

AIRCRAFT ACCIDENT REPORT AND EXECUTIVE SUMMARY

				Reference:	CA18/2/3/8829	
Aircraft Registration	ZU-FEZ	Date of Accident	03 September 2010		Time of Accident	1130Z
Type of Aircraft	Sportsman GS 2		Type of Operation		Private	
Pilot-in-command Licence Type		Private Pilot	Age	48	Licence Valid	Yes
Pilot-in-command Flying Experience		Total Flying Hours	292.4		Hours on Type	24.1
Last point of departure		Knysna				
Next point of intended landing		Plettenberg Bay				
Location of the accident site with reference to easily defined geographical points (GPS readings if possible)						
Private airstrip at Jakalskraal district - Plettenberg Bay.						
Meteorological Information		Surface Wind: Southerly, Wind Speed: 3 - 5kts; Temperature: 24°C, Visibility: Good				
Number of people on board	1 + 0	No. of people injured	0	No. of people killed	0	
Synopsis						
<p>During approach for landing the pilot pulled back on the control stick to initiate flaring in order to touch down on the runway. The pilot realised that the control stick was not moving back as required, but had somehow got stuck. His observation at the time was that the aircraft was experiencing a control lock condition. The result was that the aircraft landed hard on the runway and bounced. During the unstable landing sequence the nose landing gear collapsed and broke off. The aircraft flipped over and ended up lying upside down. The aircraft sustained substantial damage in the accident.</p> <p>During the investigation process, the evidence found indicated that the obstruction was probably between the control stick and passenger seat head rest. The passenger seat head rest was folded forward and prevented the control stick on the passenger side from travelling that last few inches required when flaring for the landing.</p>						
Probable Cause						
Unsuccessful landing due to obstruction on elevator control resulting on a nose gear failure and the aircraft flipping over.						
Contributory Factors						
Inadequate pre flight						
IARC Date				Release Date		



AIRCRAFT ACCIDENT REPORT

Name of Owner/Operator : Van Zuydam I J
Manufacturer : Glasair Aviation LLC
Model : GS-2 Sportsman
Nationality : South African
Registration Marks : ZU-FEZ
Place : Jakalskraal - Pletenberg Bay
Date : 03 September 2010
Time : 1130Z

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 (1997) 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 establish legal liability.***

Disclaimer:

This report is given without prejudice to the rights of the CAA, which are reserved.

1. FACTUAL INFORMATION

1.1 History of Flight

1.1.1 The pilot was the sole occupant of the aircraft. He flew the GS-2 Sportsman aircraft from plot 108 in the Knysna District to Jakkalskraal plot 25 - Plettenberg Bay District (both farm airstrips). It was a private flight under visual flight rules (VFR) by day. The pilot reported that after an uneventful flight of approximately 10 minutes, upon final approach to Runway 36 and at approximately 2 metres from touchdown, the aircraft's flight controls were restricted unexpectedly. The pilot was unable to flare the aircraft which resulted in it bouncing on the runway during landing. The nose landing gear collapsed during the landing sequence, followed by the aircraft flipping over. The aircraft ended up lying on its roof but facing in the opposite direction of initial landing. The aircraft sustained substantial structural damage; however the pilot was not injured in the accident.

1.2 Injuries to Persons

Injuries	Pilot	Crew	Pass.	Other
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	-
None	1	-	-	-

1.3 Damage to Aircraft

1.3.1 The aircraft sustained substantial damage.



Figure 1, showing damage sustained in the accident.

1.4 Other Damage

1.4.1 None.

1.5 Personnel Information

Nationality	South African	Gender	Male	Age	48
Licence Number	xxxxxxxxxxxx	Licence Type	Private Pilot		
Licence valid	Yes	Type Endorsed	Yes		
Ratings	Flight Tests – Single Engine Piston				
Medical Expiry Date	31 October 2010				
Restrictions	None				
Previous Accidents	None				

Flying Experience:

Total Hours	292.4
Total Past 90 Days	unknown
Total on Type Past 90 Days	unknown
Total on Type	24.1

1.6 Aircraft Information

Airframe:

Type	GS – 2 Sportsman	
Serial Number	7292	
Manufacturer	Glasair Aviation LLC	
Date of Manufacture	2009	
Total Airframe Hours (At time of Accident)	46.0	
Last Annual Inspection (Date & Hours)	14 March 2010	25.2
Hours since Last Annual Inspection	20.8	
Authority to Fly (Issue Date)	18 March 2010	
C of R (Issue Date) (Present owner)	24 August 2009 Van Zuydam I J	
Operating Categories	Private Operation Authority to Fly	

Engine:

Type	Lycoming IO 390
Serial Number	L – 175 – 80 - E
Hours since New	46.0
Hours since Overhaul	TBO not reached.

