AAIU Report No. 2000-007
AAIU File No. 1999-0012
Published:22/06/2000

Aircraft Type and Registration:	Piper PA18-150, EI-CIG
No. and Type of Engines:	One Lycoming 0-320
Aircraft Serial Number:	18-7360
Year of Manufacture:	1960
Date and Time (UTC):	13 March 1999, 12.50 hrs approx.
Location:	Dublin West (Perrystown)
Type of Flight:	Aerial Work
Persons on Board:	One
Injuries:	None
Nature of Damage:	Nil
Commanders Licence:	Commercial Pilot
Commanders Age:	56 years
Commanders Flying Experience:	7250 hours, of which 125 hours on type
Information Source:	Eyewitness and Watch Manager Dublin ATC. AAIU Field Investigation

SYNOPSIS

At 11.30 hours the aircraft took off on the flight, towing an advertising banner from Weston Airfield, for a 2 hour flying detail in the Dublin south city area. At 12.50 hours, whilst the aircraft was over Perrystown, the banner became detached from the aircraft and fell to the ground.

HISTORY OF THE FLIGHT

The Piper Super Cub aircraft took off on the flight, towing an advertising banner, from Runway 25 at Weston Aerodrome. At approx. 1 hour 20 minutes into the flight at a height of approx. 1700 ft the banner became detached from the aircraft and was seen falling to the ground. The aircraft turned and remained at the scene for some time before returning to Weston. The banner came to rest lying across electricity cables and a house. Units of the Dublin fire brigade arrived, the electricity turned off and the banner removed from the scene.

1.1 Injuries to Persons

There were no injuries to any person.

1.2 Damage to Aircraft

There was no damage to the aircraft as a result of this incident.

1.2.1 Other Damage

There was no other damage. The banner and its towing gear fell approx. 1700 ft and got stuck on a house and two electricity poles. The electricity cables were live for several hours until they were made safe.

1.3 Aircraft Information

The components of the banner system are:

(a) The Fixed Installation

The tow release mechanism (tow hook) and its mounting fixture are attached to the tail of the aircraft (Fig.1). The release mechanism serves as the point of attachment of all trailing equipment and release is remotely operated by cable from the cockpit (Fig.2).

(b) The Grapple Line

This device is used to engage the towline when making an aerial pickup of the banner. It consists of a ring at the forward end, which connects to the tow hook, connected by a 9-meter (30 ft) cable to a multi-prong hook on the aft end. A safety link (breaking strength 340 kg) is provided at the forward end, which breaks in the event of an accidental overload on the system.

Aerial Pickup Towline

This nylon line connects the grapple hook to the actual advertising banner. It measures 76 metres (250 ft). The other end is connected to a collector ring to which the banner itself is attached. (See Fig. 2)

The Tow Hitch Mechanism Operation

This release mechanism is shown at Fig. 2. When the pilot pulls the cable in the cockpit the resulting tension in the cable causes the latch arm (C) to move forward, thus releasing the "pelican hook" (B) from its rubber mounting. The ring attached to the cable assembly is thus free to drop from the aircraft and the banner with it.

Aerial Pickup

The endless loop of the towline is placed atop two poles placed at right angles to the aircraft approach path and 5M to 6M apart. (See Fig 3). The aircraft approaches with the cable assembly and grapple hook deployed. The loop of the towline is caught by the hook as the aircraft climbs away sharply at full power. From then on, the banner can only be released either through breaking of the safety line (tension greater than 340 kg) or through the operation of the release mechanism.

1.4 Meteorological information

Wind;	240 degrees true, 20-25 knots at 2000feet.
Visibility:	more than 10 kilometres.
Cloud:	FEW at 2000 to 3000 feet with isolated cumulonimbus, base 1800 to 2400 feet.
Temp/Dew-Point:	10/03

1.5 Tests and Research

On 15th March 1999, two days after the incident, a licensed aircraft inspector inspected the tow hook release mechanism. He tested the system by inserting the ring end of the grapple line in to the release mechanism and placing the cable under tension. He found the system satisfactory. He noted that the rubber block had slight wear at its top end and replaced the bolt on which the latch arm rotates as a further precaution. The system was then released as fit for flight.

1.6 Additional Information

The manufacturers of the banner equipment issued an instructor's booklet to cover the operation of the equipment. In Appendix 1 of this document attention is drawn to "*important data on coupling grapple hook cable*". It states that on initial take off "*the hook's cable will have to be pulled forward and kept under tension until the hook is dropped. If the cable ring is placed around the pelican hook part of the mechanism (B), the forward tension could conceivably nudge the latch arm (C) forward. If the arm is pushed far enough forward, the release will open, dropping the hook and cable*". This problem can be eliminated permanently by adding a guard to the tow hitch that would prevent the release from being opened accidentally. Such a guard is described in the booklet and can be manufactured locally. It was not installed on this aircraft.

2. ANALYSIS

The system was tested on the ground following the accident and operated satisfactorily. As a precaution the rubber block and other components were changed.

The aircraft had been flying for 1-hour 20 mins with the banner attached. If the release mechanism had a defect then it would be expected that it would inadvertently release at the point of maximum cable tension, i.e. at the point of pickup.

However, it is possible that if the rubber block were worn then in-flight vibration could cause the latch arm to move forward, releasing the pelican hook and with it the banner assembly. The latch arm has only to move 15 degrees to effect release and if the rubber was worn this angle would be even less.

