



**MINISTRY OF TRANSPORT,  
CONSTRUCTION AND MARITIME ECONOMY  
STATE COMMISSION ON AIRCRAFT ACCIDENT INVESTIGATION**



**FINAL REPORT**

***ACCIDENT***

**Occurrence No: 835/2011**

**Aircraft: ATR-72 airplane, registration marks: SP-LFH**

**14 July 2011**

**Warsaw Chopin Airport (EPWA)**

*This report is a document presenting the position of the State Commission on Aircraft Accident Investigation concerning circumstances of the air occurrence, its causes and safety recommendations.*

*The report is the result of the investigation carried out in accordance with the applicable domestic and international legal provisions for prevention purposes only.*

*The investigation was conducted without the need of application of legal evidential procedure.*

*In connection with the provisions of the Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC (EU Journal of Laws L. 2010.295.35), the wording used in this report may not be considered as an indication of the person guilty or responsible for the occurrence.*

*The Commission does not apportion blame or liability.*

*In connection with the above, any form of use of this report for any purpose other than air accidents and serious incidents prevention, can lead to wrong conclusions and interpretations.*

*This report was drawn up in the Polish language. Other language versions may be drawn up for information purposes only.*

**Warsaw 2013**

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## GENERAL INFORMATION

Type of occurrence : **Accident**

Type and model of aircraft : **ATR-72 airplane**

Aircraft registration marks : **SP-LFH**

Aircraft commander : **ATPL(A)**

Flight organizer : **EUROLOT S.A.**

Aircraft user : **EUROLOT S.A.**

Aircraft owner : **LEASING**

Place of the occurrence : **Warsaw Chopin Airport (EPWA), taxiway „M2”**

Date and time of the occurrence: **14 July 2011, 22:30:41 hrs LMT (20:30:41 hrs UTC)**

Damage to the aircraft : **Substantially damaged - withdrawn from service**

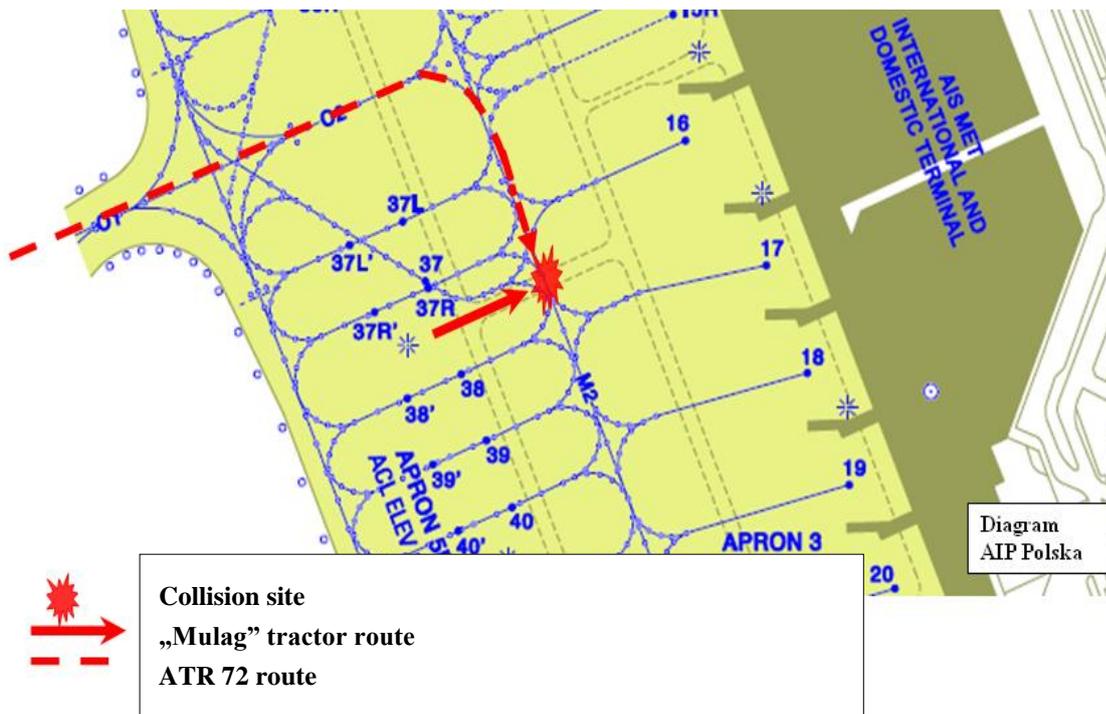
Injuries to persons :

flight crew/PAX : **None**

Tractor operator : **Head injuries**

## SYNOPSIS

On 14 July, 2011 ATR 72 flight crew after landing at EPWA aerodrome received the clearance for taxiing to parking stand 41 via taxiways: "S", "O" and "M". When the airplane was on taxiway "M2", "Mulag" type tractor was moving by the service road, passing perpendicularly to taxiway "M2".



The tractor driver did not give the right of way to ATR 72 and the tractor collided with the airplane. As a result, the airplane and the tractor sustained substantial damages. The flight crew stopped the airplane and shut down the engines. Airport Fire Brigade and an ambulance were called. The tractor operator suffered some injuries and was taken to hospital. The airplane passengers and the flight crew did not suffer any injuries. The impact caused a fuel leakage from the airplane of 200 m<sup>2</sup> in area, which was removed along with other elements of the damaged aircraft by the Airport Fire Brigade. The airplane and the "Mulag" tractor were withdrawn from the further service. During the accident there were adverse weather conditions at the airport - heavy rain and lightning which caused reduction in visibility.

Investigation of the occurrence was conducted by the SCAAI Investigating Team in the following composition:

- MSc (Eng.) Bogdan Fydrych - Investigator-in-Charge;
- D. (Eng.) Maciej Lasek - Team member;
- MSc Wiesław Jedynak - Team member;
- MSc (Eng.) Piotr Lipiec - Team member.

In the course of the investigation SCAAI determined the following cause of the air accident:

**Inadequate observation of the Ground Movement Area by the "Mulag" tractor operator.**

**Contributing factors:**

1. Heavy rain and lightning.
2. Light reflections on the aerodrome surface which hindered observation from the tractor cab.
3. Construction of the "Mulag" tractor cab, left side of which could partially or completely obscure silhouette of the airplane.
4. Short distance between a service road and taxiway "O2".

Having completed the investigation SCAAI proposed seven safety recommendations.

