MINISTRY OF TRANSPORT, CONSTRUCTION AND REGIONAL DEVELOPMENT OF THE SLOVAK REPUBLIC
Aviation and Maritime Investigation Authority
Nám. slobody 6, P.O.BOX 100, 810 05 Bratislava 15

Reg. No.: SKS2012001

F I N A L R E P O R T

on investigation of serious incident

of aircraft **CESSNA 310Q**

registration No. **OM-GEO**

Date: 05.03.2012

Place: Košice Airport / LZKZ

A. I N T R O D U C T I O N

The investigation of air accident, serious incident, 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 Air Accident and Incident Investigation to the Convention on International Civil Aviation.

The exclusive aim of investigation is to establish causes of accident, serious 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 the air accident in question have an informative character and can only be used as recommendation for the implementation of measures to prevent occurrence of other air accidents and serious incidents with similar causes.

Owner:	GEODETICCA 3D WORKS, s.r.o.
Operator:	Heli Company s.r.o.
Type of aircraft:	CESSNA 310Q
Registration number:	OM-GEO

Take-off site:	LZKZ
Planned landing site:	Airport Bratislava / LZIB
Place of accident:	LZKZ
	N 48°39´38,26´´, E 021°14´25,72´´
Date and time of accident:	05.03.2012, 10 h 20 min

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

B. INFORMATIVE SUMMARY

On 05.03.2012 at 10:20 the pilot made a take-off with aircraft CESSNA 310Q from the airport LZKZ to the airport LZIB. After the take-off the pilot carried out operations and heard a strong impact in the forebody during retraction of the landing gear. After communication with TWR Košice and visual contact with the aircraft the duty air traffic control officer informed the pilot that main legs of the landing gear were retracted, but the front leg was extended under angle of 45°. The pilot stated a fault of the front landing gear leg and made safety landing at the airport LZKZ.

After landing the aircraft was slightly damaged.

The crew left the cockpit without help of others, unharmed.

Specialized commission appointed for investigation of the serious incident:

Arnošt FOFF – chairman of the Investigation Commission
Ing. Zdenko BIELIK – member of the Investigation Commission.

Report issued by:

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

C. MAIN PART OF REPORT

1. FACTUAL INFORMATION

1.1 History of the flight

On 05.03.2012 at 09:30 the crew took over the aircraft CESSNA 310Q, identification No. OM-GEO, from the aircraft maintenance engineer, who had implemented the pre-flight preparation of the aircraft, at the airport LZKZ. The command pilot was to make a flight with the aircraft from the airport LZKZ to the airport LZIB for the purpose of technical flight on the basis of flight clearance issued by the Civil Aviation Authority of SR.

The pilot made the take-off at 10:20 from the runway („RWY“) 01 of the airport LZKZ. The aircraft unstuck at a speed of 100 MPH and when it reached the speed of 120 MPH the pilot retracted the landing gear.

During the retraction a strong impact was heard in the forebody of the aircraft, green control lamps went out and the red lamp signalling the locking of landing gear went on. The pilot reported unspecified problem with retraction of landing gear to the air traffic controller. After agreement with the air traffic controller the pilot made an overhead flight in the direction of RWY 19. At the level of TWR, after visual contact with the aircraft, the air traffic controller confirmed the retraction of the main landing gear. The front landing gear leg got stuck in the interposition under angle of 45°.

The pilot again attempted to extend and retract the landing gear and after repeated overhead flight in the direction of RWY 01 he was informed by the air traffic controller that the position of the front landing gear had not changed. The pilot gained altitude of 2,500 ft east of RWY 01 and attempted an emergency extension of the landing gear.

After the new overhead flight in the direction of RWY 01 the air traffic controller again confirmed the unchanged position of the front landing gear to the pilot. The latter decided to make a precautionary landing with unlocked landing-gear leg and informed about his decision the air traffic controller who permitted the precautionary landing on RWY 01.

