



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



Reg.No. SKS2013002

FINAL REPORT

on investigation of serious incident
of aircraft type **PS-28 Cruiser**
Registration No.**OM - SCA**

Date: 26.05.2013

Place: Airport Očová / LZOC

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.

A. INTRODUCTION

Type of aircraft: PS-28 Cruiser



Registration No:	OM-SCA
Operator/Owner:	SKY SERVICE s.r.o./Ing. Vladimír Kašpar-UNIELEKTRO
Take-off site:	LZOC
Planned landing site:	LZOC
Flight phase:	taxiing
Type of operation:	training flight
Place of serious incident:	LZOC
Date and time of serious incident:	26.05.2013, 17:28

Note: All time data in this report are stated in the UTC time.

B. INFORMATIVE SUMMARY

On 26 May 2013, when the aircraft was in the take-off holding position in front of the grass runway (hereinafter "RWY") 26 of airport LZOC, its front landing gear leg suddenly broke, the nose of the aircraft sank, the propeller came into contact with the ground and the engine was stopped by force.

The crew members were not injured in the serious incident.

The following commission was appointed for investigation of the occurrence:

Ing. Juraj GYENES
Lic. Jaroslava MIČEKOVÁ

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
2. ANALYSES
3. CONCLUSIONS
4. SAFETY RECOMMENDATIONS

1. FACTUAL INFORMATION

1.1 History of the flight

On 26 May 2013 the crew composed of an instructor and a pilot-student was making a training flight with aircraft type PS-28 Cruiser, registration No. OM-SCA. When the aircraft reached the take-off holding position of RWY 26 of the airport LZOC its front landing gear leg suddenly broke, the nose of the aircraft sank, the propeller came into contact with the ground and the engine was stopped by force.

The serious incident was reported by the aircraft operator to the District Police Department in Zvolen, which reported the incident by phone to the Aviation and Maritime Investigation Authority of MoTCRD SR.

Daytime: Day
Flight rules: VFR

1.2 Injuries to persons

Injury	Crew	Passengers	Other persons
Fatal	-	-	-
Serious	-	-	-
Minor	-	-	-
None	2	-	

1.3 Damage to aircraft

The aircraft was seriously damaged in the serious incident. Due to the breakage of the front landing gear leg, followed by the contact of the nose of the aircraft with the ground, the propeller (blades) and the front landing gear cover were damaged and the engine was stopped by force.





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 - instructor:

A national of the Slovak Republic, male, aged of 41 years,
holder of commercial pilot licence CPL(A) No. CZ/1010214864 issued by the Civil Aviation Authority of the Czech Republic on 21 December 2010 with marked validity until 08.10.2017.

Medical certificate of 1st class with marked validity until 29.04.2014.

Limited certificate of radio telephonist No. OFI-96/2008.

Qualifications:

BE90/99/100/200/IR	with marked validity until 31.08.2013
MEP(L)/IR	with marked validity until 31.12.2013
SEP(L)	with marked validity until 31.10.2014
FI(A)	with marked validity until 31.10.2015

Flying experience:

Total flight hours: 570 h 47 min and 984 flights

For the last 90 days: 144 h 46 min

For the last 30 days: 23 h 20 min

On the day of incident: 6 h 36 min

Pilot-student:

A national of Norway, male, aged of 25 years,

holder of the student flight personnel licence No. 2013/01/08 issued by the aviation school SKYSERVICE with marked validity until 28.02.2015.

Medical certificate of 2nd class with marked validity until 15.11.2017.

Flying experience: total flight hours: 15 h 47 min

1.6 Aircraft information

Airframe:

Type:	PS-28 Cruiser
Registration No:	OM-SCA
Serial No:	C0466
Manufacturer:	Czech Sport Aircraft, a.s. Kunovice, Czech Republic

Total operating hours since manufacture: 298 h 54 min

Certificate of airworthiness No. 1105/01, issued by the Civil Aviation Authority of the Slovak Republic, with marked validity until 21.06.2013.

Liability insurance: Allianz Slovenská poisťovňa, No.411 017 039.

1.7 Meteorological situation

Not applicable.

1.8 Aids to navigation

Not applicable.

1.9 **Communications**

The aircraft were equipped by radio communication equipment enabling two-way communication with all air stations at every moment of the flight.

1.10 **Aerodrome information**

The Airport LZOC is a non-public domestic aerodrome with irregular operation.