**1. FACTUAL INFORMATION.**

**1.1. History of the occurrence.**

After completion of the landing roll on runway 33 an ATR 72 flight crew performed taxiing via taxiways: "S", "O1", "O2" and "M2" to an assigned parking space. At that time, after the end of its operations on the apron the "Mulag" tractor was moving along the safety line of taxiway "A4" from parking stand 39 in the direction of stand 38. Between stands 38 and 37R the tractor turned

toward the service road intersecting taxiway "M2" to drive to office in order to replace the radio battery.

Approaching the safety line the tractor driver slowed down to the minimal speed and then moved in the direction of the airport building by the service road intersecting with taxiway "M2". In the area of parking stands 37 and 16, at the intersection of the service road with taxiway "M2" the "Mulag" tractor collided with ATR-72 aircraft, which was taxiing by taxiway "M2". As a result of the collision "Mulag" operator suffered the head injury. The ATR airplane and the "Mulag" tractor were withdrawn from further service due to sustained damages.

**The following is a chronological sequence of the events reconstructed on the basis of the radio and telephone communications and CCTV recordings.**

Notes:

- 1. All times in LMT.*
- 2. A slight timing inaccuracies may occur due to lack of synchronization of CCTV time with the time of radio communication recording system.*
- 3. Telephone calls were synchronized with the radio communication.*

22.30.41 hrs: "Mulag" tractor hit the right side of ATR 72 airplane.

22.32.29 hrs: Airport Duty Officer decision on the complete closure of taxiway "M" passed to TWR.

22.33.20 hrs: Airport Duty Officer (shift supervisor - ADO) called ambulance to the scene.

22.34.41 hrs: Airport Duty Officer 5 (ADO5) arrived at the scene.

22.34.49 hrs: ADO requested Coordination to provide buses for the passengers of the damaged airplane.

22.36.31 hrs: A bus arrived at the scene.

22.37.23 hrs: Request (person not determined) to Coordination to call Airport Fire Brigade due to fuel leakage from the airplane.

22.37.31 hrs: Ambulance arrived at the scene.

22.38.44 hrs: Coordination confirmed calling Airport Fire Brigade.

22.38.56 hrs: 8 minutes and 15 seconds after the occurrence the Captain got off the plane to inspect it.

22.39.44 hrs: ADO5 informed ADO about urgent need for Airport Fire Brigade due to fuel leakage.

22.39.56 hrs: ADO called Airport Fire Brigade to the scene.

22.40.31 hrs: Airport Fire Brigade arrived at the scene.

22.41.25 hrs: TWR informed ADO about suspension of takeoffs and taxiings of all aircraft at the aerodrome.

22.42.29 hrs: Transition of the passengers from the airplane to the bus.

22.45.36 hrs: Departure of the bus with passengers.

22.47.26 hrs: Departure of ambulance with the injured operator of the "Mulag" tractor.

## **1.2. Injuries to persons.**

<b>Injuries</b>	<b>Crew</b>	<b>Passengers</b>	<b>Others</b>
Fatal	0	0	0
Serious	0	0	1 (tractor operator)
None	2/2	33	0

## **1.3. Damage to aircraft - ATR-72.**

As a result of the collision the right engine of the aircraft with its 4-blade propeller, fuselage skin in the area of the right main landing gear gondola and the upper part of fuselage (hit by the propeller blade) were substantially damaged. The airplane was withdrawn from the further service.

## **1.4. Other damage – „Mulag” tractor.**

As a result of the collision the cab roof, engine cover and cab windows were substantially damaged. The tractor was withdrawn from the further service.

## **1.5. Personnel information.**

1.5.1. All members of the flight crew and the cabin crew had valid medical certificates and valid ratings to perform their functions on the board.

1.5.2. "Mulag" tractor operator had a valid authorization to operate the vehicle.

## **1.6. Aircraft and tractor information**

1.6.1. ATR-72 airplane had a valid Airworthiness Certificate, was serviced on the current basis.

1.6.2. Tractor - "Mulag", model "Comet 4" was in good working order and serviced on a current basis.

Serial number: 97F010044

Maximum gross weight: 4500 kg

Own weight: 4100 kg

Permissible front axle load: 2200 kg

Permissible rear axle load: 3000 kg

Maximum allowable speed: 25 km/h

Technical check: valid on the day of the occurrence.

### 1.7. Meteorological information.

During the occurrence a storm front combined with heavy rain and lightning was passing over the aerodrome Meteorological Aerodrome Warning No. 141834 dated 14 June 2011 at 20.41 hrs LMT contained information about the possibility of storms and wind shear between 21.00 and 23.30 hrs LMT.

### 1.8. Aids to navigation.

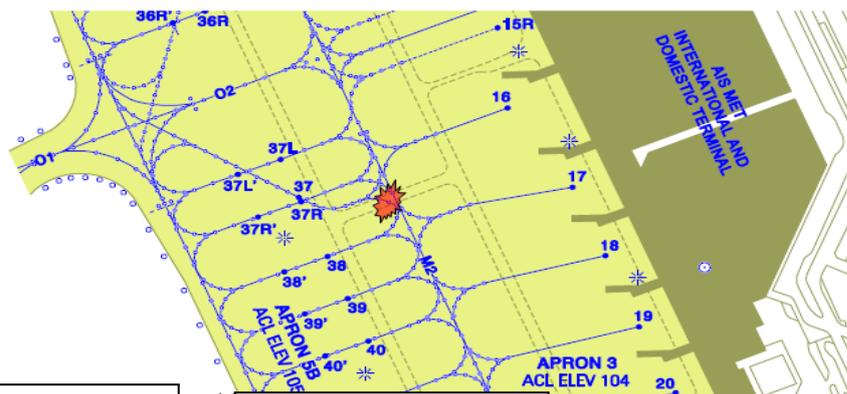
Lighting and marking of taxiways were in good working order and switched on.

### 1.9. Communications.

The crew maintained a two-way radio communication with TWR personnel.

### 1.10. Occurrence site information.

The event took place on the ground movement area of the Warsaw Chopin Airport at the intersection of taxiway "M2" with a service road (see diagram and Photo No1 below).



AIP Poland diagram

Collision site



Photo No. 1 (SCAAI)

Collision site

### **1.11. Flight recorders.**

ATR 72 airplane, registration marks SP-LFH was equipped with a digital flight recorder UFDR 980-4100-DXUN type manufactured by Sundstrand company. The flight recorder was read out in LOTAMS company on 15 July 2011.

ATR 72 airplane, registration marks SP-LFH was also equipped with a digital cockpit voice recorder (CVR) AV557C 9800-6005-076 type, SN/10179 manufactured by Sundstrand Company. The CVR was read out in *Bundesstelle für Flugunfalluntersuchung (BFU)* laboratory in Germany in the presence of SCAAI representative on 11 August 2011.

