REPUBLIC OF SLOVENIA
MINISTRY OF INFRASTRUCTURE

AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION SERVICE

Langusova ulica 4, SI-1535 Ljubljana

T: +386 1 478 80 00
F: +386 1 478 81 89
E: gp.mzip@gov.si
www.mzip.gov.si

Number: 37200-5/2012/59-00121019
Date: 16. 10. 2014

FINAL REPORT

ON THE INVESTIGATION OF THE AIRCRAFT ACCIDENT INVOLVING THE AIRCRAFT PIPER PA-34-200T, SENECA II, REGISTRATION S5-DGL, ON 26 OCTOBER 2012 AT THE DIVAČA AIRPORT - LJDI

Republic of Slovenia

"2012"

TABLE OF CONTENT

INTRODUCTION

This final aircraft accident investigation report contains facts, analysis, causes, and safety recommendations established by the Aircraft Accident Investigation Commission with regard to the circumstances in which the accident happened.

In accordance with Article 3.1 of Chapter 3 of the tenth issue of Annex 13 to the Chicago Convention on International Civil Aviation and pursuant to Article 1 of Regulation (EU) No. 996/2010 of the European Parliament and Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation, paragraph 4 of Article 137 of the Aviation Act (Official Gazette RS No. 81/10), and Article 2 of the Decree on the investigation of aircraft accidents, serious incidents, and incidents (Official Gazette RS No. 72/03 and 110/05), the purpose of the final aircraft accident investigation report is not to determine guilt, or individual or collective responsibility.

Without a doubt, the final investigation report must contribute to aviation safety.

It is important for the final investigation report to be used for preventing further aircraft accidents or incidents. Using the final aircraft accident investigation report for other purposes can lead to misinterpretations.

In case of any divergence of interpretation of the text, the Slovene version shall prevail.

COMPOSITION OF THE ACCIDENT INVESTIGATION COMMISSION

Pursuant to paragraph 4 of Article 5 of Regulation (EU) No. 996/2010 of the European Parliament and Council on the investigation and prevention of accidents and incidents in civil aviation, third paragraph of Article 138 of the Aviation Act (Official Gazette RS No. 81/10) and pursuant to Article 7 of the Decree on the investigation of aircraft accidents, serious incidents and incidents (Official gazette RS No. 72/03 and 110/05), the head of the Aircraft Accident and Incident Investigation Service at the Ministry of Infrastructure and Spatial planning of the Republic of Slovenia has appointed, by Decision No. 37200-5/2012/4-003 of 7 November 2012, a commission for the investigation of the aircraft accident, with the purpose of investigating the circumstances in which the accident happened, establishing the causes for the aircraft accident and producing safety recommendations for the prevention of aircraft accidents in the future.

Composition of the Commission:

1. **Toni STOJČEVSKI**, Ministry of Infrastructure and Spatial Planning, Aircraft Accident and Incident Investigation Service, **Investigator-in-Charge**.

SUMMARY

1. Date and time of the accident: 26 October 2012 at 16:15 LT[1]

2. Aircraft: Piper, PA-34-200T Seneca II

3. Serial No: 34-7970003

3. Registration mark: S5-DGL

4. Location of the accident: Divača Airport (LJDI), Republic of Slovenia

5. Type of flight: VFR (Visual Flight Rules) – under visual flight rules

6. Owner: National Institute of Oceanography and experimental Geophysics – OGS, Borgo Gotta Gigante n. 42/c, 34010 Sardonic 8TS, ITALY

7. Operator: JANEZ LET d. o. o., Ul. Juša Kozaka 1, 1000 Ljubljana, SLOVENIA

8.1 Injuries:

Injuries	***Crew***	***Passengers***	***Others***
Fatal	-	-	-
Serious	-	-	-
Minor/None	**0/2**	-	

8.2 Damage to Aircraft:

Structural damage to the left landing gear leg and left wing, damage to both tires, damage to the lower part of the fuselage. The two-bladed left engine propeller hit the asphalt runway several times causing the left engine to stop. There have been visible deformation of the shell at the wing junction and deformation of the left and right engine shell (nacelle).

8.3 Damage to equipment: No damage

[1] *The time referred to in this report is Local Time = LT.*

1. FACTUAL INFORMATION

1.1. History of the flight

On 26 October 2012, the pilot was scheduled to carry out a practical test of flight qualifications with the selected Pilot Examiner to renew his Multi Engine Piston Aeroplane (MEP) class rating. A few days earlier, the pilot successfully passed the test for the renewal of his IR/ME(A) class rating to fly in instrument conditions on a Flight Navigation Procedures Trainer (FNPT simulator). According to the pilot's statement, the pilot was at this time required to perform a practical flight in an aircraft under Visual Flight Rules (VFR) in Visual Meteorological Conditions (VMC). After completing the pre-flight preparations, the crew took off immediately after a rain shower at 4:03 p.m. local time. According to statements obtained, the pilot – a candidate for rating renewal – sat on the left side, and the Pilot Examiner sat on the right side of the aircraft. After the first aerodrome traffic circuit with a touch-and-go landing, the pilot intended to perform a full-stop landing. During the final landing phase in the direction 31, the pilot checked all flight and engine parameters for safe landing.

According to the pilot's statement, the landing point was located between 100 to 200 meters from the runway threshold with a slightly lower profile due to the inclination of the runway in the direction 31. After touching the runway in the deceleration phase, the pilot estimated that the braking effect was insufficient. When he tried to brake, the left landing gear leg sank and the aircraft tilted to the left, so that 28 meters before the end of the runway the two-bladed left engine propeller hit the runway and the top of the left wing glided along the edge of the remaining length of the runway. After the runway excursion, the aircraft stopped on the grassy area about 25m from threshold 13. The airport fire department immediately intervened at the scene of the event. The crew did not suffer any injuries and left the plane on their own. There was no other traffic in the airport zone.

1.2. Injuries to persons involved in the event

Injuries	*Crew*	*Passengers*	*Others*
Fatal	/	/	/
Serious	/	/	/
Minor / **None**	0 / **2**	/	

1.3. Damage to the aircraft

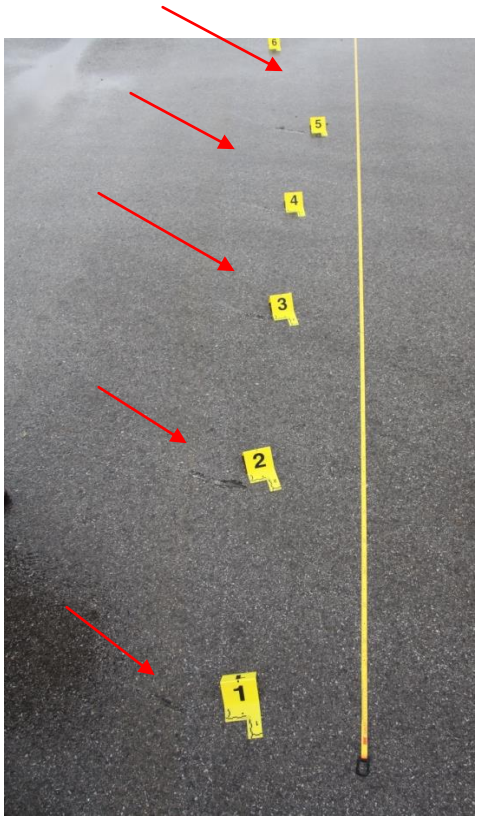
The support fittings of the left landing gear leg were damaged during landing and braking of the aircraft. Consequently, the plane glided along the grass surface with the top of the left wing outside the edge of the runway. The left engine propeller hit the asphalt runway several times. The left landing gear wheel sank under the flap of the left wing. The lower surface of the left wing was thus damaged and deformed. During the runway excursion, the lower part of the tail surfaces, left height control and fuselage were damaged. There was visible deformation of the shell – nacelle – on the inner side of both motors.

Figure 1 Aircraft at the stopping point after the runway excursion - damages

Figure 2 Damage to aircraft

1.4. Other damage

When the left engine propeller hit the asphalt runway, minor superficial damage was caused to the surface asphalt layer. There was no other damage.



Figures 3 and 4 Damage to the surface asphalt layer

1.5. Personnel information (data obtained on 12 November 2012)

1.5.1. Information on the pilot's licence

Pilot (candidate for rating renewal): Male, 42 years of age
Nationality: Slovene

Flying licences: CPL(A) – Commercial Pilot Licence
Date of issue: 10 October 2002, Valid until: 15 September 2016

Ratings:

- SEP (land), Valid until: 19 November 2012
- MEP (land), Valid until: 29 October 2012
- IR/ME(A), Valid until: 29 October 2013

- IR/SE(A), Valid until: 9 December 2011
- CRI(A)/MEP(land), Valid until: 8 March 2014
- FI(A), Valid until: 10 October 2014

Restrictions: None

Flying licences: Examiner's licence

Date of issue: 31 January 2000, Valid until: 6 June 2014

Ratings:

- SLO/FE(A)/PPL,CPL, Valid until: 6 June 2014
- SLO/CRE(A)/SEP(land), Valid until: 6 June 2014
- IRE(A)/SE/ME, Valid until: 6 June 2014
- CRE(A)/ME, Valid until: 6 June 2014
- FIE(A), Valid until: 6 June 2014

1.5.2. Information on the pilot's total flight time

- Flight time in the last 90 days ------ 24 hours and 21 minutes
- Flight time in the last 30 days ------ 8 hours and 17 minutes
- Flight time in the last 24 hours ------ 0
- Flight time on the aircraft type ---------- 53 hours and 58 minutes
- Total flight time ------ 3183 hours

