Gardan GY80-160, G-ASZS

AAIB Bulletin No: 3/2001

Ref: EW/G2000/12/14 - Category: 1.3

Aircraft Type and Registration:	Gardan GY80-160, G-ASZS
No & Type of Engines:	1 Lycoming O-320-B3B piston engine
Year of Manufacture:	1965
Date & Time (UTC):	17 December 2000 at 0958 hrs
Location:	Wellsbourne Mountford Airport, Warwicks
Type of Flight:	Private Training
Persons on Board:	Crew - 1 - Passengers - None
Injuries:	Crew - None - Passengers - N/A
Nature of Damage:	Landing gear, underside of fuselage and tail fin damaged
Commander's Licence:	Private Pilot's Licence
Commander's Age:	38 years
Commander's Flying Experience:	218 hours (of which 83 were on type) Last 90 days - 1 hour Last 28 days - 1 hour
Information Source:	Aircraft Accident Report Form submitted by the pilot and examination of failed landing gear torque tube lever

History of the flight

On the morning of the accident, the pilot was intending to carry out circuit practice. He completed the normal pre-flight inspections before spending 20 minutes removing ice from the wings and tailplane. Nothing abnormal was noted during these inspections. Following completion of the cockpit checks and engine start, he then taxied to the holding point and carried out the power checks and vital actions. The aircraft took off from Runway 18R, climbing straight ahead to 1,000 feet before turning right into the circuit pattern. The take-off roll and landing gear retraction were normal. On the downwind leg, the pilot lowered the landing gear and flaps before completing the rest of the pre-landing checks. He was given a precautionary reminder from the AFIS Officer to "check the greens", which he acknowledged. The aircraft made a reasonably gentle touchdown. The landing roll was continued into a right turn onto Runway 05, during which some nose wheel shimmy was experienced, although nothing out of the ordinary. As the aircraft approached the

junction of Runway 05 and the perimeter track, a loud 'bang' was heard and the main landing gear collapsed. The nose landing gear remained extended and the pilot was able to shut down the engine and secure the aircraft. He was uninjured and exited the aircraft unassisted. The nosewheel collapsed during the recovery of the aircraft, causing the tail fin to be slightly damaged by the forklift truck being used to lift the aircraft.

The pilot reported that he could not remember if the green "gear down" light had illuminated and commented that the bright sunlight coming through the windscreen at the time had made difficult to see if the light was on. He felt sure nevertheless that the landing gear was down, as he had noticed a drop in airspeed when the landing gear was operated.

Landing gear operation

The Gardan GY80 Horizon is a single engine, four seater, low-wing monoplane of 1960's vintage. It is fitted with a semi-retractable tricycle landing gear which retracts rearwards; the wheels protrude partially from their housings when the landing gear is retracted. The landing gear is retracted and extended manually by turning a handle located in the centre pedestal, between the pilot and co-pilot's seats. The handle, which is attached to a vertical screwjack, must be turned 19 turns counterclockwise to extend the gear and 19 turns clockwise to raise the gear. A locking knob at the base of the landing gear handle ensures that it can only be turned in the desired direction and locks the handle to ensure that the gear remains locked fully up or down. There is a green light on the instrument panel to indicate to the pilot that the landing gear is fully down. The wing flaps are mechanically interconnected with the landing gear so that they are raised and lowered together.

Operation of the landing gear handle turns the screwjack, which is connected to the middle element of the three arm control bellcrank. The upper arm of the bellcrank is connected directly to the nose gear upper drag brace via an adjustable rod. The lower arm of the bellcrank is connected via a rod to a lever on the main landing gear torque tube. The left and right main landing gear upper drag braces are fixed to each end of the main landing gear torque tube. When the landing gear handle is turned, linear motion of the screwjack rotates the control bellcrank, which in turn operates the nose gear rod and the lever on the main landing gear torque tube, rotating the nose and main landing gear upper drag braces, thus raising or lowering the gear. The landing gears are fully down when the upper and lower drag brace stops contact each other, at which point the drag brace assemblies becomes rigid and capable of supporting the landing gear loads and the weight of the aircraft. The landing gear handle becomes stiffer to operate in the final quarter of a turn as the drag brace stops come into contact, which provides the pilot with an additional cue that the landing gear is fully down. The pilot could not recall whether he had felt this stiffening of operation when he lowered the landing gear. If the landing gear is not wound fully down, taxiing and landing loads can be transmitted back through the gear actuating mechanism, exceeding the design limits of the landing gear actuation mechanism components.

Investigation findings

Photographs of the landing gear system taken after the incident showed that the lever on the main landing torque tube had fractured and the housing of the landing gear operating handle had been partially torn out of the centre console. The main landing gear torque tube lever was sent to the AAIB to be metallurgically examined. The results showed that the lever had experienced an overload failure. There was no evidence of any pre-existing defect in the lever. The sudden failure of the torque tube lever and forcing of the operating handle housing out of the centre console, is

consistent with the landing gear actuation system having been subjected to excessive loading, due to the landing gear not having been wound to the fully down and locked position.

It is believed that the landing gear handle may not have been rotated sufficiently for the main landing gear drag braces to have locked rigid. It was possible for the pilot to be unaware of this as the bright sunlight at the time had made it difficult to observe the green gear down and locked light. After the incident he could not recall the stiffening of the gear operating handle, an additional indication that the gear is approaching fully down and locked.