### **1.12. Wreckage and impact information.**

As a result of the collision the right engine of the aircraft with its 4-blade propeller, fuselage skin in the area of the right main landing gear gondola and the skin of the upper part of the fuselage (hit by the propeller blade) were substantially damaged (photos No 2 to No 5). Wreckage of the aircraft and the vehicle were dispersed at a large area. The highest density of the wreckage was in the area of collision (photo No 6, sketch No 1. "Mulag" tractor cab was cut by the working propeller and its engine cover was damaged as a result of impact with the aircraft (Photos No 7 and No 8).



**Photo 2. Wreckage in the area of the occurrence site . (photo by “Polish Airports” State Enterprise)**



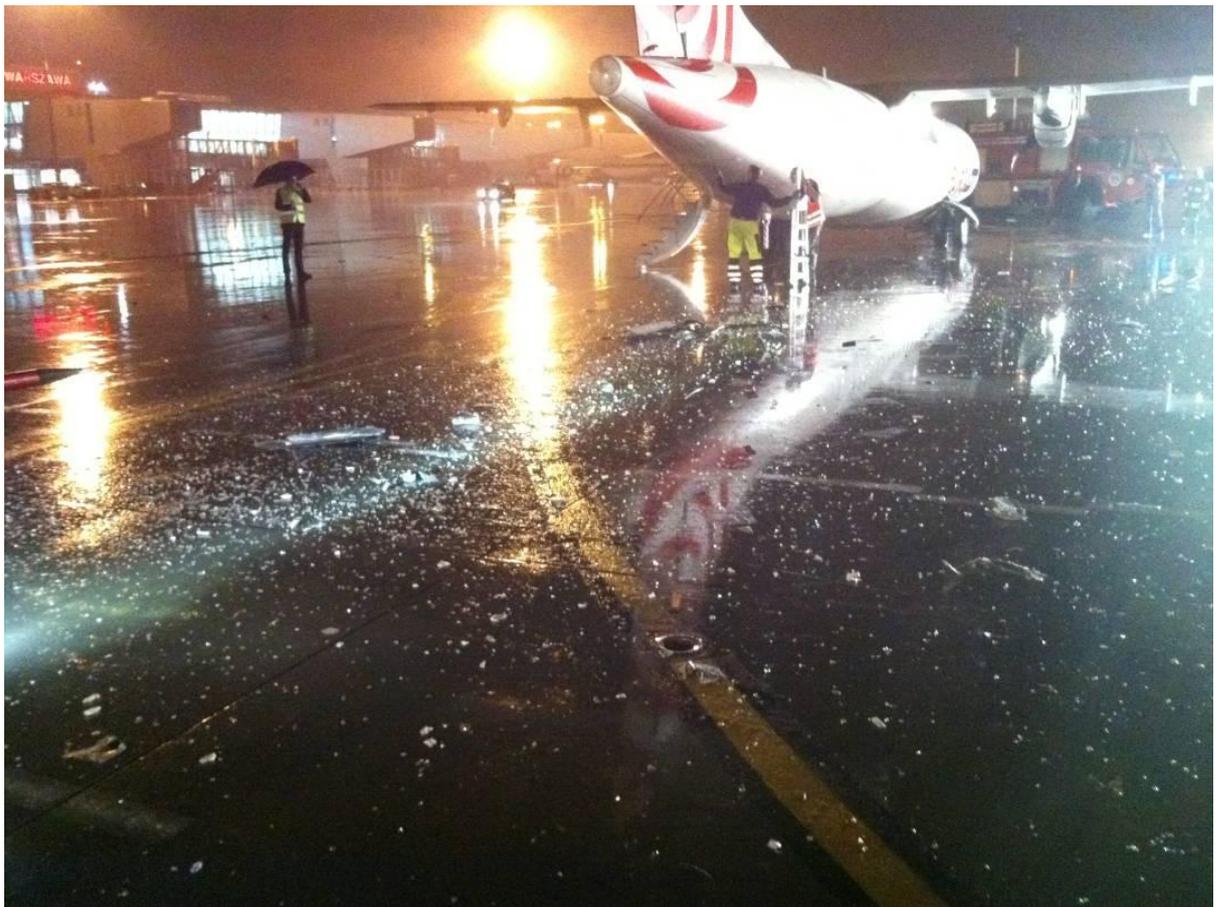
**Photo 3. Damaged the landing gear gondola and the fuselage skin. (photo by LS Airport Service S.A.)**



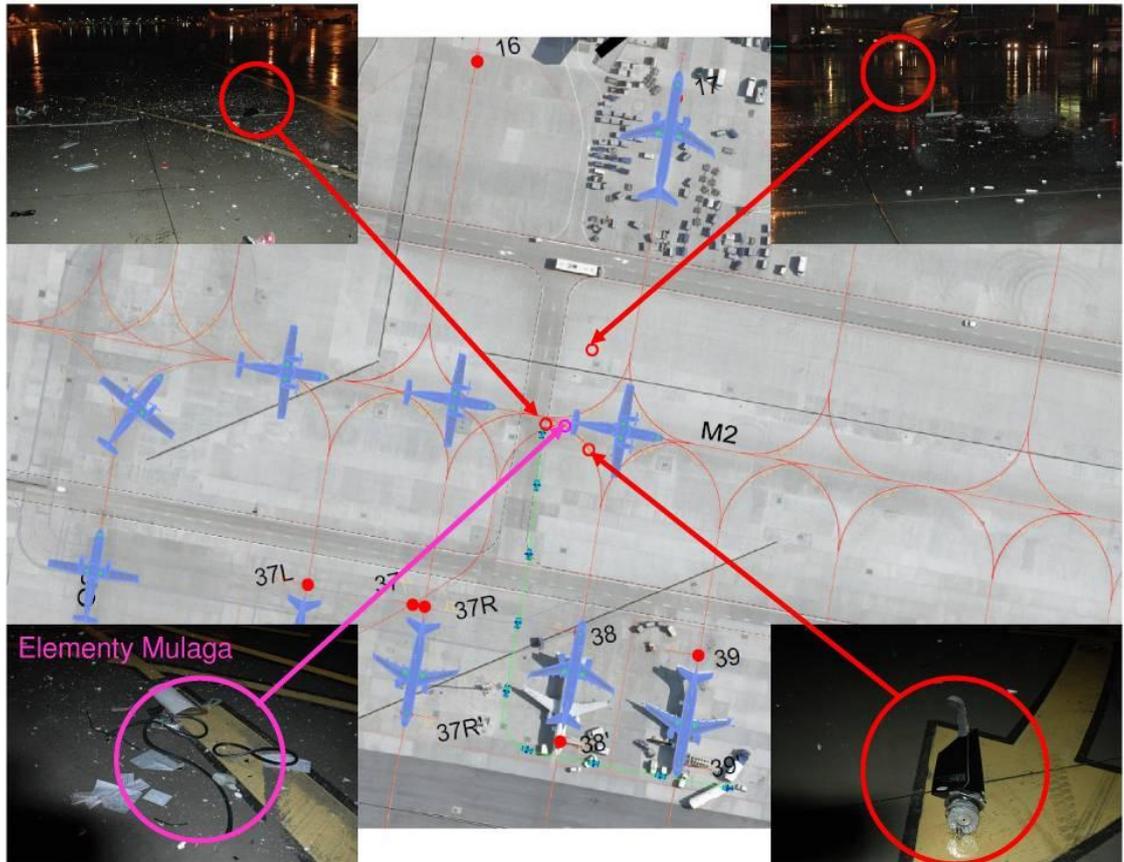
**Photo 4. Damaged propeller. (photo by LS Airport Service S.A.)**