The pilot and the air traffic controller agreed on coordinated action during the precautionary landing. The pilot made a right-hand circle, stabilized the flight speed at 120 MPH, put the wing flaps into position of 15°, tightened its safe ty belts and made a landing manoeuvre to RWY 01. The aircraft touched RWY in the first third of its length. The pilot maintained the speed of 80 MPH and gradually throttled back to keep the forebody of the aircraft in the air as long as possible, while decreasing the speed. Then he gave order to turn off the engines and the main electrics switch.

After speed reduction the forebody of the aircraft tilted forward and when it touched RWY 01 the aircraft glided 46 m and finally came to a standstill.

The crew members were not injured in this serious incident and left the aircraft on their own.

The fire rescue corps of the airport LZKZ arrived at the place of incident. The firemen did not detect any leakage of fuel and after 20 minutes the aircraft was transported from RWY 01 to the premises of the Aero Club Košice with assistance of its members.

The crew of the aircraft underwent the breath test with negative result (0.00% of alcohol in blood).

LPS SR, š.p., through its unit RCC reported the occurrence 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 suffered substantial damage in the serious incident. The following parts of the aircraft were damaged as a result of retraction of the unblocked front landing-gear leg and subsequent contact of the forebody with RWY:

front landing-gear leg,

pitot tube,

right and left-hand front landing-gear doors,

right and left-hand propellers and

deformation of the right-side engine hood skin and the front landing-gear retraction and extension rod.


OM-GEO

1.4 **Other damages**

The Aviation and Maritime Investigation Authority was not informed about circumstances with potential application of other claims for compensation of damages towards a third party.

1.5 **Personnel information**

Pilot in command:

Citizen of the Slovak Republic, aged of 56 years

Holder of the commercial pilot licence CPL(A) No. SK 03960144, issued by the Civil Aviation Authority of the Slovak Republic, with marked validity until 04.09.2013.

Qualification:MEP(L), with marked validity until 31.07.2012.

Medical certificate of 1st class with marked validity until 23.08.2012.

General licence of radio telephonist – VVR – 48/2008 with unlimited validity.

Flying experience:

Total flight hours: 4 910 h and 11 120 flights

Second crew member:

Citizen of the Slovak Republic, aged of 51 years

Holder of the commercial pilot licence CPL(A) No. SK 03900163, issued by the Civil Aviation Authority of the Slovak Republic, with marked validity until 31.03.2013.

Qualification:MEP(L), with marked validity until 30.09.2012.

Medical certificate of 1st class with marked validity until 16.11.2012.

General licence of radio telephonist – VF:62/2007 valid until 01.02.2017.

Flying experience:

Total flight hours: 7 500 h and 32 000 flights

1.6 **Aircraft information**

a) Airframe:

Type:	CESSNA 310 Q
Registration No.:	OM-GEO
Serial No:	310-0533
Year of manufacture:	1972
Manufacturer:	Cessna Aircraft Company / 310Q USA

Total number of flight hours since manufacture: 3570 h

Certificate of airworthiness No. 1063/01 with marked validity until 31.12.2011.

Flight clearance issued by the Civil Aviation Authority of SR for the flight No. 1063/01 with marked validity from 05.03.2012 to 23.03.2012.

Liability insurance: ALLIANZ – Slovenská poisťovňa a.s. with marked validity until 16.02.2013.

b)

Left-side engine:		**Right-side engine:**	
Type:	IO470V9B	Type:	IO470V9B
Serial No:	170477R	Serial No:	1001150
Year of manufacture:	02.02.1997	Year of manufacture:	25.09.2009

Manufacturer: TELEDYNE CONTINENTAL ENGINES

Total time in service	Total time in service
since manufacture: not specified	since manufacture: not specified
since GO: 174 h 35 min	since GO: 35 h 11 min

c) Left-hand propeller:

Type:	3AF32C87NR/S82NC-4
Serial No:	779190
Year of manufacture:	1977
Manufacturer:	McCauley

Total time in service
since manufacture: not specified
since GO: 14 h 10 min

Right-hand propeller:

Type:	3AF32C504C/G82
Serial No:	022556
Year of manufacture:	1991

Total time in service
since manufacture: not specified
since GO:134 h 11 min

1.7 **Meteorological situation**

010∜12 kt 330V070 9999 SCT 038 00/M10 Q 1022

Meteorological conditions on the place and at the time of event had no influence on the flight and did not participate in the occurrence of serious incident.