Due to the leverage between the cockpit and release mechanism a short small inadvertent instantaneous action on the cockpit release cable would open the tow hook. (This of course, works in favour of the total safety of the system in that the assembly can be released quickly in the event of an emergency in flight).

Again, if the cable assembly ring got on to the pelican hook, prior to the in-flight banner pick up, it is possible that the latch arm could be nudged forward. In-flight vibration, plus the drag of the whole banner assembly on the pelican hook, could cause that hook to dislocate from the latch. The installation of the recommended guard could have minimised this likelihood however.

3. CONCLUSIONS

3.1 The latch arm of this mechanism could have nudged forward due to the action of the cable assembly ring prior to in flight banner pick-up.

3.2 The combination of in-flight vibration and a slightly worn rubber could have eventually caused the release of the assembly.

3.3 The pilot of the aircraft could have inadvertently acted on the cockpit control thus causing the tow release mechanism to activate.

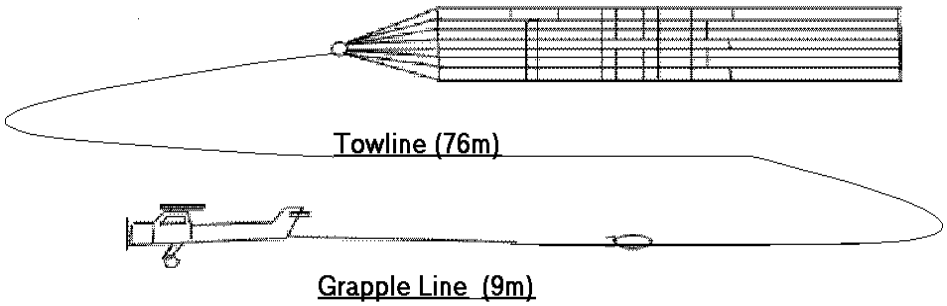
4. SAFETY RECOMMENDATIONS

4.1 The banner manufacturer's suggestion of a modification regarding a locally made guard to cover the latch arm should be considered by the Operator. **(SR 7 of 2000)**

4.2 The release mechanism should be inspected annually and the rubber block replaced. This should be recorded in the aircraft logbook. **(SR 8 of 2000)**

4.3 The installation of a release mechanism having a more positive locking device should also be considered as an alternative to the one installed. **(SR 9 of 2000)**

FIG.1 Tow Hitch attached to rear of EI-CIG.



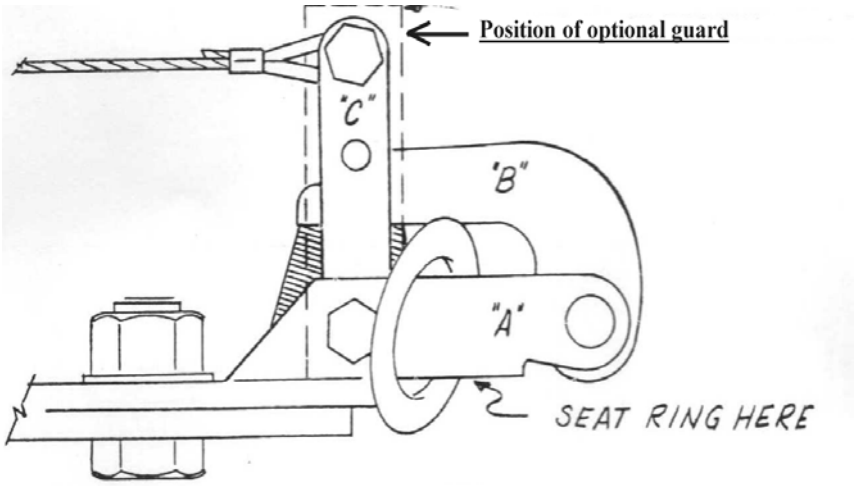


Fig 2 Take off position of hook and (above), general arrangement of towline in flight.

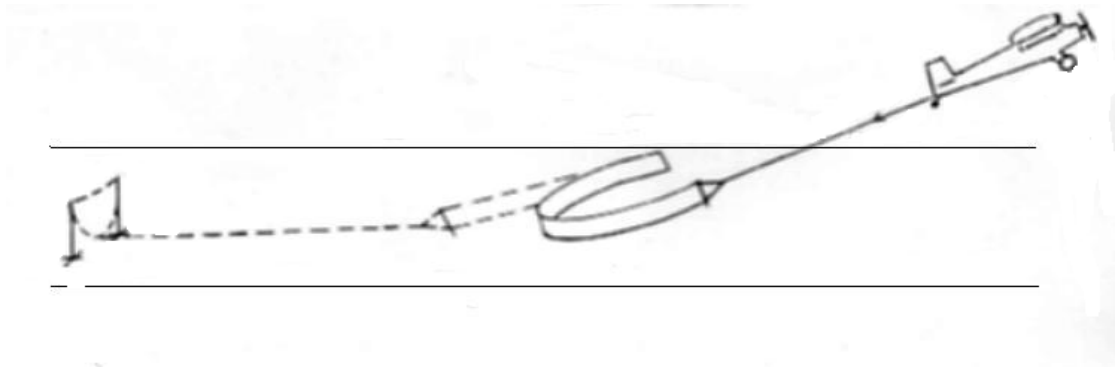


Fig 3 Sketch of Aerial Pickup.