**Photo 5. Damaged gondola of the right main landing gear (photo by “Polish Airports” State Enterprise)**



**Photo 6. Wreckage of the airplane and the tractor in the collision area (photo by “Polish Airports” State Enterprise)**



Sketch 1. Location of parts of the propeller blades and elements of the "Mulag" tractor (by "Polish Airports" State Enterprise)



Photo 7. Damaged "Mulag" tractor . (photo by "Polish Airports" State Enterprise)



**Photo 8. Rear cover damaged by the propeller (photo by LS Airport Service S.A.)**

### **1.13. Medical and pathological information.**

As a result of the collision "Mulag" tractor operator suffered a head injury and was taken to hospital. After necessary medical aid he was released from hospital and continued further outpatient treatment.

### **1.14. Fire.**

Fire did not occur, but it was a real risk of fire due to the fuel leakage from the fuel system which resulted in a flood area of approximately 200 m<sup>2</sup> which was combined with the power supply to the airplane.

### **1.15. Survival aspects.**

1. Ambulance was called 2 minutes and 39 seconds after the occurrence.
2. Ambulance arrived 6 minutes and 50 seconds after the occurrence i.e. 4 minutes and 11 seconds after the call.
3. Bus for passengers arrived 5 minutes and 50 seconds after the occurrence.

4. Airport Fire Brigade was called 6 minutes and 42 seconds after the occurrence.
5. Airport Fire Brigade arrived 9 minutes and 50 seconds after the occurrence i.e. 3 minutes and 08 seconds after the call.
6. Passengers evacuation commenced 13 minutes and 5 seconds after the occurrence.
7. Passengers evacuation lasted 56 seconds i.e. was completed after 14 minutes and 01 second after the occurrence.
8. The bus with the passengers left the scene 14 minutes and 55 seconds after the occurrence, i.e. 9 minutes and 5 seconds after its arrival.
9. The ambulance with the injured tractor operator left the scene 16 minutes and 45 seconds after the occurrence, i.e. 9 minutes and 55 seconds after its arrival.

#### **1.16. Tests and research.**

The Investigating Team analyzed:

1. Relevant video recordings from CCTV cameras;
2. Recordings of telephone and radio communications;
3. Flight data recorder (FDR) recordings;
4. Cockpit voice recorder (CVR) recordings;
5. Available photographic documentation;
6. Statements of individuals involved in the accident and witnesses;
7. Provisions of Manual of Vehicles and Pedestrians Movement at Warsaw Chopin Airport;
8. The technical and service documentation of "Mulag" tractor side number 1127.

#### **1.17. Organizational and management information.**

In accordance with the recommendations of Annex 13 to the Chicago Convention and Regulation of the European Parliament and the Council SCAA I informed about the occurrence ICAO, EASA, European Commission and the State of manufacture of the airplane. In the course of the Final Report preparation SCAA I used information contained in the "Protocol of air occurrence investigation" prepared by P.P. "Polish Airports" State Enterprise" and other materials received from LS Airport Services.

#### **1.18. Additional information.**

After acquaintance with the Draft Final report LS Airport Services made comments related to illumination angle from floodlights installed on the airport building and location of service roads. These comments were conveyed to "Polish Airports" State Enterprise". "Polish Airports" State Enterprise answered to the Commission that after analysis it was determined that:

- the angular setting of the floodlights was done in accordance with the applicable project so that the required illumination level of the parking stands contained in ICAO Annex 14 was met.
- change of the service roads location and the traffic organization (in particular, the change of the ground movement organization in the area of taxiway Z2 and stand 10) was at that time impossible.

Eurolot S.A. did not make any comments to the Draft Final Report.

### **1.19. Useful or effective investigation techniques.**

Traditional investigation techniques were used.

## **2. ANALYSIS.**

### **2.1. Analysis of the airplane taxiing and the flight crew actions.**

The airplane landed on runway "RWY 33" and vacated it moving into taxiway "S". Then it taxied via taxiways "O1", "O2" and turned right into taxiway "M2". The airplane was taxiing with the following lights on: navigation lights, warning lights "beacon", taxi lights (on the nose landing gear leg) and the lights illuminating the wings.

Rain and darkness prevailing at the aerodrome during the landing and taxiing hindered the flight crew orientation. During the taxiing toward stand 41 the crew determined their position by watching the stands numbers. The Co-pilot reported to Captain passing stand 38, which means that not only the taxiway center line was observed, but also its surroundings. This observation was seriously hindered by mist on the airplane side windows. The mist was caused by a high humidity of the air and was independent of the crew actions.

In the area of stands 37 and 16, at the intersection of taxiway "M" with the service road the airplane was hit by a "Mulag" tractor. The flight crew reported the collision to TWR personnel.

The aircraft Commander ordered the engines shutdown. The left engine was shutdown in the standard way. After finding that there was no way to shut down the right engine (blocked CL lever) Captain called checklist ON GROUND ENGINE FIRE OR EMERGENCY EXIT instead of ON GROUND ENGINE FIRE OR SEVERE MECHANICAL DAMAGE.

The memory actions resulting from ON GROUND ENGINE FIRE OR SEVERE MECHANICAL DAMAGE procedure were carried out.

