The original of the Final Report was issued in the Slovak language.
In case of inconsistency original version in Slovak language is applicable.

MINISTRY OF TRANSPORT, CONSTRUCTION
AND REGIONAL DEVELOPMENT
OF THE SLOVAK REPUBLIC

AVIATION AND MARITIME INVESTIGATION AUTHORITY
Námestie slobody 6, P.O.BOX 100
810 05 Bratislava 15

F I N A L R E P O R T

on investigation of accident

of helicopter type **Mi-2**

Registration No. **UR-CAEO**

Reg. No.: SKA2015007

The investigation of occurrence has been conducted pursuant to Art. 18 of the Act No. 143/1998 on Civil Aviation (Civil Aviation Act) and on Amendment of Certain Acts and in accordance with the Regulation (EU) No. 996/2010 of the European Parliament and of the Council on investigation and prevention of civil aviation accidents and incidents, governing the investigation of civil aviation accidents and incidents.

The final report is issued in accordance with the Regulation L 13 that is the application of the provisions of ANNEX 13 Aircraft Accident and Incident Investigation to the Convention on International Civil Aviation.

The exclusive aim of investigation is to establish causes of accident, incident and to prevent their occurrence, but not to refer to any fault or liability of persons.

This final report, its individual parts or other documents related to the investigation of occurrence in question have an informative character and can only be used as recommendation for the implementation of measures to prevent occurrence of other accidents and incidents with similar causes.

Used abbreviations

ARK	Automatic radio compass
hPa	hecto Pascal
LPS SR, š.p.	Letové prevádzkové služby, š.p. SR
NDB	Non-directional radio beacon
VFR	Visibility flight rules
UTC	Co-ordinated Universal Time
ZK	Entered course

A. INTRODUCTION

Operator / Owner: Meščerjakov Oleksij Mikolajovič
Type of operation: illegal
Type of helicopter: Mi-2

Registration No: UR-CAEO
Take-off site: unknown location within the territory of Ukraine
Flight phase: landing
Place of accident: Stretavka
Date and time of accident: 11.11.2015, 02:10

Poznámka: All time data in this report are in UTC.

B. INFORMATIVE SUMMARY

On 11.11.2015, at about 02:10, the inhabitants of the commune Stretavka heard the noise of a flying helicopter, which faded out after some time. As the police earlier also registered movement of a helicopter flying to up country of Slovakia near the Ukraine border, they started the search for the machine. The helicopter was found on 13 November 2015 destroyed in the cadastral area of Stretavka. The pilot and all passengers onboard the helicopter were killed in the accident.

The following commission was appointed for investigation of the air accident:

Ing. Juraj GYENES
Ing. Zdeno BIELIK

The report is issued by:

Aviation and Maritime Investigation Authority
of the Ministry of Transport, Construction and Regional Development
of the Slovak Republic.

C. MAIN PART OF REPORT

1. FACTUAL INFORMATION

1.1 History of the flight

The helicopter took off from an unknown site within the territory of Ukrajine at unknown time for the purpose of illegal transport of migrants. It carried the pilot and 7 passengers; one passenger was the owner of helicopter and the other passengers were citizens of Afganistan and Iraq. After the illegal crossing of the state border, the helicopter continued the flight over the territory of the Slovak Republic with intention to land and disembark the illegal migrants.

The flight took place at night. A thick fog hovered over the planned landing site near the commune, which in combination with the dark did not allow the pilot to gain visual contact with the ground necessary for the landing manoeuvre; in spite of this fact, the pilot attempted to land in these unfavourable weather conditions.

The control panel ARK-9 showed the frequency of 317 MHz, which proved that the pilot probably tried to use NDB of the airport Poprad-Tatry in combination with adjustment of ZK on the wide pointer/rail of the course system indicator (*Fig.6*) for the approach to the planned landing site, which was marked in his aeronautical chart 1: 500 000 by a blue circle (*Fig.1*) and which corresponded to the place of accident.