1.5.3. Information on the pilot's medical certificate

TYPE OF MEDICAL CERTIFICATE:	Medical Certificate Class 1 Medical Certificate Class 2
Restrictions:	/
Valid until:	15 December 2012 (Class 1) 15 June 2014 (Class 2)

1.5.4. Information on the examiner's pilot licence

Pilot Examiner: Male, 59 years of age

Nationality: Slovene

Flying licences: ATPL(A) – Transport Pilot Licence

Date of issue: 29 December 2000, Valid until: 3 March 2016

Ratings:

- SEP (land), Valid until: 13 September 2014
- MEP (land), Valid until: 18 January 2013
- IR/ME(A), Valid until: 29 December 2012
- FI(A), Valid until: 10 September 2015

Flying licences: Examiner's licence

Date of issue: 1 February 2000, Valid until: 1 February 2015

Ratings:

- CRE(A)/ME, Valid until: 1 February 2015
- CRE(A)/SEP(land), Valid until: 1 February 2015
- FIE(A), Valid until: 1 February 2015
- IRE(A)/SE/ME, Valid until: 1 February 2015
- TRE/SFE(A)/A320, Valid until: 1 February 2015
- Senior Examiner/A320, Valid until: 1 February 2015

Restrictions: None

1.5.5. Information on the examiner's medical certificate

TYPE OF MEDICAL CERTIFICATE:	Medical Certificate Class 1 Medical Certificate Class 2
Restrictions:	/
Valid until:	7 May 2013 (Class 1) 7 November 2013 (Class 2)

1.5.6. Information on the examiner's total flight time

- Flight time in the last 12 months ------ 510 hours
- Flight time in the last 90 days ------ 159 hours
- Flight time in the last 30 days ------ 55 hours
- Flight time in the last 24 hours ------ /
- Flight time on the type ---------- 4 hours
- Total flight time ------ 19324 hours

1.6. Aircraft information

1.6.1. General information

- Type: Piper Seneca PA-34-200T
- Serial number: 34-7970003
- Year of manufacture: 1979
- Maximum Take-off Mass (MTOM): 1882 kg
- Manufacturer: Piper Aircraft, Inc./ Vero Beach, Florida 32960, U.S.A.
- Registration mark: S5-DGL
- Country of registration: Republic of Slovenia
- Owner: National Institute of Oceanography and experimental Geophysics – OGS, Borgo Grotta Gigante n. 42/c, 34010 Sgonico 8TS, Italy
- Operator: JANEZ LET d.o.o., UL. Juša Kozaka 1, 1000 Ljubljana, SLOVENIA
- Entry into the Aircraft Register of RS: 26 May 2010
- Confirmation no. on entry into the Register: 850
- Certificate of airworthiness extension: issued on 17 May 2012, Valid until 24 May 2013
- Aircraft total time before the accident: 5639 hours and 28 minutes
- Aircraft total time since the last maintenance check: 35 hours and 28 minutes (100-hour check at 5604)

1.6.2 Engine information (Left - Right)

- Engine type: Teledyine Continental
- LH: TSIO-360-EB, total time: 698/41
- Serial number: 307602
- RH: LTSIO-360-EB, total time: 473:06
- Serial number: 266452R

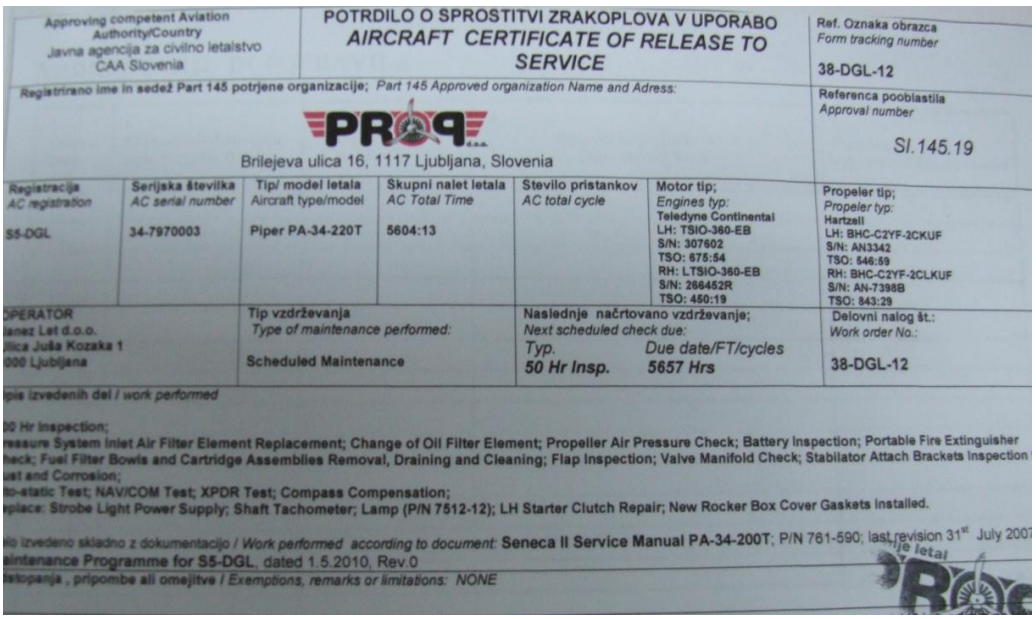
1.6.3. Propeller information

- Manufacturer: Hartzell Propeller Inc.U.S.A.
- Propeller type: two bladed with a variable pitch
- Left: LH BHC-C2YF-2CKUF
- Serial number: AN-3342, total time: 569:46
- Right: RH BHC-C2YF-2CLKUF
- Serial number: AN-7398B, total time: 866:16

1.6.4. Information on maintenance and management within the CAMO organization

The aircraft was maintained according to the approved maintenance program of 1 May 2010 at the approved maintenance organization. According to data obtained from CAMO and the maintenance organization, the last 100-hour maintenance check was performed between 1 June 2012 and 15 June 2012 and an additional maintenance check was performed on 24 July 2012 at aircraft total time of 5604:13 and 5627: 00 hours. The next 50-hour maintenance check was scheduled to be performed when aircraft total time would reach 5657 hours.

Maintenance documentation (Work Orders/Service Report) of the regular maintenance checks at the maintenance organization as well as documentation of the certified continuing airworthiness management organization (**CAMO**) was checked. Documentation relating to compliance with the issued airworthiness directives relating to aircraft landing gear (Airworthiness Directive - AD NOTES) was checked. There were no deficiencies identified.



Approving competent Aviation Authority/Country
Javna agencija za civilno letalstvo
CAA Slovenia

POTRDILO O SPROSTITVI ZRAKOPLOVA V UPORABO
AIRCRAFT CERTIFICATE OF RELEASE TO SERVICE

Ref. Oznaka obrazca
Form tracking number
38-DGL-12

Registrirano ime in sedež Part 145 potrjene organizacije; *Part 145 Approved organization Name and Adress:*
PROP
Brilejeva ulica 16, 1117 Ljubljana, Slovenia

Referenca pooblastila
Approval number
SI.145.19

Registracija *AC registration*	Serijska številka *AC serial number*	Tip/ model letala *Aircraft type/model*	Skupni nalet letala *AC Total Time*	Stevilo pristankov *AC total cycle*	Motor tip; *Engines typ:*	Propeler tip; *Propeler typ:*
S5-DGL	34-7970003	Piper PA-34-220T	5604:13		Teledyne Continental LH: TSIO-360-EB S/N: 307602 TSO: 675:54 RH: LTSIO-360-EB S/N: 266452R TSO: 450:19	Hartzell LH: BHC-C2YF-2CKUF S/N: AN3342 TSO: 546:59 RH: BHC-C2YF-2CLKUF S/N: AN-7398B TSO: 843:29

OPERATOR
lanez Let d.o.o.
lica Juša Kozaka 1
000 Ljubljana

Tip vzdrževanja
Type of maintenance performed:
Scheduled Maintenance

Naslednje načrtovano vzdrževanje;
Next scheduled check due:
Typ. 50 Hr Insp.
Due date/FT/cycles 5657 Hrs

Delovni nalog št.:
Work order No.:
38-DGL-12

pis izvedenih del / *work performed*
0 Hr Inspection;
ressure System Inlet Air Filter Element Replacement; Change of Oil Filter Element; Propeller Air Pressure Check; Battery Inspection; Portable Fire Extinguisher
heck; Fuel Filter Bowls and Cartridge Assemblies Removal, Draining and Cleaning; Flap Inspection; Valve Manifold Check; Stabilator Attach Brackets Inspection
ust and Corrosion;
to-static Test; NAV/COM Test; XPDR Test; Compass Compensation;
place: Strobe Light Power Supply; Shaft Tachometer; Lamp (P/N 7512-12); LH Starter Clutch Repair; New Rocker Box Cover Gaskets Installed.

o izvedeno skladno z dokumentacijo / *Work performed according to document:* Seneca II Service Manual PA-34-200T; P/N 761-590; last revision 31st July 200
aintenance Programme for S5-DGL, dated 1.5.2010, Rev.0
stopanja , pripombe ali omejitve / *Exemptions, remarks or limitations:* NONE

Figure 5 Entry of a 100-hour maintenance check with the scheduled 50-hour maintenance check

1.6.5. Mass and balance

Mass and balance were within the limits allowed.