1.11 **Flight recorders**

Not applicable.

1.12 **Wreckage and impact information**

Not applicable.

1.13 **Medical and pathological information**

Not applicable.

1.14 **Fire**

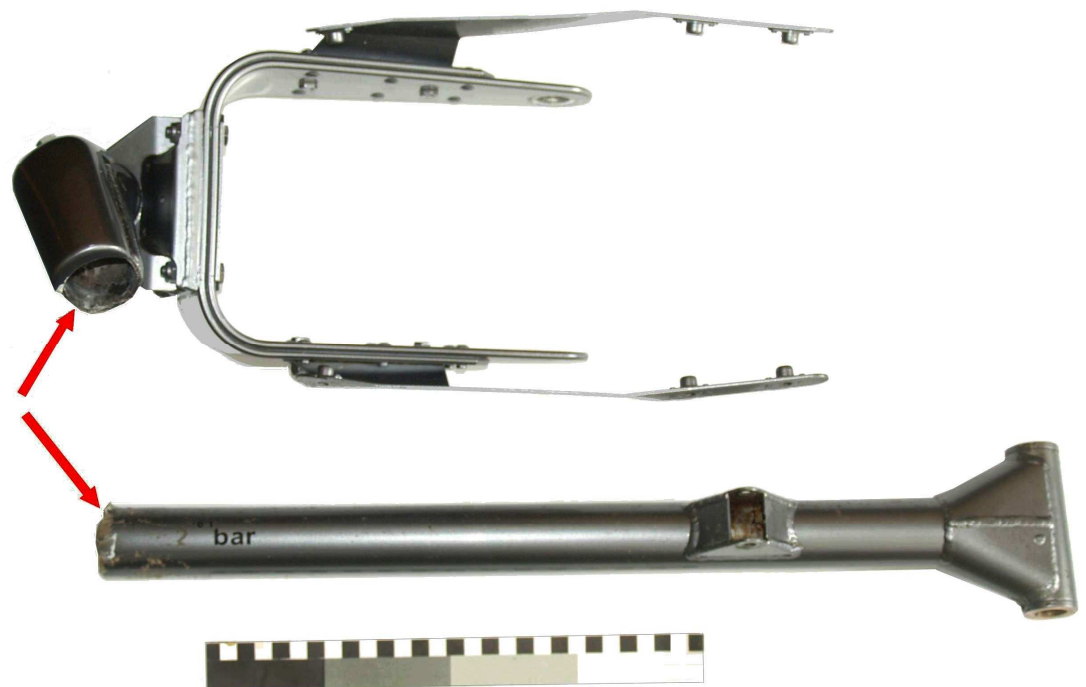
No fire broke out.

1.15 **Survival aspects**

The search and rescue using the SAR means were not required.

1.16 **Tests and research**

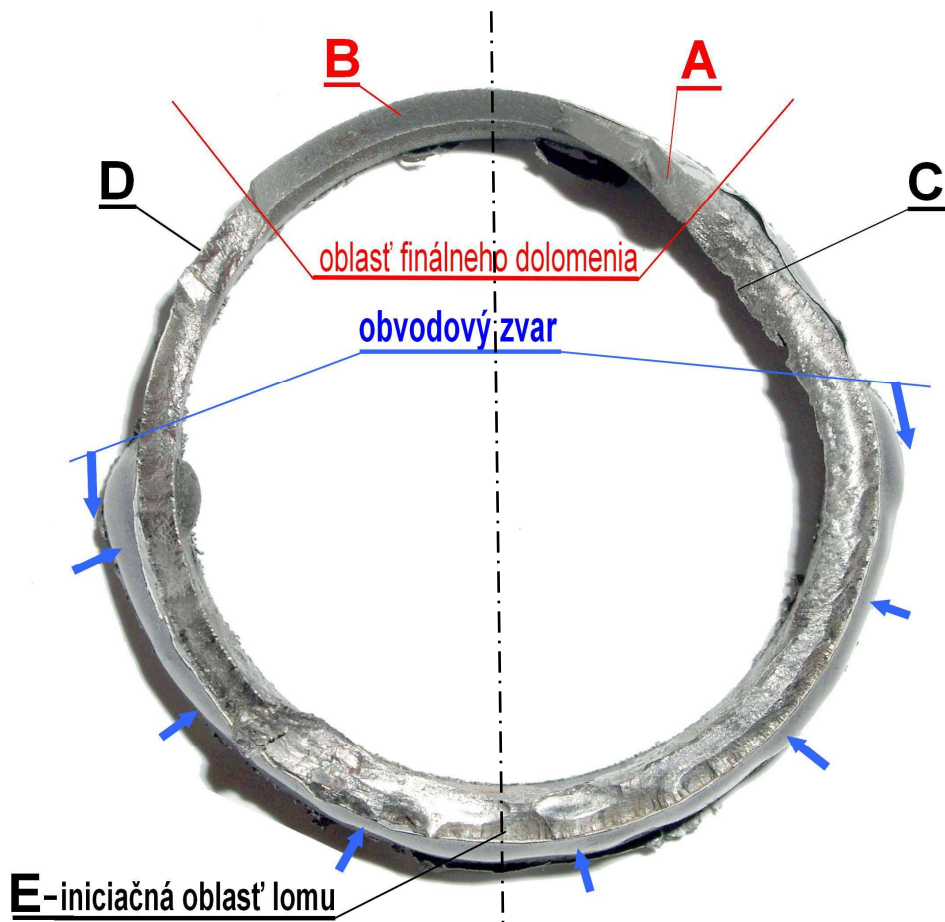
The front landing gear of the aircraft, separated by fracture, was submitted for inspection.