When descending for landing at a forward speed, the left wheel of main landing gear came into contact with the ground, which caused sharp braking on a soft surface and inclination of the helicopter to the left, where it touched the ground with blades of its lift engine. It caused the turnover of the helicopter and its gradual destruction in a 80-90 m long section. In the last phase of movement of wreckage the cockpit was fully devastated and the whole crew was dispersed around the main parts of the broken fuselage of the helicopter. Two bodies were found in the blind arm of river Uh behind the wreckage in the flight direction.

Daytime: night
Flight rules: VFR

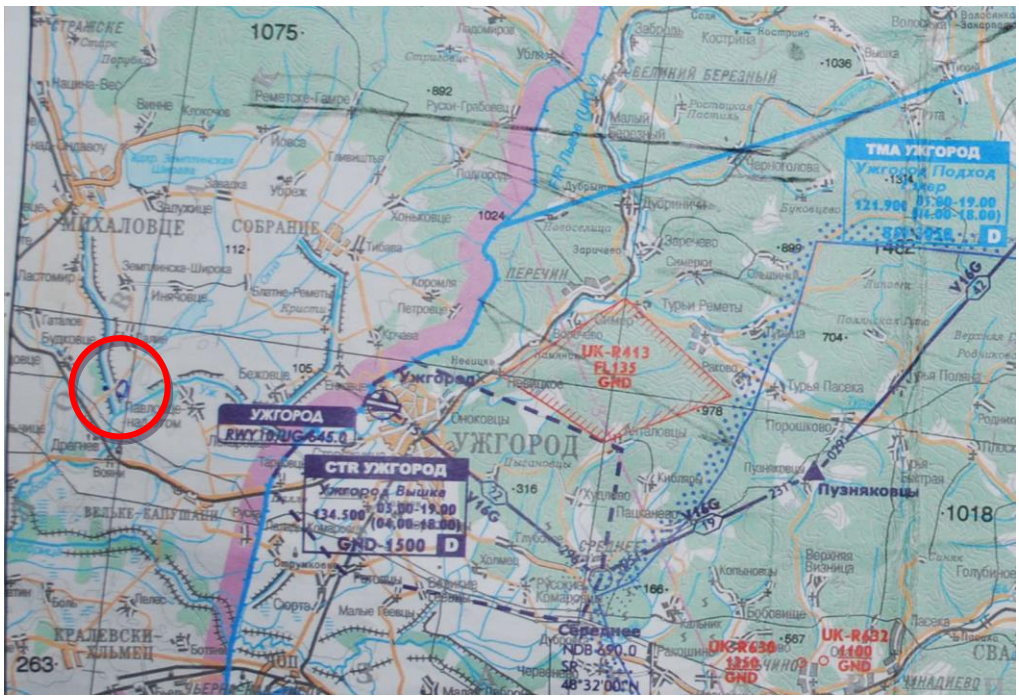

Fig.1 Marked planned landing site

1.2 Injuries to persons

Injury	Crew	Passengers	Other persons
Fatal	1	7	-
Serious	-	-	-
Minor	-	-	-
None	-	-	-

1.3 Damage to helicopter

The helicopter was destroyed in the accident.

Fig.2 Front upper part of the airframe with engines

Fig.3 Rear part of the airframe with the right wheel of main landing gear and secondary fuel tank

1.4 **Other damage**

No circumstances with potential claims for compensation of other damage toward a third party were notified to the Aviation and Maritime Investigation Authority.

1.5 **Personnel information**

Pilot:

A national of Ukraine, aged of 52 years, holder of the commercial pilot licence for helicopters CPL(H) issued by the State Aviation Administration of Ukraine, with marked validity until 16.12.2015.

Medical certificate of 1st class with marked validity until 03.06.2015.

The pilot was not trained for flights with helicopter Mi-2 at night.

