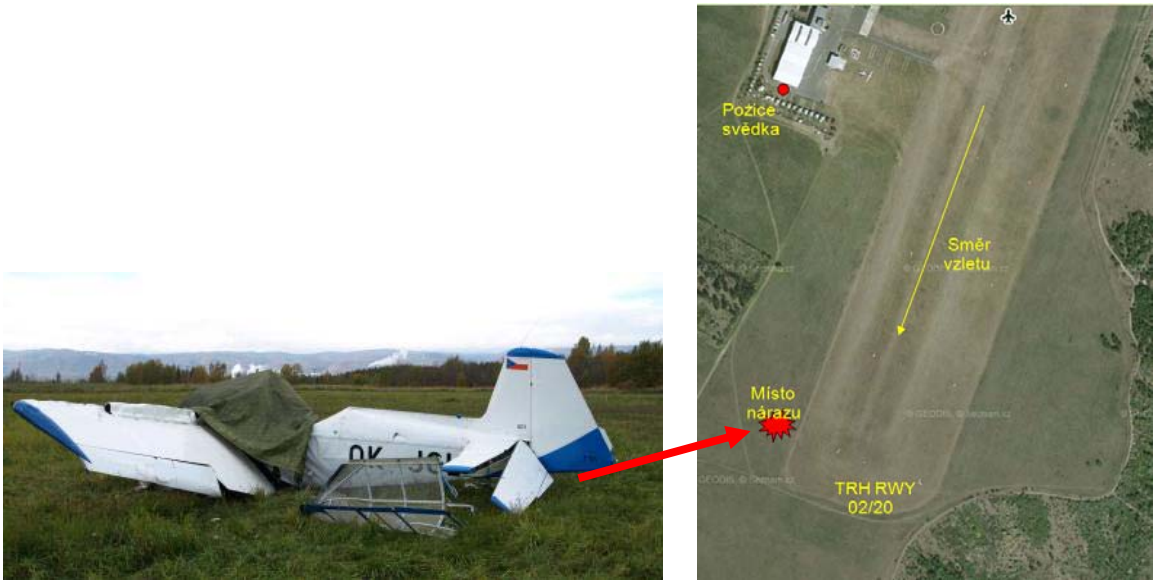
1.11 Flight recorders and recording means

There was no means to record flight data aboard the plane.

1.12 Description of accident site

The site of the accident was on grass at the end of RWY 20R, 98 m to the right of the RWY 02L left threshold mark. The aircraft longitudinal axis / nose directed towards a heading of ca 230 deg. In its forward prolongation at a distance of 8.5 – 11.5 m was a print of the aircraft nose.

In the print there was a broken blade of the propeller. To the left there was an adjacent print of the left wing in which were pieces of white and blue paint. In the vicinity between right wing and tail were fragments of aircraft structure and parts of instrumentation. Behind the left wing lay the canopy in the upside down position.



The accident site

At the impact the engine broke off to the left and along with the engine bed it was torn from its attachment on the fire bulkhead. On the engine was left the second propeller blade on which no rotation traces were found. Oil was leaking from the pierced oil tank. The gravity fuel tank was pierced at bottom. Non-measurable amount of gasoline was left in the tank.

The nose fuselage was deformed by the head impact as far as behind the wing leading edge. The fuselage cloth skin around the cockpit and engine cowlings were torn and deformed by impact. The fuselage framework was deformed as far as the aft seat along with aircraft and engine controls. The fuselage part from aft seat backwards was distorted upwards.

The wing leading edge was flattened spanwise by the head impact as far as the main spar level. The left aileron was deflected 15 deg. down and deformed at 1/3 from trailing edge downwards. The left gasoline tank was pierced and leaking, the fill-up hole was closed and safety secured. The right wing leading edge was deformed by head impact as far as about one fourth from the root. There was gasoline in the right fuel tank, reaching 45 – 50 mm below the filling hole edge. The filling hole was closed and safety secured. The right aileron was deflected 15 degrees upward.

Both of the lift flaps were thrown downwards and forwards. The lift flaps and landing flaps positioning mechanism was set at the position “flaps retracted” as indicated by the relative position of the wheel gear (pinion) and tooth segment. The cardan drive at the fuselage/wing boundary was out of housing. Screws of the drive coupling were sheared. The flaps position indicator in both cabins showed “0” value.

