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Swiss Transportation Safety Investigation Board STSB

Aviation Division

Final Report No. 2273

by the Swiss Transportation Safety Investigation Board STSB

concerning the accident involving the
PA-28RT-201T aircraft,
registration HB-PLC,

on 30 May 2015

Grenchen/SO regional airport

Ursachen

Der Unfall ist auf eine Landung mit teilweise ausgefahrenem Fahrwerk zurückzuführen, bei der das linke Hauptfahrwerk einklappte, das Flugzeug in der Folge die Piste mit geringer Geschwindigkeit verliess und im angrenzenden Wiesland zum Stillstand kam.

Weder über das normale Ausfahren noch das alternative „free fall“-Verfahren liess sich das linke Hauptfahrwerk unter Zusammenwirken folgender Faktoren vollständig ausfahren:

- Ein erhöhter, mechanischer Widerstand führte zu einem Verklemmen eines Fahrwerkbeins;
- Aufgrund eines Kabelbruchs am Hauptfahrwerk stellte die Hydraulikpumpe ab, bevor das betroffene Hauptfahrwerk verriegelt war.

General information on this report

This report contains the Swiss Transportation Safety Investigation Board's (STSB) conclusions on the circumstances and causes of the accident which is the subject of the investigation.

In accordance with Art 3.1 of the 10th edition, applicable from 18 November 2010, of Annex 13 to the Convention on International Civil Aviation of 7 December 1944 and Article 24 of the Federal Air Navigation Act, the sole purpose of the investigation of an aircraft accident or serious incident is to prevent accidents or serious incidents. The legal assessment of accident/incident causes and circumstances is expressly no concern of the investigation. It is therefore not the purpose of this investigation to determine blame or clarify questions of liability.

If this report is used for purposes other than accident/incident prevention, due consideration shall be given to this circumstance.

The definitive version of this report is the original in the German language.

All information, unless otherwise indicated, relates to the time of the accident.

All times in this report, unless otherwise indicated, are stated in local time (LT). At the time of the accident, Central European Summer Time (CEST) applied as local time in Switzerland. The relation between LT, CEST and coordinated universal time (UTC) is:
LT = CEST = UTC + 2 hours.

Final Report

Aircraft type	PA-28RT-201T	HB-PLC
Operator	MaximAir AG, Flughafenstrasse 117, 2540 Grenchen, Switzerland	
Owner	MaximAir AG, Flughafenstrasse 117, 2540 Grenchen, Switzerland	

Flight instructor	Swiss citizen, born 1959		
Licence	Commercial pilot licence aeroplane (CPL(A)) according to the European Aviation Safety Agency (EASA), issued by the Federal Office of Civil Aviation (FOCA)		
	Flight instructor (aeroplane) (FI(A))		
Flying hours	Total	8679 hours	During the last 90 days 85:19 hours
	On the type involved in the accident	approx. 3000 hours	During the last 90 days 17:33 hours

Pilot	Swiss citizen, born 1964		
Licence	CPL(A)) according to EASA, issued by the FOCA		
Flying hours	Total	605 hours	During the last 90 days 2:05 hours
	On the type involved in the accident	approx. 75 hours	During the last 90 days 2:05 hours

Location	Grenchen/SO regional airport (LSZG)		
Coordinates	---	Altitude	---
Date and time	30 May 2015, 16:28		

Type of operation	Training
Flight rules	VFR
Flight phase	Landing
Type of accident	System failure and malfunction, landing with partially extended landing gear, lateral runway excursion
Departure point	Grenchen/SO regional airport (LSZG)
Destination point	Grenchen/SO regional airport (LSZG)

Injuries to persons

Injuries	Crew	Passengers	Total number of occupants	Others
Fatal	0	0	0	0
Serious	0	0	0	0
Minor	0	0	0	0
None	2	1	3	Not applicable
Total	2	1	3	0

Damage to aircraft Minor damage

Other damage None

1 Factual information

1.1 Flight preparations and history of the flight

1.1.1 General

For the following description of the flight preparations and history of the flight, the recordings of the radiotelephony traffic, radar data and the statements of the pilots were primarily used.

The flight was conducted according to visual flight rules (VFR). The flight was a training flight.

1.1.2 Flight preparations

On 30 May 2015, the flight instructor and two pilots A and B met at 09:50 for a detailed briefing on the standard operating procedures of the MaximAir flight school. Following the briefing, there was an extensive outside check on the aircraft PA-28RT-201T, registration HB-PLC, during which the suspension was thoroughly tested. The instructor showed the two pilots all the items to be checked, including the micro-switches (cf. Section 1.3.2.1). No anomalies were determined.

There then followed the first training flight with Pilot A and the flight instructor, which was uneventful. Pilot B sat in the rear seat as an observer.

After lunch there was another briefing with Pilot B, during which the two go-around procedures (high and low go-arounds) were explained. The aim of the second flight in the afternoon was to conduct the high and low go-arounds after four to six circuits and touch-and-go approaches. This was the flight instructor's first flight with Pilot B.

Following the briefing, the usual documentation (METAR¹, TAF², NOTAM³, DABS⁴) was studied as part of the flight preparations and the aircraft was refuelled with 18 litres to approximately 50 US gal. At 14:23, HB-PLC left the apron and taxied to the holding point on runway 25 (hard surface). In addition to the flight instructor and Pilot B⁵ there was also a passenger with no flying experience in the rear seat.