1.7. Meteorological information

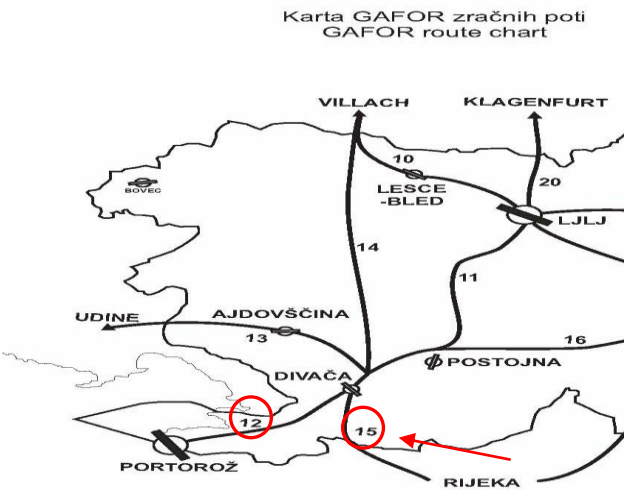
Weather information obtained from the Slovenian Environmental Agency was summarized according to the information forwarded by the Škocjan meteorological station, which is located about 2 kilometres south-west of the Divača Airport. Data are representative in terms of micro-location, terrain configuration, general weather conditions on the day of the accident and the proximity of the measuring devices.

1.7.1. General forecast and data from the automatic weather station

A description of the weather conditions shows that on the day of the accident at 12:30 p.m. local time it began to rain. It was raining within every half-hour until midnight. Rainfall intensity is shown in column R[mm]. The total quantity of rainfall in a given time can be seen in column R Tot.

On the basis of the analysis of weather developments until 26 October 2012, it was found that the total rainfall in the night between 15 and 16 October was 20.8 mm. This was the only precipitation in this area prior to 26 October 2012. Winds 10 m above the ground were moderate, but in the heights, the general direction of the wind can be deduced from the accompanying radar images and radar reflectivity.

GAFOR/METAR Data



*Routes for the Divača area are 12 and 15, and all the routes from 11 to 16 assumed **X***

METAR from Portorož airport as on 26 October 2012 (from 11 a.m. UTC until 1:30 p.m. UTC)

METAR LJPZ 261100Z 34004KT 280V040 3000 -RA BR FEW016 SCT023 OVC040 16/15 Q1007 RETS=
METAR LJPZ 261130Z VRB02KT 5000 BR FEW016 SCT026 OVC060 17/16 Q1007 RERA=
METAR LJPZ 261200Z 25002KT 5000 BR FEW017 SCT100 BKN130 18/16 Q1006=
METAR LJPZ 261230Z VRB01KT 5000 BR FEW017 SCT100 BKN130 18/16 Q1006=
METAR LJPZ 261300Z 09001KT 8000 FEW017 BKN020 18/16 Q1006=
METAR LJPZ 261330Z 24003KT 190V290 8000 SCT017 BKN036 18/16 Q1005=

TAF for Portorož
TAF LJPZ 260800Z 2609/2618 VRB02KT 5000 BR FEW030 SCT040 BKN060 BECMG 2609/2612 18008KT RA SCT020 OVC040=

TAF LJPZ 261100Z 2612/2621 18005KT 5000 -RA BR SCT020 OVC033 PROB30 TEMPO 2612/2618 TSRA SCT020 BKN033CB=

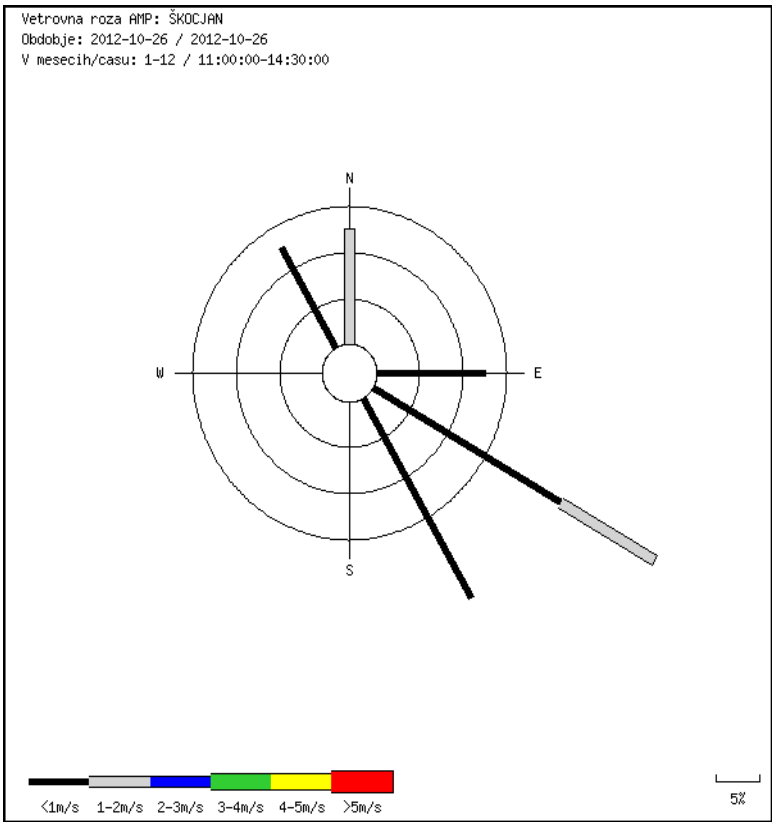
The rainfall data and other data are supplied in the attached table on data obtained from Škocjan automatic weather station.

- LT time - local time
- T2m - temperature at a height of 2m
- P hPa - air pressure
- H proc - relative humidity
- G1Ra - global radiation
- Wspeed - wind speed
- Wdir - direction of the wind
- WSmax - max wind speed
- Wdmax - direction at max speed
- R mm - rainfall quantity
- Rtot - total rainfall quantity

Date	LT time	T2m	P [hPa]	H[proc]	GlRa	WSpeed	Wdir	WSmax	Wdmax	**R[mm]**	**RTot**
2012-10-26	03:00	6.4	962.7	97	-1.4	0.1	152	0.6	270	0	0
2012-10-26	03:30	6.4	962.6	97	-0.3	0.1	166	0.6	17	0	0
2012-10-26	04:00	6.5	962.4	97	-1.3	0.4	250	1.3	45	0	0
2012-10-26	04:30	6.5	962.2	97	0.5	0.1	46	0.6	287	0	0
2012-10-26	05:00	6.9	962	98	0	0.1	142	0.9	203	0	0
2012-10-26	05:30	7.4	961.9	98	0	0.2	91	1.1	113	0	0
2012-10-26	06:00	7.7	961.6	98	0	0.3	74	0.7	293	0	0
2012-10-26	06:30	8	961.5	98	1.1	0.1	38	1.2	113	0	0
2012-10-26	07:00	8.2	961.5	98	8.4	0	330	0.5	124	0	0
2012-10-26	07:30	8.6	961.7	98	16	0.1	252	1	349	0	0
2012-10-26	08:00	8.9	961.6	98	55.4	0.1	35	1	17	0	0
2012-10-26	08:30	9.5	961.6	98	78.8	0.1	29	0.9	287	0	0
2012-10-26	09:00	10.1	961.5	98	179.7	0.5	48	0.8	276	0	0
2012-10-26	09:30	10.9	961.2	98	145.5	0.1	317	0.7	214	0	0
2012-10-26	10:00	12.2	960.9	98	389.3	0.4	135	1.1	214	0	0
2012-10-26	10:30	13.6	960.6	95	170.8	0.5	91	2	107	0	0
2012-10-26	11:00	14.6	960.3	93	167.1	0.7	145	2	146	0	0
2012-10-26	11:30	14.6	959.9	92	72.3	0.8	133	2.5	101	0	0
2012-10-26	**12:00**	**14.7**	**959.5**	**92**	**18.4**	**0**	**125**	**1.2**	**101**	**0.2**	**0.2**
2012-10-26	**12:30**	**14.4**	**959.1**	**93**	**12.9**	**0.5**	**343**	**0.8**	**338**	**2.8**	**3**
2012-10-26	**13:00**	**14**	**958.7**	**95**	**31.2**	**1.4**	**355**	**3.4**	**349**	**11**	**14**
2012-10-26	**13:30**	**14.1**	**958.1**	**96**	**33.2**	**1.3**	**111**	**3.7**	**146**	**2**	**16**

2012-10-26	**14:00**	**14**	**957.7**	**96**	**17.8**	**0.7**	**136**	**4**	**158**	**1.8**	**17.8**
2012-10-26	**14:30**	**14**	**957.5**	**96**	**11.5**	**0.5**	**82**	**2**	**135**	**2.4**	**20.2**
2012-10-26	**15:00**	**13.8**	**957**	**97**	**36.7**	**1**	**104**	**3**	**113**	**0.4**	**20.6**
2012-10-26	**15:30**	**13.8**	**956.5**	**97**	**16**	**0.2**	**116**	**1.2**	**79**	**0.2**	**20.8**
2012-10-26	**16:00**	**13.8**	**956.2**	**97**	**3.8**	**1.5**	**133**	**3.4**	**141**	**3.2**	**24**
2012-10-26	16:30	13.8	955.8	96	1.8	0.7	259	4.8	180	1.8	25.8
2012-10-26	17:00	13.7	955.5	96	0.3	0.9	162	2.6	186	1.8	27.6
2012-10-26	17:30	13.7	955.4	96	0	1.7	189	3.7	180	2	29.6
2012-10-26	18:00	13.6	955.1	95	-0.6	1.6	169	4.5	180	1	30.6
2012-10-26	18:30	13.5	954.7	95	-0.1	0.4	240	2.7	208	1.4	32
2012-10-26	19:00	13.3	954	96	0	0.9	25	2.2	62	0.2	32.2
2012-10-26	19:30	13.2	953.6	96	0	0.5	137	1.7	79	0.2	32.4
2012-10-26	20:00	13.3	952.9	97	-0.1	1.1	119	2.9	141	0.2	32.6
2012-10-26	20:30	14.6	952.5	96	-0.6	2.9	157	6.5	135	0.4	33
2012-10-26	21:00	14.8	952	95	-0.6	3.2	152	8	146	1	34
2012-10-26	21:30	14.8	951.5	92	-0.1	2.6	178	7.5	169	0.8	34.8
2012-10-26	22:00	14.5	951.2	89	-0.6	4.3	178	9.3	186	0.4	35.2
2012-10-26	22:30	15	950.6	88	-1.2	4	182	9.5	186	0	35.2
2012-10-26	23:00	15	950.2	90	-1.2	4	206	10.5	186	0.4	35.6
2012-10-26	23:30	14.8	949.7	91	-1.1	2	208	7.1	208	0	35.6