These actions were terminated on the action "FIRE HANDLE affected side PULL". The memory actions resulting from this procedure require the following:

- *PL 1+2 GI/REVERSE AS RQD*

*When aircraft stopped*

- *PARKING BRAKE ENGAGE*
- *CL 1+2 FTR THEN FUEL SO*
- *FIRE HANDLE AFFECTED SIDE PULL*
- *FIRST AGENT AFFECTED SIDE DISCH*
- *IF FIRE AFTER FURTHER 30 SEC SECOND AGENT AFFECTED SIDE DISCH*

The memory actions were terminated on the action - FIRE HANDLE AFFECTED SIDE PULL.

Wrong name of the procedure did not affect the performance of memory operations. Necessity to apply this procedure resulted from inability to shut down the engine in the standard way, and not from fire or the engine failure. Interruption of the actions sequence and abandonment of a fire extinguisher activation resulted from assessment of the circumstances by the flight crew.

After the engines shutdown the appropriate checklist was read. The Commander decided that the passengers would stay on board of the airplane. The decision was passed to the Chief Purser and the passengers. Commander went out of the airplane to assess the situation in detail. After finding the spilled fuel he asked the aerodrome services to call the Airport Fire Brigade.

After arrival of a bus the passengers were warned of the slippery surface and led out of the airplane.

The cooperation of the flight crew and the cabin crew was correct in both chains: Captain - Chief Purser, as well as Captain - Chief Purser - passengers. Information to the passengers was passed by the Captain and the Chief Purser.

Lack of the crew decision on the passengers evacuation immediately after the collision could be explained only by the fact that the crew was not aware of the actual damage to the aircraft and the potential associated hazards.

The importance of the flight crew cooperation with the ground services can be clearly seen in this case because the ground personnel could assess the type of damage and the level of hazard to the safety. In this case Commander realized the extent of damage only after leaving the aircraft.

Analysis of the occurrence brought Commission to the conclusion that the decision on passengers evacuation should had been made immediately after finding the fuel leakage, and the power supply on board should had been immediately turned off.

## **2.2. Analysis of the tractor operator actions.**

On the day of the occurrence the operator started his work at 15.00 hrs LMT. The previous day was for him the day off. Before starting his work, he carried out inspection of the "Mulag" tractor, side number 1127 (wipers operation, lights, brakes, general condition). Tractor was in good working order. On that day only the operator involved in the accident used the tractor. In the course of his shift after 17.00 hrs LMT the operator had a break, as he said at least 30 minutes.

According to the operator, on the accident day his workload was normal, and in some periods low. Prior to the accident he was ordered to hook the stairs to the tractor and wait for further instructions. Next he was ordered to drive the tractor with stairs to the area of the designated stand in order to bring them to an airplane.

After reaching the stand he noticed that the Ground Power Unit was inoperative. The tractor operator knew where the other operative power unit was so he towed it to the stand. Because the battery in his portable radio was close to discharge, he decided to go to the office for replacement. "Mulag" tractor was moving along the safety line of taxiway "A4" from stand 39 in the direction of stand 37. Between stands 38 and 37R it turned in the direction of the service road intersecting taxiway "M2".

When approaching the safety line the "Mulag" operator slowed down significantly since a mobile conveyor belt was coming from the right. The driver of the vehicle with the conveyor belt gave the right of way to the "Mulag" operator. According to the statement of the "Mulag" operator prior to entering the service road he had a problem with gear changing. During the gear changing he looked inside the cab on the gear lever. Then he looked to the left, but did not notice any airplane and continued driving (towards the airport building) on the service road which intersected taxiway "M2".

While driving "Mulag" on the service road the driver suddenly noticed on the left side at a very small distance a silhouette of an airplane taxiing on taxiway "M2". In order to avoid a collision he made a sudden movement of the steering wheel to the right and the tractor started to perform the right turn. However, this maneuver did not prevent collision, and when the operator noticed a rotating propeller approaching the tractor cab, he quickly lay down on the floor.

Collision with the airplane ATR 72 occurred at the intersection of the service road with taxiway "M2". During the accident there was heavy rain and lightning at the aerodrome. Despite the rain in the course of driving the tractor operator kept the side window in the left door opened in order to improve visibility. This is documented in Photo No 9 made shortly after the accident.



Photo 9. Damaged Mulag tractor with the side window opened. (photo by “Polish Airports” State Enterprise)

### 2.3. Hypothesis of the causes of the tractor operator failure to notice the airplane.

The Commission presents below a probable course of the accident. It is based on photos taken by the Commission when an Embraer airplane was taxiing by taxiways "O2" and "M2" and the video recordings from CCTV cameras made during the accident. It was assumed that the average speed of the "Mulag" tractor was close to the speed of the taxiing aircraft i.e. approximately 28 km/h and that they had approximately the same distance to cover.

The presented photos (from 9 to 13) show an Embraer taxiing by taxiway "O2" and then "M2" to the occurrence place. Embraer taxiing time from the position on Photo No 9 to the intersection of the service road with taxiway "M2" was 17 seconds. Based on CCTV recording the ATR-72 taxiing time on the same distance was 16 seconds.

The purpose of the experiment was to reconstruct the probable course of the occurrence and to present visibility from the tractor cab when it was on taxiway "O" and "M2" in order to determine the cause(s) of the driver failure to notice the taxiing ATR-72. Based on the recordings from CCTV cameras the Commission determined that the tractor was moving at a speed of about 28 km/h (speed limit on the Ground Movement Area is 30 km/h). Based on the "Mulag" operator's statement, he was acting in the time deficit due to the radio battery discharging and urgent necessity of its replacement in the office since he expected further orders.

Photo No 10 shows the position of Embraer airplane beginning a turn from taxiway "O2" in taxiway "M2". Based on recording from CCTV camera No 1, when the ATR was approximately at Embraer place, the "Mulag" slowed down approaching the safety line on the parking apron at stand 38 (Recording No 1). Probably at this time, the tractor operator looked to the right at the service road parallel to taxiway "M2", which he wanted to take following the service road

crossing DK "M2" in the direction of the office. He noticed the vehicle with the conveyor belt, which gave him the right of way. According to the statement of "Mulag" operator, when trying to shift the gear he experienced difficulties and looked into the cab at the gear lever.