Tail part was integral (unbroken), left stabilizer was diagonally deformed at 1/3 and left elevator was pulled out of hinges. Movement of control surfaces was blocked due to the deformation of control elements in front and central fuselage sections. When checking out the controls, nothing pointed to a state indicating that steering would not work properly before the crash. The levers, strings, cables and rods were secured at their ends properly.

The two crew members got stuck in the wreckage. They were fastened with four-point safety belts. The belts were fastened and buckled. The lever to open the canopy was in the shut position.

The fuel cock control levers in both cabins were in the front position “reserve fuel tank”. The gas lever and the lever of altitude correction in both cabins were in front position “full gas” and “full correction”. The rods to control gas and altitude correction were arch-deformed downwards before the fire bulkhead. The carburettor throttle lever was set at “full gas” and the altitude correction lever was at 2/3 range “lean mixture”.

Longitudinal balance actuator was set at position “aircraft slightly head-heavy”. The board instruments in front cabin read as follows: airspeed indicator 75 – 77 km/h, climbing rate indicator showed extreme value -15 m/s, altimeter 466 m for a pressure set at 998 mb. The board instruments in back cabin read as follows: airspeed indicator 75 – 77 km/h, climbing rate indicator +9 m/s, altimeter 6,960 m for a pressure set at 1,000 mb. The radio station frequency was set at 123.4*xx* MHz.

The main switch in the front cabin was in “off” position, in the back cabin there was no switch. Ignition actuators in both cabins were adjusted at “1+2” position. The positions of six switches on the right desk after the crash were as follows:

- *Switch “Dynamo” – OFF*
- *Switch Landing Flaps Control – ON*
- *Switch Turn Indicator – OFF*
- *Switch Airspeed Tube Heating – OFF*
- *Switch Radio receiver – ON*
- *Switch “Instruments” – ON*

1.13 Medical and pathological Information

During the crash the two crew members suffered fatal injuries. It was found out on inspection that the pilot sat in the front seat and “another person” in the back seat. The death was caused by polytrauma - a combined multi-injury to several organs. The impact brought about head, thorax and abdomen injuries, and injuries to pilot´s legs. No pathological changes were found out in the two crew members. Toxicological blood examination did not reveal ethanol or other forbidden stuff in bodies of either crew members.

The pilot´s bio-chemical somatic-psychic examination showed that before his death he underwent only a light psychic stress which shortly before death (ca 10 – 20 seconds) grew up to a very strong negative emotional state – distress reactions. “Another person” sitting at the back suffered a long higher psychic stress which later on grew into a distress reaction as he perceived the ultimate flight stage as a life endangering threat. It is also possible that before the accident it was he who steered the airplane, as indicates his injured right hand, maybe holding the control stick, and the results of bio-chemical examination.

1.14 Fire

There was no fire following the impact.

1.15 Survival aspects

Search was not organized. A city rescue team, fast health service, and the Police of the Czech Republic arrived at the accident scene.

1.16 Tests and research

1.16.1 Verification of altitude correction effect on engine work

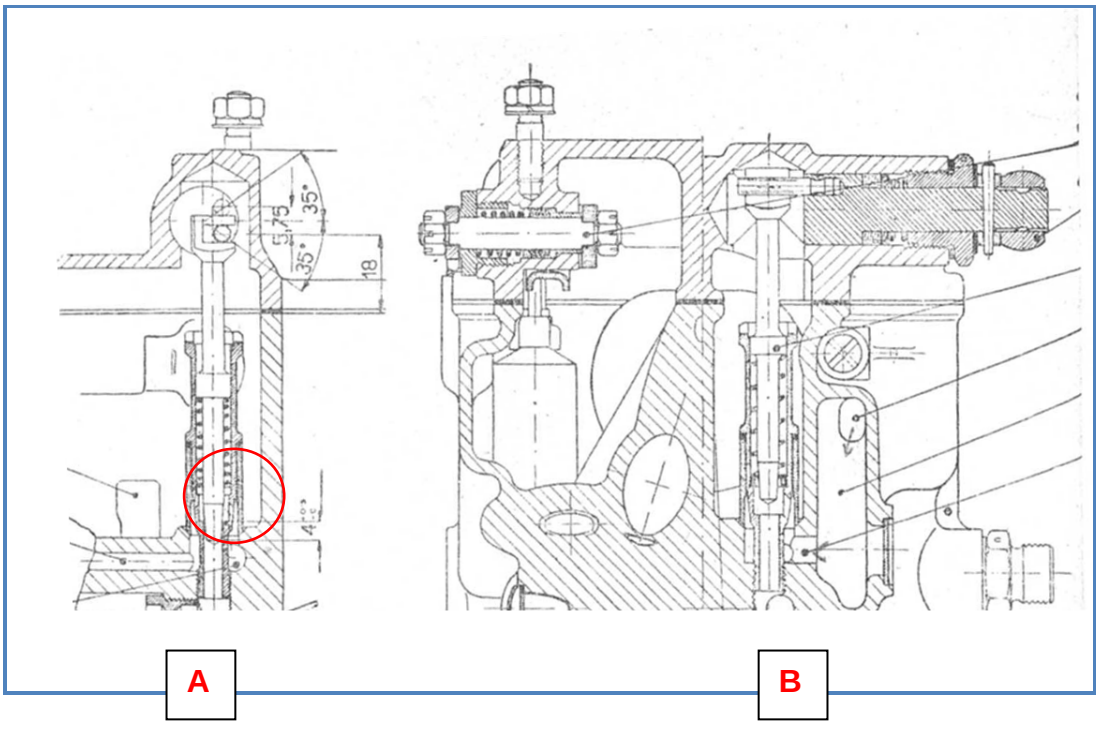
To get more information and verify the altitude correction effect, or to find out the effect of setting altitude correction level to “full correction”, on engine work, a ground experiment was done.