1.8 **Aids to navigation**

Not applicable.

1.9 **Communications**

The aircraft was equipped by radio communication system and maintained two-way cmmunication with TWR Košice, from which the crew received the required instructions before the take-off and landing.

1.10 **Aerodrome information**

The airport LZKZ is an international airport with RWY with reinforced surface. At the time of serious incident it was operable and fit for take-off and landing of this type of aircraft.

1.11 **Flight recorders and other recorders**

Not applicable.

1.12 **Wreckage and impact information**

When the aircraft came to a standstill on RWY 01, its forebody was inclined in the direction of landing on RWY 01 of the airport LZKZ. After landing the aircraft remained in one piece.

The final position of the aircraft after the serious incident was documented, including preparation of photodocumentation.

1.13 **Medical and pathological information**

Not applicable.

1.14 **Fire**

No fire broke out.

1.15 **Survival aspects**

Research and rescue operations were not required.

1.16 **Tests and research**

The rupture of the front landing-gear tie rod was subjected to expertise.

Two flat supports of the tie rod were broken at a point, where the pin boss of piston rod of hydraulic operating cylinder was connected to the rod.

Section II
Group Assembly Parts List

LANDING GEAR

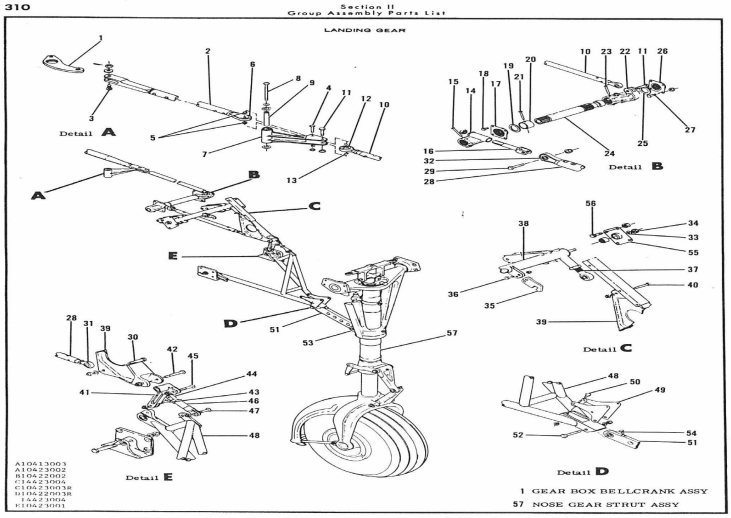


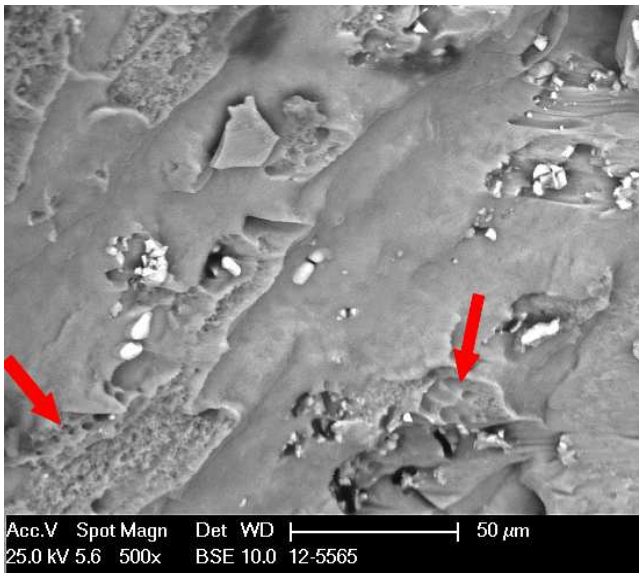
Figure 103. Nose Gear Retraction Linkage Installation