1.1.3 History of the flight

The aircraft HB-PLC took off from runway 25 (hard surface) on 30 May 2015 at 14:34 at Grenchen regional airport (LSZG).

After four uneventful circuits, the pilot and flight instructor noticed that the landing gear did not fully extend during the fifth approach. Although the display for the nose and right main landing gear illuminated green, that of the left main landing gear did not. At 15:11, the flight instructor ordered a go-around and assumed control of the radio. According to their statements, the crew completed another circuit in order to perform an initial situation analysis (cf. Annex 1). The pilot controlled the aircraft and the flight instructor subsequently replaced the landing gear display lightbulb in order to exclude the possibility of a defective lightbulb.

During the next approach the landing gear performed in the same manner; only two of the three landing gear displays illuminated green. After a further go-around, during which the flight instructor informed the aerodrome controller of the existing

¹ METAR: meteorological aviation routine weather report

² TAF: terminal aerodrome forecast

³ NOTAM: notice to airmen

⁴ DABS: daily airspace bulletin Switzerland

⁵ Hereinafter only the term "pilots" is used in this final report

problem at 15:18, the crew exited the circuit and climbed to an altitude of approximately 5500 ft QNH heading towards Lake Biel in order to perform in-depth troubleshooting. At this point the crew made a position report and informed aerodrome control that they would remain on the frequency and report again for the approach.

The crew then worked through emergency checklist “9 EMERGENCY LANDING GEAR EXTENSION” (cf. Section 1.6.1) in the region around St. Peter’s Island at an altitude of between 4000 ft and 5500 ft QNH. The flight instructor read through the items on the checklist and the pilot performed the appropriate actions. The landing gear selector switch was set to the “DOWN” position and the landing gear circuit breaker (CB) was pulled before activating the emergency gear extender. With the landing gear set in the extended position (gear down position), only the front and right landing gear displays illuminated green; that of the left landing gear did not.

During repeated extension and retraction of the landing gear, the crew determined that the red gear unsafe light (cf. Section 1.3.2.1) went out in both the retracted and extended position. This led the crew to conclude that the down lock switch for the left landing gear could be a possible cause of the problem and they decided to return to Grenchen to perform a low-pass. By means of a visual inspection by the aerodrome controller, the crew wished to verify whether the down lock switch might be the problem or whether there was an actual landing gear fault.

At an altitude of approximately 4000 ft QNH over Erlach, the crew informed the aerodrome controller of the unchanged landing gear status and requested a low-pass. They also requested the fire service for the subsequent landing and sent a distress call (MAYDAY) at 15:35.

When the crew reported again approximately ten minutes later, while on the left base leg of the approach, the aerodrome controller offered them a low-pass over runway 25R (grass), which the crew confirmed.

The flight instructor assumed control for the low-pass and when the aerodrome controller enquired about the issue, he clarified that it was the left landing gear leg, which according to the display was not locked. The aerodrome controller confirmed this and at 15:47 instructed the crew to turn off their headlights and switch to ground frequency (121.800 MHz) according to prior coordination with his colleague on the ground control (GRO) working position. The crew was therefore given the option of addressing the problem quietly and discussing it with other persons if necessary.

A mechanic from a maintenance company based in Grenchen then called the crew on this frequency. There then followed a brief exchange in dialect, during which in reply to a question the crew confirmed that they had checked every option and were of the opinion that as the gear unsafe light had turned off, the landing gear should be locked. The mechanic indicated to the crew that the left landing gear was not locked. The air traffic controller GRO confirmed on the radio that the left landing gear was extended to approximately 70 degrees according to his estimation (cf. Figure 1).

The crew then again flew in a southwesterly direction until they were over Lake Neuchâtel, where they once again worked through the emergency checklist “9 EMERGENCY LANDING GEAR EXTENSION”. The flight instructor then conducted several elevated-g manoeuvres and abrupt yaw manoeuvres at an altitude of approximately 2500 - 4000 ft QNH. A descent in the configuration for the final approach at the lowest safe speed of 75 kt was also unsuccessful. It was not possible to fully extend the left landing gear.

The crew then decided on another low-pass over the grass runway in Grenchen. This time they requested runway 07L from the GRO air traffic controller, which he confirmed. After the low-pass, the crew again received confirmation that the left landing gear was not fully extended.

The crew then headed towards Solothurn and prepared for an approach on runway 25. In the process, they addressed the division of tasks for the imminent landing several times. They also conducted an emergency briefing for the passenger in the rear seat, which included a brace position for the landing. At 16:23, the crew was requested to report on the aerodrome frequency for the approach.

The flight instructor decided that he would conduct the landing on runway 25 (hard surface). The wind conditions, 330 degrees and 11 knots, were more suitable for a landing on runway 07 in terms of directional stability; however the flight instructor preferred to fly head to wind with fully extended flaps in order to touch the aircraft down on the ground with minimum energy. He thereby made his choice for the hard-surface runway in order to avoid flipping or uncontrolled rotation around the vertical axis (cartwheeling) upon initial contact. The flight instructor turned off the engine in the landing flare and switched the main switch to the "OFF" position. At the behest of the flight instructor, the pilot switched the fuel selector to the "OFF" position and switched off the ignition (magnetos) once the aircraft was on the ground. During the landing, the flight instructor attempted to keep the left main landing gear off the ground for as long as possible. After the left main landing gear immediately collapsed, the left wing touched the ground and HB-PLC drifted to the left. The flight instructor held the aircraft on the runway for as long as possible using the right pedal. HB-PLC veered off the runway to the left 260 m after the touchdown point for single-engine aircraft at low speed and came to a standstill on the adjacent grass at 16:28.