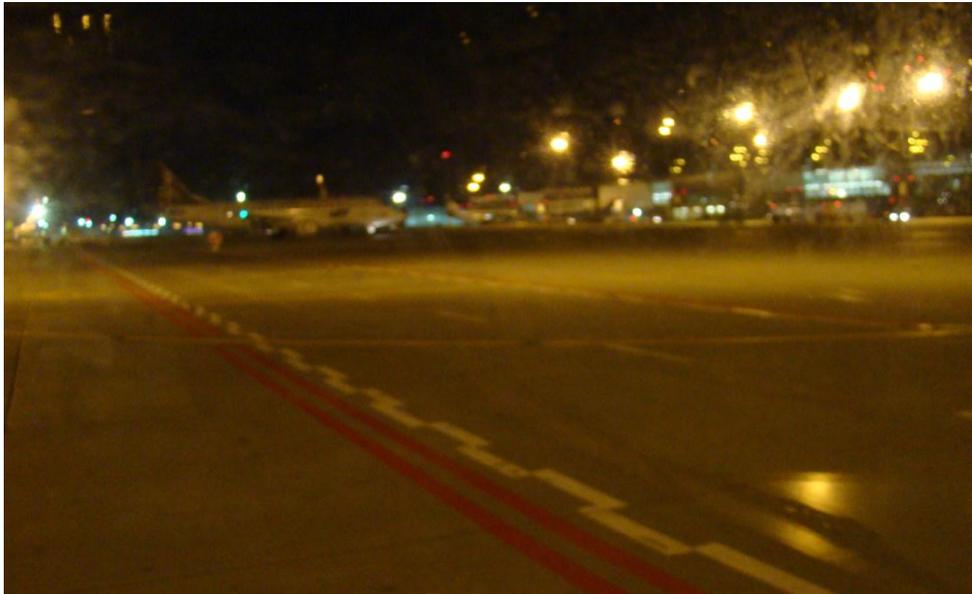


Photo 10. A plane taxiing by taxiway „O”. (photo by SCAAI)



Recording No 1 from CCTV camera.

Photo No 11 shows Embraer airplane (as seen from the "Mulag" cab) commencing taxiing by taxiway "M2" after the right turn from taxiway "O2".

Based on recording from CCTV camera, when ATR 72 was approximately at Embraer place, that is already on taxiway "M2" the "Mulag" was at that time still on the parking apron at stand 38 short of the service road parallel to taxiway "M2" (recording No 2). Perhaps at that time the tractor operator looked out of the cab to the left in order to see taxiway "O", on which he did

not notice any airplane. Perhaps then he looked again to the right to make sure whether the vehicle with conveyor belt was still ready to give him the right of way and only after that he speeded up.



Photo 11. Embraer taxiing by taxiway „M2” (photo by SCAAI)



Recording No 2 from CCTV camera.

Recording No 3 from CCTV camera shows ATR 72 continuing taxiing by taxiway "M2" and "Mulag" tractor crossing the service road parallel to taxiway "M2".



Recording No 3 from CCTV camera No 447.

Recording No 4 from CCTV camera shows that "Mulag" was already on the service road perpendicular to taxiway "M2", when ATR 72 was passing stand 16. Probably at that time the silhouette of the airplane could have been partially or completely obscured for "Mulag" driver. It could have been obscured by the left window post or as a result of light reflections from the wet apron and therefore the driver did not notice the airplane (photo No: 12-13)



Recording No 4 from CCTV camera No 447.



**Photo 12. Partially obscured Embraer airplane taxiing by taxiway „M2” (photo by SCAAI)**



**Photo 13. Partially obscured Embraer airplane taxiing by taxiway „M2” (photo SCAAI)**

Recording No 5 shows the "Mulag" tractor located on the service road and ATR-72 airplane taxiing by taxiway "M2". Probably at that time the "Mulag" driver was watching the service road in front of him or looked to the right to monitor the service road parallel to taxiway "M2", running along the airport building, on which at the time two vehicles were moving. May be because of this he did not notice ATR-72 passing stand 16.



Recording No 5 from CCTV camera No 209.

"Mulag" tractor and ATR 72 airplane moving in the direction of the collision place recorded at 1-second intervals are shown in the recordings No 6 to 8.



Recordings No 6-8 from CCTV camera No 209.

Recording No 8 (22:30:40 hrs) shows the "Mulag" tractor and ATR-72 airplane one second before the collision. According to the statement of the "Mulag" driver he probably only then spotted the airplane and made ineffective rapid movement of the steering wheel to the right to perform the maneuver preventing collision. Then, when he noticed the rotating propeller of the right engine, he instinctively lay on the floor of the cab.

Recording No 9 shows the collision moment. the "Mulag" tractor is obscured by ATR 72 fuselage. After the collision the airplane fuel system was unsealed and rapid leakage of the fuel occurred, which is clearly visible on the recordings from CCTV cameras.



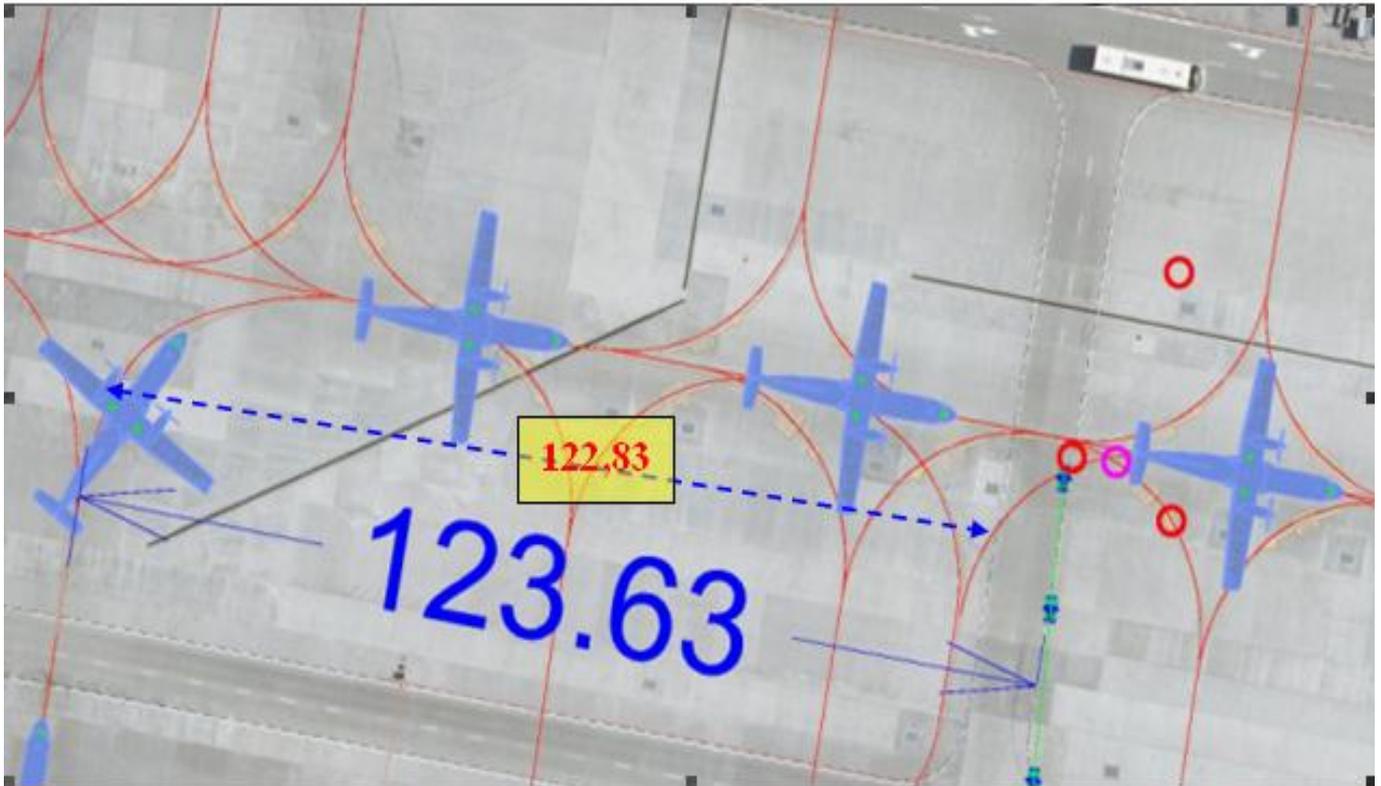
**Recording No 9 from CCTV camera No 209.**