The carburettor type W45 AK4 possesses an altitude correction system. It is used, according to the Walter Minor 4-III engine manual, to make mixture leaner at flights at altitudes of more than 1.500 m.

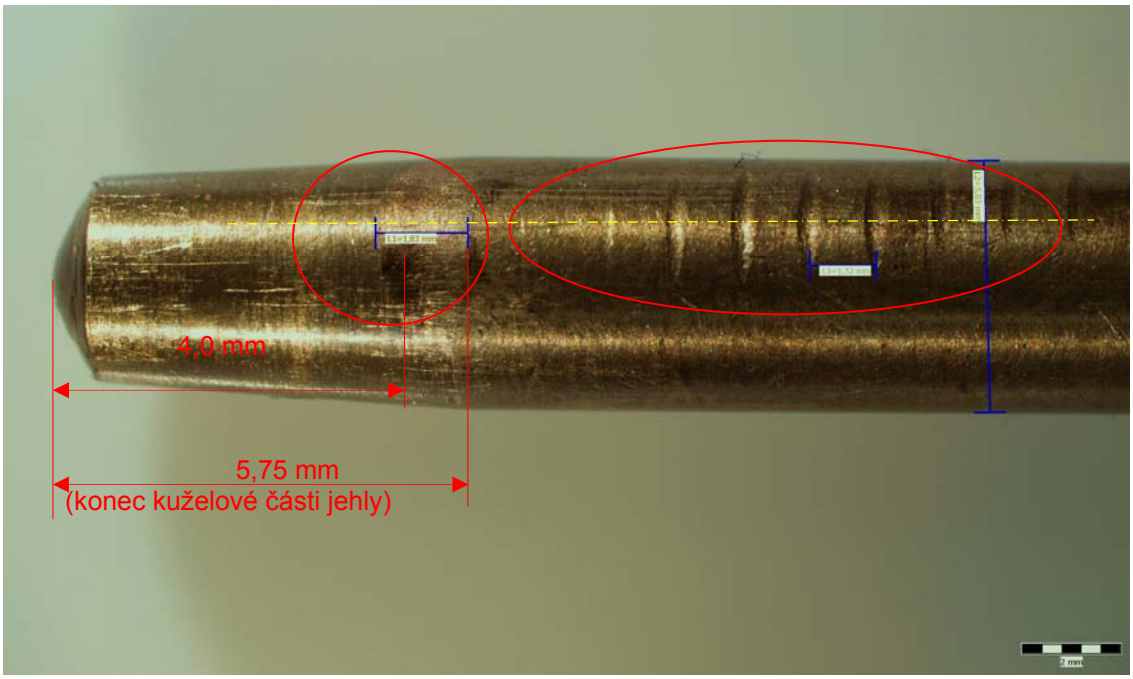
The altitude correction control in the cabin is on the right, just under the gas lever, and is mechanically connected to enable control from both the front and back seats. In moving the lever forward the mixture gets leaner and vice versa. The altitude correction control is linked to the engine via rods and a countershaft. In the carburettor the rotational movement from the levers is transferred to a correction needle via an eccentric gear with a stroke of 5.75 mm.

The correction needle (of brass) is pushed to the saddle 4 mm deep against the force of a steel spring, which reduces the amount of petrol to come to the main carburettor jet.

