

Aircraft Type and Registration:	Rockwell Commander 112, G-DASH	
No & Type of Engines:	1 Lycoming IO-360-C1D6 piston engine	
Year of Manufacture:	1975	
Date & Time (UTC):	11 April 2005 at 1815 hrs	
Location:	Bourn Airfield, Cambridge	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 1
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Damage to propeller, engine nacelle and nose landing gear leg	
Commander's Licence:	UK Private Pilot's Licence	
Commander's Age:	69 years	
Commander's Flying Experience:	490 hours (of which 70 were on type) Last 90 days - 10 hours Last 28 days - 10 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot and AAIB inquiries	

Synopsis

At the end of the ground roll, following a normal landing, the nose landing gear retracted and the propeller hit the ground.

History of flight

On returning from an uneventful flight to St Mawgan for a landing on Runway 24 at Bourn, the pilot lowered the landing gear and confirmed that the three green landing gear indication lights were illuminated. The pilot stated that the landing and initial ground run was normal; however, as he applied the wheel brakes lightly, with a ground speed of approximately 10 kt, the nose landing gear partially collapsed and the propeller struck the ground causing the engine to stop. The pilot considered that there were a number of rough patches on the surface of the runway.

Significant features of the landing gear system

The aircraft is equipped with a hydraulically operated, retractable tricycle landing gear that is controlled by a two position, detented, switch mounted on the instrument panel. This switch is approximately six inches to the left of the flap selector switch. Three green lights in the cockpit are illuminated when the landing gear is locked down and a red unsafe light is illuminated when the landing gear is in transit. The nose landing gear system consists of an oleo-pneumatic shock strut, drag brace assembly, emergency extension springs, hydraulic actuator incorporating a mechanical lock, pressure and position switches. A squat switch is located on the right main landing gear leg to prevent the landing gear retracting whilst the aircraft is on the ground.

When the landing gear selector switch is selected to DOWN, the hydraulic pump is activated and hydraulic fluid is directed to the down port of the landing gear actuator. As the nose leg actuator operates, the leg extends, assisted by the emergency extension springs, and the drag brace moves into the over-centre position where a geometric lock prevents the nose landing gear leg from retracting. When all three landing leg actuators are in the fully down position, hydraulic pressure switches de-energise the hydraulic pump and the mechanical locks, under spring pressure, move to physically lock the actuators in the down position. These mechanical locks will only disengage when hydraulic pressure is applied to the 'up' side of the actuators. On selecting landing gear UP, providing the squat switch on the right main landing gear leg has closed (ie no weight on the wheel), the hydraulic pump is activated and hydraulic fluid is directed to the 'up' port of the landing gear hydraulic actuators. The mechanical locks in the actuators disengage, the drag brace is pulled through its geometric lock and the gear retracts. Once all three gears are retracted, the position switches de-energise the hydraulic pump and the landing gear is retained in this position by hydraulic pressure within the system. Loss of hydraulic pressure and partial extension of the landing gear is detected by the position switches, which re-energise the hydraulic pump causing the landing gear to move back into the retracted position.

Maintenance

During the investigation, an intermittent earth connection was discovered in the electrical circuit for the nose leg down-lock position switch, which had not been apparent during normal operation of the aircraft. However, this fault was in the gear-down circuit and could not cause the gear to retract. Apart from this intermittent earth connection, the maintenance organisation could find no other fault in the landing gear system. Moreover, retraction tests, undertaken with the accident and replacement nose landing gear legs fitted to the aircraft, also revealed no other faults in the system.

Analysis

Whilst the intermittent earth connection in the nose down-lock position switch could prevent the landing gear from extending normally; the pilot stated that he had three green landing gear indication lights prior to landing, indicating that the landing gear was down and locked at the time. However, if the landing gear selector had inadvertently been moved to the UP position after landing, and the squat switch had closed as the aircraft ran over a rough surface of the runway, then the landing gear might have started to retract. Normally the order in which the landing gear legs retract is dependent on the force that each hydraulic actuator must act against and, therefore, it is probable that the nose landing gear would start to retract before the main landing gear legs. If the landing gear selector switch was subsequently moved back to the DOWN position, and the earth circuit on the nose-down lock switch was broken, then the hydraulic pump would not operate and the weight of the aircraft would cause the nose leg to collapse whilst the main landing gear legs remained locked. The pilot does not recall selecting landing gear UP after landing.