Figure 1: HB-PLC on final approach to runway 25 (hard surface) at Grenchen regional airport (LSZG) with incompletely extended landing gear (white circle).

Fire did not break out. The occupants were uninjured and were able to exit the aircraft unassisted. From the time of troubleshooting up to the landing, everything had gone smoothly in the cockpit.

1.2 Meteorological information

1.2.1 General meteorological situation

A ridge of high pressure extended from the Bay of Biscay to Central Europe. At the same time, a trough extended from the North Sea to the Baltic. Switzerland was on the southern edge of this trough.

1.2.2 Weather at the time and location of the accident

The weather was dry and partly sunny with cumulus clouds over the Jura mountains and extended areas of cirrus over the Jura mountains and Swiss Plateau.

Weather	Partly sunny
Cloud	3/8 – 4/8 at 6000 ft AAE ⁶ 5/8 – 7/8 at approx. 25,000 ft AAE
Visibility	10 km or over
Wind	290 degrees, 10 kt, wind direction variable between of 250 - 330 degrees
Temperature/dewpoint	21 °C / 9 °C
Atmospheric pressure QNH	1016 hPa
Hazards	None

1.2.3 Astronomical information

Position of the sun	Azimuth: 251 degrees	Elevation: 46 degrees
Lighting conditions	Daylight	

1.2.4 Webcam images



Figure 2: Grenchen flight school webcam facing south, 16:30

1.3 Aircraft information

1.3.1 General information

Registration	HB-PLC
Aircraft type	PA-28RT-201T (Turbo Arrow IV)
Characteristics	Single-engine, four-seater, all-metal construction aircraft, constructed as low-wing aircraft with T-tail and retractable landing gear
Manufacturer	Piper Aircraft Cooperation, Vero Beach Florida, USA
Owner and operator	MaximAir AG, Flughafenstrasse 117, 2540 Grenchen, Switzerland

⁶ AAE: above aerodrome elevation

Year of manufacture	1982
Operating hours	Airframe 6590:26 hours TSN ⁷ Engine 1096:51 hours TSN Propeller 6517:25 hours TSN, 1529:29 hours TSO ⁸
Mass and centre of gravity	Both the mass and centre of gravity were within the permitted limits according to the aircraft flight manual (AFM).
Maintenance	The last, extensive 100-hour inspection took place on 23 December 2014 at 6556:50 TSN, after 9377 landings.
Operating hours / Number of landings since last 100-hour inspection	33:39 operating hours 74 landings
Technical restrictions	None
Average fuel consumption	approx. 45 litres per hour
Airworthiness certificate by CAMO ⁹	Date of issue: 23 February 2015 End of validity: 15 March 2016

1.3.2 Landing gear

1.3.2.1 System description and normal extension

The PA-28RT-201T aircraft is equipped with tricycle landing gear in nosewheel configuration and an electrically driven hydraulic pump. The reversible hydraulic pump is used to retract and extend the landing gear according to the direction of rotation.

During retraction, the pump remains in operation until all three landing gear legs are retracted and sufficient pressure has been established in the hydraulic system to hold the landing gear. The gear up check valve prevents pressure which has been established in the system escaping via the pump if it is switched off. If the pressure drops due to a leak, the pressure switch automatically switches on the pump and re-establishes pressure in the system. In contrast to the extended landing gear, the retracted landing gear is not locked mechanically (cf. Figure 3).

During extension, the pump remains in operation until each of the three landing gear legs is fully extended and mechanically locked. The pump is switched off via the down lock switch. Each of the three landing gear legs is equipped with a down lock switch. As long as the landing gear has not been fully extended, the pump remains in operation due to the down lock switch and a separate electrical circuit. After the landing gear leg has been fully extended, it is automatically locked and the switch is activated. This means that the green indicator light is illuminated in the cockpit, which indicates that the relevant landing gear leg is locked and fully extended. The electrical circuit to the pump is also interrupted. Because each landing gear leg has a separate electrical circuit to the pump, it is usually only turned off if all three landing gear legs are locked.

⁷ TSN: time since new

⁸ TSO: time since overhaul

⁹ CAMO: Continuing Airworthiness Management Organisation (CAMO)

1.3.2.2 Back-up gear extender

At the start of series production, the present aircraft type was equipped with a back-up gear extender (BGE). This additional safety device was installed to prevent landings with accidentally retracted landing gear as well as early retraction of the landing gear when taking off. However, this installation did not feature an additional option for extending the landing gear.

Because of purported contributing factors in aviation accidents and in consideration of the advantages and disadvantages, the manufacturer issued Service Bulletin (SB) No. 866, according to which the BGE should be removed. HB-PLC underwent this SB.