From the macroscopic aspect all ruptures of the rod had a fragile or fission character without transverse contraction of material on their periphery. The presence of progressive and relaxation belts of potential fatigue mechanism of material damage were not detected on the ruptures. The ruptures had unusual saw-tooth form (fig. 1), which means that they could not have been caused by simple tensile load, where ruptures spread vertically on the direction of load in case of damaged section with certain homogeneity

Subsequently the ruptures were examined using electron scanning microscope with an energy-dispersive X-ray spectrometer. The examination detected that they were quasi-cleavage ruptures with observable areas of plastic mechanism of material damage with a distinct cup and cone morphology (fig. 2).

fig. 1

fig. 2



Potential striae of the rupture spreading fatigue mechanism were not detected in any of the examined rupture surfaces. Areas with visible traces of shearing mechanism of material damage, with material grain margins bent in the direction of load, were detected on slant sections of ruptures forming their saw-tooth shape (fig. 3). As far as the material composition concerns, the rod was made of aluminium, copper and manganese alloy with trace of iron (see the spectrogram, fig. 4).

fig. 3

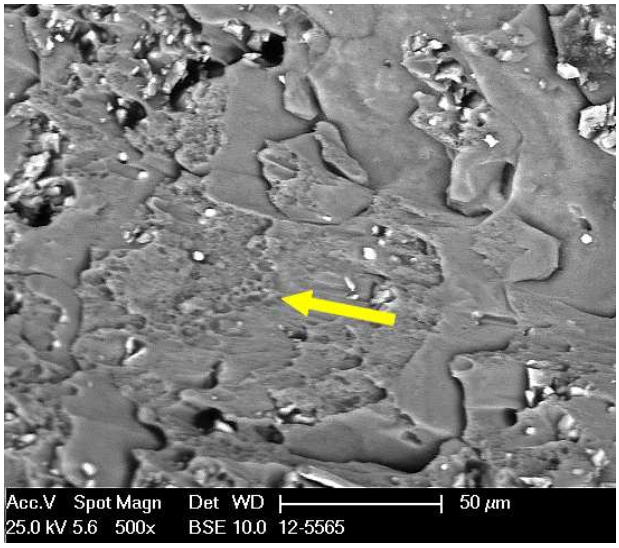
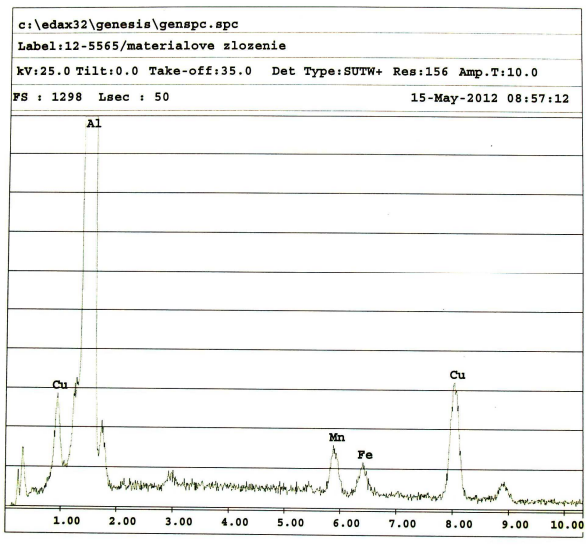


fig. 4



The absence of traces of potential fatigue mechanism of material damage proved that the rod had been damaged by power overload of the material. This assumption was confirmed by the presence of new deep imprints on internal walls of openings, through which the piston rod eye bolt passed via the broken attachments of the rod (see margins of these imprints marked with arrorws, fig. 5 and fig. 6).