The arrows mark the fracture surfaces under inspection (fig.1)

The fracture under inspection showed a visible area of final rupture of material, which represented less than a quarter (22%) of the initial supporting cross-section of material in the damaged area.

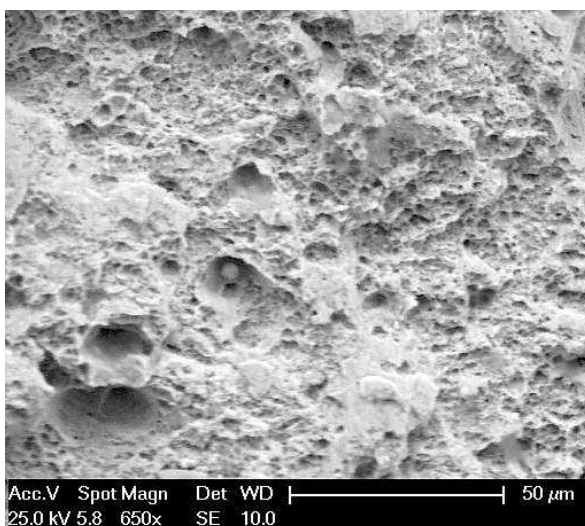
Overall view of the fracture surface with visible area of final rupture of material (fig. 2).



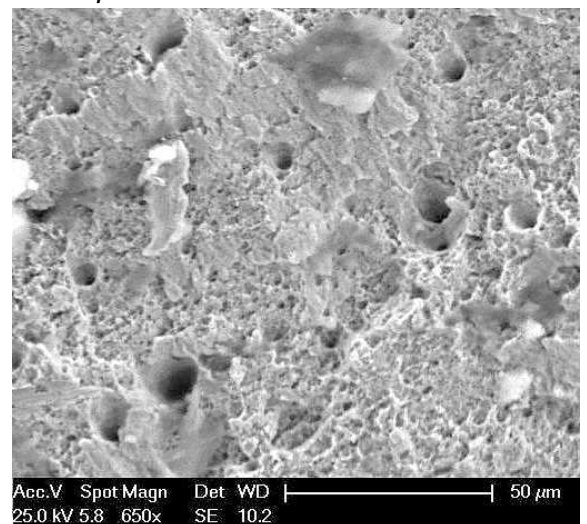
Inspection of the fracture surface by means of scanning electron microscope showed that material in the area of final rupture had been damaged by a ductile cup-and-cone fracture.