1.3.2.3 Alternative extension

The alternative landing gear extension procedure is the manual free fall emergency extend (cf. Figure 3). This involves depressurising the entire hydraulic system using the automatic gear down and emergency free fall gear valve. It allows the landing gear to descend into the extended position due to gravity and then lock automatically.

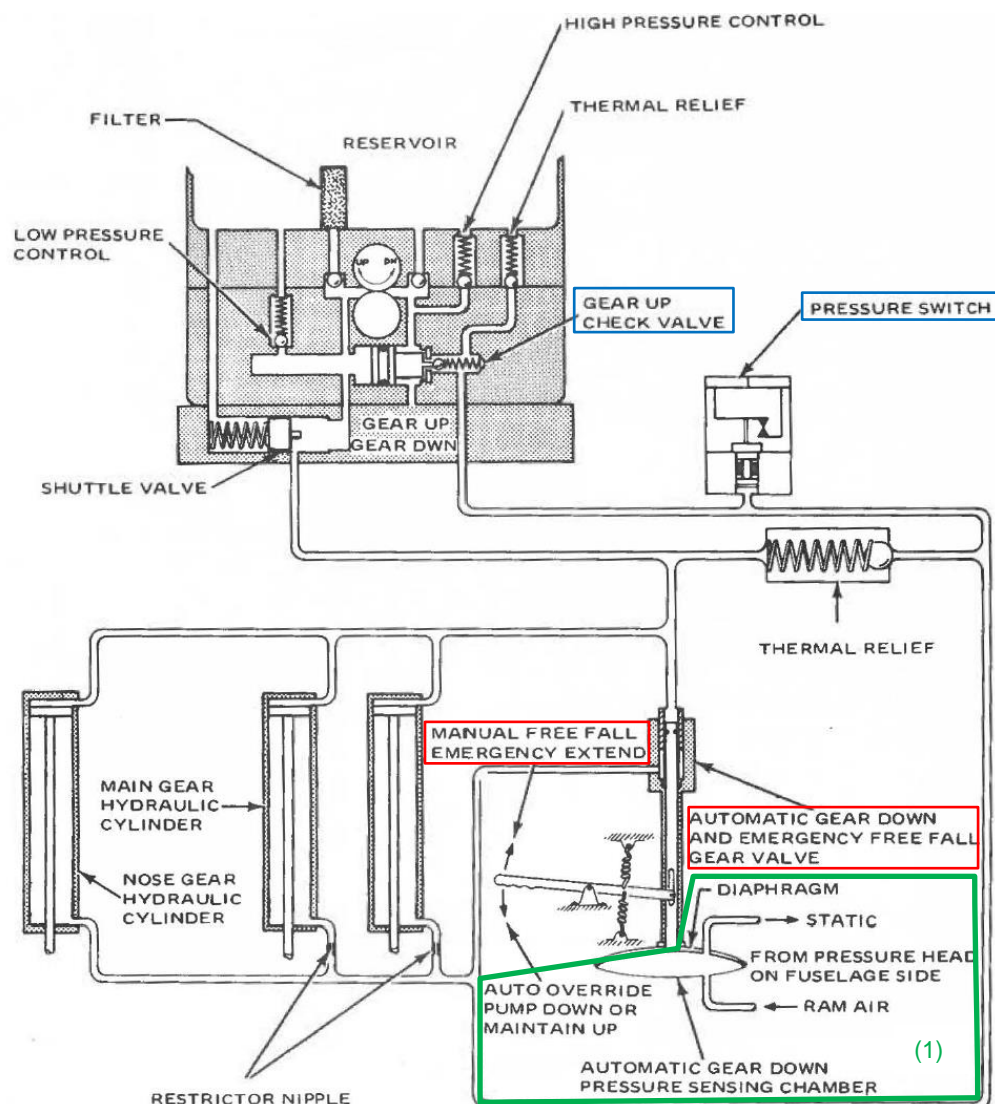


Figure 3: Schematic diagram of the hydraulic system with the back-up gear extender (1).

1.4 Wreckage and impact information

There were clear signs of contact from the tail skid, left landing gear door and the wing tip of HB-PLC along runway 25. A static discharger was also found on the runway.

HB-PLC came to a standstill on the adjacent grass, approximately 260 metres from the touchdown point for single-engine aircraft (cf. yellow circle in upper right corner of Figure 4).



Figure 4: Final position of HB PLC (red) and distinctive features as a result of the landing of HB-PLC on runway 25.

Grenchen emergency services, the assistant airfield manager and Grenchen regional airport fire services were already on site when HB-PLC performed the emergency landing (cf. Figure 1).

After HB-PLC landed, the fire services stabilised the aircraft so that no further damage could occur. To do this, they lifted the left wing and extended the left main landing gear. The counterpressure to the right landing gear meant that it unlocked and folded. The pressure was released using the automatic gear down and emergency free fall gear valve and both main landing gear were fixed in the locked position with cable ties. It was determined that there was no fuel leak and that fire could not develop.



Figure 5: HB-PLC in final position on adjoining grass

After the fire services had stabilised the aircraft, the following observations were made:

- The left wingtip was damaged and the static discharger was missing.
- The pitot tube on the underside of the left wing had been deflected backward.
- The propeller did not exhibit traces of contact.
- There were clear grease marks on the outside of the landing gear link on the left main landing gear.
- The battery and alternator switches and the fuel selector switch were in the “OFF” position.
- The ignition was turned off.
- The landing gear selector lever was in the “DOWN” position.
- Once the battery was switched on, all three landing gear indicators illuminated green.