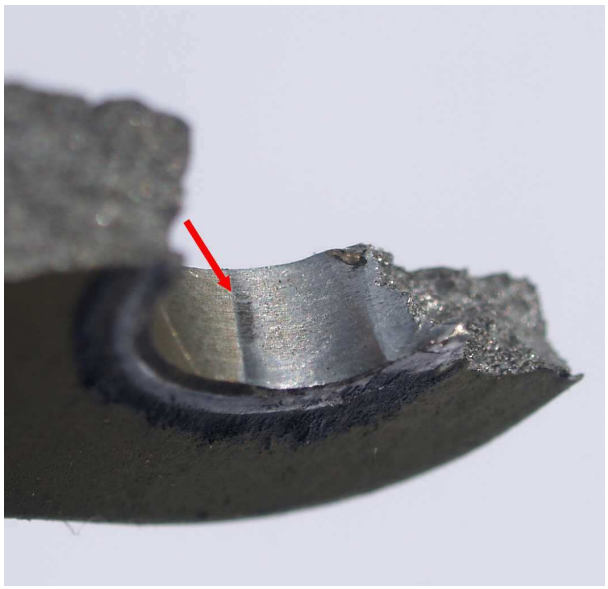


fig. 5

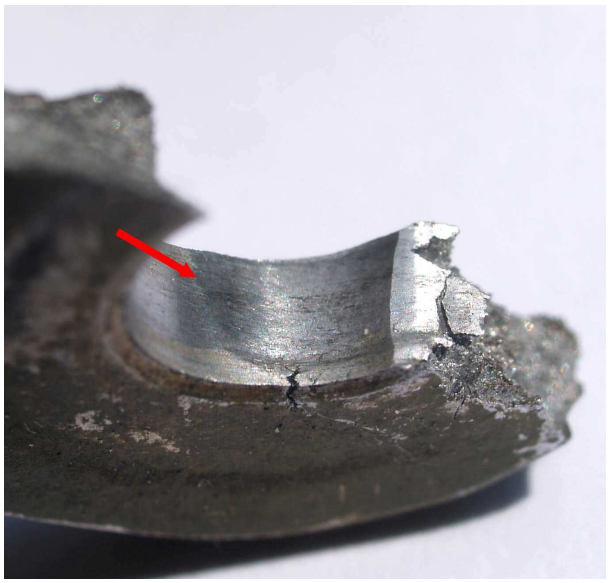


fig. 6

From conclusions of this examination it resulted that:

- the rod was damaged by quasi-cleavage ruptures with areas of plastic mechanism of material damage with distinct cup and cone morphology. Areas with visible traces of shearing mechanism of material damage were detected on slant sections of ruptures that are responsible for their saw-tooth form. Neither macroscopic nor microscopic traces of fatigue material damage were found.
- the rod was damaged by force overloading in the incorrect working regime of the rod at the time of damage.

1.17 Organizational and management information

Not applicable.

1.18 Additional information

Not applicable.

1.19 Useful or effective investigation techniques

Standard investigation methods were used.

2. ANALYSIS

2.1 Activity of pilot

The pilot proceeded in accordance with the specified procedures in the Flight Manual for CESSNA 310 and handled the situation in a safe manner.

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

3.1 Findings

- the pilot had valid qualifications for making the critical flight,
- the aircraft has a valid documentation and did not show any faults,
- the aircraft fulfilled the conditions of airworthiness before the critical flight,
- the aircraft was so seriously damaged in the serious incident that repair implemented using standard procedures and through replacement of damaged parts would not be cost effective,
- nobody was injured in this serious incident.

3.2 **Causes of serious incident:**

The main cause of the serious incident was the breaking-off of the operating rod of the front landing gear due to its force overloading in the incorrect working regime of the rod at the time of damage.

The exact cause of the incorrect working regime was not established.

4. FLIGHT SAFETY RECOMMENDATIONS

The final report from investigation of serious incident does not contain any recommendations**.**

Bratislava, 25.05.2012