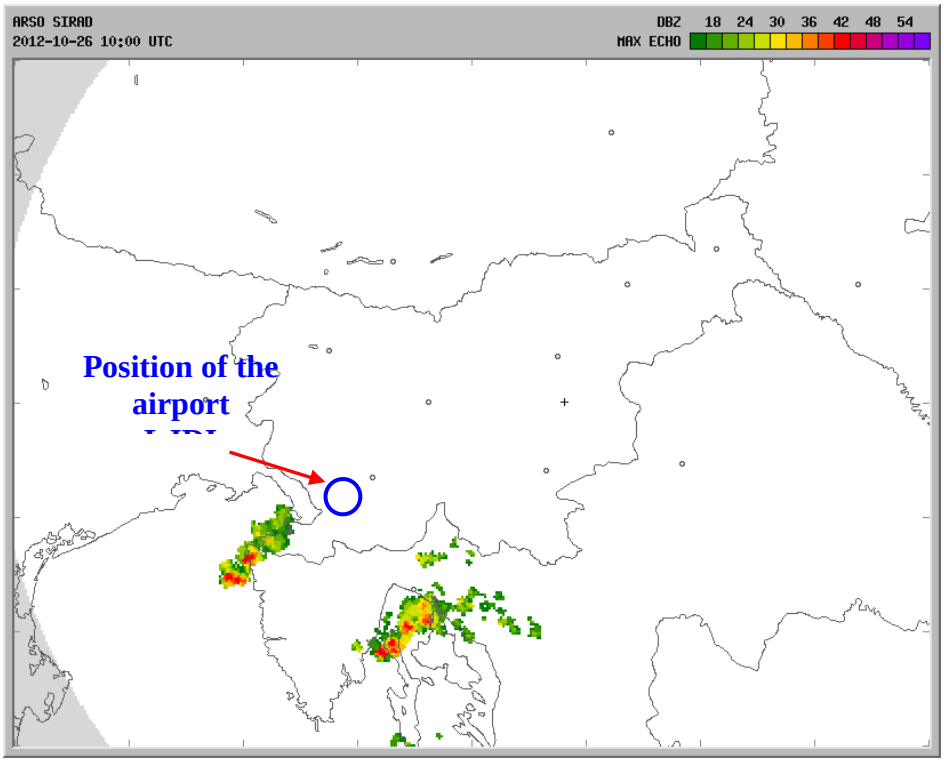
RED HIGHLIGHTED DATA REPRESENTS THE QUANTITY OF RAINFALL FROM 12 TO 4 P.M. - LT



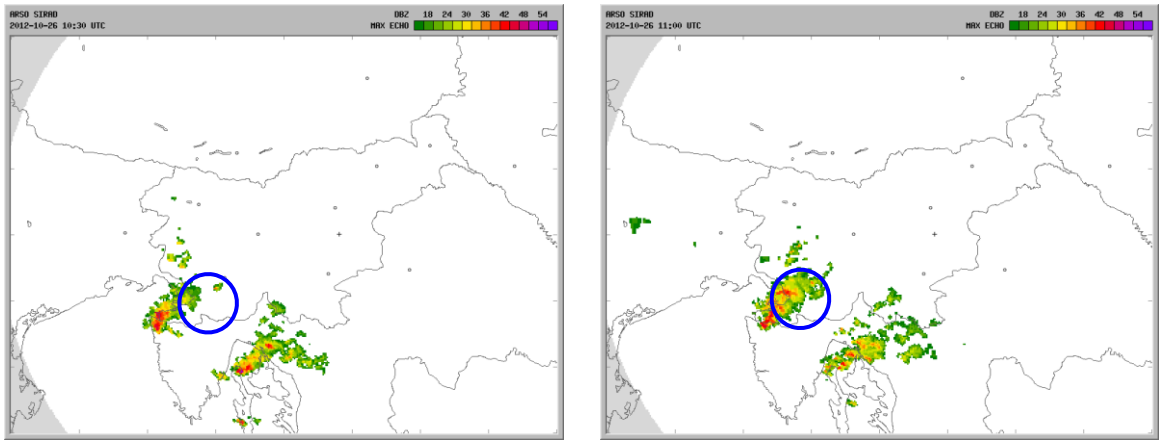
Intensity and direction of the wind at Škocjan AWS during the event

1.7.2. Radar images of precipitation

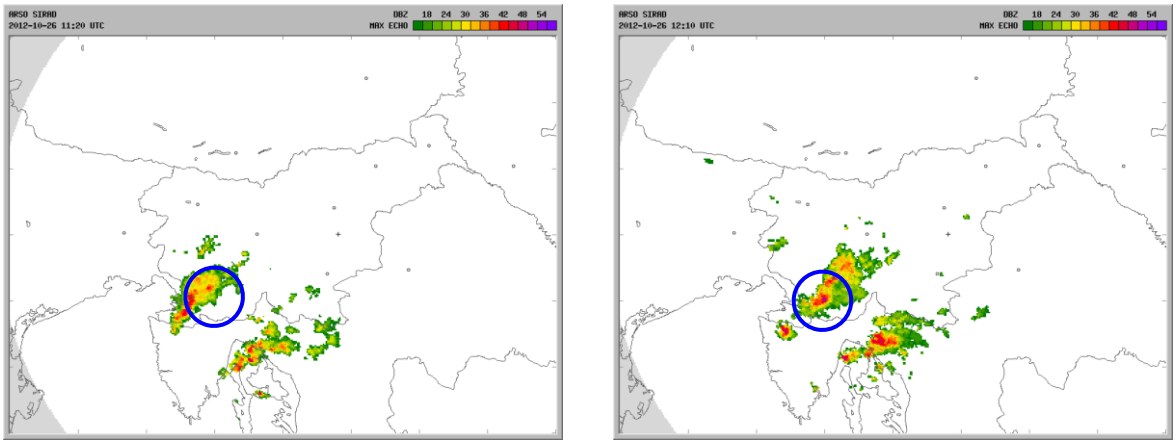
The sequence of radar images of precipitation shows the fronts and rainfall moving in, which towards the evening on the day of the event covered all of Slovenia. UTC time is given in the upper left corner of the radar images and in the right corner a precipitation intensity scale is given.



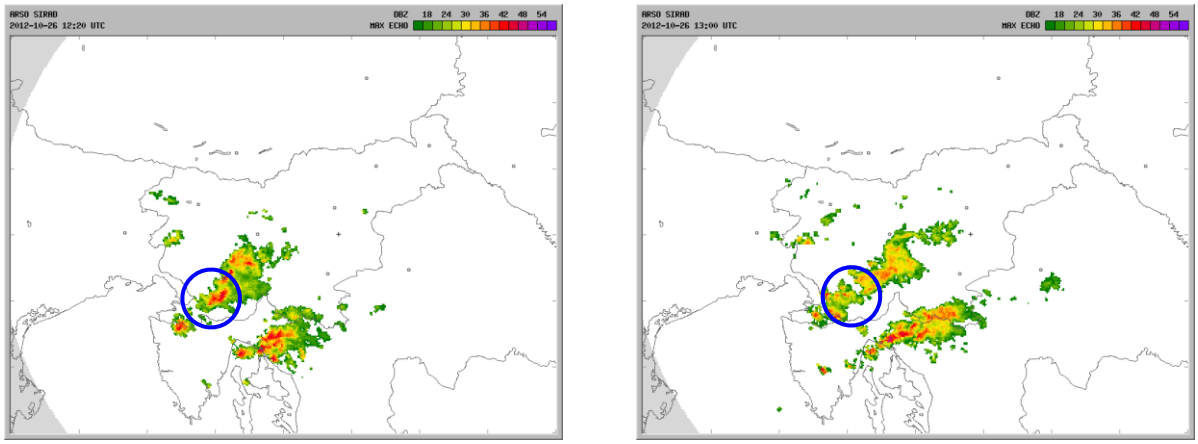
Radar image of precipitation at 12 p.m. local time.



