# Aviation Safety Investigation Report 199700878

## Aerospatiale Squirrel

## 21 March 1997

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# Aviation Safety Investigation Report

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The Bureau did not conduct an on scene investigation of this occurrence. The information presented below was obtained from information supplied to the Bureau.

**Occurrence Number:** 199700878 **Occurrence Type:** Accident
**Location:** Gelantipy
**State:** VIC **Inv Category:** 4
**Date:** Friday 21 March 1997
**Time:** 1300 hours **Time Zone** ESuT
**Highest Injury Level:** None

**Aircraft Manufacturer:** Aerospatiale
**Aircraft Model:** AS.350BA
**Aircraft Registration:** VH-JRD **Serial Number:** 1253
**Type of Operation:** Commercial Fire Control - Other
**Damage to Aircraft:** Substantial
**Departure Point:** Gelantipy Airstrip Vic
**Departure Time:** 1245 ESuT
**Destination:** Gelantipy Airstrip Vic

**Crew Details:**

| Role | Class of Licence | Hours on Type | Hours Total |
|---|---|---|---|
| Pilot-In-Command | ATPL | 223.5 | 3730 |

**Approved for Release:** Wednesday, September 10, 1997

FACTUAL INFORMATION

The AS350 helicopter was engaged in a controlled burn of a logging coupe. A drip torch was slung underneath the helicopter. It dripped ignited napalm gel on command to initiate burning on the ground. The drip torch weighed 250 kg when fully loaded with napalm.

The pilot advised that while at 50 kts and 200 ft over cleared ground, the helicopter suffered an hydraulic failure. It banked violently to the right and the hydraulic warning light began to flash but the loud warning horn never activated. He turned the hydraulics off using the switch on the collective lever and regained level flight. The helicopter then banked to the right but not as severely. He tried to electrically release the drip torch from the cargo hook but it failed to detach. He then tried the mechanical release but the load still failed to detach. At the request of the pilot, the crewman on board also tried to mechanically release the drip-torch, but still the load would not release. For four minutes, the pilot flew the helicopter back to the airstrip under control, hydraulics off, with the hope of releasing the sling load and performing a run-on landing. He flew one circuit without being able to release the sling load. Then at about 40 kts and 200 ft AGL, the helicopter banked sharply left, pitched nose down, yawed left and entered a left spiral from which the pilot could not recover before ground contact. A crewman watching from the ground said that the helicopter banked smartly to the left and nosed down almost vertical to the ground with the drip torch swinging wildly underneath. Finally the helicopter landed on top of the drip torch. The main rotor and the tail rotor blades impacted the ground but the helicopter did not roll over.

After the accident it was discovered that the main rotors had struck the tail boom and the tail rotor drive shaft was severed. It has not been determined whether the drive shaft was severed in flight during an unusual manoeuvre or when the helicopter landed on top of the drip torch.

The load-ring attaching the drip torch cable to the cargo hook was oval in shape. The client provided the load-ring as part of the drip torch equipment. The ring had been manufactured to suit a slightly different type of cargo hook which may also be fitted to an AS350. Prior to being used operationally, inflight trials had been conducted with the load-ring to ensure it was not prone to dynamic roll out from the hook. The ring was in good condition and had been in service successfully for a considerable time. After the accident it was discovered that it was possible for the load ring to lodge itself partially around the cargo hook housing under negative "G" conditions. Once lodged around the housing, the rim of the only weld on the ring could snag on the housing. In this condition, neither the electrical nor the mechanical release system could detach the snagged load-ring.

The cable between the load-ring and the drip torch was not long enough to enable the pilot to land beside the drip torch with its cable still attached to the cargo hook. The existing cable length had proven to be successful during normal operations; its length minimised the potential pendulum effect of the load. If the helicopter pilot had been able to hover safely, hydraulics on, and rest the load on the ground, a crewman could have stood under the helicopter, de-snagged the load ring from the housing, and manually released the load.

With various combinations of helicopter cargo hooks and sling gear equipment, problems in not being able to release a slung load, or inadvertent load release, have been rare. Dimensions for the primary attachment ring to the cargo hook are contained in the AS350 flight manual supplement for the cargo hook. The load ring in use in this accident was larger than the dimensions described in the supplement.

Subsequent inspection of the hydraulic pump, its drive belt, the hydraulic servos, accumulators, and flight controls, found no significant fault with the mechanical aspects of the hydraulic system. No hydraulic fluid leaks were found. No fault was found with the hydraulic solenoid and switches. However several wires were found to be broken, mostly as a result of the damage sustained during the landing. The wire which controlled the hydraulic warning horn was found to be corroded and broken; this broken wire de-activated the warning horn. A wire to the hydraulic on/off solenoid was found to be broken but it could not be determined whether or not this wire was broken before the accident.

The company chief pilot had previously checked out the pilot and found him to be competent coping with hydraulic emergencies; this included successful hovering of the AS350 with hydraulics off.

Weather was not a contributing factor in the accident.

The helicopter was within its centre of gravity and weight limits.

## ANALYSIS

The load ring was larger than allowed by the flight manual supplement. The way that the load-ring caught on the cargo hook housing was most unusual. Momentary negative "G" must have occurred in flight to have lifted the load ring high enough to snag.

Despite a thorough examination of relevant components no definite cause of the hydraulic failure has been ascertained. The problems encountered in flight by the pilot might have resulted from a wiring problem causing an uncommanded intermittent on/off situation with the hydraulics. The pilot may have experienced heavy, non servo assisted controls suddenly followed by servo assisted light control forces. This could partially account for the unusual inflight attitudes experienced by the pilot. The drip torch swinging wildly underneath the helicopter probably exacerbated the pilot's ability to control the helicopter.

## SAFETY ACTION

The operator advised that load rings have since been replaced to prevent snagging. The operator has adopted a system of colour-coding load rings and cargo hooks to ensure that wrong size rings are not used on the variety of cargo hooks fitted to different helicopters owned by the company.

The provider of the drip torch has removed the oval load-rings from service and is working closely with the helicopter operator to ensure that sling equipment is compatible with the cargo hook fitted to helicopters used in controlled burning.