Propeller:

Type	Hartzell OH 49252 B
Serial Number	CH 49252 B
Hours since New	46.0
Hours since Overhaul	Midlife not reached.

- 1.6.1 The aircraft was imported to South Africa from the United States of America (USA). It arrived as a kit and was assembled by an aircraft maintenance organisation (AMO) at George Airport. After the aircraft had been assembled, the aircraft maintenance organisation went on to carry out Test Flights and found that the aircraft was airworthy. The AMO then certified and issued the certificate of release to service (CRS).
- 1.6.2 The aircraft and maintenance documentation were inspected and no anomalies were identified.
- 1.6.3 The pilot operated the aircraft in his own private capacity in the recreational operating category. Prior to flying the aircraft, the pilot carried out a pre-flight inspection and found the aircraft to be in a serviceable condition. All aircraft systems were functioning and the pilot did not report any defect or malfunction.
- 1.6.4 The loads of baggage (x 4 pieces of safety glass on the floor between the two front seats and rear seat, x 10 thin pieces of wood laying on top of the safety glass and folded forward passenger seat and two plastic bags of groceries on the rear seat) were carried on board the aircraft. The load was not weighed but estimated to be approximately 40 kilograms altogether.

1.6.5 Fuel Status: The aircraft departed from Knysna with 120 litres of Aviation Gasoline (Avgas). The fuel that remained on board the aircraft at the time of the accident was approximately 110 litres, which was determined to be sufficient for the flight.

1.7 Meteorological Information

Wind direction	Southerly	Wind speed	3 – 5 kts	Visibility	Good
Temperature	24°C	Cloud cover	Clear	Cloud base	CAVOK
Dew point	unknown				

1.7.1 The weather information in the column above was submitted to the SACAA by the pilot-in-command (PIC) in a questionnaire.

1.7 Aids to Navigation

1.7.1 The location where the accident occurred was at an unlicensed airstrip. There were no aids to navigation available which were relevant to the investigation.

1.7.2 The aircraft was equipped with standard navigation equipment. Other additional instrumentation and equipment (EFIS and EMS) fitted to the aircraft were included on the approved equipment list of the aircraft. The pilot reported that there were no defects identified with the navigation equipment and that it was in a serviceable condition prior to the accident.

1.9 Communications

1.9.1 The aircraft was fitted with Garmin S 140 radio communication equipment. The pilot did not report any defect or malfunction experienced with the communication equipment either on the ground or during the flight. The pilot broadcasted his intentions on Plettenberg Bay's area frequency 124.8 MHz. The communication equipment was in a serviceable condition.

1.9.2 The pilot operated the aircraft in uncontrolled airspace. The airstrip where the pilot landed had no communication facilities available.

1.10 Aerodrome Information

1.10.1 The location of the accident site was at a private airstrip on a farm.

1.11 Flight Recorders

1.11.1 The aircraft was not equipped with a Flight Data Recorder (FDR) or a Cockpit Voice Recorder (CVR), nor was it required by regulation.

1.11.2 The aircraft had an EFIS component (P/N AF-3500EEA, S/N 60653) fitted. The EFIS was in a serviceable condition. According to the calibration label, the component was last calibrated on 1 December 2009. The EFIS was removed from the aircraft to download the flight and performance information of the accident flight. The downloading of the information transpired in the presence of the local agent.



Figure 2 shows the EFIS component.

1.11.3 Special focus was put on the last track flown to Plettenburg Bay. See below under test and research the result.

1.12 Wreckage and Impact Information

1.12.1 The aircraft was approaching the runway from a northerly direction. The runway length was determined to be approximately 500 metres long. It was a prepared ground runway on a hilly terrain that had a slight up-slope. The aircraft landed hard and bounced on the runway. While it was bouncing, the nose landing gear collapsed and broke off. At approximately 150 metres down the runway from the threshold, the aircraft flipped over. The aircraft sustained substantial damage in the ground impact sequence.