Figure 6: Left main landing gear of HB-PLC with cable ties (yellow arrow) and clear grease marks on the outside of the landing gear link (white frame)

1.5 Troubleshooting

The landing gear of HB-PLC was examined in depth. The following observations were made:

- When the aircraft was jacked up, it was possible to reproduce the fault during both normal extension of the landing gear and the alternative procedure (cf. Section 1.3.2.3).
- After dismantling the actuating cylinder on the left main landing gear the fault remained present, even during the free fall procedure.
- A check of the hydraulic oil level indicated a full tank.

A renewed examination of the landing gear extension revealed that the hydraulic pump turned off too early, i.e. before all three landing gear legs had fully extended and locked.



Figure 7: Left main landing gear of jacked-up HB-PLC in its incompletely extended position

The subsequent test on the three landing gear legs yielded the following results:

- Upon operation of the down lock switch of both the nose landing gear and the right main landing gear, the pump started immediately.
- Upon operation of the down lock switch of the left main landing gear, the pump did not respond.
- A workshop inspection of the removed down lock switch for the left main landing gear revealed that it was functioning normally.
- Upon further investigation, it was found that there was a fault in an electrical cable leading from the left main landing gear down lock switch to the pump motor which could not be seen from the outside. Electrical power to the hydraulic pump was therefore interrupted even though the left main landing gear was not yet located in the final position and was therefore not locked (cf. Annex 3).

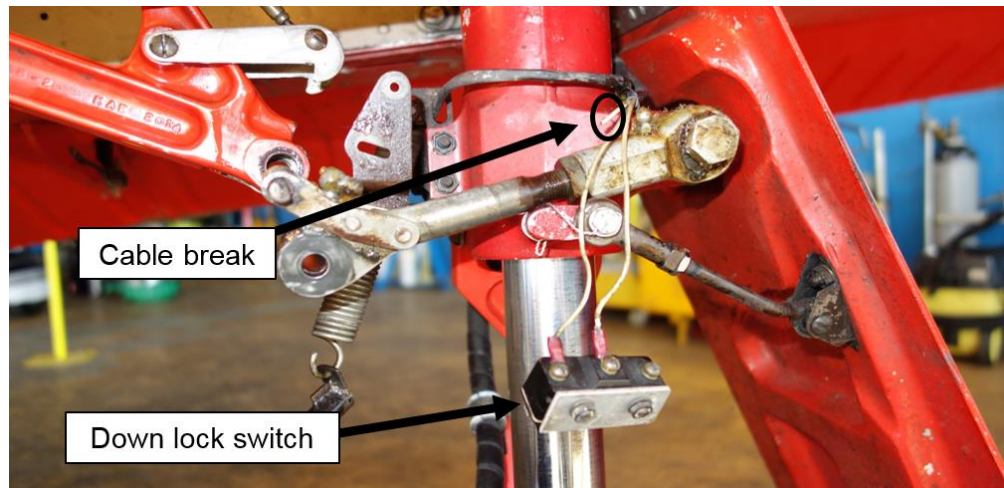


Figure 8: Position of the broken cable on the left main landing gear above the down lock switches after dismantling

- The left landing gear joints were then treated with penetrating oil, after which the free fall procedures again worked normally.
- After the joints were dismantled, it was determined that both the bolts and bores exhibited evidence of fretting (cf. Annex 2), which is due to dry operation (cf. Figure 9).

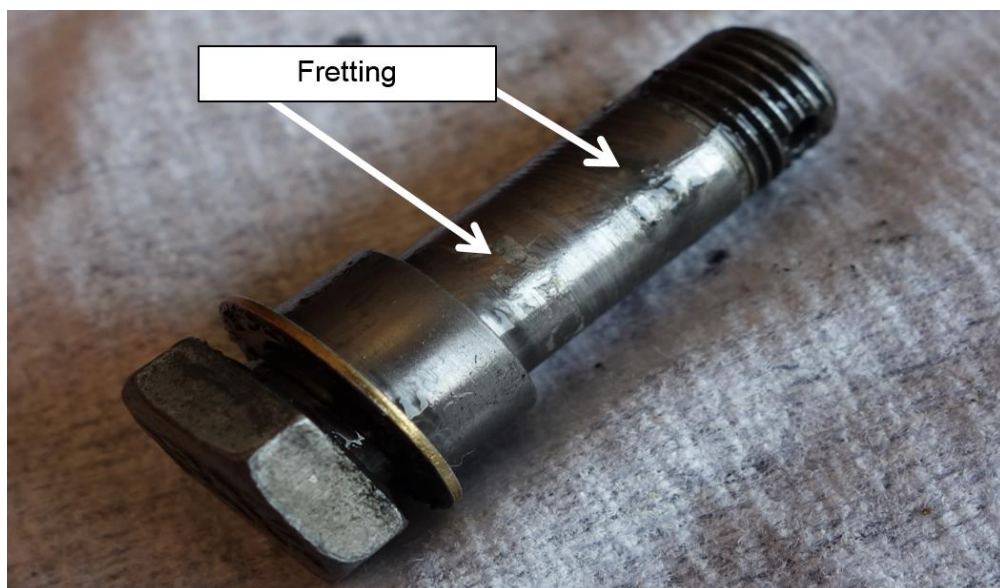


Figure 9: Fretting on bolt

- The grease nipple for the bolt bearing was continuous.