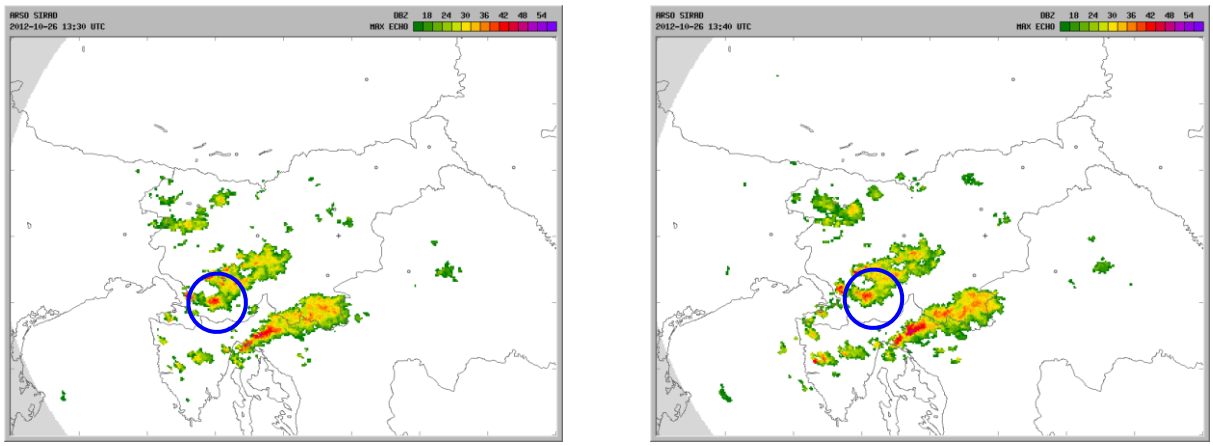
Radar image of precipitation at 12:30 p.m. and 1 p.m. local time.



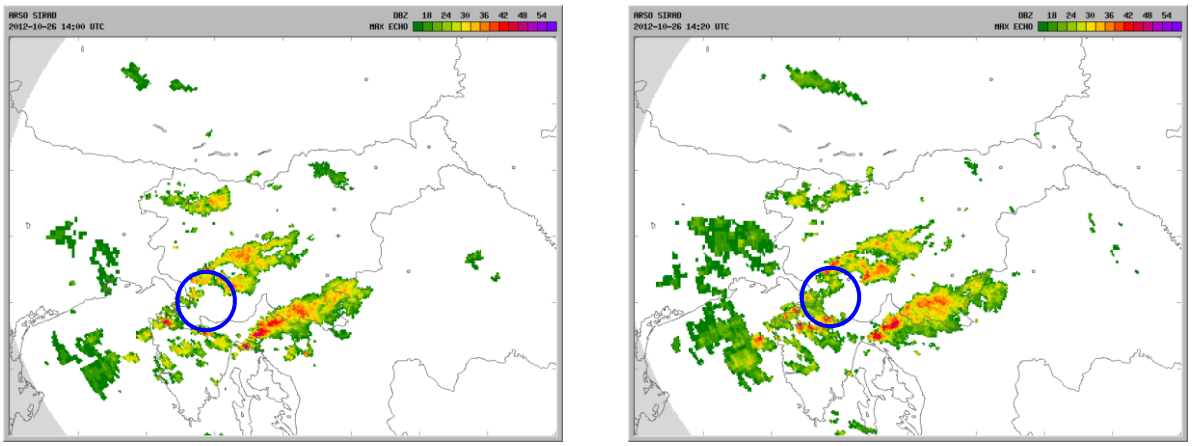
Radar image of precipitation at 1:20 p.m. and 2:10 p.m. local time.



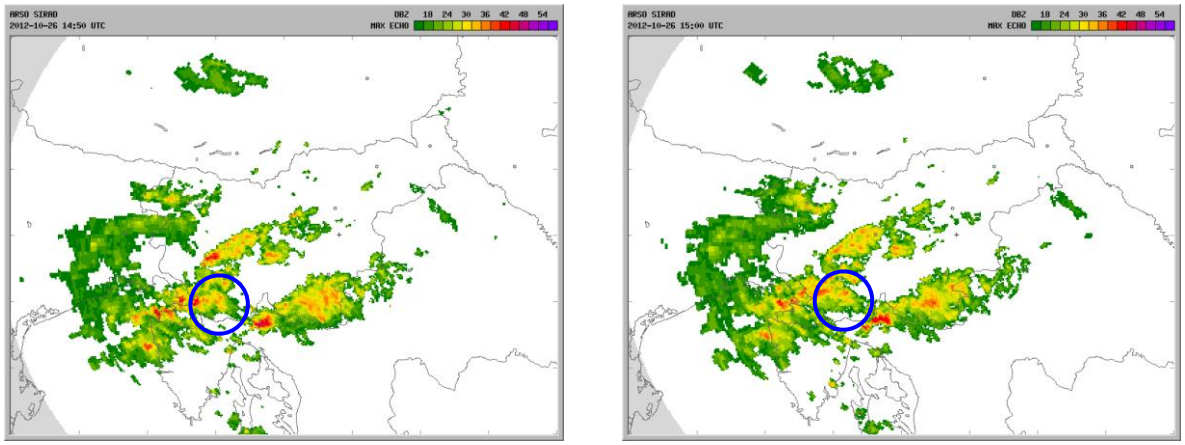
Radar image of precipitation at 2:20 p.m. and 3 p.m. local time.



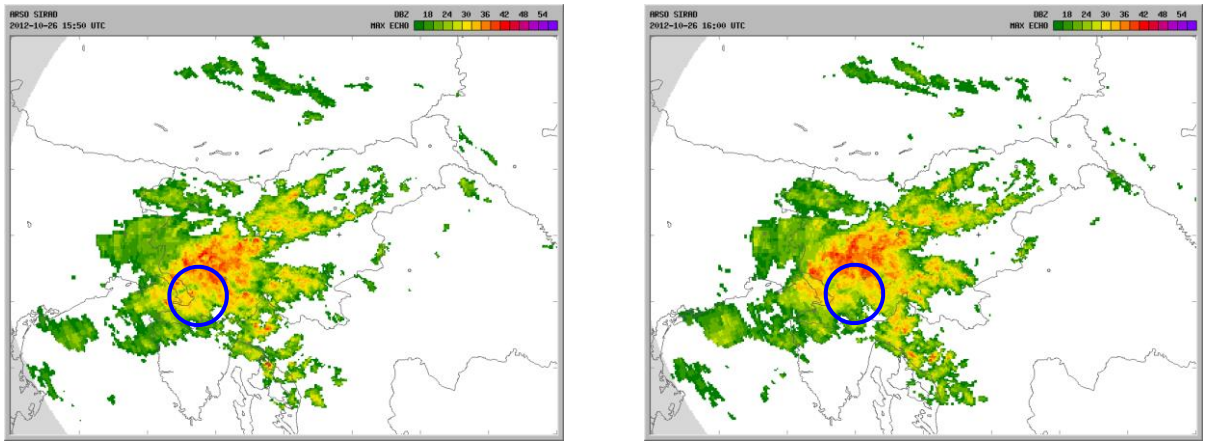
Radar image of precipitation at 3:30 p.m. and 3:40 p.m. local time.



Radar image of precipitation at 4 p.m. and 4:20[2] p.m. local time.



Radar image of precipitation at 4:50 p.m. and 5 p.m. local time.



Radar image of precipitation at 5:50 p.m. and 6 p.m. local time.

[2] The aviation accident took place at 4:15 LT. The crew took off immediately after rain showers.

1.8. Aids to navigations

Not applicable.

1.9. Communications

The Divača Airport Aviation Guide provides that communication takes place on a frequency of 123.50 MHz. During the flight communication at that frequency was established at the airport. During the aviation accident there was no other aircraft present in the airport zone. According to statements obtained on the event, the crew performed a Radio Check on the aircraft after starting the engines. Afterwards, the crew did not communicate further.

1.10. Airport information

1.10.1. General

Divača Airport is located 3.5 km east of Divača. The airport operator "Klub kraški letalski center Divača" had an authorisation issued by the Republic of Slovenia Civil Aviation Agency (CAA), allowing it to operate during the day under visual meteorological conditions (VMC) and under visual flight rules (VFR) for aircraft not exceeding 5,700 kg of Maximum Take-off Weight (MTOW).

Figure 6 Asphalt RWY 13-31 the day after the event (photo in the direction of the aircraft landing)

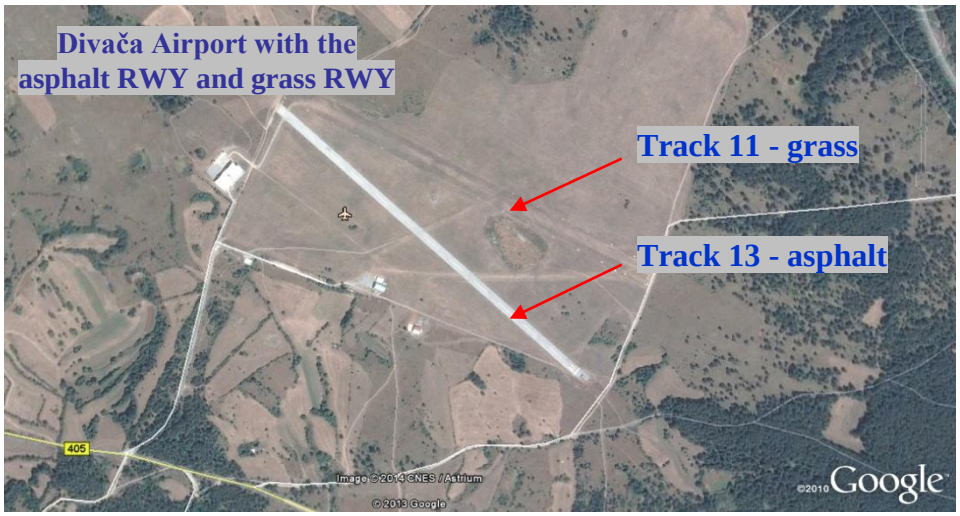
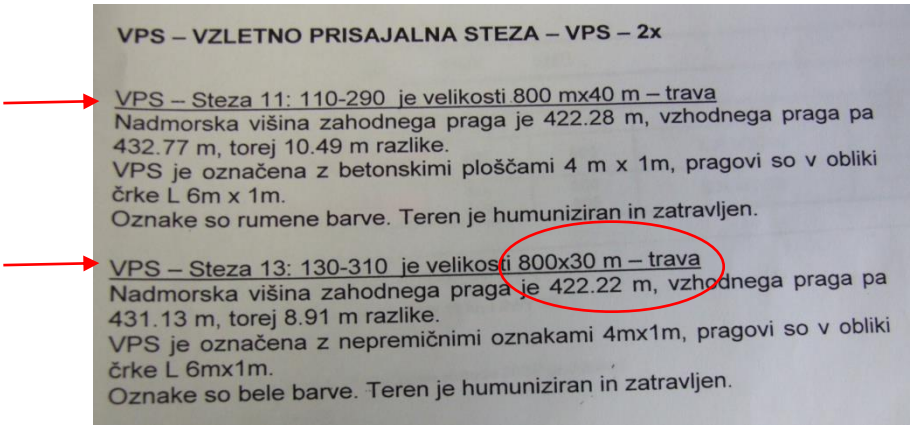


