
ACCIDENT

Aircraft Type and Registration:	SZD-48-1 Jantar Sandard 2, G-CFHV	
No & Type of Engines:	None	
Year of Manufacture:	1980	
Date & Time (UTC):	31 May 2009 at 1400 hrs	
Location:	Long Mynd Airfield, Shropshire	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - None
Injuries:	Crew - 1 (Fatal)	Passengers - N/A
Nature of Damage:	Glider destroyed	
Commander's Licence:	BGA Bronze certificate	
Commander's Age:	49 years	
Commander's Flying Experience:	53 hours (of which 2 were on type) Last 90 days - 38 hours Last 28 days - 11 hours	
Information Source:	AAIB Field Investigation	

Synopsis

During the early phase of a winch launch, the glider stalled, entered an autorotation and impacted the ground. The investigation found no evidence of any pre-existing mechanical defects with the glider and concluded that the pilot, who was fatally injured, probably applied a greater pitch control input than was appropriate during the launch.

History of the flight

Runway 36L was in use on the day of the accident. There was no significant cloud and the visibility was excellent. The surface wind was forecast as being from the north at around 10 kt, but during the day the wind direction veered to north-easterly and increased to 15 kt.

At 1515 hrs, the duty instructor at the gliding club was launched by winch in a two-seat K21 glider. He described the flying conditions during the launch as "unremarkable". Around the same time, the pilot of the Jantar, who had earlier been granted permission from the duty instructor to fly the glider, performed a positive control check and positioned the aircraft to be the next in line to launch. He was then seen to perform his pre-flight checks and, after the cable was returned to the launch point, it was attached to his aircraft.

The retrieve winch driver used a radio to advise the launch winch driver that the next launch would be a Standard Jantar. The winch driver had launched this

glider type several hundred times before and when he was given the signal to launch, he applied the standard amount of power for this glider type.

Witnesses at the launch point describe the glider commencing its launch normally, although one witness observed a slight right wing drop which was quickly recovered. After the glider became airborne, it stayed low for a slightly longer period than normal, prior to pitching up very sharply. All of the witnesses considered that it was in a steeper than normal pitch attitude at around 100 ft above the ground, when its left wing was seen to drop. The glider continued rotating to the left, descending rapidly, before disappearing from view behind a rise in the ground; several people heard the impact.

The winch driver reported that he saw the glider in plan form earlier than he expected, and then saw it arc towards the west. When he realised that the glider was not going to recover, he applied the winch brake and shut off the winch. He observed the glider hitting the ground at a point which appeared to him to be about 100 yards from the launch point. He then got in a vehicle with the 'crash kit' and drove to the accident.

Several people, including a doctor, reached the glider within minutes of the accident but it was apparent that the pilot had suffered fatal injuries.

Pilot experience and training records

The pilot had been gliding for about a year. He flew regularly and had recently achieved his BGA Bronze qualification. In May 2009, he purchased a share in the glider involved in the accident and had flown it three times prior to the accident. On the day before the accident, he flew a navigational training sortie with an instructor in a two seat DG505 glider; the instructor recorded that his performance had been satisfactory.

He also flew three times in a single seat Discus glider.

A detailed examination of the pilot's training records showed no evidence of any recurring problems with winch launches, or with any other aspect of his flying.

Pathology

A post-mortem examination of the pilot was carried out by a specialist aviation pathologist. His report concluded that the pilot died of multiple severe injuries, consistent with having been sustained in a non-survivable glider accident. The post-mortem examination revealed no evidence of natural disease and toxicological analysis of the pilot's blood concluded that the pilot was not under the influence of alcohol or any other drugs.

Aircraft information

The Jantar Standard 2 is a high performance sailplane of Standard Class, see Figure 1. The cantilever shoulder wings have single glass fibre main spars, no ribs and are covered with foam core moulded skins. The wings have simple ailerons and airbrakes in the upper and lower surfaces of each wing. There is provision for water ballast, but this facility was not used on the accident aircraft. The glass fibre fuselage has a steel tube central frame, and the rear portion is stiffened by half-frames and ribs. The seat back is adjustable to accommodate pilots of varying sizes. The cantilever T-tail is of similar construction to the wings and has a spring trim in the elevator. There is a retractable monowheel with disc brake and a semi-recessed tail wheel.

Although less benign than the training aircraft used at the gliding club, it was not considered by the club instructors to have any significantly adverse handling characteristics. It has a 1g stalling speed of 34.5 kt, and a maximum lift/drag ratio of 39 at 51 kt. The Jantar Standard 2 first flew in December 1977.



Figure 1

Jantar Standard 2 G-CFHV

Weight and balance

The glider's most recent annual inspection confirmed that the configuration of the aircraft accurately reflected the mass and balance statement. Although the pilot was towards the upper range of both weight and height, he was within the published limits for the aircraft.