1.6 Organisational and management information

1.6.1 Flight school operating procedures

The operating procedures of the flight school MaximAir include the following instructions for extending the landing gear in the section entitled “Emergency Procedures Checklist” (bold in the original):

“9 EMERGENCY LANDING GEAR EXTENSION

Prior to emergency extension procedure:

Master switch..... - ON - check

1.6.2 Manufacturer

When questioned, the aircraft manufacturer Piper stated that cable breaks in the main landing gear were not known to be a common problem.

According to the instructions in the aircraft maintenance manual (AMM), the free fall procedure must be inspected during the check flight on every 100-hour inspection.

1.6.3 Maintenance company

The maintenance company Mecnair SA in Ecuwillens stated that it had checked the free fall procedure during the 100-hour inspection on 24 December 2014. No complaints were recorded.

The responsible maintenance company did not wish to comment on the fretting on the bolt and bore (cf. Figure 9).

1.7 Medical information

Police tested the blood alcohol concentration of both the pilot and flight instructor using a breath test approximately fifteen minutes after the accident. The result was 0.00 ‰ for both crew members.

There are no indications of any of the crew suffering health problems during the flight involved in the accident.

2 Analysis

2.1 Technical aspects

The fault investigations in the aftermath of the accident (cf. Section 1.5) identified the following two independent faults:

- A cable break on the left main landing gear: such events occur suddenly and cannot be anticipated by an inspection. To be able to land safely in the case of such a fault, the free fall procedure must work. This must be performed and checked during every 100-hour inspection of the aircraft. According to the statement of the maintenance company, this inspection was last performed on 24 December 2014 without any complaints.
- Left main landing gear seizing: fretting on bolt (cf. Figure 9) and bore were probably the result of dry operation. This is due to lack of or inadequate lubrication and leads to surface defects, as were found on the bolt and bore.

Upon commencing the circuits, the power of the left hydraulic cylinder at normal gear extension was sufficient to overcome the resistance of the seized landing gear leg and allow it to lock fully when extended.

When the crew extended the landing gear during the fifth approach and during the subsequent emergency procedures, the hydraulic pump only operated until the other two down lock switches reported correct locking of the respective landing gear legs and subsequently stopped due to the cable break (cf. Section 1.3.2.1). The affected left landing gear leg remained incompletely extended (cf. **Fehler! Verweisquelle konnte nicht gefunden werden.**) and the red gear unsafe light went out.

The increased resistance also meant that the left landing gear leg could not be fully extended using the alternative free fall procedure via the emergency gear extender.

2.2 Human and operational aspects

2.2.1 Flight crew

The crew's decision to initiate an immediate go-around as a result of the left main landing gear display failing to illuminate green during the fifth approach was logical. The crew also set the correct priorities by exiting the circuit in the direction of Lake Biel in order to perform in-depth troubleshooting. The crew divided the tasks of working through the emergency checklist "9 EMERGENCY LANDING GEAR EXTENSION" (cf. Section 1.6.1) sensibly in accordance with the principles of crew resource management (CRM).

During repeated extension and retraction of the landing gear, the crew determined that the red gear unsafe light went out in both the retracted and extended positions. The conclusion that the down lock switch of the left main landing gear could be a possible cause of the problem is evidence that the crew had a good knowledge of the landing gear functions (cf. Section 1.3.2.1).

The decision to return to Grenchen for the low-pass and let the aerodrome controller verify whether the down lock switch was the cause or whether there was an actual landing gear fault was prudent.

The crew then again flew in a southwesterly direction until they were over Lake Neuchâtel, where they descended in a configuration for the final approach at the lowest safe speed of 75 kt without success. This procedure was due to a nose landing gear fault. It indicates that the crew, who had a remaining endurance of

more than two hours, tried everything possible to extend the left main landing gear fully.

The preparation and implementation of the landing on runway 25 (hard surface) were comprehensive.

2.2.2 Air traffic control

Aerodrome control offered the crew good support from the time it was informed of the technical problem at 15:18, after the second go-around. The controller allowed two low-passes for visual examination of the left main landing gear and thus provided useful information for the situational assessment. The decision to switch to the ground frequency (121.800 MHz) in order to allow calm communication with third parties if necessary was appropriate.

3 Conclusions

3.1 Findings

3.1.1 Technical aspects

- The aircraft was licensed for VFR transport.
- The last extensive 100-hour inspection took place on 23 December 2014 at 6556:50 TSN after 9377 landings.
- The operating hours and number of landings between the last 100-hour inspection and the time of the accident were 33:39 hours and 74 landings respectively.
- Fretting on the bolt and bore (cf. Annex 2) suggest dry operation, resulting in increased resistance when extending the left main landing gear.
- A cable break was discovered on the left main landing gear approximately the down lock switch. This caused the hydraulic pump to cut out before the left main landing gear was fully extended and locked; it also caused the red gear unsafe light to go out (cf. Annex 3).
- After cutting out the pump as a result of the cable break, the left main landing gear seized due to lack of hydraulic pressure and could no longer be fully extended.