1.6 **Information about helicopter**

Type:	Mi-2
Registration No:	UR-CAEO (since 2010), until 2009 UR-14307
Serial number:	546135049
Manufacturer:	PZL Świdnik / Poland
Year of manufacture:	1979
Total operating hours:	not identified
Right-hand engine:	GTD350, plate with serial number removed
Left-hand engine:	GTD350, serial No: 48163222139

The Permit to Fly No. 10259 for the helicopter was issued by the State Aviation Administration of Ukraine on 16 December 2010, with marked validity until 23 November 2011, without possibility to transport passengers, cargo and to perform aerial work. This permit expired on 24.11.2011. No documents permitting its operation were issued after this date.

The certificate of verification of airworthiness was not issued.
Third-party insurance was not concluded.
The helicopter was removed from the aircraft register of Ukraine in July 2013.

The inspection of individual parts of the helicopter wreckage and traces in the ground indicated that the condition of helicopter before the accident and during the flight had not been the cause of the accident. Both engines showed normal performance until the moment of accident.

1.7 Meteorological situation

On 11.11.2015 around 02:10 the sky over the commune Stretavka was cloudy to overcast. Weak variable wind with speed of about 5 km/h was blowing. The air temperature 6.5°C and relative humidity around 95 %. The free ground surface was humid. Last precipitation was recorded on 10 November 2015 in the afternoon in the form of light or drizzling rain. Fog or heavy air dimness occurred in the area. Horizontal visibility was within the range of 0.5 – 2.0 km. We suppose that the fog structure was not homogenous. In view of the type of landscape with varied surface (fields, forests, stretches of water) fog may have occurred in strips or patches. It was an astronomic night, i.e. it was dark, and (new) moon was not visible on the sky at that time.

In higher atmosphere levels north-west air circulation prevailed. At the level of 850 hPa (approximately 1,500 m) the wind speed was about 50 km/h. The air temperature at this level fluctuated around the level of 7.5 °C. The lower level of 925 hPa (approximately 800 m) had temperature about 12°C and south-east wind with speed of 15 km/h.

According to the witnesses who hear the noise of a flying helicopter, heavy fog occurred in the area at the time of the accident.

1.8 Aids to navigation

The pilot used the navigation device **GARMIN aera** of series 500.

Fig.4 Rear panel of navigation device GARMIN

Fig.5 Manual of device GARMIN aera

In the last flight section the pilot probably used also NDB of the airport Poprad-Tatry.

Fig. 6 Combined ARK and course indicator

1.9 Communications

The pilot did not establish communication with LPS SR, š.p. and probably used the manual radio station MIDLAND X-Tra Talk GXT1050 for communication with an unknown person on the ground (*Fig.7*).

Fig.7 Radio station MIDLAND

1.10 Aerodrome information

N/A.

1.11 Flight recorders

The helicopter was not equipped by any flight recorder.

1.12 Wreckage and impact information

The place of accident was determined by the longitude and latitude:

48°36´31.8´´, E 22°00´01.9´´

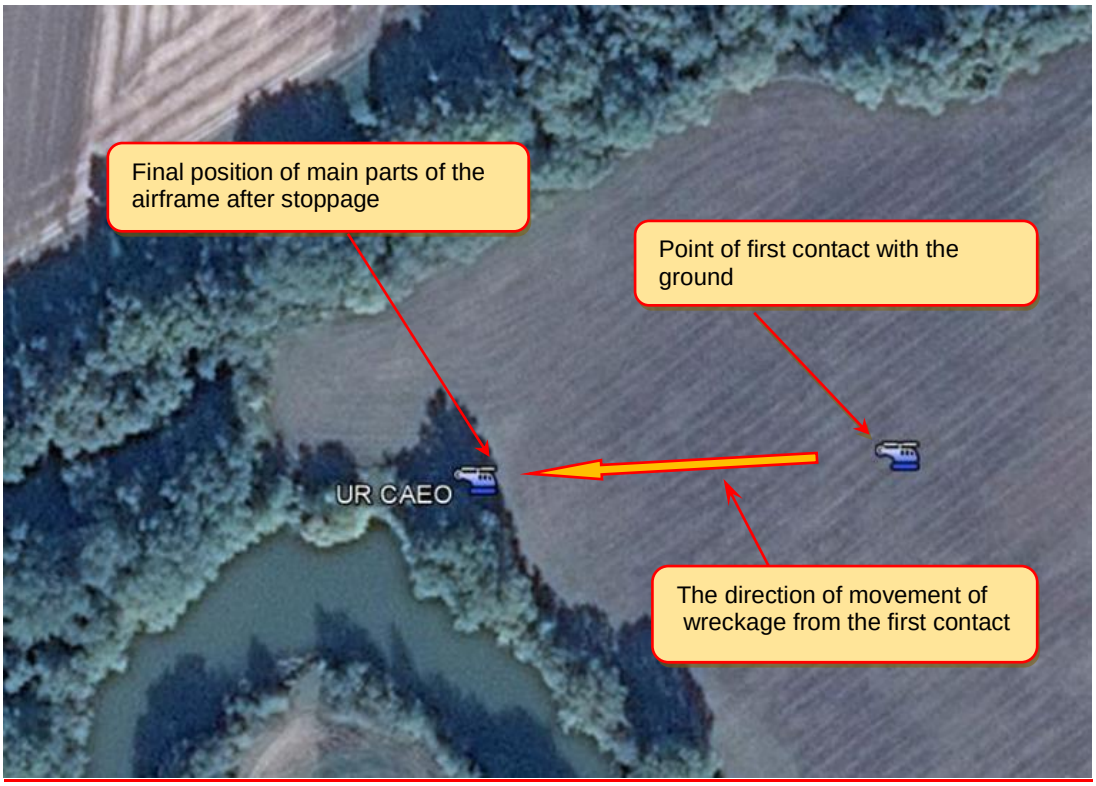

Fig. 8

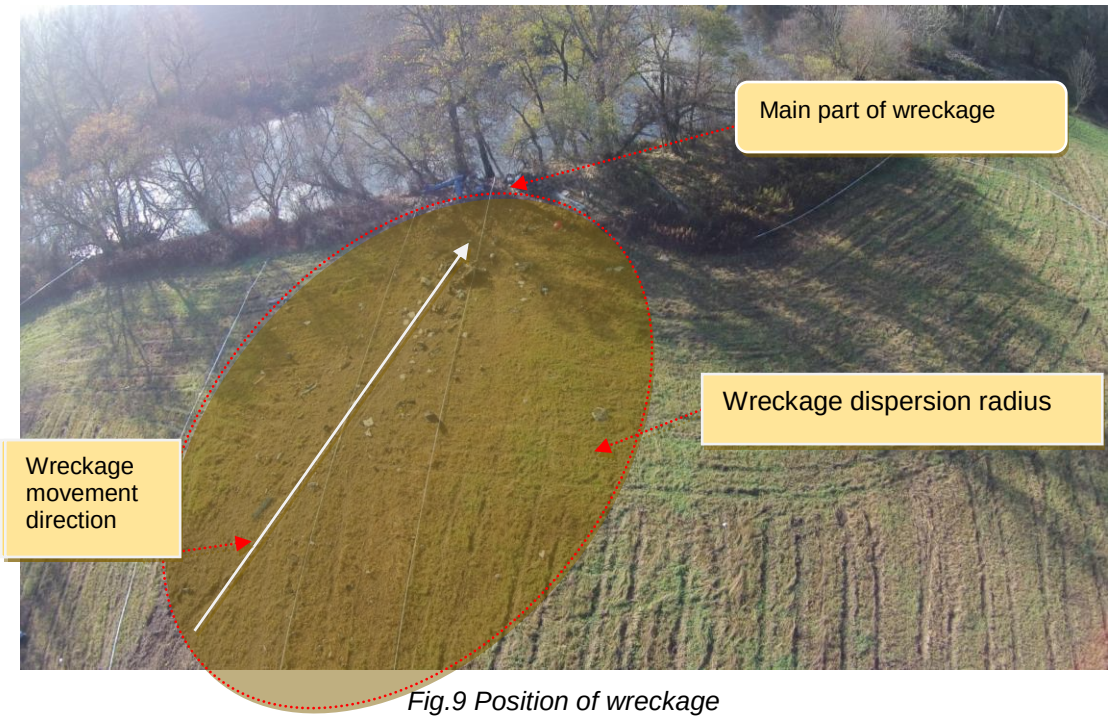

Fig.9 Position of wreckage

1.13 Medical and pathological information

The analysis of biological materials sampled during the autopsy did not detect the presence of ethyl alcohol, commonly used medicines from the categories of painkillers, tranquilizers and sleeping pills (analgesics, ataractics, barbiturates and benzodiazepines), or other psychoactive substances, narcotics and drugs, which could have influence thinking and behaviour of the named at the time of accident or contribute to his death.

All accident-related changes detected during the autopsy of the pilot were in causative relation with the accident and occurred at the heavy impact with the ground.

Neither the external and internal inspection of the corpse, nor additional laboratory tests of biological material sampled during the autopsy detected any acute or chronic pathological changes, which could have negatively influence attention and behaviour of the named pilot at the time of accident, or which would be in causative relation with his death.

Based on the biochemical analysis, the measured values may correspond to a metabolic response of the pilot´s organism in the end of the flight with a short-term mental stress, meaning a negative emotion originating from the recognition of sudden crisis, which developed into an emergency situation, ended by impact of the helicopter with the ground.

From the forensic aspect it was a violent death caused by accident: injury and rupture of several vital organs, fractures of several bones of the skull, torso and extremities, polytrauma suffered by the pilot due to the impact with the ground.

1.14 Fire

No fire broke out.

1.15 Survival aspects

All persons suffered fatal injuries at the impact with the ground.

