AIRCRAFT INCIDENT SHORT REPORT

CA18/3/2/1312: The landing gears collapsed during the landing roll.

Date and time	**:**	20 May 2020, 0650Z
Location	:	Runway 08 Krugersdorp Airfield (FAKR)
Aircraft registration	**:**	ZU-TAM
Aircraft manufacturer and model	**:**	Jihlavan Airplanes S.R.O. Skyleader 600
Last point of departure	**:**	Eagles Creek Airfield, Gauteng Province
Next point of intended landing	**:**	Krugersdorp Airfield, Gauteng Province
Location of incident site with reference: to easily defined geographical points (GPS readings if possible)		26°4'56.10" South, 027°43'21.17" East at an elevation of 5482ft AMSL
Meteorological information	:	Surface wind: 180° at 2 knots; temperature: 13°C; CAVOK
Type of operation	:	General Aviation (Part 94)
Persons on-board	:	1+1
Injuries	:	None
Damage to aircraft	:	The aircraft sustained minor damage

All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Purpose of the Investigation:

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (2011), this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and ***not to apportion blame or liability.***

Disclaimer:

1. SYNOPSIS

1.1 On 20 May 2020, a pilot and a passenger took off from Eagles Creek Airfield on a ferry flight to Krugersdorp Airfield (FAKR). The aircraft was scheduled to undergo an annual inspection which was to be conducted at FAKR.

1.2 As soon as the pilot was airborne and had retracted the gears, he heard a sound that emanated from the undercarriage. The landing gear circuit breakers did not pop out; however, the green lights went off, confirming that the gears were not down. The pilot attempted to use the emergency gear system (turn handles) located in the cockpit for emergency recycling, but this did not work even though the pilot used his weight to turn the handles.

1.3 He stated that his first thought was to fly to Grand Central Airport (FAGC) or Lanseria International Airport (FALA) but realised that there would be no assistance there as there were no maintenance personnel who would help him (country's lockdown period). He then contacted the Approved Person (AP) who was scheduled to perform the annual inspection on the aircraft at FAKR. The AP advised the pilot to fly to FAKR, and he also mentioned that he would need about 40 minutes to drive from his location to FAKR. The pilot maintained his flight plan via Rustenburg Airfield (FARG) to give the AP time to get to FAKR; and he later directed to FAKR.

1.4 On arrival at FAKR, the pilot executed a fly past and the AP confirmed that the nose gear was fully down but the main landing gears were partially extended. The AP advised him to land on Runway 08 but to anticipate the possibility of the undercarriage collapsing upon landing. The pilot landed on Runway 08 and, on touch down, the main landing gears and the nose gear collapsed. The aircraft skidded a few metres before coming to a stop on the runway.

1.5 The aircraft sustained substantial damage to the lower fuselage, tyre rims, rib and the guide. The two occupants were not injured during the incident sequence.

1.6 The investigation revealed that it was probable that the collapse of the landing gears during landing was due to a disconnected pushrod as a result of an unsecured bolt on the right-side main landing gear wheel well.

2. FACTUAL INFORMATION

2.1 On 20 May 2020, a pilot and a passenger on-board a Skyleader 600 aircraft with registration ZU-TAM took off on a ferry flight from Eagles Creek Airfield in Gauteng province with the intention to land at Krugersdorp Airfield (FAKR) in the same province. The aircraft was scheduled to undergo an annual inspection which was to be conducted at FAKR. The aircraft was flown under a special flight permit. The flight was conducted under visual flight rules (VFR) by day in visual meteorological conditions (VMC). The flight was operated under the provisions of Part 94 of the Civil Aviation Regulations (CAR) 2011 as amended. There was no flight plan filed for the flight.

2.2 The pilot stated that he performed a thorough pre-flight inspection. As soon as he was airborne and had retracted the gears, he heard a sound that emanated from the undercarriage. The landing gear circuit breakers did not pop out, however, the green lights went off, confirming that the gears were not down. He attempted to use the emergency gear system (turn handles) located in the cockpit for emergency recycling, however, this did not work even though the pilot had used his weight to turn the handles.