3.1.2 Crew and operational aspects

- The pilots were in possession of the necessary licences for the flight.
- There are no indications of the pilots suffering health problems during the flight involved in the accident.
- Both the mass and centre of gravity of the aircraft were within the permitted limits according to the aircraft flight manual (AFM) at the time of the accident.

3.1.3 History of the flight

- The PA-28RT-201T aircraft, registration HB-PLC, took off on 30 May 2015 at 14:34 from runway 25 (hard surface) at Grenchen regional airport (LSZG).
- On board were a flight instructor, a student and a passenger without flying experience.
- After four uneventful circuits, during the fifth approach the crew noticed that the left main landing gear was not extending fully and initiated a go-around.
- A further circuit to perform an initial situational analysis was unsuccessful and led to another go-around at 15:18.
- The crew exited the circuit in the direction of Lake Biel to perform in-depth troubleshooting and to work through the emergency checklist for the "*EMERGENCY LANDING GEAR EXTENSION*".
- The crew then returned to Grenchen, sent a distress call (MAYDAY) at 15:35 and conducted a low-pass over runway 25R (grass).
- After again leaving the circuit and heading towards Lake Neuchâtel and making a low-pass over runway 07L (grass), the crew decided on a landing on runway 25 (hard surface) with fully extended flaps.

- HB-PLC veered off the left of the runway 260 m after the touchdown point for single-engine aircraft at low speed and came to a standstill on the adjacent grass at 16:28.
- There was no fuel leak and the occupants were able to vacate the aircraft unharmed.

3.1.4 General conditions

- The weather conditions had no influence on the accident.

3.2 Causes

The accident was due to landing with partially extended landing gear, at which the left main landing gear collapsed, the aircraft subsequently veered off the runway at low speed and came to a standstill on the adjacent grass.

Neither the normal extension nor the alternative free fall procedures made it possible to fully extend the left main landing gear. The following factors played a contributory role:

- Increased mechanical resistance resulted in one landing gear leg seizing;
- A cable break on the main landing gear meant that the hydraulic pump cut out before the affected main landing gear was locked.

- 4 Safety recommendations, safety advices and measures taken since the accident**
- 4.1 Safety recommendations**
None
- 4.2 Safety advices**
None
- 4.3 Measures taken since the accident**
None