1.16 Tests and research

- As the main fuel tank was destroyed by the hard contact of the fuselage with the ground and subsequent forward movement of the helicopter (*Fig. 10*) and as the secondary fuel tanks were perforated too, fuel sampling and testing could not be performed. The intensive smell of dispersed fuel on the place of accident indicated that the tanks had contained fuel before the accident.

Fig. 10 Destructioned main fuel tank

- The oil from the main gearbox and both engines was sampled and tested in the laboratory. The analysis of oil from the main gearbox and both engines was performed by the company Spoločnosť pre výrobu, distribúciu a servis mazív, s.r.o. MOL-LUB LABORATÓRIUM WEARCHECK, Hungary.

  From results of the analysis the following conclusions were derived:

  Left-hand engine:
  The oil contains solid particles visible by naked eye. The oil purity is inadequate. The deposits in the oil indicate its ageing.

  Right-hand engine:
  The oil contains solid particles visible by naked eye. The deposits in the oil indicate its ageing. The abrasive metal content is adequate.

  Main gearbox:
  The oil contains solid particles visible by naked eye.
  The deposits in the oil indicate its ageing. Very high iron content.

  The traces of running lift rotor and the readings of devices monitoring the engine function (*Fig. 11 - 13*) indicate that the engines were running before the accident.

Fig.11 Lift rotor blade pitch

Fig.12 Temperature of exhaust gases (left-hand engine)

Fig.13 Engine speeds

- The damaged speed meter was subject to expert examination at the Institute of Criminology and Forensic Science of the Police Corps of SR in Bratislava in order to determine the forward speed at which the collision of the helicopter with the ground occurred.