Details of the fracture surface in areas marked by positions "A" and "B"

Cup-and-cone fracture in the area A



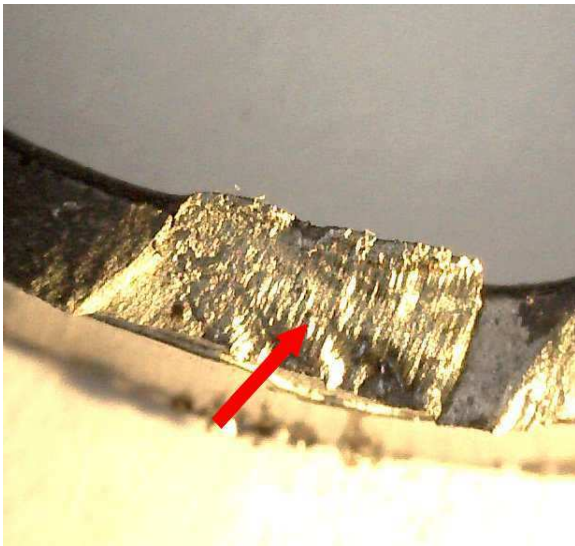
Cup-and-cone fracture in the area B



In the area "D", just in front of the area of final rupture of material, parallel stripes similar to those caused by fatigue damage of material exposed to high nominal load were visible on the fracture surface.

The side view of this fracture area revealed that its inner margin was deformed inwards into the supporting land-gear tube and from its outer side it appeared as if it was driven into the material, which proved that the stripes were not standard progression or relaxation stripes of fatigue fracture, but that they were caused by sliding of a solid hard object along this part of the fracture surface.

Parallel stripes on the fracture surface in the area "D"



Deformation of the fracture surface margin in the area "D" inwards into the tube



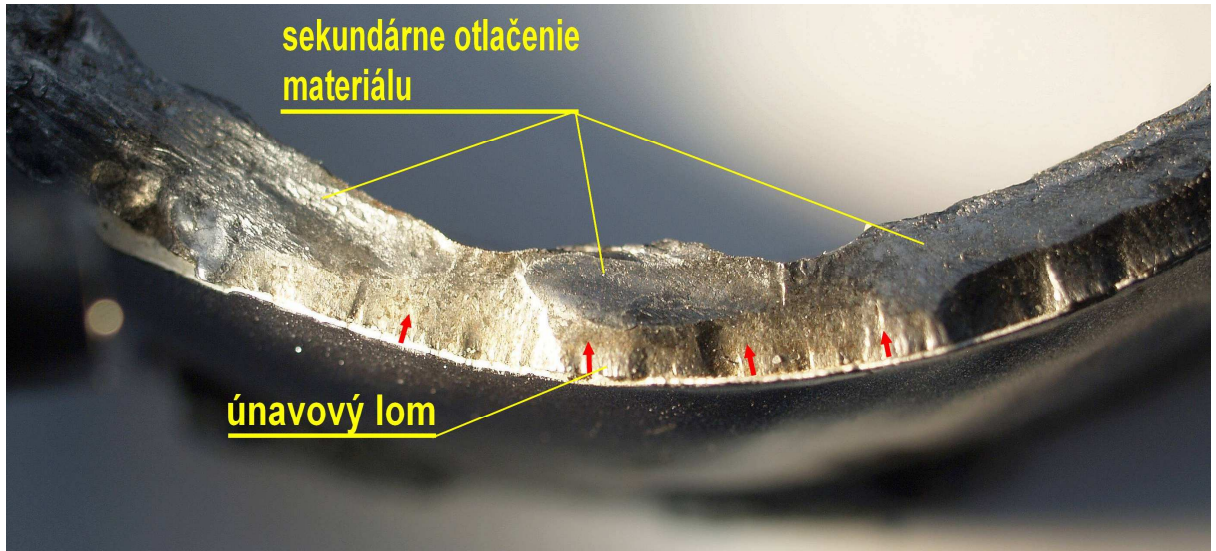
On the opposite side of the fracture in the area "C" a similar bruising of material was even more visible.



Bruising of the fracture surface in the area "C"

Opposite to the area of final rupture of material was situated the fracture initiation area (lower part of fracture surface on Figure 2 marked by position "E"). Also this area showed here and there visible secondary bruises.

In the marginal parts the rupture did not show any accompanying deformation of material, was relatively smooth in the direction of progression (shown by arrows) and had visible radial stages on the outer margin.