2.3 He further stated that his first thought was to fly to Grand Central Airport (FAGC) or Lanseria International Airport (FALA), but he realised that there would be no assistance at those airports as there were no maintenance personnel who would help him (country's lockdown period). He then contacted the Approved Person (AP) at FAKR who was scheduled to perform the annual inspection on the aircraft. The AP advised the pilot to fly to FAKR. The pilot maintained his flight plan via Rustenburg Airfield (FARG) to give the AP time to get to FAKR and, later, directed to FAKR so as to meet the AP who was about 40 minutes away from FAKR at the time the pilot contacted him.

2.4 On arrival at FAKR, the pilot executed a fly past and the AP confirmed that the main landing gears were partially extended, but that the nose gear was fully down. The AP advised the pilot to land on Runway 08 but made him aware of the possibility of the undercarriage collapsing upon landing. The pilot had lined up for landing on Runway 08 and had reduced the speed to 40 knots but maintained it above stall speed (33 knots). He then shut down the engine and, on touch down, the main landing gears and the nose gear collapsed. The aircraft skidded a few metres before coming to a stop on the runway.

2.5 The aircraft sustained substantial damage to the lower fuselage, tyre rims, rib and the guide. The pilot and the passenger were not injured during the incident sequence.

2.6 The incident occurred during daylight on Runway 08 FAKR at GPS co-ordinates determined to be: 26°4'56.10" South, 027°43'21.17" East at a field elevation of 5 482 feet (ft) above mean sea level (AMSL).

Figure 1: Google Earth overlay of the incident site. (Source: Google Earth)

Figure 2: The aircraft as it came to rest post-incident. (Source: Pilot)

2.7 The AP who recovered the aircraft stated that he could not do a post-incident operational test of the landing gears as the right-side pushrod had damaged the rib and the guide that pass through it. The pushrod had disconnected during take-off when the pilot attempted to retract the gears. He further stated that upon disassembling of the landing gear actuator and linkages, he carried out a functional test of the actuator motor separately and found it to be in good working condition. All wiring between the landing gear motor, gear indicator and limit switches as well as control circuit were inspected for integrity and routing to the circuit breaker (CB). No defects were noted.

2.8 The disconnected pushrod placed the right-hand main landing gear (RH MLG) in a condition outside the certification state (rendering the RH MLG unserviceable/unairworthy and, thereby, exposing the RH MLG strut assembly to the possibility of not extending).

2.9 Upon inspection of the main wheels and tyres, the investigators found scratch marks on the rims, as well as chafed marks on the outboard higher edge of the tyres (See Figure 3). This indicated that upon touch down on the runway, the tyres and the gears were not fully extended, meaning that the gears were at an angle as the aircraft impacted the ground.

Figure 3: The aircraft tyres post-accident.