Winch information

The gliding club at Long Mynd uses a retrieve winch system for launching gliders. This uses two winches, one located at each end of the takeoff run, but with their cables connected together. The more powerful winch is used to launch the glider; the retrieve winch is then used to recover the end of the cable back to the launch point ready to be connected to the next glider. The launch winch at Long Mynd was operated by a professional winch driver who had worked at the club for around 16 years. The retrieve winch was operated by a club member, who had received the appropriate training.

The launch winch was inspected after the accident with no defects being identified.

Wreckage site

The wreckage was contained within a small area some 345 m from the threshold of Runway 36L and 120 m left of the extended centreline. Several large divots had been created by the right wing as it hit the ground and broke up, along with a depression made by the leading edge. The divot created by the wingtip was the largest and showed evidence that the wing had rotated about this point during the impact. The nose section had created a shallow hole containing remnants of the fuselage structure, the nature of which showed evidence of the glider rotating to the left as it struck the ground. The left wing leading edge created a small depression adjacent to the nose impact mark. The main fuselage wreckage was located a short distance in front of the ground marks. The right wing was detached and lying adjacent and parallel to the fuselage, with the wingtip towards the tail. The left wing was also detached and lying on the right side of, and at an acute angle to, the fuselage, with the wingtip pointing towards the runway. The canopy and instrument panel had been completely removed from the aircraft and were located next to the left wing. The fuselage came to rest upright, and there was significant disruption to the nose and cockpit area.

Wreckage examination

Each wing had remained in one piece but the left wing spar had failed at the point where it tapered to form a joining section with the right wing spar, allowing the wings to separate from the fuselage. The fittings locking the two spars together at the central join were still securely in place. The right wing was heavily disrupted from the ground impact, particularly at the wing tip. The right wing aileron had detached and its control tubes were distorted and had failed at the wing root. The spoiler was in the retracted position. The left wing was almost undamaged, with only a small depression along the leading edge. The aileron control connection had failed at the wing root and movement of the aileron was restricted. The spoiler was in the deployed position.

The wings were disassembled and the aileron and spoiler control systems were found intact and restricted only by the distortion resulting from the ground impact. The aileron control mechanism within the fuselage was also connected and operating correctly. The right wing aileron had detached from its mount during the ground impact. The left wing spoiler deployed as a consequence of the wing detaching from the fuselage during the ground impact sequence. The pilot's seat back had detached from its adjustable mounting.

The rudder pedal mechanism was intact, but badly distorted, and the control cables to the rudder were still connected. The rudder itself had become detached at the top hinge position, but its control tubes were still in position and free to move. The pilot's seat was intact, but the left lap strap had failed at the point where it attached to the fuselage. The left wing location spigot arm had deformed at the central weld and the arm was bent 90° forward from its normal position. The fuselage structure aft of the cockpit was undamaged, with the horizontal

stabiliser still attached. The elevators were connected and free to move. The total energy probe had sheared off at the point where it was mounted on the leading edge of the vertical stabiliser.

The ASI and associated static and pitot system were heavily disrupted during the ground impact. So the calibration of the ASI system could not be assessed. However, each of the individual components operated correctly when tested, and there was no evidence of blockage in any of the associated tubing.

Maintenance history

The aircraft had undergone an annual inspection one month prior to the accident. This included a satisfactory calibration test of the ASI. The daily inspection for the day of the accident had been signed off in the Daily Inspection book, with no defects recorded. The entry also recorded that a positive control check¹ had been carried out prior to the accident launch. Another member of the syndicate who had flown the glider the previous day recorded no defects and the aircraft had remained assembled overnight.

Engineering analysis

The disposition and analysis of the wreckage was consistent with the aircraft having entered autorotation following a left wing drop shortly after takeoff. There was no evidence to suggest that the flying controls had become detached or restricted prior to impact with the ground, or that an asymmetric deployment of the spoilers had occurred, or that the ASI was reading incorrectly. Although the seat position could not be confirmed due to

Footnote

¹ A positive control check involves a second person, with the requisite experience, applying resistance to the relevant flying control surface while the pilot applies a control input. This confirms continuity of the control systems, particularly after reassembly of the glider following transportation or stowage.

the impact damage, given the pilot's height it is probable that he flew with the seat back in the fully rear position. Therefore, it is unlikely that rearward movement of the seat back in-flight could have caused the pilot to inadvertently pull back on the control column at a critical time.

In summary, all damage seen during the examination of the wreckage was consistent with being caused during the accident.

Winch launch accidents

An analysis of winch launch accidents reveals that fatal injuries mostly resulted from the glider stalling during pitch rotation on takeoff, and from spins following winch power loss during the launch.