According to the Commission the hypothesis presented above may explain the reasons why the "Mulag" tractor operator did not notice in time the taxiing ATR- 72.

In the Commission opinion the circumstances which may have influenced the occurrence of the accident were:

- weather conditions during the event - heavy rain with lightning;
- light reflections in the area of taxiway "O" and "M2", which, in particular on the wet surface of the aerodrome ground movement area hampered observation of the moving vehicles and airplanes.
- the construction of the "Mulag" cab, which could probably obscure the aircraft taxiing by taxiway M2;
- small distance - 122,83 m - between the service road and taxiway "O2" center line. (picture below).

*Photos No 10-14 were taken in good weather conditions with the tractor side window partially opened. Clearly visible reflections at the aerodrome surface as well as on the vehicle windscreen and shading of the airplane Embraer resulting from lighting by the floodlights placed on the airport building, which limited visibility from the tractor cab. The recordings from CCTV cameras show reflections on the wet surface and shading aeroplane ATR 72 during the event.*



Sketch 2. Taxiway „O” and the service road with the distances marked. (by “Polish Airports” State Enterprise and SCAAI)

#### 2.4. Analysis of actions of the aerodrome services involved in the rescue operation.

Management of the situation was carried out by ADO (Shift Supervisor) who acted by orders and arrangements with many services at the same time. This resulted in a significant increase of his workload. The other ADOs acting at the scene were unevenly workloaded. Radio recordings show low activity of ADO4.

According to the Aerodrome Rescue Operations Plan, the TWR personnel is the authority declaring emergency. In case of the investigated occurrence TWR personnel received information on the collision from the flight crew who did not declare "Emergency". Nobody informed either the flight crew or TWR personnel about the occurrence scale, which resulted in failing to declare “Emergency” by TWR personnel.

In accordance with the applicable documents ADO did not have the authority to declare emergency for the airport services. Therefore, ADO did not do it. In the Commission opinion ADO as a person appointed to the overall operational management of the airport should have such a power.

In case of declaration of “Emergency” the services response times (Airport Fire Brigade and Medical Services) would have been reduced by at least 1 minute for medical services and about 5 minutes for Airport Fire Brigade. Another key aspect of the occurrence is its potential for escalation - such as ignition of spilled fuel which could happen at any time since the

airplane power supply was not turned off. In case of declaration of emergency the external forces and resources would have been activated immediately to assist and secure the scene. Lack of external forces and resources, which have not been alerted, could adversely affect the ability to assist any injured persons on board and in the vicinity of the airplane in the case of the fuel ignition.

## **2.5 Analysis of the damage hazard to other aircraft.**

To estimate the hazard of damage to other aircraft three concentric areas were marked around the occurrence site: I - with a radius of 50 m, II - 75 m, and III - 100 m (Sketch No 1). According to the available photographic documentation, the largest number of wreckage of large and medium size were found in area I. It should be assumed that a number of smaller elements could probably be found in the area II and perhaps also in the area III.

At 22.32.29 hrs LMT ADO decided to completely close taxiway "M", without indicating its specific section (the incident took place at taxiway "M2"). DOP informed TWR personnel via telephone that taxiway "M" is closed at the section starting from stand 37 to 40. Due to heavy workload only at 22.39.03 hrs LMT DOP issued NOTAM message informing about closure of taxiway "M". The information did not reach the Apron Coordinating Team and the Ground Movement Service Team. Only at 22.47.39 hrs DOP informed the Apron Coordinating Team via telephone about closure of taxiway "M" from stand 40 to 42.

At the time of the occurrence within the above areas in the parking positions No. 37L, 37R, 38, 39 and 17 were located the airplanes which then performed air operations:

22.47.50 hrs: E170 airplane taxied out from stand 37R;