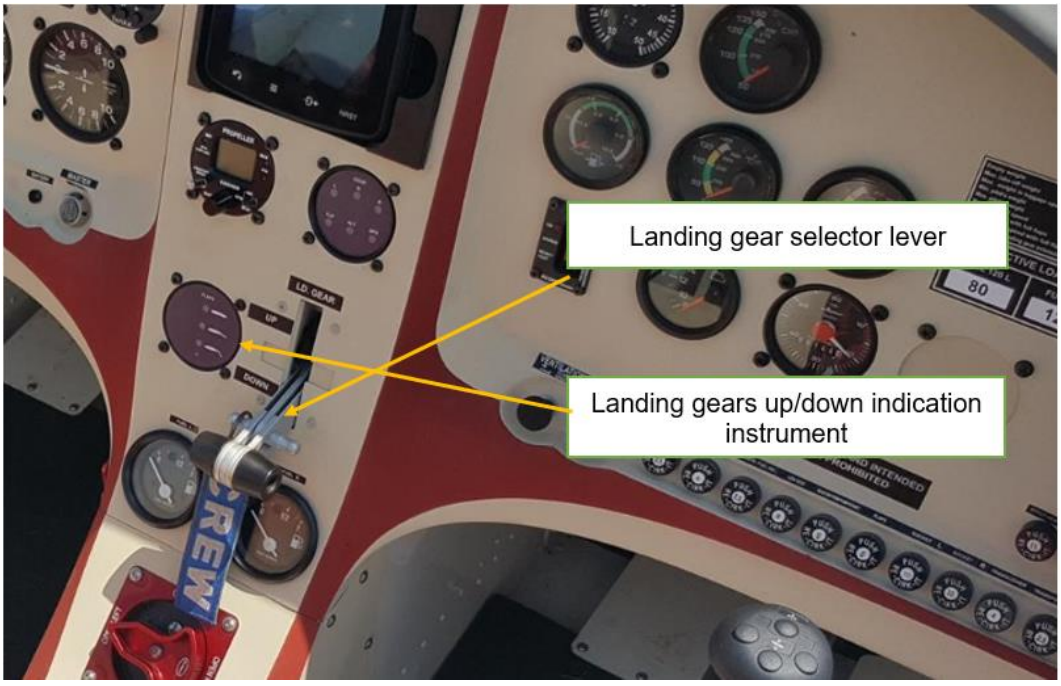

Figure 4: Cockpit Instrument panel. (Source: Zall Jihlavan Airplanes SRO)

2.10 It is likely that the sound that the pilot heard was the landing gear pushrod disconnecting from the attachment bolt. The disconnected pushrod caused further damage on the rib and guide, and as a result, caused damage during the collapse of the undercarriage. It is probable that the bolt became loose over time and, on the incident flight, it came off, resulting in the pushrod dislodging while the gear up was selected in the cockpit. However, the pushrod was not damaged due to its robust design.

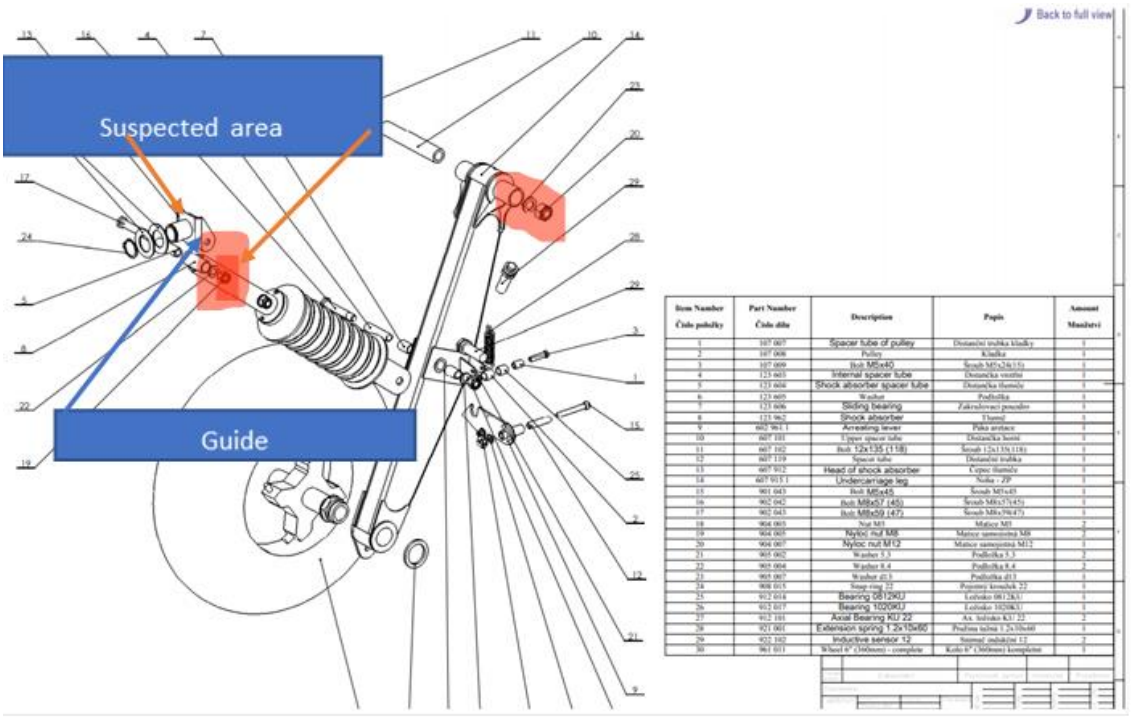

Figure 5: Illustration of the pushrod/drive rod. (Source: manufacturer's IPC)

