ACCIDENT

Aircraft Type and Registration:	Piper PA-24-250 Comanche, G-BYTI
No & Type of Engines:	1 Lycoming O-540-A1D5 piston engine
Year of Manufacture:	1963
Date & Time (UTC):	17 July 2011 at 1230 hrs
Location:	Field near Gamston Airport, Nottinghamshire
Type of Flight:	Private
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - None Passengers - N/A
Nature of Damage:	Propeller, fuselage, flaps, right wing spar
Commander's Licence:	Private Pilot's Licence
Commander's Age:	55 years
Commander's Flying Experience:	394 hours Last 90 days - 14 hours Last 28 days - 7 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and subsequent AAIB enquiries

Synopsis

Following takeoff from grass Runway 24 at Sherburn-in-Elmet Airfield, the landing gear failed to retract fully. The pilot was unable to lower the landing gear either by normal means or by using the emergency extension system. The pilot carried out a wheels-up landing in a crop field adjacent to Runway 21 at Gamston Airport. The propeller and lower fuselage skin were damaged during the landing, but the pilot and passenger were uninjured and vacated the aircraft without assistance.

It was determined that deflation of the right landing gear oleo had prevented full retraction of the landing gear. During subsequent attempts to lower the landing gear, a clevis pin in the landing gear operating mechanism had fouled against the edge of an access hole in a structural beam and jammed, preventing the landing gear from operating.

History of the flight

The aircraft was being flown by two qualified pilots who intended to conduct some circuits and local flying from Gamston Airport. After completing two circuits with full stop landings at Gamston, Pilot A flew the aircraft to Sherburn-in-Elmet Airfield. The approach and landing on grass Runway 24 and the taxi to the tarmac parking area at Sherburn were uneventful. After a short break at Sherburn, Pilot B (hereafter referred

to as 'the pilot') elected to fly the aircraft back to Gamston. He reported that the aircraft walkround and pre-takeoff checks were completed normally. The pilot subsequently described the takeoff run on Runway 24 as somewhat bumpy, but no more so than he considered reasonable for a departure from a grass surface.

When the pilot selected the landing gear selector switch to UP at 500 ft, he observed that the amber indication light above the gear selector switch did not illuminate to indicate that the landing gear was up and locked. He also noted that the landing gear emergency handle was in approximately the 45º position. The pilot continued the climb to 2,000 ft and turned towards Gamston. He recycled the landing gear selector switch a number of times, but the landing gear did not move. On arrival at Gamston he declared a PAN and carried out two fly-pasts. ATC confirmed that the landing gear appeared to be partially retracted. Further attempts by the pilot to lower the landing gear were unsuccessful and he then operated the emergency landing gear extension system, also without success. He performed another fly-past and ATC reported that the landing gear was still in the same position. The pilot then departed the circuit to the south of the airfield in order to use up some fuel prior to landing. On returning to Gamston, he elected to land in a field of rapeseed crop to the right of asphalt Runway 21.

The aircraft landed in the field, coming to rest after a ground run of 27 m; the propeller struck the ground causing the aircraft to turn through approximately 300º. Both pilots were uninjured and were able to vacate the aircraft through the normal exit without assistance.

Maintenance information

Some weeks prior to the accident the pilot had noticed during a pre-flight walkround that the right landing gear oleo was slightly deflated. It was subsequently re-inflated to the correct extension by a maintenance engineer and no further problems were reported. The aircraft underwent a 6 month/50 hour check on the day prior to the accident and there were no findings related to the landing gear.

After the accident the right landing gear oleo was observed to be fully compressed.

Landing gear system description

The PA-24 Comanche has a fully retractable, electrically operated tricycle landing gear. The air-oil oleo struts of the main landing gear legs must extend in order to provide sufficient clearance to allow the wheels to enter the wheel well during the retraction cycle; the Pilots' Operating Handbook advises that it is important that the aircraft is not operated with flat or deflated oleos.

