ACCIDENT

Aircraft Type and Registration:	Murphy Rebel, G-BZFT
No & Type of Engines:	1 O-320-C2A piston engine
Year of Manufacture:	2001
Date & Time (UTC):	5 September 2006 at 1530 hrs
Location:	Branscombe, 10 nm east of Exeter
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to right landing gear attachment point, right wingtip and propeller
Commander's Licence:	Private Pilot's Licence
Commander's Age:	72 years
Commander's Flying Experience:	2,261 hours (of which 180 were on type) Last 90 days - 32 hours Last 28 days - 18 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and AAIB enquiries

Synopsis

After a satisfactory three-point landing, the aircraft completed about half its expected ground roll but then started to turn left. The pilot was unable to correct the turn with full right rudder and full right brake. During the subsequent ground loop the right landing gear leg collapsed and the aircraft came to rest after turning through approximately 120º. No-one was injured in the accident.

It was not possible to determine with confidence the cause of the ground loop. The most likely reason appeared to be a stiff main wheel bearing.

History of the flight

After a satisfactory three-point landing on Runway 27, the aircraft completed about half its expected ground roll but then started a left turn. The pilot was unable to correct the turn with full right rudder and full right brake. During the subsequent ground loop the right landing gear leg collapsed and the aircraft came to rest on the right wing tip after turning through approximately 120º. After turning off the fuel, ignition and electric master switch, the occupants evacuated the aircraft through the left door.

The pilot reported that the wind at the time was calm and that the forecast wind at 2,000 ft was 10 kt at 230º. The pilot also reported that the Centre of Gravity (CG) was

14.5 inches aft of datum, well within the limits of 10.85 to 18.10 inches aft of datum.

Aircraft information

The Murphy Rebel is a two-seat, high-wing, home-build aircraft which has a tail-wheeled landing gear, a steerable tail-wheel, and differential hydraulic brakes. The aircraft has good short field performance with a typical final approach speed of 55 mph.

Ground looping

Ground looping is a phenomenon that tail-wheeled aircraft can be subject to since the aircraft's centre of gravity is behind the main wheels. They are more likely to be affected when the aircraft decelerates after landing and the stabilising effect of the vertical tail reduces as the air flow slows. Any tendency to yaw (from aerodynamic or wheel forces) needs to be corrected by some combination of rudder, tail-wheel steering, and asymmetric braking. Ground looping can also be initiated by any failure in the operation of the brakes or wheels which causes an abnormal yaw force.

Pilot's comments

The pilot had 2,261 hours flying experience of which over 2,000 hours were on tail-wheeled aircraft, and over 180 were on type. He initially thought that a large bump in the ground might have caused the onset of the ground loop.

The aircraft had suffered ground loops on three occasions before this accident. The cause of the first event was attributed to a mishandled attempt at a main-wheels only landing; a different pilot was flying the aircraft on that occasion. The second event occurred after the aircraft was firmly into the landing roll after a three-point landing, and was possibly cross-wind related since significant local thermal activity was reported. The third event occurred at low speed near the end of a normal landing roll, and resulted in no damage to the aircraft. After this event the pilot consulted the manufacturer and tried to set the main wheels as close to zero toe-in/toe-out as possible, but this did not prevent the subsequent occurrence.

During the repair of the aircraft two possible causes of this accident were found. Firstly, one of the wheel bearings was found to be stiff when the retaining nut was tightened in accordance with the manufacturer's recommended torque. It was not possible to determine whether this bearing was on the left or right wheel at the time of the accident.

Secondly, there was some damage around the fuselage skin where the steerable tail-wheel unit is mounted to the rear fuselage. The pilot considers that this damage could have been present before the accident and might have contributed to one or more of the ground loops.

As a result of his investigation, the owner has decided to replace the stiff wheel bearing, as well as both the left and right brakes. He is also replacing the tail-wheel unit with one of an alternative design as well as repairing and reinforcing the rear fuselage where the tail-wheel is attached.

Analysis

The pilot has considerable experience with tail-wheeled aircraft and it seems unlikely that the ground loop was pilot induced. Also, neither a rearwards CG nor a high cross-wind component appears to be a factor in this accident. Therefore the most likely cause of the ground loop would appear to be a stiff main wheel bearing.