Stalls during rotation

A stall during the transition from takeoff to the main climb on a winch launch may result in the glider rolling uncontrollably. In some cases, the glider has hit the ground inverted, with the cable still attached. A stall during pitch rotation can result in one wing losing lift marginally before the other, causing it to drop. The stalled wing experiences an increasing angle of attack as it drops, keeping it stalled, while the rising wing experiences a reduced angle of attack, thus moving it away from stall and allowing it to produce lift. This induces a rapid roll moment and can lead to autorotation and an incipient spin.

The stall speed of a glider increases during rotation in pitch, as a larger angle of attack is required to achieve more lift from the wing. This higher lift is required in order to balance the other forces on the glider and to provide a vertical acceleration into the climb. There are three reasons for this:

- As the nose pitches up the lift force is inclined away from the vertical and must increase if the component of lift resolved in the vertical direction is to balance the weight of the glider.
- The pull force in the cable is large, typically 80% of the weight of the glider. At takeoff, this force is horizontal, providing the glider's initial horizontal acceleration, and has no effect on the required lift. However, as the nose pitches up during rotation, the lift force becomes increasingly opposed to the pull force. The lift must therefore increase if it is to balance this pull force and stop the horizontal acceleration.
- At the end of rotation the glider is climbing at an airspeed of perhaps 55 kt, which corresponds to a vertical velocity of about 35 kt. The vertical velocity of the glider must therefore increase during rotation from zero at takeoff to about 35 kt. This requires a force which comes from an increase in lift generated by the wing.

The forces on a glider during rotation may be modelled and the load factor (g) estimated for different rotation rates, pull forces in the cable, climb angles and other variables. This modelling shows the stall speed during rotation is very dependant on the rate of rotation, ie, the higher the rate of rotation, the shorter the time in which the glider has to be accelerated vertically from 0 to 35 kt. As this requires a greater lift force from the wings, there is an associated increase in the stall speed.

The dependence of stall speed on rate of rotation for a Jantar Standard 2 (with an unaccelerated stalling speed of 34.5 kt and maximum lift to drag ratio of 39), at climb angles of 10° and 25°, with a cable pull of 80% of the weight of the glider, is indicated in Figure 2.

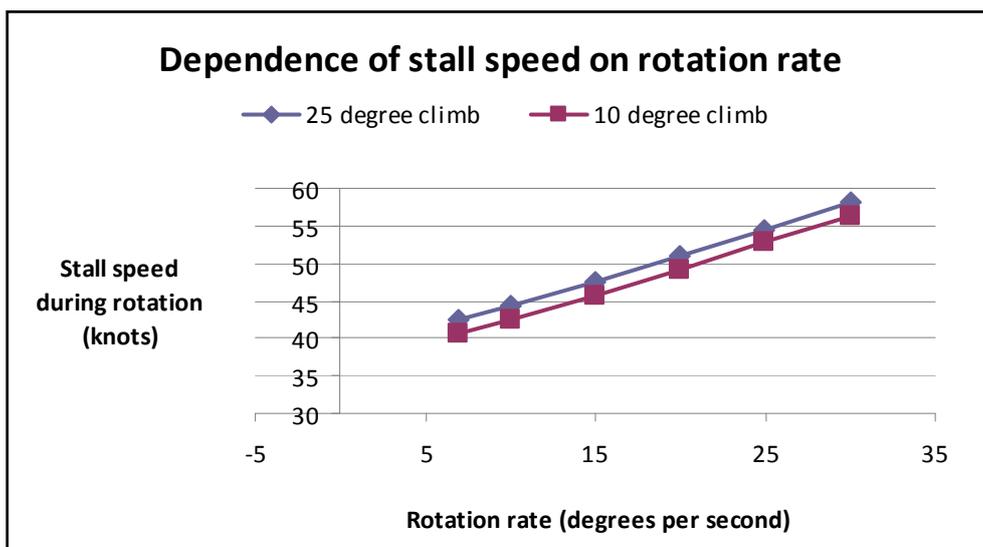


Figure 2

Relationship of stall speed with rate of rotation

At the 10° climb angle, the stalling speed increases from 41 kt at a rotation rate of 7° per second, to 56 kt, at a rotation rate of 30° per second. The corresponding stall speeds at a 25° climb angle are 43 kt and 58 kt.

BGA Safe Winch Launch Initiative

The BGA, who assisted the AAIB with this investigation, had previously conducted an analysis of their accident database. They found that a significant percentage of glider accidents occurred during winch launches. To address this they developed the Safe Winch Launch Initiative.

The initiative consisted of an educational campaign, within the BGA community, to make glider pilots more

aware of the hazards associated with winch launching and this, initially, resulted in a reduction in the accident rate.

Conclusion

The examination of the wreckage found no reason to suggest that a technical fault was a causal factor in this accident. The investigation concluded that the pilot probably applied a larger control input than was appropriate as the glider rotated, resulting in the rapid rate of pitch rotation. The stall and loss of control was unrecoverable given the height available.