Figure 2 shows wreckage in direction of landing.



Figure 3 shows wreckage facing opposite direction of landing.

1.12.2 During the investigation process, the damage observed was that the rear fuselage had cracked, the tail section (rudder) was crushed, the propeller blades were bent, the nose cone and windscreen were smashed, the nose landing gear was broken off and the right wing spar bent.

1.13 Medical and Pathological Information

1.13.1 None.

1.14 Fire

1.14.1 There was no evidence of a pre- or post-impact fire.

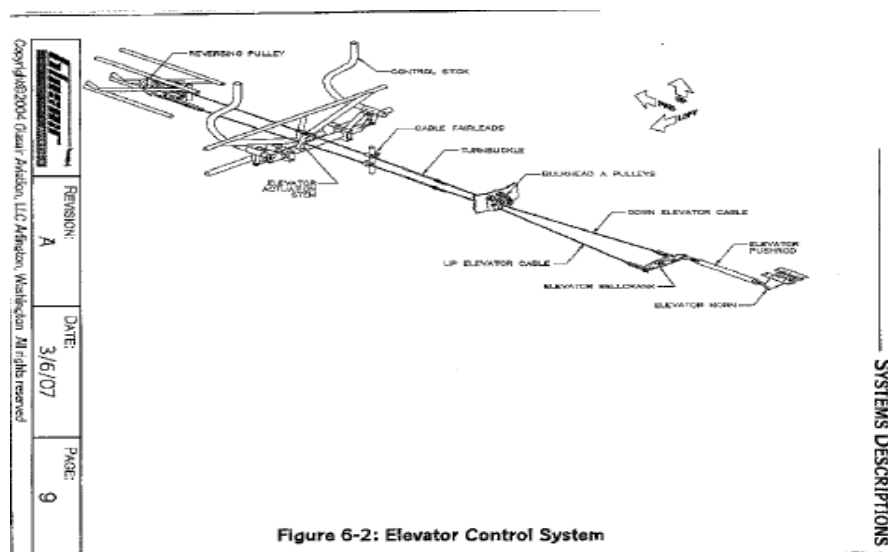
1.15 Survival Aspects

1.15.1 The accident was considered to be survivable. The cockpit and cabin area of the aircraft was still intact after the occurrence. The aircraft was exposed to very low impact forces, thus the pilot did not sustain any injury. The pilot was also properly restrained with the safety belts and safety harnesses. After the aircraft had flipped over, the pilot evacuated the aircraft without experiencing any problem.

1.16 Tests and Research

1.16.1 According to the Pilot Operating Handbook: *“the primary control systems are of a conventional 3 – axis design using dual stick controls for pitch and roll and dual rudder pedals for yaw. Positive travel stops are provided for all primary controls. The elevator, aileron and flap control interconnections are by cable to bellcranks, with push rod connecting each bellcrank to its control surface.”*

1.16.2 The primary control systems of the aircraft were inspected with the aim to determine the factors that contributed to the control lock condition. The evidence found indicated that only the elevator control system operation had been affected. The aft movement of the control stick to initiate a corresponding downward deflection reaction from the elevator control surface was found to be malfunctioning. The indication regarding the malfunctioning situation was that an obstruction had occurred between the passenger seat back (if folded forward) and the control stick. See below figure showing the elevator control system:



1.16.4 The following tests were carried out to determine if the passenger seat back and control stick obstruction had been correct.

The passenger seat back was folded forward as it was during the flight. The control stick was pulled back against the top edge of the seat back. The indication was that the seat back was preventing the control stick from moving further back up to the travel stop. There was a difference in the forward and aft movement of the control stick. In order to measure the difference, the elevator control surface deflection “up/down” had to be measured.

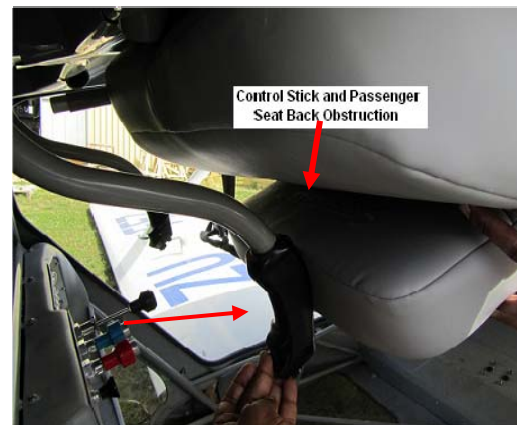


Figure 4 shows obstruction caused by seat.