Judging on a print found on the correction needle it was found out that at a distant of 4.0 mm from the needle end, the needle was impressed on by the correction case. In addition, several prints were discovered on the needle surface coming from the spring coils with pitch 1.32 to 1.40 mm. This dimension corresponds to the spring compression and to the needle position “lean mixture”. The needle prints discovered occupy one row to witness that the resultant of inertial forces due the plane impact on the ground directed almost perpendicularly to the needle axis, which was set to position “lean mixture” during the impact.



Position of correction needle: A/ - full correction – “lean mixture”
B/ - without correction – “rich mixture”



On the correction needle it was found out that at a distant of 4.0 mm from the needle end, the needle was impressed on by the correction case

The ground experiment was done on a Z 126 plane with the same type of engine. The engine was warmed up to the working temperature. After shifting simultaneously the gas lever and the altitude correction level to the front position, the engine transition to higher speed was not accompanied by irregular run. The engine did not reach its maximum speed, the actual speed being about 200 – 300 rpm less. The experiment was repeated several times, always with the same result.

1.16.2 Verification of aircraft fuel system

After determining the end position of the fuel cock following the crash, the function of the aircraft fuel system was tested.
The mechanical state of the following important parts of fuel installation was checked:

- mechanical pump WALTER 2M50,
- fuel assembly LUN 6250,
- carburettor W45 AK4,
- gravity tank.

All of the parts worked properly, their state corresponded to the time they had been in operation. The gravity tank was pierced during the crash.
The LUN 6250 fuel cock was in position “00” after the impact. The “00” position is used for emergency fuel supply, for instance if Walter 2M50 pump fails or if fuel in main tanks has run out. In that case the position of the fuel cock in the cabin indicates “reserve fuel tank” and the cock can be controlled both from the front and back seats. Then the fuel flows to the carburettor from the gravity tank through a filter.

In case the fuel cock is set to “00” position (fuel reserve tank), Walter 2M50 pump works and there is enough fuel in right, left and connecting tanks, the pump drives petrol to the gravity tank and farther to the carburettor. After reaching a

pressure of about 30 kPa (0.3 kg/cm2) at the pump outlet, the pump restrains its output and delivery to the gravity tank stops until the pressure drops under 30 kPa and the petrol delivery restarts.

During the critical flight, the above conditions were probably met and supposedly the fuel cock switch-over to the position “reserve fuel tank” had no crucial effect on petrol delivery to the carburettor.

1.17 Organizational and management information

Air traffic at the LKMO airport ended before the air accident and during the Z 126 flight there was no other traffic. AFIS station was not active. Z 126 flight was cleared by the deputy chief of air operations.

1.18 Additional information

Witnesses of air accident

Except for the deputy chief of air operations there was no witness of the air accident. The witness did not see directly how the accident happened because from the place he stood and heard the engine and other noise there is no direct view of the crash site. The witness possesses air qualifications and he himself flew Z 126 plane with registration mark OK-JGL.

1.19. Useful or effective investigation techniques

The accident has been investigated according to L 13 National Regulation (Investigation into Air Accidents and Incidents of the Czech Republic) as per recommendation of ICAO - Annex 13.

2 Analyses

2.1 Ground impact

Judging from the aircraft damage due to inertial forces on hitting the ground, traces on the wreckage surface, deformation of nose fuselage, wing leading edges and propeller, it was found out that the plane crashed on the ground almost perpendicularly at an angle of 80 – 90 degrees. Most probably, the engine did not work the moment it hit the ground. Due to the fuselage structure elasticity and reaction forces the plane bounced a few meters back and ended on belly. Having evaluated the impact nature, it is very likely that the plane dropped at a very low speed and had begun to spin.

2.2 Effect of pilot´s experience on critical situation

The pilot´s main experience was his practice in commercial air traffic. Records from his employer´s exams show he was very good at handling emergencies too. He was further experienced as a pilot and instructor on the PAC 750XL aircraft and aircraft types of SEP land class, to which also belongs Z 126.

Over the last 90 days, the pilot flew Z 126 type for five minutes as instructor on August 15, 2010. He operated his last flight on Z 126 as pilot on April 18, 2010 (flight to space lasting 19 min). Over the last 90 days he operated two flights as a pilot on Z 43 type.

2.3 Probable causes of fall during takeoff

The fall could have happened due to the following causes:

a/ loss of engine power during climb after takeoff,
b/ sudden loss of speed,
c/ change in aircraft aerodynamic characteristics,
d/ control failure,
e/ human factor.