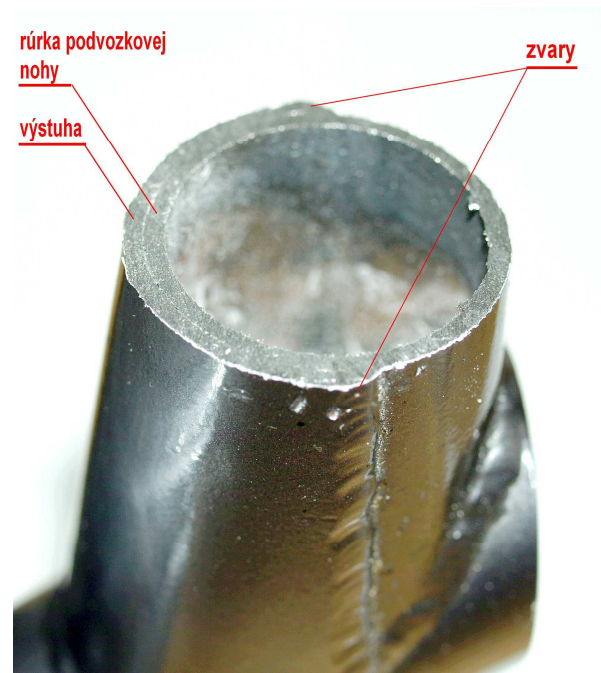


Area of fatigue fracture initiation and direction of its progression

From the overall character of the fracture it was clear that it was a fatigue fracture initiated in the lower part of the landing-gear leg section on the margin of the weld joint, by which the stiffener was welded to the supporting landing-gear tube and the welded area marked by blue arrows in Figure 2.



Fracture initiation area in the lower part of damaged landing-gear leg cross-section



Landing-gear leg and stiffener (after taking of samples for electron microscopy)

The margin of transverse weld joint between the supporting landing-gear tube and its stiffener was in this case a significant stress concentrator. This fact, together with variable loading of the landing gear (aircraft taxiing on non-reinforced surfaces, aircraft handling during its manual pulling or pushing on the front landing gear) enabled in this case the initiation and development of a fatigue mechanism. In the damaged area the tube material (chrome and manganese alloyed steel) – could have decreased strength properties because it was so-called “weld heat affected zone“.

The visible secondary bruising of the fatigue-affected section of the fracture surface proved that the landing gear had been operated also with partial fracture.

1.17 Organizational and management information

The flight operation was carried out in accordance with aviation regulations valid in the territory of the Slovak Republic.

1.18 Additional information

Not applicable.

1.19 Useful or effective investigation techniques

Standard investigation methods were used.

2. ANALYSIS

There was a fatigue fracture with visible area of final rupture of material. In the area of final rupture the fracture had the character of ductile rupture of material with visible cup-and cone morphology of the fracture surface.

The damage to the aircraft landing gear was caused by exceeding of the fatigue strength in the fracture initiation area, where also other conditions required for initiation and development of a fatigue fracture – variability of loading and stress concentration in the initiation area – were fulfilled.

In this case the fatigue strength in the damaged area of the landing gear could have been decreased also by deteriorated strength properties of material in the weld heat affected zone.

3. CONCLUSIONS / Cause of serious incident

3.1 Findings

- the crew had valid qualifications for the critical flight,
- the aircraft had valid documentation and did not show any faults before the serious incident,
- the aircraft fulfilled the conditions of airworthiness before the critical flight.

3.2 Causes of serious incident:

The primary cause of the serious incident was the breaking of the arm of the front landing-gear leg after exceeding of the fatigue strength in the point of fracture.

4. FLIGHT SAFETY RECOMMENDATIONS

On the basis of investigation of causes of the serious incident that occurred on 26 May 2013 we make the following recommendations:

for the manufacturer of aircraft Czech Sport Aircraft a.s.:

- to issue a binding service bulletin for inspection of the front landing-gear legs of all operated aircraft of this type using the NDT (Non-Destructive testing) method,
- to determine the cycles and methods of non-destructive testing for early detection and evaluation of structural changes and physical properties of materials used in the front landing-gear leg and to incorporate them in the maintenance manual of this aircraft type,
- to introduce potential technological changes in production of the front landing-gear leg to eliminate the formation of fatigue fractures.

For the Civil Aviation Authority of SR:

- to familiarise the owners/operators of the aircraft type with conclusions of this final report,
- after the issue of the binding service bulletin to verify at the aircraft owners/operators the implementation of measures prescribed by the aircraft manufacturer and the incorporation of the required changes in the maintenance programmes in order to increase the periodicity of regular inspections of the front landing-gear leg (critical welding point) in cases where the operation is implemented for the purpose of pilot training or predominantly on non-reinforced grass RWY, where fatigue fractures may occur in case of an increased number of cycles and a higher frequency of contacts of the front wheel with bumps on natural RWY.

Bratislava, 07.08.2013