Aviation Safety Investigation Report 199402610

Sikorsky Aircraft
S-76C

10 September 1994

Readers are advised that the Australian Transport Safety Bureau investigates for the sole purpose of enhancing transport safety. Consequently, Bureau reports are confined to matters of safety significance and may be misleading if used for any other purposes.

Investigations commenced on or before 30 June 2003, including the publication of reports as a result of those investigations, are authorised by the Executive Director of the Bureau in accordance with Part 2A of the Air Navigation Act 1920.

Investigations commenced after 1 July 2003, including the publication of reports as a result of those investigations, are authorised by the Executive Director of the Bureau in accordance with the Transport Safety Investigation Act 2003 (TSI Act). Reports released under the TSI Act are not admissible as evidence in any civil or criminal proceedings.

NOTE: All air safety occurrences reported to the ATSB are categorised and recorded. For a detailed explanation on Category definitions please refer to the ATSB website at www.atsb.gov.au.

Aviation Safety Investigation Report

199402610

Occurrence Number: 199402610 **Occurrence Type:** Incident
Location: 3 km E Longford Heliport
State: VIC **Inv Category:** 4
Date: Saturday 10 September 1994
Time: 0915 hours **Time Zone** EST
Highest Injury Level: None

Aircraft Manufacturer: Sikorsky Aircraft
Aircraft Model: S-76C
Aircraft Registration: VH-EXQ **Serial Number:** 760424
Type of Operation: Non-commercial Corporate/Executive
Damage to Aircraft: Nil
Departure Point: Longford VIC
Departure Time: 0910 EST
Destination: Mackerel Oil Platform VIC

Crew Details:

Role	Class of Licence	Hours on Type	Hours Total
Pilot-In-Command	ATPL 1st Class	5100.0	12500

Approved for Release: Wednesday, October 26, 1994

[redacted]

Circumstances

This incident involved the loss of a sling load, namely four 205 litre drums of hydraulic oil from a pallet in a cargo net, while cruising at 90 knots at 800 ft above the ground (AGL). The incident was the subject of an internal investigation by the operator. The Bureau was asked to review the operator's investigation and provide comment as considered necessary. For this purpose, a Bureau investigator attended the scene of the occurrence and visited the operator's base.

Tarmac assistants prepared a sling load consisting of four 205 litre drums of hydraulic oil standing upright, bungs uppermost, on a standard wooden forklift pallet. A cargo net surrounded the base of the pallet and the bottom half of the drums. The four corners of the net were gathered to one point above the drums. A shackle attached the net to a wire strop about 3 metres long. A swivel attached the wire strop to the cargo hook on the helicopter.

After a normal takeoff was performed with the 770 kg (approx) sling load attached, the pilot asked the crewman, sitting on the right side of the helicopter beside the sliding door, and the tower controller, how the sling load was hanging inflight. Both advised that the load was trailing at about 10 to 15 degrees off the vertical and not swinging or rotating. The sling load felt to the pilot as though it was trailing nicely. The load could not be viewed by the pilot because the helicopter was not fitted with a pilot sling load viewing mirror.

Without warning, while cruising at 800 feet AGL at 90 knots, the pilot felt a jolt through the airframe and the helicopter began to climb with no change being applied to the power setting or the inflight attitude of the helicopter. It felt to the pilot as if the sling load had dropped off. The pilot instructed the crewman to visually check the load. The crewman saw that the four drums were missing but the net, containing the pallet, was still attached to the cargo hook. The pilot immediately returned to the Longford heliport with the net still attached. On arrival at Longford heliport, engineers discovered that when the drums fell out of the cargo net the pallet/cargo net had swung back far enough to contact the tailboom of the helicopter. The boom was not dented but a slight smear of paint from the wooden pallet was left on the tailboom.

The drums were almost identical to Jet A1 or AVGAS drums with one main difference - the top of each drum included an extra press-fit bung approximately 8 cm in diameter. Hydraulic oil, which was subsequently found on the webbing of the cargo net, appeared to be confined to one corner of the load. There was enough stain on the net to accept that at least one of the drums had vented oil in flight. The most likely source of venting was from a dislodged press fit bung. Tensioned-up around the four drums was a thin stainless steel strap. The main function of the tensioned strap was to make the drums less likely to fall off the pallet during forklift handling. However, the strap also should have made the drums less likely to topple out of the cargo net in flight. The strap/band was never found after the incident. This configuration of drums in a sling load had been successfully used by the operator in the past.

All the drums impacted the ground within an area of about 60 metres diameter. The site was open, flat, heathland well clear of all buildings and human occupation. No livestock were nearby. The four impact points were so close that it is highly probable that all of the drums departed the cargo net during one sudden event in flight.