2.3.1 Loss of engine power

The loss of engine power or engine irregular run during takeoff could have happened due to a wrong fuel mixture (rich/lean), ignition failure, or a mechanical defect. According to the witness who heard the bang and subsequent short irregular noise of running engine, it could have been a noise effect “blowing back”, when the mixture burns in the exhaust pipe as the engine power has been increased. It is not an exceptional phenomenon in the Walter Minor 4-III engine where the mixture is prepared in the carburettor. This phenomenon occurs when the gas lever is abruptly moved forwards to increase the engine power. When the optimum mixture ratio is reached, the engine speed stabilizes at selected rpm.

It cannot be determined unambiguously from the position of gas and altitude correction levers whether the levers have been shifted to their forward position. They are placed closely to each other and in moving gas lever forward to increase power for climbing the altitude correction level could have also been moved simultaneously. With regard to the big deformation of the fuselage front part it cannot be excluded that the final position of gas and altitude correction levers was influenced by the ground impact.

The position of the altitude correction needle in the carburettor corresponded to “full correction” as well. It was found out experimentally that the position of altitude correction needle had no effect on engine run at transition to higher output. However, the correction lever could have a negative effect on engine maximum power, reducing aircraft performance in the climbing phase.

The transition to higher engine speed could have also been effected by drop of engine working temperature during descent at touch and go landing. At the takeoff phase as the engine power had to be increased rapidly, the engine could have started running irregularly for a short time. The aircraft was not equipped with a cylinder head thermometer so the engine temperature could only be assessed by the oil temperature on the engine combined meter.

The engine power loss or irregular run could have also been due to carburettor ice blockage. Meteorological conditions during the flight were such that the fuel could ice up in the carburettor. The engine manual states that icing is possible at air temperatures 0 to +5 degrees C and high ambient air humidity. According to the weather records the temperature ranged from +3 to +7 degrees C and dew point from 2.9 to 4.9 degrees C. Due to the weather development and showers (rain and snow)

the air humidity around the airport was high. So ice accretion on the carburettor valve and diffuser may have been formed, leading to irregular running of engine and its conk-out.

Technical inspection of the engine did not prove the engine to conk out due to a mechanical defect or ignition failure. Definite reason why the engine stopped working was not found.

2.3.2 Sudden loss of speed

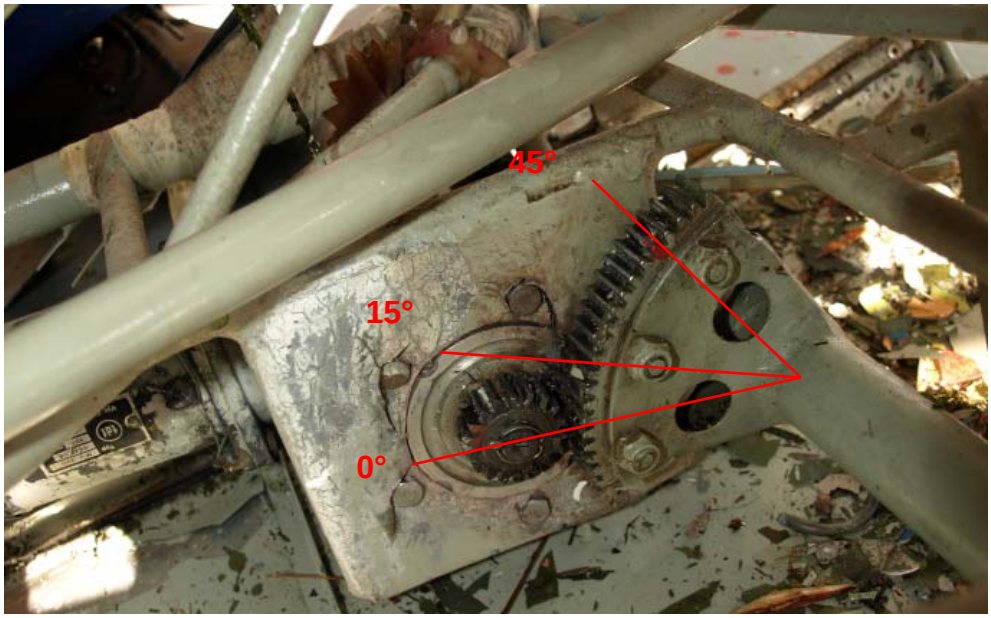
The air accident circumstances point to a sudden and big loss of airspeed. So the aircraft and crew may have found themselves in conditions averse to steering, leading to the crash.