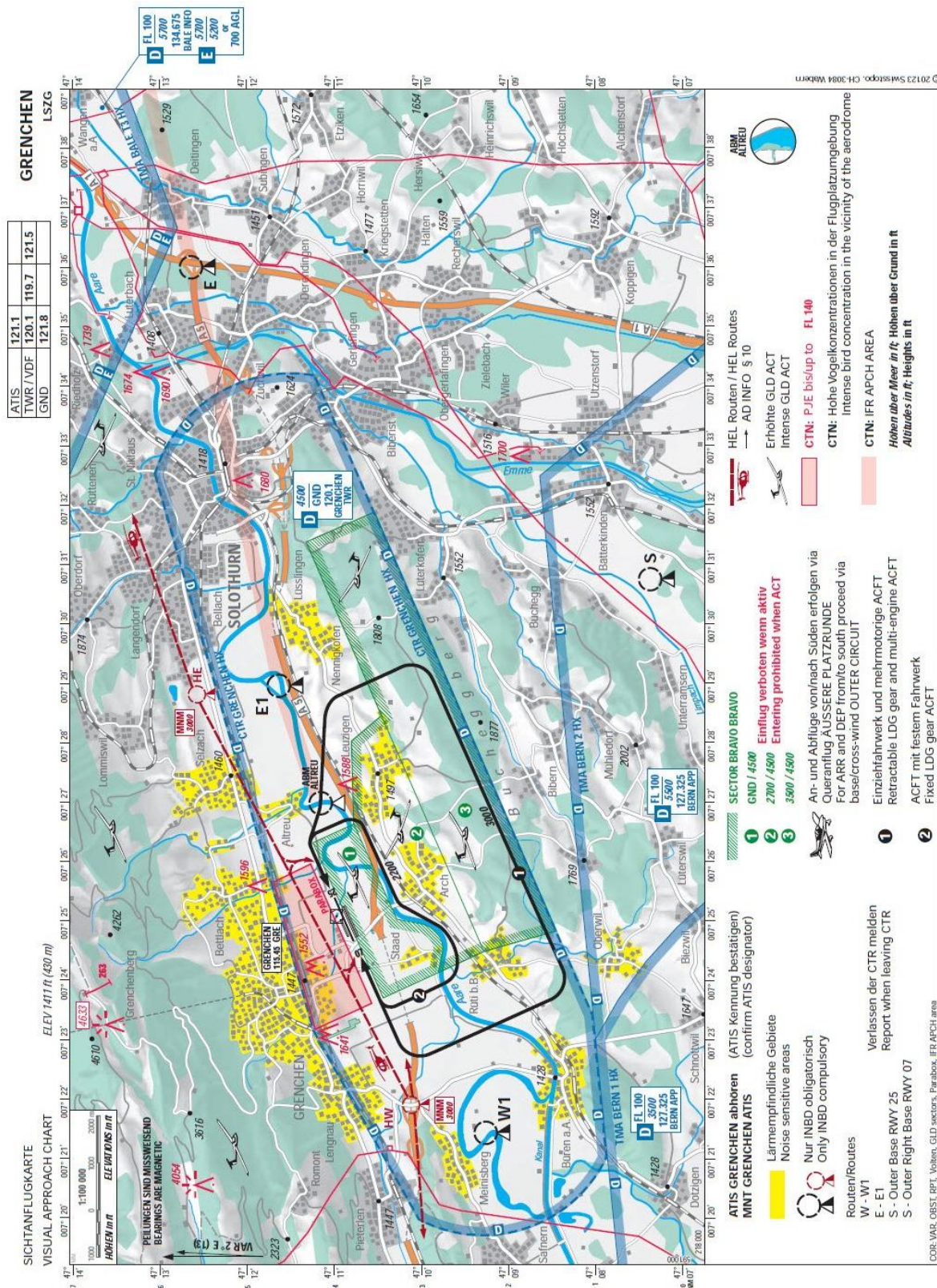
Payerne, 22 August 2016

Investigation Bureau STSB

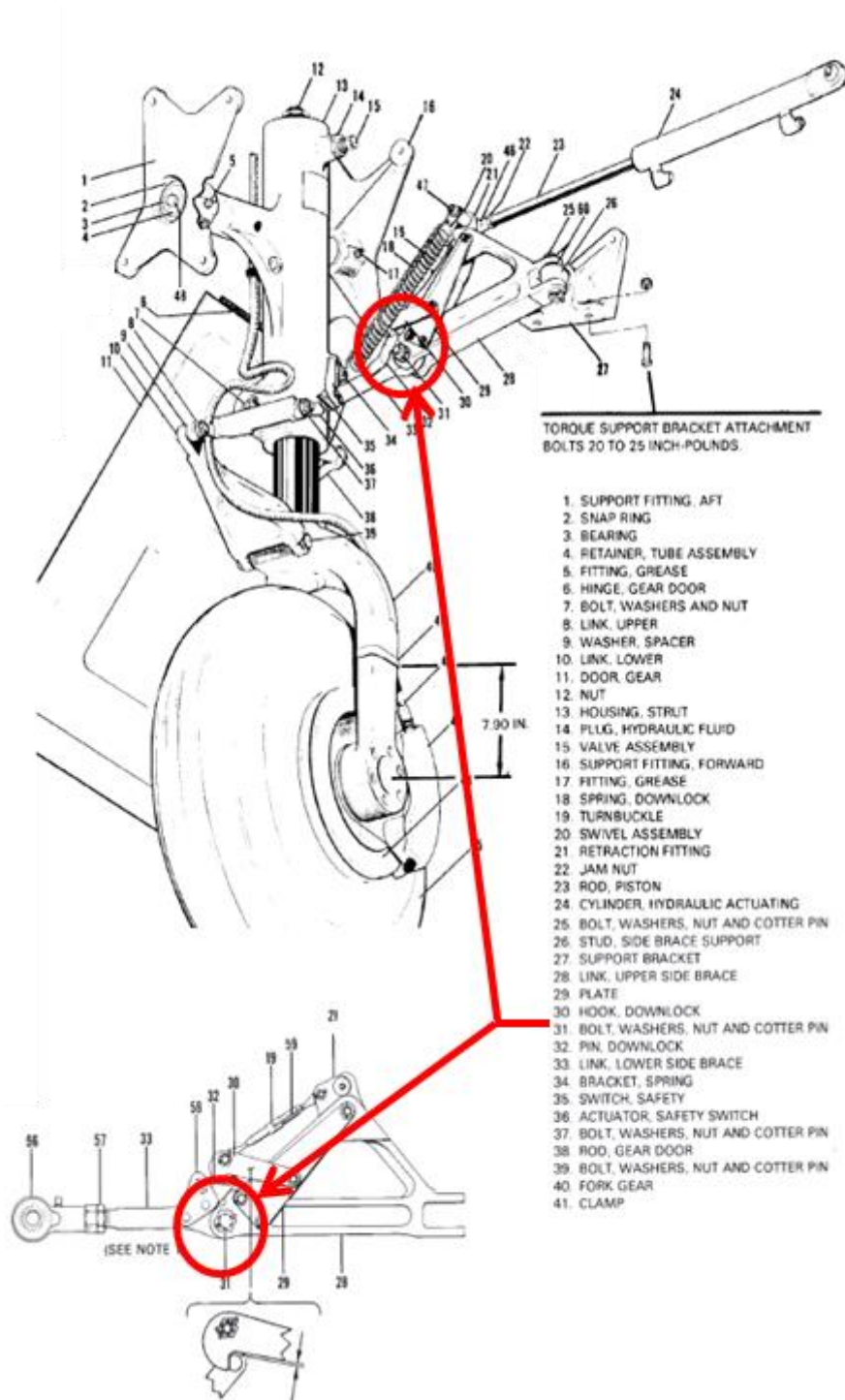
This final report was approved by the Board of the Swiss Transportation Safety Investigation Board STSB (Art. 10 lit. h of the Ordinance on the Safety Investigation of Transportation Incidents of 17 December 2014).

Berne, 11 August 2016

Annex 1: VFR approach chart for Grenchen (LSZG) regional airport



Annex 2: Schematic diagram of main landing gear leg



Annex 3: Electrical wiring diagram for landing gear leg from manufacturer's maintenance manual