- (i) Elevator Travels: According to the Pilot Operating Manual (POH) the maximum elevator control surface travel distance is - up (23 degrees) and down (20 degrees) with an allowance of ± 1 degree in either direction. Based on the evidence of the information, the forward and aft movement of the control stick compared to the elevator control surface up and down was measured to determine if it was in compliance with the measurements included in the POH. The evidence found indicated that the elevator control surface moved - up ± 13 degrees and down 20 degrees. There was a difference of approximately 10 degrees in the “up” movement which was caused by the obstruction between the control stick and passenger seat back.

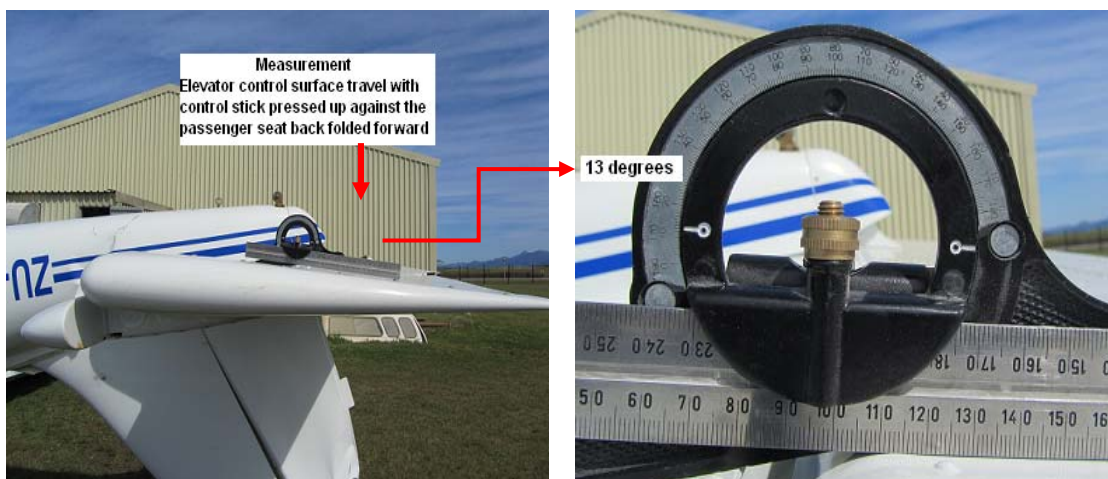
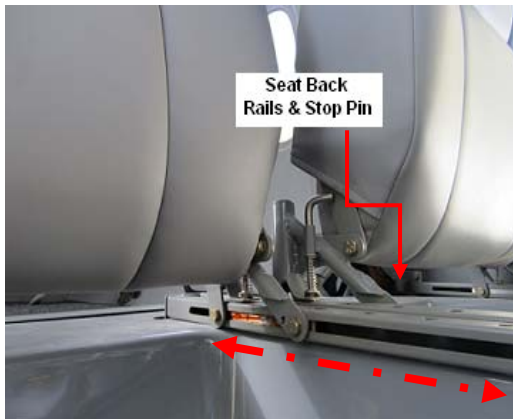


Figure shows flight control surfaces being measured.

1.16.3 Pilot and passenger seat backs: The pilot and passenger seat backs have the capacity to be moved forward and rearward in the seat rails. This depends on how far forward or rearward the occupant wants the seat back. There are a total of eight (8) holes in the seat rail for the seat locking pins to be secured. The movement of the seat back, especially the passenger seat back, is critical because the seat back can become an obstruction for the control stick.

- (i) The distance between the seat back pivot point and locking pin was determined to be approximately 30 millimetres.
- (ii) The Seat Rail has eight holes wherein the locking pin is secured to stop it from inadvertently moving forward or rearward. The holes are approximately 40 millimetres in distance away from each other.