The retraction mechanism consists of an electric motor, transmission assembly and torque tube assembly, which actuate push-pull cables and rods to each of the landing gear legs. The motor is activated by a selector switch on the instrument panel. An anti-retraction switch on the left main gear prevents the electric circuit to the landing gear motor from being completed until the gear oleo is fully extended.

If the electric motor fails, an emergency extension system can be operated. This requires the pilot to move the landing gear electrical selector switch to the OFF position so that the motor does not oppose the movement of the gear mechanism when the gear is manually lowered. The pilot must then position the electrical release arm fully forward to disconnect

the electric motor from the gear operating mechanism before opening the emergency extension handle. This moves backwards and forwards in normal operation as the gear is raised and lowered and therefore provides a coarse indication of gear position; the telescopic handle is extended to lower the landing gear manually.

Aircraft examination

The aircraft was examined by the AAIB after it had been recovered to a maintenance facility and the landing gear lowered. A small dent was noted on the right wing lower skin on the aft edge of the wheel well. The dent was consistent with the right main landing gear torque link having contacted the edge of the wheel well.

Examination of the landing gear retraction system revealed evidence that a clevis pin attaching the nose landing gear push-pull rod to the torque tube assembly had fouled against the web of a longitudinal beam and become jammed on the edge of an access hole in the web (Figures 1 and 2).

The web of the longitudinal beam was slightly bowed inboard. It was likely that this distortion resulted from attempts to lower the gear after the clevis pin had become jammed against the web.

Discussion

The pilot considers that the right landing gear oleo deflated during the takeoff run at Sherburn-in-Elmet. As a result the torque link became wedged against the edge of the wheel well during retraction, preventing the landing gear from retracting fully. The landing gear retraction motor would have continued to run, attempting to overcome the resistance caused by the jammed torque link. It is likely that the forces