2.11 Description and operation of the landing gear retraction and extension system as obtained from the manufacturer: Pilot's Operating Handbook/Flight Manual

Landing gear system of the Skyleader 600 is designed with two electric motors. First for nose gear, second for main gear. Landing gear is locked mechanically in both positions. With hooks in retracted position and with brake struts in open position. Each position of gears and control lever are censored with induction sensors. Gear position is controlled with lever and electronic unit.

All system is secured against electric failure by mechanical emergency open.

During the production and operation of the JA-600 aircraft, only one service bulletin was issued regarding the landing gear. It was issued in 2018 and concerned a warning about the possibility of the spontaneous retraction of the landing gear on the ground. The landing gear is controlled by one lever in the cabin, which, when moved to the "open" position, unlocks the mechanical locking cables on the main landing gear and at the same time instructs the landing gear electronics via an inductive sensor. The landing gear electronics are located on the dashboard, and contain three signaling LEDs (green - landing gear OK open, red - lights up when the gear is moving (unsecured state), not lit - landing gear pulled). The electronics control two motion

linear electric actuators (one for the front carriage, the other for the main gear). The end positions (closed x open) at all three legs are monitored by inductive sensors. The system also includes an emergency mechanical opening of the landing gear. It is controlled by the handles under the pilot's seat and allows the landing gear to be opened in the event of an electric power failure (even from any intermediate position) - the opening is not signaled, only the handles turn fully to the end. The attached pictures will tell you more.

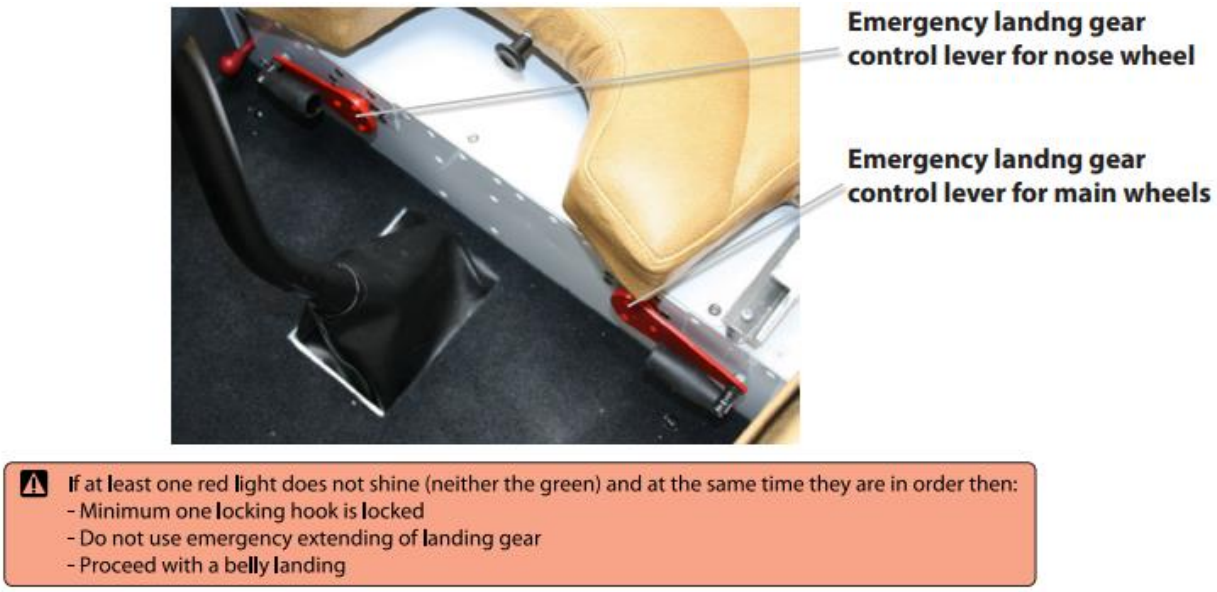

Figure 6: Picture showing emergency handles. (Source: Manufacturer's POH)