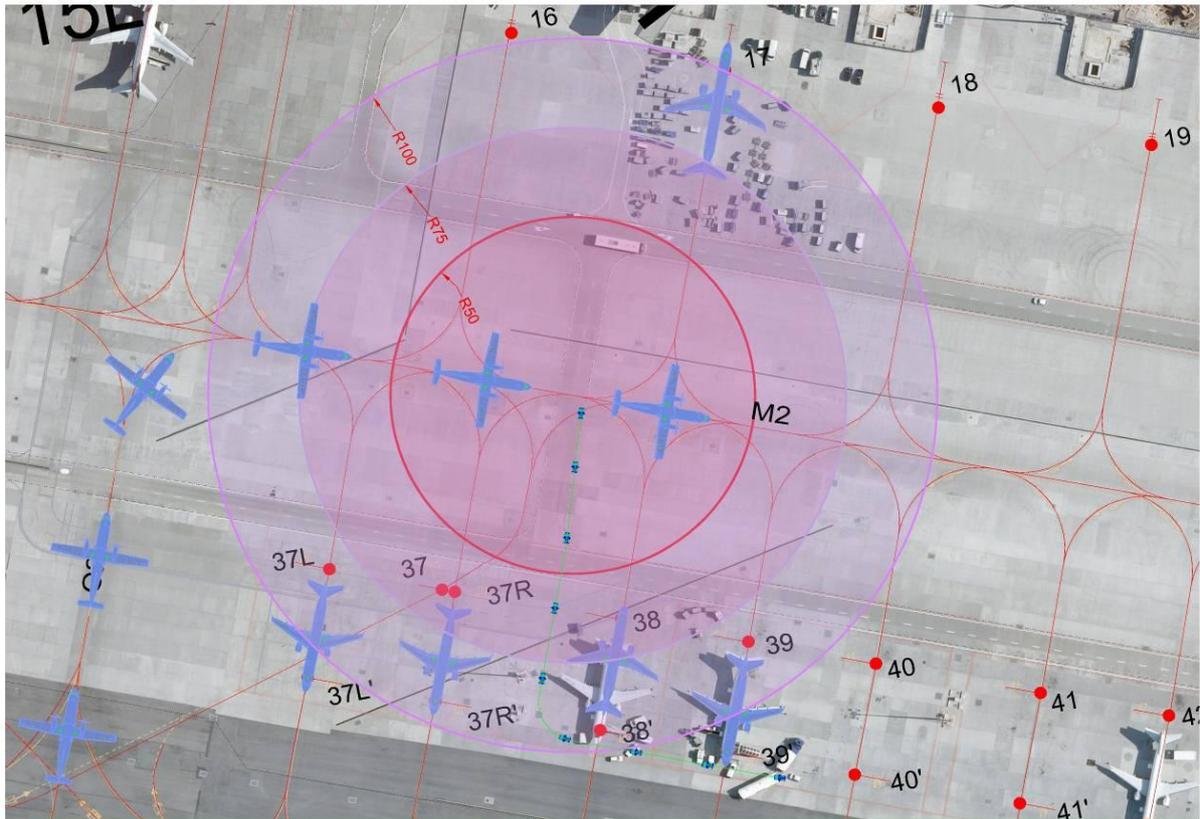
22.53.23 hrs: E170 airplane taxied out from stand 37L;

22.54.33 hrs: E170 airplane was pushed from stand 38;

23.02.37 hrs: E195 airplane was pushed from stand 17;

23.11.17 hrs: E170 airplane taxied out from stand 39.

The collision resulted in separation of the airplane right engine propeller blades and the "Mulag" tractor parts which were scattered around aerodrome maneuvering area. Following the accident it would be appropriate to suspend air operations in order to check the airplanes for Foreign Object Damage (FOD) and the parking stands for the presence of Foreign Objects.



Sketch 3. Place of the occurrence with the three marked areas. (by "Polish Airports" State Enterprise)

### 3. CONCLUSIONS.

#### 3.1. Commission findings.

1. Flight crew had the appropriate ratings and valid aero-medical certificates.
2. ATR-72 airplane had a valid Airworthiness Certificate and was properly maintained.
3. Airplane taxiing speed was correct.
4. Captain did not decide to turn off the airplane power supply even when he knew the extent of damage and the fuel leakage.
5. Late decision on evacuation of the passengers.
6. "Mulag" tractor operator had a permit to drive PPS vehicles.
7. "Mulag" tractor "Comet 4" model was in good working order and was properly maintained.
8. Speed of the "Mulag" tractor was correct.
9. Declaration of emergency for airport services (which was not declared) would have facilitated management of the situation and provided forces and resources in case of the occurrence escalation.
10. Flight operations at nearby sites were not suspended, airplanes were not checked for presence of Foreign Object Damage (FOD) and parking stands were not checked for presence of Foreign Objects.

11. Inadequate cooperation between ground services and the flight crew, who learned about the consequences of the collision only after personal inspection of the aircraft by Captain.

### **3.2. Cause of the accident:**

#### **Inadequate observation of the Movement Area by the “Mulag” tractor operator.**

#### **Contributing factors:**

1. Heavy rain and lightning.
2. Light reflections on the aerodrome surface which hindered observation .
3. Construction of the "Mulag" tractor cab, the left post of which could partially or completely obscure the airplane
4. Short distance between a service road and taxiway "O2".

### **4. SAFETY RECOMMENDATIONS\***

After familiarizing with the evidence collected in the course of the investigation into the occurrence State Commission on Aircraft Accident Investigation, proposes the following safety recommendations:

#### **LS Airport Services:**

1. Discuss the occurrence with the personnel carrying out activities at the maneuvering area of the aerodrome. Use for this purpose video recordings showing course of the occurrence with particular attention to the rules of movement at the aerodrome maneuvering area.
2. Forward the Final Report and the video materials to the persons carrying out basic and refresher trainings with the personnel carrying out activities at the maneuvering area in order to use these materials during the trainings.

#### **“Polish Airports” State Enterprise**

3. Make changes in the Action Plan in Emergency, and Airport Operations Management Instruction which will enable Duty Officer to declare emergency for the airport services.
4. Make changes in the Action Plan in Emergency, and Airport Operations Management Instruction which will enable Duty Officer immediate notification of the flight crews about the effects of occurrences in order to decide immediately about the potential evacuation of passengers.
5. Introducing additional horizontal and/or vertical signs "*STOP - taxiing airplane*" on the service roads intersecting taxiways.
6. Consider changing location of the service road by increasing its distance from taxiway "O2" or cancellation of the service road.

**Eurolot S.A.**

7. Discuss the occurrence with the crews drawing their attention to the decisions about potential evacuation of passengers.

**The conclusions and preventive recommendations contained in the "Protocol of air occurrence investigation" made by "Polish Airports" State Enterprise:**

1. Forward the CCTV recordings and photos taken at the scene to Aerodrome Services Training Center for use in the training of persons applying for authorization to move around the aerodrome.
2. Train the staff of Ground Movement Safety Supervising Team in securing the occurrence site and preparing documentation for subsequent investigation (photos, sketches, etc.).
3. Discuss this occurrence with all Duty Officers, especially with regard to the division of responsibilities among different DOs.
4. Consider time synchronization of the CCTV cameras recorder, radio and telephone communication recorder and Airport Fire Brigade recorder.
5. During the refresher training related to the aerodrome ground movement pay special attention to the correct way of radio communication – this applies in particular to ground movement coordinators "Follow Me" and the Airport Fire Brigade personnel.

THE END

Investigator-in-Charge

*signature*

*\*Note: In accordance with Article 18 par. 1 of the Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC the addressee of a safety recommendation **shall inform the State Commission on Aircraft Accident Investigation within 90 days of the receipt of that letter**, of the actions taken or under consideration, and where appropriate, of the time necessary for their completion and where no action is taken, the reasons therefor. The above information shall be forwarded to the Commission Headquarters to the following address: MINISTERSTWO TRANSPORTU, BUDOWNICTWA i GOSPODARKI MORSKIEJ ul. Chałubińskiego 4/6; 00-928 Warszawa, tel. + 48 22 630 11 31, fax + 48 22 630 11 17*