Figure 7 Divača Airport before the event

1.10.2. Information on the runway on the day of the event

On the day of the event, the airport was operating in accordance with the "Divača Airport Aviation Guide" issued on 21 February 2011 (revision No. 2) and the CAA operating licence of 21 February 2012. According to the Airport Guide, revision No. 2, the airport had two grass runways. Grass runway 13 was paved many years ago but the changes were not implemented in the airport documents according to the regulations governing the field of building construction in Slovenia.



VPS – VZLETNO PRISAJALNA STEZA – VPS – 2x

VPS – Steza 11: 110-290 je velikosti 800 mx40 m – trava
Nadmorska višina zahodnega praga je 422.28 m, vzhodnega praga pa 432.77 m, torej 10.49 m razlike.
VPS je označena z betonskimi ploščami 4 m x 1m, pragovi so v obliki črke L 6m x 1m.
Oznake so rumene barve. Teren je humuniziran in zatravljen.

VPS – Steza 13: 130-310 je velikosti 800x30 m – trava
Nadmorska višina zahodnega praga je 422.22 m, vzhodnega praga pa 431.13 m, torej 8.91 m razlike.
VPS je označena z nepremičnimi oznakami 4mx1m, pragovi so v obliki črke L 6mx1m.
Oznake so bele barve. Teren je humuniziran in zatravljen.

Figure 8 Formally valid data from the Divača Airport Aviation Guide rev. No. 2

According to the operating licence issued by the CAA on 21 February 2012, the operator was not allowed to operate runway 13-31. Pursuant to the decision issued, the airport operator was obliged to obtain an operating permit and provide for the proper marking of the closed runway 13-31.

1.10.3. Information on the airport after the event

The documentation obtained from the CAA shows that the new information on the airport was documented in revision no. 4 of the Airport Guide of 7 November 2012 (11 days after the event). The CAA issued a new operating licence on 16 November 2012 (20 days after the event). CAA air controllers carried out a technical examination of runway 13 on 19 October 2012 (6 days before the event), from which it was found that there were reservations about the issue of the operating permit. The airport operator was ordered to deliver a report to the CAA by 16 December 2012 on the measurement of the friction coefficient.

Figure No. 9 (data from the Airport Guide revision no. 4) shows that the asphalt surface of the runway 13 measures 774m x 18m. Data on the basis of measurements that were carried out after the event are also the actual data on the day of the accident, which were implemented after the event in revision no. 4 of the Airport Guide of 7 November 2012.

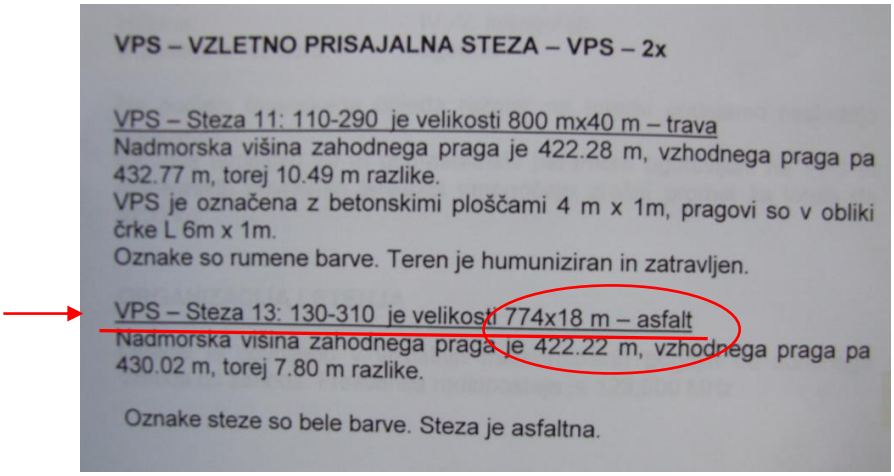


Figure 9 Data from the Divača Airport Aviation Guide rev. No. 4

- The geographical coordinates of the airport: N 45°40'59" / E 014°00'10"
- Runway: 13-31, length 774m x 18m, asphalt
- Altitude of threshold 31: 430.02 m
- Altitude of threshold 13: 422.22 m

1.10.4. Other airport information

On 21 June 2012 and 21 September 2012, the Slovenian Air Navigation Services (ANS) based on the application by the airport operator to issue a NOTAM[3] message, published the following notice:

RWY 13/31 CLOSED

[3] Notices to Airmen published by the Slovenian ANS. NOTAM No.: C0836/12. More information in respect of NOTAM notices is available at: http://www.skybrary.aero/index.php/Notice_To_Airmen

This request was issued in accordance with the "Instructions for request to issue NOTAM messages" revision No. 3.2 of 11 October 2012. The analysis of the published NOTAM notice shows that according to the CAA decision of 21 February 2012, the airport operator was obliged to provide for an appropriate marking of the closed RWY 13-31. According to the point 2.4 of the Instructions for request to issue NOTAM messages, the request did not contain a detailed description of the activities. In the meantime, RWY 31-13 was the subject of the administrative and judicial procedures between the entities relating to the national building regulations in the Republic of Slovenia.

1.11. Flight recorders

The aviation rules for this category of aircraft do not require the flight recorders.

1.12. Wreckage and impact information

Aircraft Accident and Incident Investigation Service was informed of the incident by the pilot – candidate – and the Koper Police Directorate, which inspected the scene of the event on the day of the accident in the night time when it was raining. The Investigator-in-Charge investigated the scene of the accident the following day. At the arrival of the Investigator-in-Charge, Koper Police Directorate officers, the aircraft operator's fire-fighters and one of its representatives were present at the scene of the accident. The location of the accident was properly secured.

1.13. Medical and pathological information

/

1.14. Fire

There was no fire.

1.15. Survival aspects

/

1.16. Course of the investigation

The scene of the accident was inspected and documented by the Koper Police Directorate in the evening on the day of the event. The following day, the Investigator-in-Charge visited the scene of the accident. Later on, statements were obtained from the pilot, pilot examiner and witnesses. Additional technical investigations were conducted on 20 November 2012, 11 April 2013, 11 June 2013, 24 September 2013, 11 November 2013 and 20 March 2014. In the process of investigation, the Slovenian Air Navigation Services obtained documentation on the pilot, pilot examiner, aircraft

documentation, documentation on the airport and documentation on the aircraft operator. At the request of the Investigator-in-Charge, the competent Institute of Metal Constructions delivered a report on the review and investigation of landing gear material on 20 January 2014. Draft final report in Slovenian language was issued on 23 May 2014. The Aircraft Accident Investigation Commission has carried out further inquiries after the issuance of the draft final report.

1.17. Information on the operator/owner

The aircraft was used by the operator on the basis of a contract with the owner. The operator was using the aircraft in the aircraft fleet of an air carrier holding an Air Operator Certificate (AOC), and in the fleet of an aircraft flight school holding a Flight Training Organisation licence (FTO). Occasionally, the operator lent the aircraft to qualified pilots for the purpose of maintenance and renewal of air permits, authorizations and ratings. Based on the review of the operator's operational documents, the operator stated the Divača Airport as the parent Airport – for the base, air carrier and flight school. The operator is also the holder of the G organization for managing the aircraft's continued airworthiness.

1.18. Other information

Some time ago, the pilot worked as a flight instructor in the operator's flight school. He also worked as a pilot for the air carrier. He was well familiar with the aircraft involved in the operations of the air carrier, as well as with the flight school and with the parent Airport.

1.19. Investigation techniques

Standard investigation techniques were used. The authorized organization for the investigation of metal elements examined the bearing structure material of the landing gear. After the issuance of the draft final report further inquiries have been carried out.

2. ANALYSIS

2.1. General

On 28 September 2012, the pilot – a candidate for rating renewal in accordance with the Instructions on the verification of aviation qualifications of aircraft and helicopters pilots (No. 010-139/2011/5 of 14 December 2011) – informed the CAA about the planned verification as required by the prescribed CAA instructions. One day before the event, the pilot informed the CAA once again that on 24 October 2012 IR/ME part of the FNPT II would be checked and that the other part of the check would be carried out depending on the availability of the aircraft. In the notice sent to the CAA, the pilot announced that he would renew his MEP rating by 29 October 2012, from which the Commission concludes that the pilot was in a hurry due to the remaining days until the expiry of the rating.