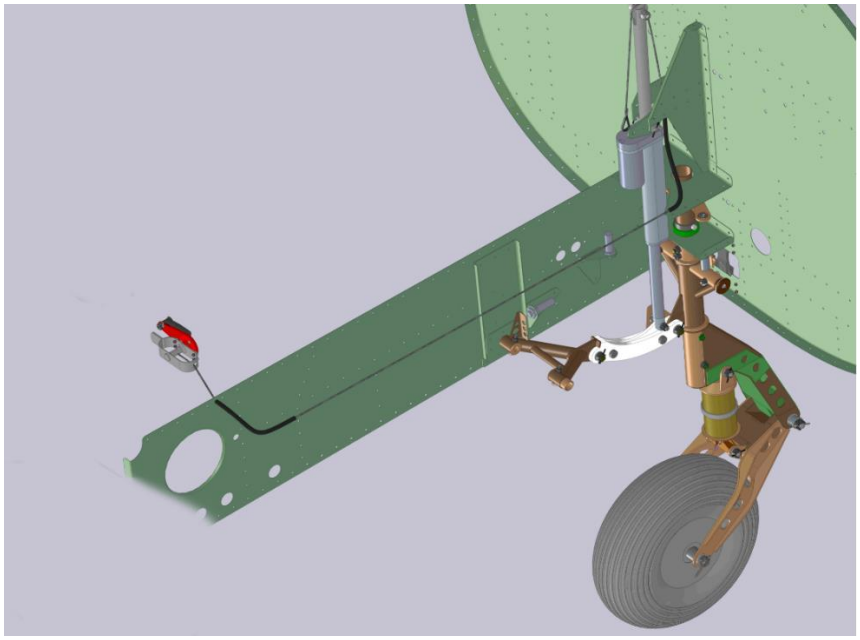

Figure 7: Illustration of the nose gear emergency system. (Source: Manufacturer's POH)

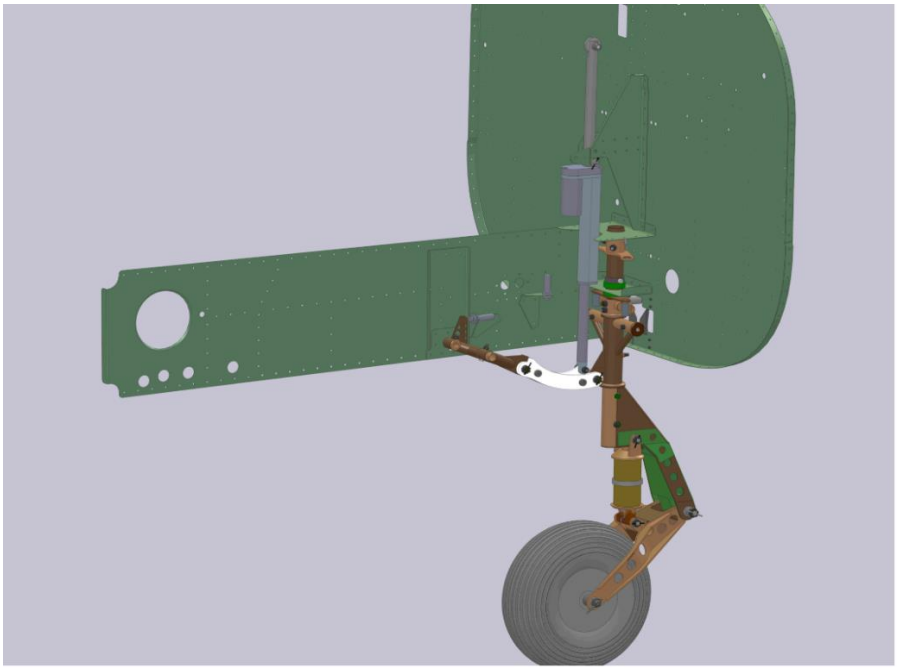

Figure 8: Illustration of a nose gear that is extended correctly. (Source: Manufacturer's POH)