- (iii) If the seat back is pushed backwards to its furthest point on the seat rail and folded forward, the distance from the pivot point to the top of the seat back will be approximately 540 millimetres.
- (iv) Every time the seat back is moved one hole forward, the distance from the pivot point to the top of the seat back increases by approximately 40 millimetres, which is calculated to be the following: (x2-580,x3-620,x4-660,x5-700,x6-740,x7-780 and x8-820). The increase in the distance of the seat back being moved forward is equal to the obstruction presented between the seat uprest and the control.
- (v) The pilot and passenger seat backs are also not fitted with a latch device that would keep it from folding forward inadvertently during flight.

1.16.4 The G2-Sportsman aircraft which was on the South African Civil Aircraft Register, was inspected. The aim was to determine if a similar anomaly exists about the passenger seat back and control stick obstruction. During the inspections the following was identified: All the aircraft are affected.

1.16.5 The aircraft was fitted with an auto pilot system. The auto pilot was found to be in a serviceable condition.

1.16.6 The flight and performance data that was downloaded from the EFIS component was used to construct the flight track and analyse the information. The track flown was found to be consistent with the information reported by the pilot. The track data was plotted on Google Earth as indicated below:

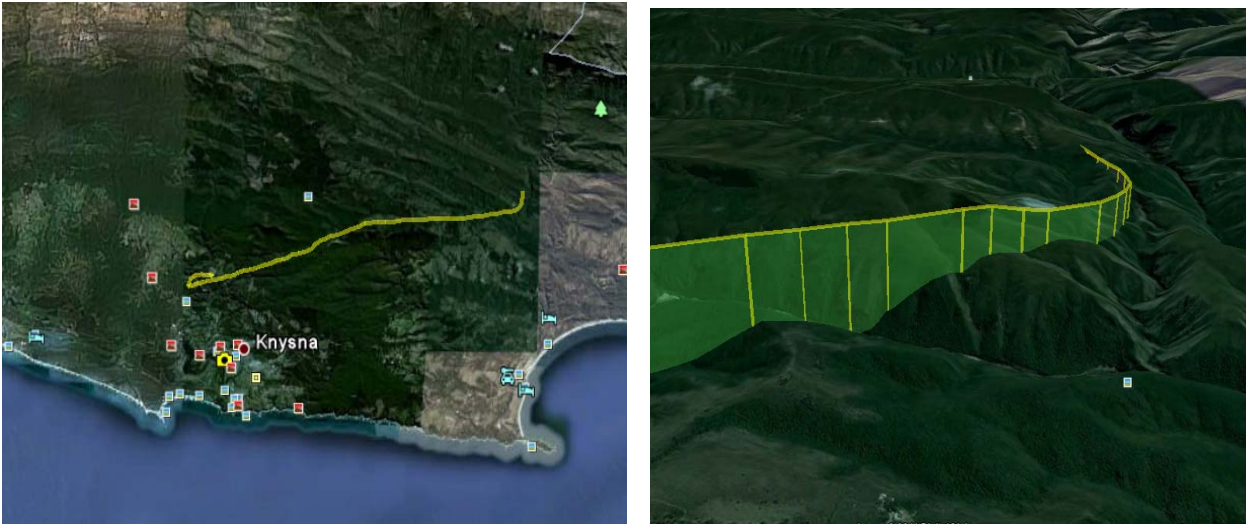


Figure 5, shows track that was flown on the day.

- (i) The EFIS data shows that the aircraft's descent and approach were normal. There was no information which suggested that the pilot caused the aircraft to climb after initial descent or to climb after initiating the approach to land.

1.17 Organisational and Management Information

- 1.17.1 The aircraft was classified as a Non Type Certificated Aircraft (NTCA) in South Africa. It was registered as an Amateur Built Fixed Wing aircraft and operated in the operating category "recreation". The conditions of operation were that the aircraft is privately operated and not utilised for remuneration.
- 1.17.2 The aircraft was assembled and an annual inspection carried out by an approved AMO. The AMO was appropriately rated on the type and authorised to carry out maintenance on the aircraft. There was no anomaly identified with the management and maintenance activities of the AMO.
- 1.17.3 The SACAA's investigation department did not do an on-site investigation. The wreckage was recovered from the accident site to FAGG before the wreckage could be examined.
- 1.17.4 The SACAA's certification department was informed about the safety factors which were identified during the wreckage investigation process. The findings identified were similar to that found during the investigation. At the time of completing the report, no action had been taken to notify operators and owners of the identified safety factors.
- 1.17.5 The aircraft manufacturer was also requested to assist with relevant information. The initial indication was that the aircraft manufacturer was willing to assist. The manufacturer later indicated that they were in the process of doing their own internal investigation. The result was that the relationship between the two parties deteriorated to a point where communication was no longer an option. The aircraft manufacturer presented certain conditions before they provide the requested information. The NTSB was notified to intervene and they facilitated the flow of information. All parties in the end were happy with the NTSB intervention.