2.2. Analysis of the preparation and implementation of the flight

From the examination of the aircraft documentation – the Journey Log Book and obtained statements – the pilot and the pilot examiner attempted to perform a flight at the Divača airport two days before the event but the flight was aborted due to difficulties in starting the engines. According to the statements obtained the crew finished the pre-flight preparation on the day of the event and decided to perform the flight within the airport zone due to the weather conditions.

Based on the data on the time of the take-off and time of the event, the Total Flight Time lasted 12 min. The content of checks for the revalidation of the MEP rating requires a minimal route sector time which is not shorter than 15 minutes (Route sector means a flight comprising take-off, departure, cruise of not less than 15 minutes, arrival, approach and landing phases). According to the pilot's statements, the decision of the crew to land the aircraft with a full shut-down was based on the decision of the examiner that the candidate had successfully completed the verification of the aviation qualifications for MEP rating renewal taking into account the content of the IR/ME renewal procedure performed on the simulator.

2.2.1. Landing analysis

According to the pilot's statement, all the flight parameters in the final approach phase were in accordance with the manufacturer's Landing Check List. The configuration of the aircraft was checked by the crew during the final approach (LDG check, three green - landing gear down).

According to the pilot's statement, the landing point was slightly, about 100 to 200 m, lower than runway threshold 31.

According to witnesses' statements, the point of contact with the runway was more than 200 m from runway threshold 31. After the contact with the runway in the deceleration phase, the pilot estimated that the braking effect was insufficient and that there was no deceleration. Due to increased amount of water on the track there was an aquaplaning effect,[4] which led to a loss of directional control and braking ability.

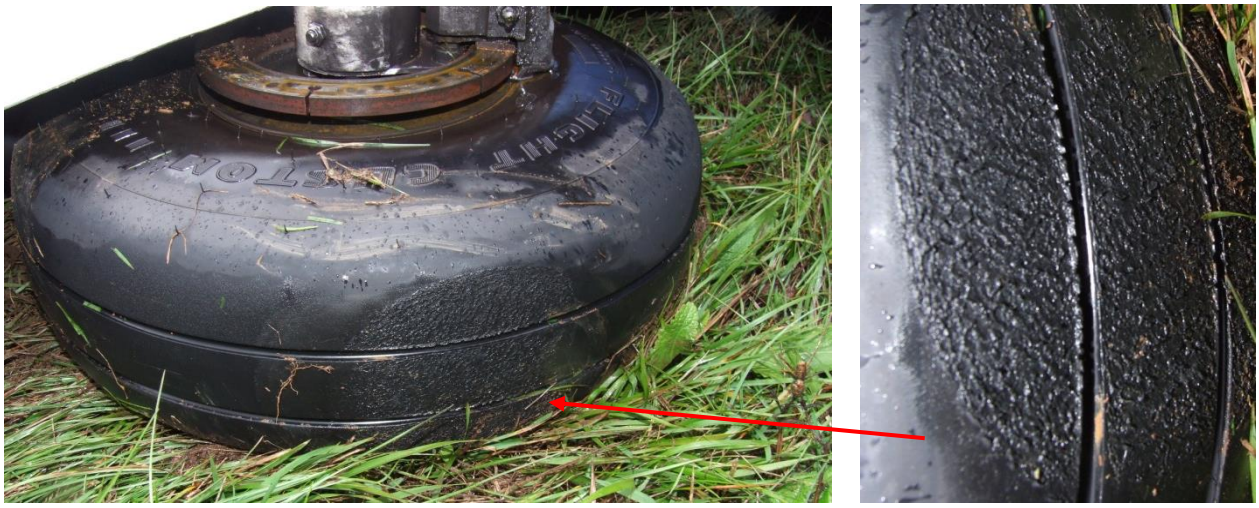


Figure 10 Aquaplaning marks on the left LG leg tire

Figure 11 Aquaplaning marks on the right LG leg tire

The tire marks on both wheels show the multiple aquaplaning effect. The attempt of braking and maintaining the direction most likely led to strong vibrations and strongly unsymmetrical braking of the aircraft, causing the support fitting to fracture. The skeletal analysis revealed damage to the shock absorber on the two landing gear legs. The shock absorbers two pistons are bent in the axial direction forward-rearward. The mentioned deformation occurred as a result of unsymmetrical braking.

[4] http://www.skybrary.aero/index.php/Aquaplaning, http://www.skybrary.aero/index.php/Landing_Distances

The consequence of this event is classified as a runway excursion[5].

2.3. Analysis of the landing gear

The investigation failed to reveal any damage or failure of parts or hydro installations or micro switches on the landing gear, which would result in unlocking of the left landing gear leg. Failure of the main support fitting (Trunion) was caused due to visible damage to one of the two fixed support fittings in the form of a butterfly - Figure 12.

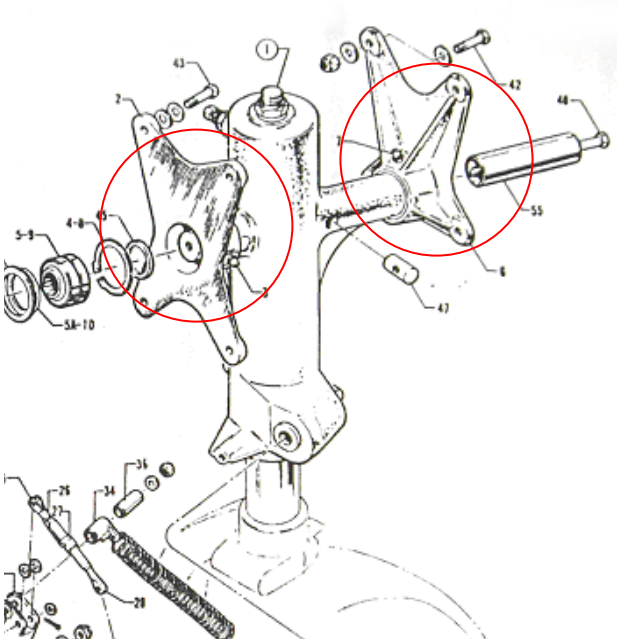


Figure 12

Figure 13

The investigation of the Trunion support fittings included an additional investigation of the material, which was performed by an approved institution for the investigation of metal structures. The left landing gear leg shock absorber was investigated. The findings of the left landing gear leg investigations are given in the Institute's Report no. P29381 of 10 January 2014. Due to the discovered deformation of the shock absorber, the right landing gear leg was dismantled and an investigation was performed - measurement of the deformation of the right landing gear leg shock absorber. The measured value of the bent left and right piston is 2.48 mm and 2.83 mm, respectively.

