ACCIDENT

Aircraft Type and Registration:	Pioneer 400, G-TLOY
No & Type of Engines:	1 Rotax 914F piston engine
Year of Manufacture:	2012 (Serial no: LAA 364-15112)
Date & Time (UTC):	26 August 2012 at 1534 hrs
Location:	Ledbury Airstrip, Herefordshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Propeller, underside of aircraft and landing gear jackscrews
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	56 years
Commander's Flying Experience:	6,500 hours (of which 40 were on type) Last 90 days - 28 hours Last 28 days - 19 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and subsequent AAIB enquiries

Synopsis

During a test flight for the initial issue of a Permit to Fly, the pilot reported a loss of pitch control authority during a go-around from low speed. On the subsequent approach the pilot delayed lowering the landing gear to ensure he could land on the airstrip, but it was not fully extended by the time the aircraft touched down and the gear collapsed during the landing roll. Prior to the flight 50% of the length of the elevator trim tab Gurney flap had been removed to correct a perceived problem of limited forward elevator authority during cruise, and post-accident inspection revealed that the elevator cables had low tension. After repair the aircraft was test flown by the LAA's Chief Test Pilot, who considered the design was acceptable without further change.

History of the flight

The pilot was undertaking the fifth in a series of test flights for the aircraft's initial issue of a Permit to Fly. He was accompanied by the owner, who assisted with the test schedule and recording of the results.

On this flight he descended the aircraft from 2,000 ft at 120 kt towards Ledbury Airstrip, before levelling and closing the throttle to decelerate and trim for the best glide speed in the clean configuration. Full aft (nose-up) elevator trim was used and the aircraft's speed settled at approximately 70 kt. At around 600 ft agl, full power was applied to go around. Initially, the aircraft responded normally, with moderate forward pressure required on the control stick to hold the nose down. The pilot reported that he felt something "give" in the elevator

controls and the aircraft pitched nose-up sharply and the speed decayed, despite a full forward control stick input. The pilot reduced engine power, which controlled the nose-up pitch and allowed the speed to be maintained. As there was now insufficient runway ahead on which to land, the pilot flew a wide low-speed circuit at reduced power. The elevator trim position was adjusted, but this seemed to make the situation worse, so it was returned to the previous position.

In order to assure a landing on the airstrip, the pilot delayed lowering the gear until late in the approach. The aircraft touched down on the runway and during the landing roll the gear collapsed, causing the propeller to strike the ground. When the aircraft had come to rest, both occupants were able to vacate normally; neither were injured.

Aircraft description

The aircraft is a four-seat design featuring a wooden primary structure (Figure 1). The design was approved by the LAA and two other examples are on the UK register. Power is provided by a Rotax 914F piston engine and the landing gear is retractable via an electric motor driving three screwjacks, one for each landing gear leg. Pitch control is provided by a fixed tailplane with an elevator connected to the control stick by cables. Pitch trim is provided by an electrically-driven trim tab on the left elevator, operated by a rocker switch in the cockpit. A fixed Gurney flap[1] is installed on the lower trailing edge of the trim tab to provide the optimum trim range throughout the wide speed and loading range of this aircraft type.

Figure 1

General view of a similar aircraft

Footnote

[1] A Gurney flap is a small, flat strip fitted to the trailing edge of an aerofoil, typically set at right angles to the airflow.

Background information

The aircraft is an amateur-built design. This particular aircraft was constructed from a kit under the supervision of the LAA. As the build progressed, a number of stage inspections were completed by a suitably qualified LAA Inspector to ensure the aircraft had been built to the required standard. Once complete, a final inspection was carried out to ensure the aircraft was in an airworthy condition before it was cleared for test flying to gain a Permit to Fly. The final inspection and the first flight were completed by a representative of the UK distributor who is experienced on type. No significant discrepancies were found with either the aircraft's construction or its handling.

The pilot reported an apparent limited forward elevator authority during cruise on a previous flight. In an attempt to improve this condition 50% of the length of the fixed Gurney flap was removed from the lower trailing edge of the elevator trim tab prior to the incident flight.

Post-accident inspections

The LAA commissioned an independent inspection of the aircraft and this was undertaken after the aircraft had been dismantled and taken to the UK distributor's premises. The inspection confirmed that the landing gear had failed because it was not fully extended at the time the aircraft landed. Other damage was as a result of the landing gear collapse. The inspection found all the flying control systems operated normally, although there was a slight stiff spot noted on the elevator, which suggested to the Inspector that the hinges were slightly misaligned. The elevator cables, that had been disconnected to allow dismantling, were reconnected and were observed to have low tension. The elevator cables pass through the wing spars and may therefore have been damaged during dismantling, as they had not been disconnected before an initial attempt to remove the wings was made.

The aircraft was returned to the manufacturer for repair and their inspection found no pre-existing defects with the aircraft or its controls.

Post-event flight testing

The LAA commissioned its Chief Test Pilot to conduct a flight test programme to explore the extent and nature of the handling characteristics reported by the pilot. The Gurney flap had been restored to its standard configuration for the flight. The aircraft was loaded so that the centre of gravity was at the aft limit; the worst case scenario. The report concluded:

> *'The aircraft's forward stick movement was found to be sufficient to allow an idle, full aft trim go-around to be performed safely, even at a speed as low as 1.1 times the stall speed and at full aft Centre of Gravity... ...there was an additional 1.5 inches of stick movement (14.3% of elevator movement) left above and beyond that needed to control the aircraft and speed during the low-speed go-around. Therefore, the current aircraft design was considered acceptable without further change.'*

Discussion

The final inspection before first flight did not identify any anomalies with the aircraft and previous flights by the accident pilot and another familiar with the type were without incident. Prior to this flight 50% of the length of the fixed Gurney flap had been removed after the pilot had noted an apparent limited forward elevator authority during cruise. The post-accident inspection by an independent inspector found the tension of the elevator cables was low, but because it is possible that they were damaged during a post-accident attempt at disassembly, their tension at the time of the accident is not certain, although no anomalies had been noted on the previous

flights. The reduction of the size of the Gurney flap and possible low tension in the elevator control cables both have the potential to alter the feel and range of the pitch control system. A temporary control restriction in the cockpit also could not be discounted.

Subsequent test flying of the aircraft after repair and with the Gurney flap returned to its standard configuration showed that the aircraft performed as expected and the LAA consider the design is acceptable without change.