ACCIDENT

Aircraft Type and Registration:	PZL-104 Wilga 35A, G-BWDF
No & Type of Engines:	1 PZL Kalisz AI-14RA piston engine
Year of Manufacture:	1995
Date & Time (UTC):	6 May 2010 at 0659 hrs
Location:	Hinton-in-the-Hedges Airfield, Northamptonshire
Type of Flight:	Aerial Work
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Serious) Passengers - 1 (Serious)
Nature of Damage:	Engine, undercarriage and fuselage damaged
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	45 years
Commander's Flying Experience:	602 hours (of which 155 were on type) Last 90 days - 16 hours Last 28 days - 13 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB.

Synopsis

During an attempt to tow a banner the tow line became wrapped around the tailplane, causing a nose down elevator input. The pilot maintained some control of the aircraft but could not prevent it from impacting the ground.

History of the flight

The aircraft took off from Runway 06 at Hinton-in-the-Hedges for the purpose of towing an advertising banner. The pilot was sitting in the left seat and the right seat was occupied by a person intending to receive text messages from colleagues on the ground giving locations where the banner could be shown to maximum effect. The pilot made two attempts to engage the banner during which the grapple hook attached to the aircraft failed to engage the banner tow line. An observer on the ground advised that the grapple hook had deployed correctly but was unsteady in the aircraft's slipstream. The pilot made two more unsuccessful passes before positioning for a further attempt. He reported that during the final pass the aircraft was at the correct height and speed and was aligned correctly between two pick-up poles that held the tow line off the ground for grappling. As the aircraft passed the poles, the pilot initiated a sharp pull-up, applied full power and glanced over his right shoulder to see whether the grapple hook had engaged the tow line. He recalled seeing the tow line "snake" upwards between the trailing edge of the wing and

the leading edge of the tailplane and loop over the elevator.

When the slack in the tow line had been taken up and the banner was in the air, the pilot found that the control column was being pulled forward with a force that required both hands to resist. He managed to hold the aircraft level at what he estimated to be approximately 300 ft agl and, as there was nowhere to land straight ahead, decided to fly a circuit and approach the grass north of the main runway. The recommended procedure to be applied in the event that the tow line hooked around the main landing gear or tail wheel was to fly a steep approach so that the aircraft remained below the banner until touchdown. The pilot judged that insufficient nose-up pitch authority remained to attempt a steep approach and decided instead that a shallow flapless approach would be controllable.

When the aircraft was approximately 35 ft agl on final approach, the control column was pulled forward with a force that the pilot could not resist. Then, as the nose dropped, the forward pressure on the control column reduced and he was able to raise the nose to achieve a level attitude, but this did not prevent the aircraft from hitting the ground with a high rate of descent. The impact separated the engine from its mounts and collapsed the landing gear. As the fuselage hit the ground, the front section dug in and the aircraft pivoted forwards, coming to rest inverted. The right seat occupant was able to leave the aircraft after his harness was released by witnesses, but the pilot's foot was trapped until freed by the attending fire service.

Photographic evidence

A photograph of the aircraft on one of the attempts to engage the tow line showed that the grapple hook had not deployed but was still attached to the aircraft beneath the left side of the cockpit. A later photograph showed the hook trailing behind the aircraft but it was not possible to determine when the hook actually deployed.

Other photographs showed that the tow line was wrapped around the left elevator from the trailing edge to the hinge between the elevator horn balance and the tailplane (see Figure 1, which shows the tow line after cutting by personnel on the ground). Marks on the paint in the internal gap between the tailplane and horn balance were consistent with the tow line rubbing against the two surfaces.

Figure 1.

Banner Towing Operations Manual

The operator's Banner Towing Operations Manual recommended that if the tow line became caught on the aircraft's main gear leg, the pilot should land:

> *'preferably on a hard surface to minimise the ground drag of the banner.'*

The manual also stated that a steep approach would:

> *'keep the banner at or above the height of the aircraft.'*

The procedure did not refer specifically to fouling of the elevator.

Pilot's assessment of the cause

The pilot operated the hook release mechanism only once and was unaware that the hook had not deployed immediately. Photographic evidence, along with the report from the observer on the ground, suggested that the hook deployed sometime between the first attempt to engage the tow line and the last. However, the pilot believed throughout that the hook had deployed correctly and did not modify his usual technique for engaging the tow line. He believed, therefore, that subsequent events were unlikely to have been caused by the hook's failure to release immediately.

After the aircraft had picked up the banner, the pilot believed that tension in the tow line combined with its downward angle created a nose down elevator input that he could barely overcome. He considered that on the final approach, the banner made contact with the ground when the aircraft was at approximately 35 ft agl, which increased the tension on the tow line momentarily and pulled the control column forward. Tension in the line was relieved as the aircraft descended, allowing him to raise the nose to a level attitude before impact.