[5] http://www.skybrary.aero/bookshelf/books/2053.pdf

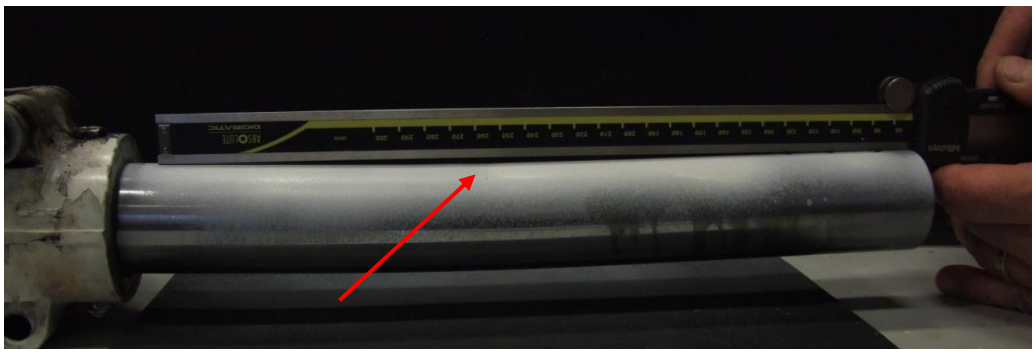


Figure 14 Bent piston of the right LDG leg shock absorber

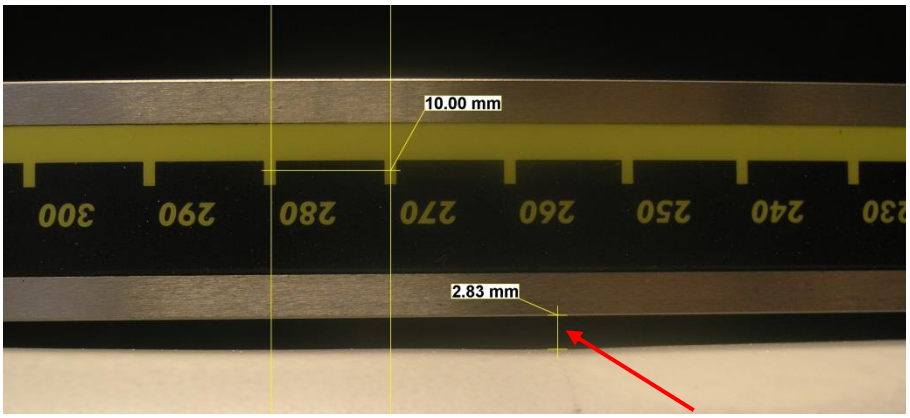


Figure 15 Measured value of the deviation of the right LDG leg shock absorber

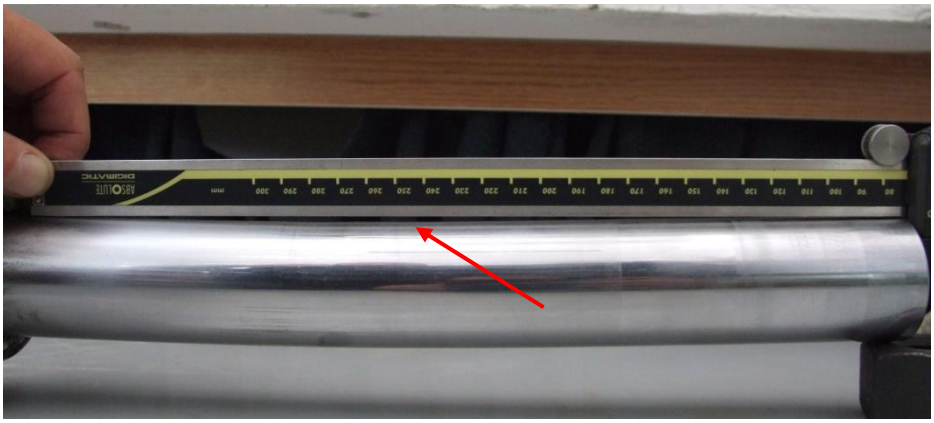


Figure 16 Bent piston of the left LDG leg shock absorber

2.4. Analysis of material

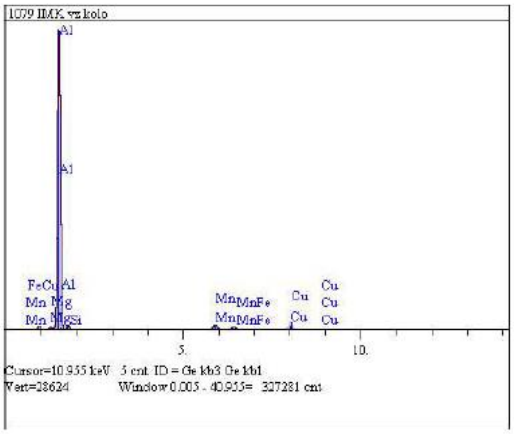
The investigation of the material of both left landing gear leg support fittings was carried out by an authorized organization for this sort of investigation - the Institute of Metal Constructions Ljubljana.

NAROČNIK: Republika Slovenija
CUSTOMER: Ministrstvo za infrastrukturo in prostor
Služba za preiskovanje letalskih nesreč
Langusova ulica 4
1000 Ljubljana

OBJEKT: Podvozje letala PA34 200T Seneca
OBJECT:

POROČILO št. P 29381
REPORT No.

PREGLED IN PREISKAVA MATERIALA PRISTAJALNEGA PODVOZJA LETALA PA34 200T SENECA



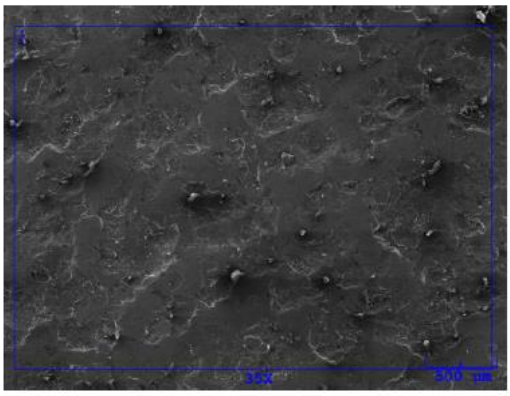
Elt.	Line	Intensity (c/s)	Error 2-sig	Atomic %	Conc		
Mg	Ka	30.50	1.105	1.045	0.890	wt.%	
Al	Ka	2,808.85	10.600	90.591	85.634	wt.%	
Si	Ka	39.41	1.256	3.045	2.996	wt.%	
Mn	Ka	71.25	1.688	3.097	5.960	wt.%	
Fe	Ka	33.03	1.149	1.590	3.111	wt.%	
Cu	La	29.99	1.095	0.633	1.409	wt.%	
				100.000	100.000	wt.%	Total

kV	20.0
Takeoff Angle	35.0°
Elapsed Livetime	100.0

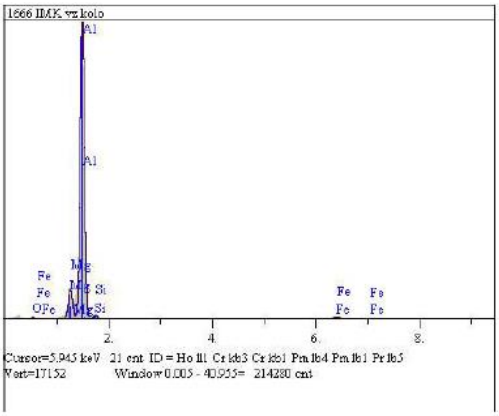
Slika 5. AES analiza in spekter kateri je viden na sliki 4

Na sliki 6 in 7 je prikazano mesto izdelave AES analize, na sliki 8 pa pripadajoči spekter in analiza.

Slika 6. Mesto izdelave AES analize



Slika 7. Mesto izdelave AES analize (35 x pov.)



Elt.	Line	Intensity (c/s)	Error 2-sig	Atomic %	Conc		
O	Ka	6.83	0.585	2.435	1.450	wt.%	
Mg	Ka	207.56	3.221	7.586	6.863	wt.%	
Al	Ka	2,207.91	10.507	86.462	86.837	wt.%	
Si	Ka	24.87	1.115	2.381	2.489	wt.%	
Fe	Ka	19.31	0.983	1.136	2.361	wt.%	
				100.000	100.000	wt.%	Total

kV	20.0
Takeoff Angle	35.0°
Elapsed Livetime	80.0

Slika 8. AES analiza in spekter kateri je viden na sliki 7

3. SKLEP

Iz opravljenih preiskav na obeh vzorcih (ang. Support Fitting in ang. Fixation Retainer Tube) z opravljeno AES analizo lahko zaključimo, da sta oba preiskovana vzorca izdelana iz aluminijeve zlitine. Glede na izgled in vrsto poškodb lahko zaključimo, da je do zloma prišlo zaradi nenadne preobremenitve pomožnega nosilca kolesa (ang. Support Fitting).
To našo ugotovitev utemeljujemo z dejstvom, da na sami prelomni površini nismo zasledili tako imenovanih linij počitka iz katerih bi lahko zaključili, da gre v tem primeru za utrujenostni lom (slika 9), ampak je bil glavni vzrok za zlom že prej omenjena nenadna preobremenitev nosilca.

.

Slika 9. Značilne linije utrujanja pri utrujenostnem lomu

Nosilec metalografskih in korozijskih preskušanj: Vodja laboratorija kovinskih konstrukcij:

Simon BOŽIČ, dipl. inž.metal. Bojan PEČAVAR

Direktor:

dr. Borut BUNDARA, univ. dipl. inž. grad.

From the investigations carried out with an AES analysis on the two samples (Support Fitting and Fixation Retainer Tube), it can be concluded that both test samples are made of aluminium alloy. Based on the appearance and the type of damage it can be concluded that the fracture occurred due to a sudden overload of the support fitting. Our conclusion is based on the fact that on the fracture surface itself no so-called rest lines were observed from which it could be concluded that this is the case of a stress fracture (Figure 9). The main cause for the fracture is the previously mentioned sudden overload of the support fitting.

3. CONCLUSIONS

3.1 Findings

- The pilot – a candidate for MEP rating renewal – had a valid licence, authorization and ratings to fly the aircraft type.
- The Pilot Examiner had a valid examiner's authorization.
- The health status of the pilot and the examiner did not affect the accident.
- There was no evidence of a malfunction of the landing gear system.
- The meteorological conditions in terms of the quantity of precipitation affected the accident.
- During the event, the airport Divača had a valid operating permit issued by the competent CAA for the grass runway 12-30.
- During the event flight crew ignored the valid NOTAM for VPS asphalt runway 13-31. Limit incurred as a result subsequently established unfinished administrative procedures of regulations governing the field of building construction in Slovenia.
- The presence of increased amount of water on the runway resulted in the occurrence of the aquaplaning phenomenon, which led to a loss of directional control, braking ability, thereby increasing the required stop length.
- Braking at high speed at the occurrence of the aquaplaning has led to a sudden overload and collapsing auxiliary carrier of the left landing gear leg.
- The combination of extended landing contact point, the higher landing speed than anticipated and increased amount of water on the runway influenced the ability to bring the aircraft to a halt during landing, in terms of the landing distance available. As a result, the aircraft drifted off track.

3.2 Risk possibility findings

The lack of guidelines in the coordination and exchange of information between organizational units within the supervisory body - Civil Aviation Agency of the Republic of Slovenia, can lead to untimely and insufficient information required by the unit for flight operations procedures in procedures of continuous control of airlines. This can causal and later consequently leads to different interpretations between the various entities and individuals in the implementation of aviation activities.

3.3 Cause of the accident

Direct cause of the accident:

Sudden overload and fracture of the left landing gear leg support fitting as a result of braking during landing and the occurrence of aquaplaning.

Indirect cause of the accident:

Incorrect assessment of the crew as regards the necessary length of the landing surface with extended contact point in the contaminated runway conditions.

4. SAFETY RECOMMENDATIONS

The Slovenian CAA should inform the examiners of instructions on the verification of qualifications of pilot of aircrafts and helicopters and evaluate the possibility of theoretical knowledge examination and skills with the goal of unifying standards (Part FCL).

The Slovenian CAA should determine the activities in the form of a preventive program for the runway excursion prevention.

Within the control procedures of the Approved Training Organization (ATO), the Slovenian CAA should inform instructors and examiners of the contents of this report.

Ministry of Infrastructure Republic of Slovenia and the Slovenian CAA should verify and evaluate compliance requirements which relate to the obligation of implementation the quality assurance system for maintenance or operators of public airports in Slovenia and later ensuring compliance and aviation safety.

Toni STOJČEVSKI
Investigator-in-Charge