The damaged drums were dumped at the tip before being examined. Later attempted retrieval of the damaged drums from the tip was unsuccessful. Careful inspection of the damaged drums may have confirmed whether or not the central press-fit bung(s) had come loose in flight. The drum which vented hydraulic oil may have sustained different impact damage to the others.

The operator carried out an internal investigation of the incident. At the request of the operator, a Bureau investigator reviewed the findings of the operator.

The main cause of the incident was that the cargo net was not large enough to enfold the drums. Had the net been large enough the drums could not have escaped despite a probable loss of hydraulic oil from at least one drum and the possible loss in flight of the tensioned metal strap around the four drums.

Findings by the operator

1. The tarmac assistants who prepared the load had not been specifically trained in rigging sling loads.

2. Only one type/size sling/cargo net was available for use.

3. The sling/cargo net did conform to Department of Labor and Industry (DLI) cargo and lifting gear testing certification standards.

4. No company procedures were in place to guide personnel on how to properly rig a sling load.

5. Tarmac assistants were trained in ground to air communications procedures and the correct method of hooking up a load to a hovering helicopter.

6. The sling/cargo net, shackles and swivel used were all in excellent condition.

7. Cargo lifting equipment was controlled and maintained according to National Association Testing Authority (NATA) standards.

Significant Factors

The following factors were considered relevant to the development of the incident:

1. The sling net was not large enough to fully enfold the drums.

2. Hydraulic oil vented from one of the drums in flight.

3. As the oil vented, a drum may have partially collapsed in flight as a result of the weight of the other drums and the action of the tensioned steel strap, thereby altering the geometry/stability of the load.

4. An undetermined event caused the drums to lose stability in flight. This, coupled to the fact that the sling net was not able to fully enfold the drums, caused the drums to topple out of the cargo net and fall to earth.

SAFETY ACTION

The following internal recommendations were made to management:

1. That no further sling loads of 205 litre drums take place until alternative methods of transport are investigated and approved.

2. That if a suitable method for airlifting of 205 litre drums is selected, only drums with screw top lids be approved for transport.

3. That an appropriate course of training be provided for tarmac assistants. (Such as a five day rigging course with the Air Movement Training Development Unit at Richmond, NSW.)

4. That consideration be given to incorporating all slings, shackles and sling nets into the present system administered by the Barrys Beach Marine Terminal (BBMT) sling store.

5. That any special lifting equipment, such as cargo nets, lifting frames or baskets be incorporated into the company cargo and lifting gear manual because many people may be involved in preparing a sling load as it passes from the point of preparation (warehouse, contractor etc.) through the helipad to the field.

6. That detailed procedures be developed by the helipad, in co-operation with their freight interface to ensure that any potential underslung loads are appropriately prepared and readied for transportation.

The BASI investigator added the following safety observations:

1. It is very wise to have a pilot sling load viewing mirror attached to a helicopter for all sling load operations. (With previouis helicopter types flown by the operator, mirrors were fitted.)

2. At present there is no Sikorsky company-approved sling load mirror for the S76. However, Helicopter Resources Pty. Ltd. of Victoria is now operating the Sikorsky S76A in the Antarctic with a pilot sling load viewing mirror attached. The Helicopter Resources mirror does have Civil Aviation Authority (CAA) Regulation 35 approval.

3. According to the flight manual, with a sling load of 862 kg or less, the maximum airspeed allowed in the S76 is 136 knots up to 6000 feet. This is a very high airspeed for sling loading. It is accepted that every different sling load may have its own maximum optimum speed after which it may sway, spin, trail too far aft, even try to fly beside the helicopter, etc. It is also accepted that the manufacturer is very thorough in flight testing a helicopter before the flight manual becomes an approved document. However, it is logical to expect that the higher the airspeed the more dramatic a problem is likely to be when/if an unusual inflight sling load event occurs. For example, if the drums had departed the cargo net from VH-EXQ at 136 knots, it is suspected that the tail boom would have been significantly damaged by the trailing pallet. Several other helicopter types have a maximum airspeed of 80 knots for sling load operations, presumably to minimize the hazard in the event of a mishap with a sling load.

As a result of the review by the Bureau investigator, the company is considering the following advice:

1. Fit an approved pilot sling load mirror to the S76 for future sling operations.

2. Despite information contained in the flight manual maximum airspeed versus weight supplement, consider a lower company sling load airspeed limit and include it in the company operations manual for CAA approval.

3. Use relevant, qualified experts to ascertain appropriate safe standards for sling equipment and ascertain any occupational health and safety implications.

4. Try to adopt one practical standard for sling equipment, if possible, for simplicity and to avoid confusion.