1.18 Additional Information

1.18.1 The pilot used the aircraft as a means of transportation and commuted between Knysna and Plettenberg Bay. He was quite familiar with the area and landed at the airstrip often .

1.19 Useful or Effective Investigation Techniques

1.19.1 None.

2. ANALYSIS

- 2.1 The pilot flew the aircraft on a private flight under visual flight rules by day. He was the sole occupant of the aircraft. The flight was uneventful until the landing, when the pilot pulled back on the control stick to flare the aircraft. The pilot realised that the control stick was not moving the full distance back as required. It felt as though the controls had locked. The aircraft touched down, but slightly harder than usual. Following the hard landing, the aircraft bounced and the nose landing gear collapsed. The nose of the aircraft impacted with the ground and it flipped over onto its roof. The aircraft sustained substantial damage.
- 2.2 The pilot had a valid licence and the G2 - Sportsman aircraft type rating was endorsed on it. The pilot also had a valid aviation medical certificate with no waivers. He was in good physical health and had no medical complications which could have prevented him from flying the aircraft on the day. The pilot was also the owner of the aircraft. He operated the aircraft privately on recreational flights.
- 2.3 The pilot carried out a pre-flight inspection on the aircraft prior to the flight. The pilot was satisfied that the aircraft was airworthy; hence his decision to depart from Knysna. Due to the load of baggage carried on board the aircraft, the front passenger seat backrest he folded forward and left in that condition for the duration of the flight. There was no information found in the Pilot's Operating Handbook that warned owners or operators against flying the aircraft with the seat backrest folded forward. The impression was that the pilot did not experience any problems with the controls of the aircraft throughout the flight.
- 2.4 On arrival at his destination at Jakalskraal-Plettenberg Bay, during short finals just before touchdown, the pilot pulled the control stick back to flare the aircraft. He realised that the control stick was not moving backward. The situation caught the pilot by surprise, especially at that critical stage of the flight. The pilot had already committed himself to executing the landing at the time. The fact that the control stick was not moving back caused the aircraft not to flare, hence the approach speed of the aircraft did not slow down enough to prevent a hard landing from happening. Following the hard landing, the aircraft bounced, the nose landing gear collapsed and the aircraft flipped onto its roof on the runway.

- 2.5 This was not the first time that the pilot was flying to Plettenberg Bay and landing on the airstrip at Plettenberg Bay. He was familiar with the terrain and weather conditions at the landing location. The pilot was aware of the upslope of the runway and he followed the same procedure as many times before when coming in for a landing. The only difference was that this time, he experienced a situation with the control stick not moving back fully to flare the aircraft. The result was that this time he was involved in the accident.
- 2.6 During the investigation process, the wreckage was inspected, placing special focus on the primary flight control systems of the aircraft. It was important to determine if there were any parts or components of the primary flight control system which may have contributed to the problem of the control stick not moving freely back. The evidence found was that the primary flight control system was operating satisfactorily. The control stick could be moved in all four directions freely. All this time when the inspections were carried out the passenger seat backrest was in the upright position.
- 2.7 The passenger seat backrest was then folded forward to simulate the same scenario of the aircraft during the flight under discussion. Remarkably when the control stick was pulled back, it was discovered that an obstruction occurred between the passenger seat backrest and the control stick. The control stick was prevented by the passenger seat backrest to move fully back to its mechanical stop. The result was that the elevator flight control surface movement, up and down, was drastically affected by the obstruction. The elevator flight control surface movement was measured to determine the true impact. It was found that the elevator flight control surface up movement with the control stick pulled back firm against the top edge of the passenger seat backrest was measured to be approximately 13 degrees. The evidence found indicated that the elevator flight control surface movement was required to be up (23 degrees) and down (20 degrees). The “up” movement was thus reduced by 10 degrees, which may have influenced the performance of the aircraft.
- 2.8 The two front seats were inspected to see if there were any other issues that might affect the safety of the aircraft. The evidence found was that the seats could be moved forward and backward on the rails provided for the seat backrests. The complication was that if the seat backrests on either side were moved forward, the obstruction caused by the control stick and seat backrest would definitely be far worse than the 13 degrees identified with regard to this incident. Another problem identified with the seat backrests was that no latching device was fitted to prevent them from inadvertently folding forward during the flight and subsequently causing the same obstruction scenario.
- 2.9 Due to the severity of the findings and safety implications identified in the investigation, both the SACAA and aircraft manufacture were immediately notified. The evidence found showed that at the time of completing the report, the SACAA had done nothing to assist in addressing the identified findings with the relevant parties. The aircraft manufacturer expressed their commitment to provide the necessary technical assistance in the investigation.