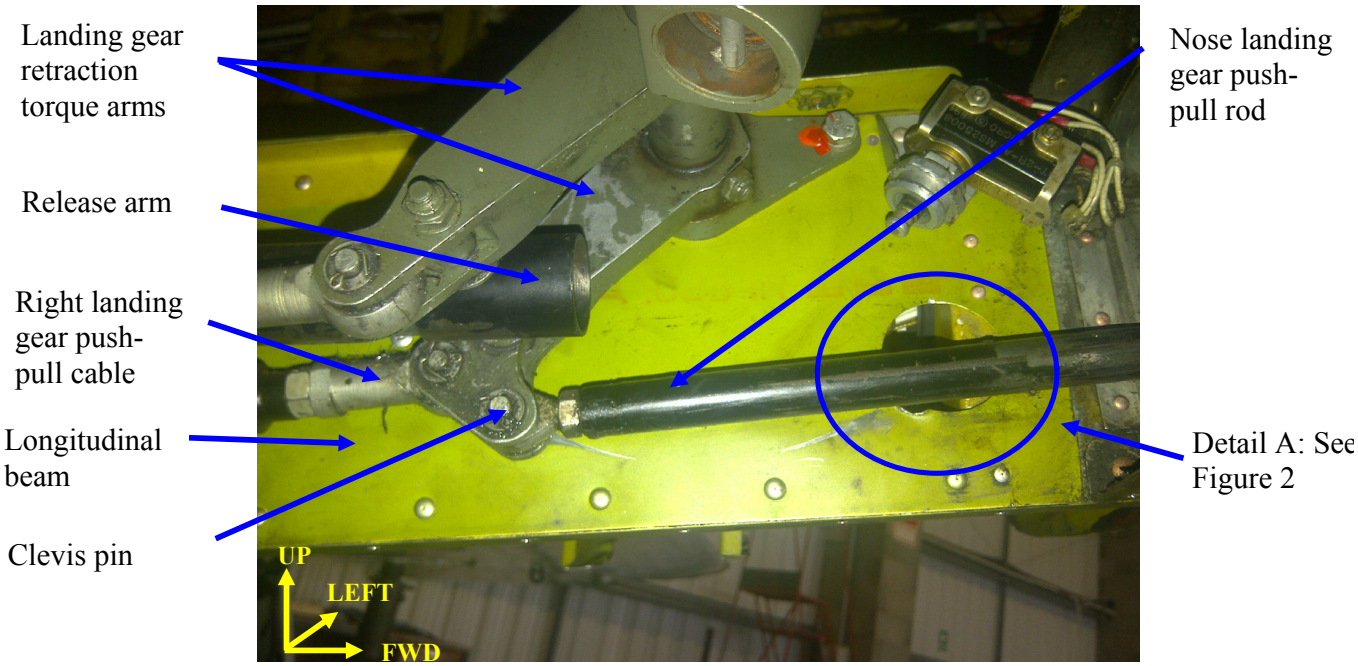

Figure 1

View looking left on landing gear retraction system, landing gear in extended position

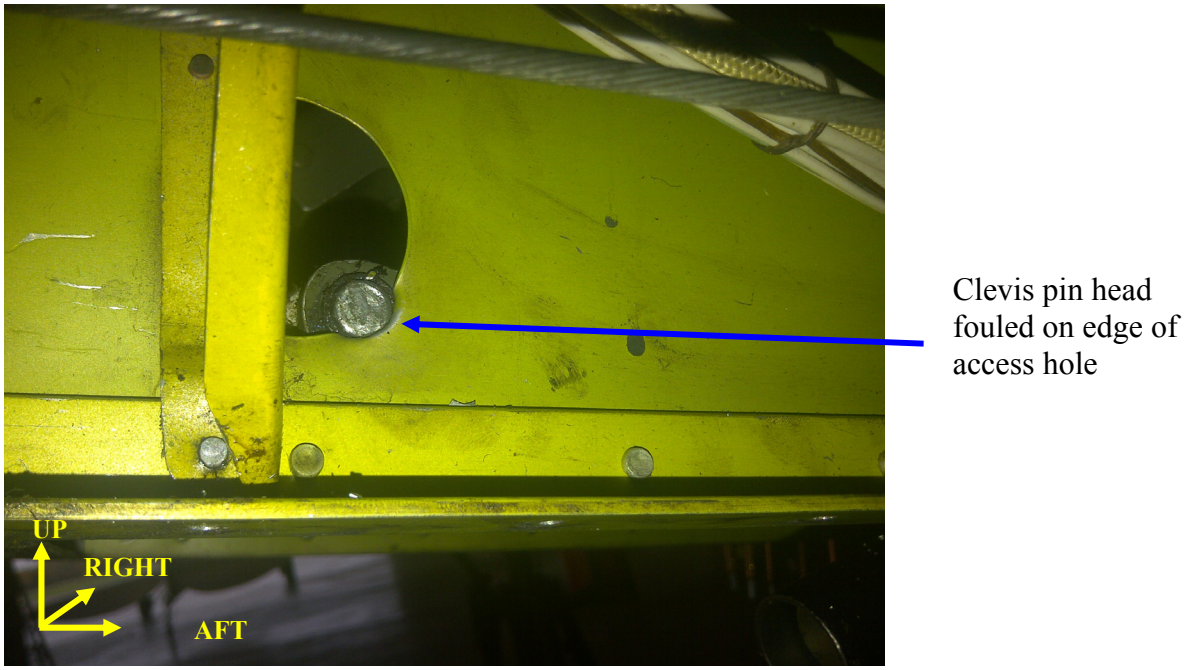

Figure 2

Detail A from Figure 1: Clevis pin fouled on edge of access hole in web of longitudinal beam, landing gear partially retracted

associated with this may have caused misalignment in the transmission assembly, sufficient to reduce the clearance between the nose landing gear push-pull rod and the longitudinal beam, leading to interference between the clevis pin and the beam. In this condition it was not possible to lower the landing gear either by the normal method or with the emergency extension system. The aircraft manufacturer was not aware of any previous similar occurrences of the clevis pin fouling on the longitudinal beam.

The reason for the right landing gear oleo deflation could not be determined from strip examination but all the seals were replaced as a precaution.