2.12 The calculated take-off weight of the aircraft on the day of the incident was approximately 500 kilograms (kg), which is below the maximum certificated take-off weight of 600kg.

Empty Weight	320 kg
Pilot	80kg
Passenger	55kg
Cargo	15kg
Fuel	30kg
Total	500 kg
Skyleader MTOW	600 kg

2.13 Maintenance records made available to the investigators showed that the undercarriage of the aircraft had no history of operational problems. A review of the maintenance records showed compliance with the Aircraft Maintenance Manual (AMM).

2.14 According to available maintenance records, the undercarriage was cycled on 13 June 2018 at 532.1 hours, and the landing gear was found to be serviceable. The AP stated that this was just for precautionary measures. The undercarriage had been in operation for 137.9 hours since it was cycled two years prior to the incident flight. The last time the aircraft was flown was on 15 March 2020, which meant that the aircraft was inactive for two months due to Covid-19 lockdown restrictions.

2.15 A review of maintenance records revealed that the aircraft's Mandatory Service Bulletin (SB) 01/2018 that addressed the security of landing gear control system issued on 6 November 2018 was not incorporated (see Appendix A).

3 Findings

3.1 The pilot was issued a Private Pilot Licence (PPL) on 2 August 2019 with an expiry date of 31 October 2020. His Class 2 medical certificate was issued on 18 July 2019 with an expiry date of 31 July 2020, with no restrictions.

3.2 The AP was issued an Approved Person certificate on 29 April 2019 with an expiry date of 28 April 2021. The AP was endorsed and rated on this aircraft type.

3.3 The aircraft was issued a Certificate of Registration on 27 July 2011.

3.4 The aircraft was issued an Authority to Fly (ATF) on 12 June 2019 with an expiry date of 30 June 2020.

3.5 The last annual inspection was conducted on 10 June 2019 at 607.2 hours. The aircraft had flown a further 62.8 hours since its annual inspection. No maintenance related anomalies were identified and recorded relating to the performance of the aircraft prior to the incident.

3.6 The aircraft was flown under a special flight permit issued on 19 May 2020 with an expiry date of 2 June 2020. The flight was from Eagles Creek Airfield to FAKR, with the specification of essential crew only. The passenger on-board was not essential crew; this was in contravention of the special flight permit. The aircraft was being ferried to FAKR for an annual inspection which was due on 18 May 2020.

3.7 According to available maintenance records, the undercarriage was cycled as per the manufacturer's requirements; and all was found to be serviceable on 13 June 2018 at 532.1 airframe hours. The undercarriage had been in operation for 137.9 hours since it was cycled two years prior to the incident flight.

3.8 Maintenance records made available to the investigator showed that the undercarriage of the aircraft had no history of operational problems. A review of the maintenance records for the incident aircraft showed compliance with the Aircraft Maintenance Manual (AMM).

3.9 A review of maintenance records revealed that the aircraft's Mandatory SB01/2018 that addressed the security of landing gear control system issued on 6 November 2018 was not incorporated.

3.10 The attempt to extend the undercarriage via the emergency handles by the pilot would not have been possible due to the disconnection of the pushrod.

3.11 The investigation revealed that it was probable that the collapse of the landing gears during landing was due to a disconnected pushrod as a result of an unsecured bolt on the right-side main landing gear wheel well.