2.10 The organisation which imports the Sportsman aircraft kits into South Africa also got involved in the investigation. Their facility at Rand Airport was visited and three newly assembled aircraft were inspected. The aircraft presented the same findings as identified during the wreckage investigation.

3. CONCLUSION

3.1 Findings

- 3.1.1 The aircraft was privately operated by the pilot on the day of the incident.
- 3.1.2 The pilot had a valid Private Pilot's Licence (PPL) and Medical Certificate with no waivers. The type rating of Sportsman GS - 2 was endorsed on the licence.
- 3.1.3 The pilot flew the aircraft on a private flight from Knysna to Plettenberg Bay, under visual flight rules (VFR) by day.
- 3.1.4 The aircraft was classified as being a Non Type Certificated Aircraft and issued with a valid Private Operation Authority to Fly.
- 3.1.5 The aircraft was assembled and maintained by an approved aircraft maintenance organisation (AMO) which was authorised to carry out maintenance on the aircraft.
- 3.1.6 The pilot carried out a pre-flight inspection, prior to the flight and found that the aircraft was in a serviceable condition.
- 3.1.7 The flight was uneventful until short finals before touchdown, when the pilot wanted to flare the aircraft for landing.
- 3.1.8 The aircraft did not flare due to an obstruction caused between the front passenger seat backrest that was folded forward, and the control stick.
- 3.1.9 The aircraft was subsequently involved in an accident and it sustained substantial damage during the ground impact sequence.
- 3.1.10 The pilot did not sustain any injury in the accident.
- 3.1.11 Both the pilot and passenger seats back rests were inspected during the investigation. There was evidence found indicating that the seat back rests were obstructing the backward movement of the control stick. It was also found that the seat backs did not have any latching device to keep them from inadvertently folding forward during flight and causing a similar problem.
- 3.1.12 The obstruction between the seat back rest and control stick affected the travel movement of the elevator flight control surface. The elevator flight control surface travel was measured and it was determined that the effect was a reduction in maximum "up" travel from the required 23 degrees to 13 degrees. Furthermore any change in the seat back rest position or the seat back rails moving forward would reduce the elevator travel even more drastically.

3.1.13 The Pilot's Operating Handbook had no information included in it to warn owners or the operator so as to prevent them from folding the seat back rest forward during flight.

3.1.14 Environmental issues such as weather conditions, the location and terrain did not contribute to the accident.

3.2 Probable Cause/s

3.2.1 Unsuccessful landing due to obstruction on elevator control resulting on a nose gear failure and the aircraft flipping over.

Contributory Factors

3.2.2 Inadequate pre flight.

4. SAFETY RECOMMENDATIONS

4.1 The SACAA, should immediately publish safety advisory information in the It is recommended that the Director of Civil Aviation (DCA) through the relevant department within form of the following: Service Bulletin, Airworthiness Directive, Service Letters etc. with the aim of notifying the GS-2 Sportsman type aircraft owners and operators of the indicated safety concerns involving the obstruction between the control stick and passenger seat back as mentioned in the report.

4.4 It is recommended that the State of Design and Manufacturer address the control stick and seat back obstruction design issues identified in the report with the aircraft manufacturer.

5. APPENDICES

5.1 None.

Report reviewed and amended by the Advisory Safety Panel

-END-