  Its examination led to the following findings:

  - The pointer of damaged speed indicator remained immobile after the accident. In its final position it pointed to the value of 67 km/h on the scale of the device. The rear counter-balancing part of the pointer was broken. In the process of breaking, its edges created two parallel indents in the device screen, pointing to letter “K” in the sign “СКОРОСТЬ” (see the indents marked by arrows in (*Fig.14* and *Fig. 15*).

  - From the direction of these indents it was obvious that at the time of their origin the pointer indicated speed of about 94 - 95 km/h (see the direction of the arrow in *Fig.14* a *15*).

  - No other traces left by the pointer were found on the device screen.

  - The indents originated when a foreign object (another part of the helicopter, vegetation, ground, body of a crew member etc.) pressed the rear part of the pointer against the device screen. It means that the indents are not simply the result of the forward inertial swing of the pointer at the moment of impact, but they originated with some, even though minimum delay after the impact, during which the pointer could have been changed its position.

  - The internal measuring mechanism of the device was devastated and no relevant readings could be obtained from it after the accident.

Fig.14 Detailed view of indents from edges of the broken part of the pointer

Fig.15 Direction of the pointer at the moment of origin of the indents

1.17 **Organizational and management information**

N/A.

1.18 **Additional information**

No prescribed documentation of the pilot or helicopter was found in the helicopter.
The helicopter had altered registration mark. Its original registration mark had been UR-CAEO, but the letter “O” was removed so that the helicopter had incorrect registration mark UR-CAE.

1.19 **Useful or effective investigation techniques**

Standard investigation techniques were used.

2. ANALYSIS

The accident was caused by a series of flagrant violations of laws and aeronautical standards. The helicopter illegally crossed the Ukraine/SR border. The pilot transported illegal migrants by a helicopter with invalid registration mark, which had been removed from the aircraft register of Ukraine, its maintenance was probably not performed by the prescribed maintenance organisation, as proved by the inadequate condition of oil charge in the lubrication system, and it did not have the required permits for operation. Based on available documentation, the pilot did not fly with helicopter Mi-2 at night before the critical flight.

The inspection of wreckage, readings of devices monitoring the function of engines, function, inspection of traces on the place of accident, analysis of results of laboratory tests of the speed meter and oil samples showed that the engines of the helicopter had been running at the time of accident, and the autopsy proved that the pilot had been conscious during the flight.

The marked circle in the aerial navigation chart indicates that the helicopter did not crash on that particular place incidentally; this place was chosen as the planned landing site and the accident occurred during the search for a suitable landing site – the pilot was searching for the chosen area at night and in a thick fog and during the blind descent with zero visibility he hit the ground at a forward speed, probably higher than 95 km/h. The subsequent forward movement of the helicopter caused destruction of the airframe.

From the above it is obvious that the accident was the result of the common effort of the pilot and the helicopter owner to achieve profit, even at the cost of flagrant violation of laws and aeronautical standards and endangering of their own lives as well as those of the passengers.

3. C O N C L U S I O N S / CAUSE OF ACCIDENT

3.1 **Findings**

- The pilot had not valid qualifications for this flight,
- The pilot did not have valid medical examination.
- The pilot was not permitted to fly with helicopter type Mi-2 at night;
- The helicopter was not equiped by flight data recorder.
- The helicopter had not valid documentation and was removed from the aircraft register.
- The helicopter was not maintained in accordance with regulations.
- Weather was not suitable for field landing.
- The flight over the Ukraine/Slovak state border was illegal and hence the pilot did not establish or maintain communication with LPS SR, š.p.

3.2 **Causes of air accident**

The main cause of the accident was the effort to land at night in foggy weather on unknown and unlit ground.

The immediate cause of the accident was the collision of the helicopter with the ground.

The contributing factor of the accident was rawness pilot in flying the Mi-2 at night.

4. SAFETY RECOMMENDATIONS

The final report does not contain any safety recommendations.

Bratislava, 16.05.2016