4 PROBABLE CAUSE/CONTRIBUTING FACTOR

4.1 The aircraft's main landing gears had jammed due to a pushrod that became disconnected as a result of an unsecured bolt on the right-side main landing gear wheel well.

4.2 Contributory Factor

4.2.1 Inadequate maintenance practices.

5. REFERENCES USED IN THE REPORT

5.1 Manufacturer's JA600 Pilot Operating Handbook (POH).

5.2 JA600 Mandatory Service Bulletin 01/2018, dated 6 November 2018.

5.3 Manufacturer's Statement.

5.4 Illustrated Parts Catalogue (IPC)

6. SAFETY RECOMMENDATION

6.1 None.

7. APPENDICES

7.1 Appendix A: Service Bulletin 01/2018
7.2 Appendix B: JA600 Pilot Operating Handbook

This Report is issued by:

Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa

APPENDIX A

Source: Manufacturer

SERVICE BULLETIN 01/2018

Bulletin Number: 01/2018

Issue Date: 6th November 2018

Subject: Increase security of landing gear control system

Classification: Mandatory

Airplanes Affected (s/n): JA-600 (Skyleader 600) and KP-2/5 (Skyleader 200/500) with retractable gear and with these serial numbers:

6 155 166 O	6 229 251 T	2 240 261 U
6 190 215 Q	6 223 254 T	5 242 264 U
6 201 204 Q	6 235 255 T	5 243 265 U
6 202 222 R	6 239 257 U	2 246 269 U
6 204 223 R	6 241 258 U	2 248 271 U
6 208 227 R	6 244 266 U	2 249 272 U
6 209 228 R	6 245 267 U	2 256 278 V
6 212 234 S	6 247 270 U	5 254 277 V
6 214 235 S	6 250 268 U	2 264 286 V
6 216 233 S	6 252 274 V	2 266 293 V
6 220 239 S	6 253 275 V	
6 221 241 S	6 257 276 V	
6 226 244 T	6 270 289 W	
6 227 249 T		

Compliance: After receive of this Service Bulletin

Reason: If the landing gear control lever position sensor is incorrectly operated, the landing gear may retract spontaneously.

Description: Firmware modification in landing gear control unit (at manufacturer workshop).

Manufacturer: ZALL JIHLAVAN airplanes, s. r. o., Znojemská 64, 58601 Jihlava, Czech Republic
Web: www.skyleader.aero; E-mail: support@skyleader.aero

WWW.SKYLEADER.AERO
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Action:

- Disconnect airplane battery
- Disassembly of the control unit from plane (unscrew the 4 screws holding the control unit on the dashboard and disconnect the electric connector at the rear of the control unit)
- Sending control unit manufacturers to modify (approx. 1 week)
- Assembly of the control unit to plane (screw the 4 screws holding the control unit on the dashboard and connect the electric connector at the rear of the control unit)
- Connect airplane battery
- Control check of all function of landing gear

Repair Cost: repair costs are covered by the manufacturer

Pages: 2

APPENDIX B

(Source: JA600 Pilot Operating Handbook)

3.4. Emergency undercarriage extension

1. Move primary landing gear control lever to "DOWN" position - if it is not already in "DOWN" position
2. Re-circ the landing gear circuit breaker and wait 30 seconds
3. If three red light or combination of green and red are shining (for each wheel must shine at least one light) turn

JA600 POH 2010-12-20

the emergency langing gear control lever until three greens are shinning

4. Proceed with normal landing

This procedure is only for aircrafts with retractable landing gear.

Emergency landng gear control lever for nose wheel

Emergency landng gear control lever for main wheels

If at least one red light does not shine (neither the green) and at the same time they are in order then:
- Minimum one locking hook is locked
- Do not use emergency extending of landing gear
- Proceed with a belly landing

3.5. Emergency landing

1. Airspeed 100-110 km/h (54-59 kt) (62-68 mph)
2. Landing area choice (landing direction, surface, wind)
3. Undercarriage * - according to landing area charater

If engine is not working:

4. Ignition switch - turn the key to OFF position

JA600 POH 2010-12-20