As stated in part 2.3.1, definite reason why the engine stopped working could not be found from the information and evidence available. Immediately after takeoff the pilot probably was unable take effective measures to avoid the loss of speed.

The minimum airspeed of Z 126 with landing flaps is 70 km/h. The front cabin speed indicator showed 75 – 77 km/h. This value is close to the stall speed without flaps, which is 80 km/h, according to "Z 126 Flying Manual". With respect to instantaneous engine power, aircraft mass, and load factor, the sudden drop of engine power could have led to the stall speed being reached.

2.3.3 Change in aircraft's aerodynamic characteristics

It follows from the position of the lift flaps mechanism and from the position of the driving gear (pinion) relative to the tooth segment that the lift flaps were retracted. The electric circuit of the flap mechanism is actuated by pressure on the electric switch dog. The flaps position is then shown in degrees on the dashboard. From the point of view of handling it means that the left hand keeps holding that switch all the time the flaps are being adjusted. Regarding the way the flaps influence aerodynamic characteristics at takeoff, the speed reserve, needed to carry out this manoeuvre safely, diminished. The time to move flaps from position "15^{o}" to position "0°"
is ca 8 – 10 sec. Most likely, the flaps were not extended or were already retracted too soon during taking off.



Tooth segment – flaps adjusting

2.3.4 Control failure

Judging from the control elements state on hitting the ground, the possibility of control failure can be excluded. The pilot was capable and able to steer the plane in a standard way.

2.3.5 Human factor

Based on the evidence available, and taking into account “another person’s” wish to steer the plane, it cannot be excluded that the pilot handed over the plane control to that person. This possible fact is evidenced by conclusion of psychic-somatic examination and injuries of either person.

The way the plane struck the ground indicates that the critical situation due to the engine conk-out had not been mastered. It cannot be excluded that a dangerous speed drop occurred, which the pilot knew too late to avoid. In case the engine conks out at a height of up to 100 m above ground level, emergency procedures recommend that the plane should at once begin to descend and land in direction so-called “ahead of itself”. Nearest obstacles in the straight direction were 300 m away from the runway end. There was enough room for the plane with inactive engine to make emergency landing in this phase of takeoff.

The position, from which the witness heard the noise of an irregularly running engine, determines approximately the position of the aircraft relative to RWY 20 at the time the critical situation occurred. From this it may be concluded that the engine’s power was first reduced in the climbing phase as the plane was at two thirds of RWY 20 length and low above the ground. In time the plane travelled ca 370 m from this position to the impact place, the pilot developed strong negative emotions and maybe distress. The pilot probably failed to react effectively. It is not known whether and to what extent the pilot informed “another person” about how to handle the plane, its flight characteristics and how to communicate between the two persons.

3 Conclusions

3.1 The commission have made the following conclusions:

Crew:

- pilot had valid license and medical;
- “another person” was holder of pilot licenses;
- because of incomplete records in pilot’s log book it could not be established if he had made sufficient number of flights on SEP land class aircraft in the last 90 days to be able to operate a flight with another person on board[1];
- it was neither confirmed nor excluded that pilot handed over control to another person;
- it was not definitely confirmed that the plane was steered by another person, but this possibility seems most likely.

Aircraft:

- had valid airworthiness certificate;
- its MTOM was not exceeded during takeoff;
- engine inspection showed that its conk-out had not been due to mechanical defect, ignition failure or wrong fuel supply;
- considering the fact the engine worked flawlessly in morning flights, there is not enough evidence it stopped running owing to other reasons.

Flight history:

- there is not enough information on the course of the flight, its critical phase having been only described by acoustic sound of one witness;
- the witness heard irregular run of engine in climbing phase;
- although it was proved that altitude correction needle had been set to position “lean mixture”, this setting had probably no effect on engine transition to higher speed, however, the engine might not have reached maximum rpm;
- most likely, lift flaps were not extended at taking off, or they were retracted too soon.
- after engine gave out, the plane in critical phase crashed at small speed, which the pilot could not avoid;
- plane crashed to the ground at a steep angle 80 – 90 degrees.

3.2 Causes

The cause of the air accident could not be determined definitely. The aircraft was probably steered by another person and the pilot did not manage to take effective action following the engine had conked out.

4 Safety recommendation

With regard to air accident circumstances I leave the investigation results without recommendation.