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- independent investigation of transport accidents and other safety occurrences
- safety data recording, analysis and research
- fostering safety awareness, knowledge and action.

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Abstract

On 8 December 2009 at about 1840 Eastern Daylight-saving Time, an Aerospatiale AS350-B2 helicopter, registered VH-NFO (NFO), and a Kawasaki BK117 helicopter, registered VH-LXC (LXC), were engaged in aerial firebombing operations about 20 km south-east of Orange Airport, New South Wales. The pilots were the only occupants of their respective helicopters. After the pilot of NFO had landed to refuel, he noticed damage to the trailing edge of the helicopter's vertical fin. In addition, the plastic navigation light cover on top of the vertical fin was broken. The pilot reported the damage to the pilot of LXC. Examination of LXC did not reveal any apparent damage. There were no injuries. The investigation is continuing.

FACTUAL INFORMATION

Sequence of events

On 8 December 2009 at about 1840 Eastern Daylight-saving Time¹ an Aerospatiale AS350-B2 helicopter, registered VH-NFO (NFO), and a Kawasaki BK117 helicopter, registered VH-LXC (LXC), were engaged in aerial firebombing operations about 20 km south-east of Orange Airport, New South Wales (NSW). The pilots were the only occupants of their helicopters.

- 1 The 24-hour clock is used in this report to describe the local time of day, Eastern Daylight-saving Time as particular events occurred. Eastern Daylight-saving Time was Coordinated Universal Time (UTC) + 11 hours.

Midair collision

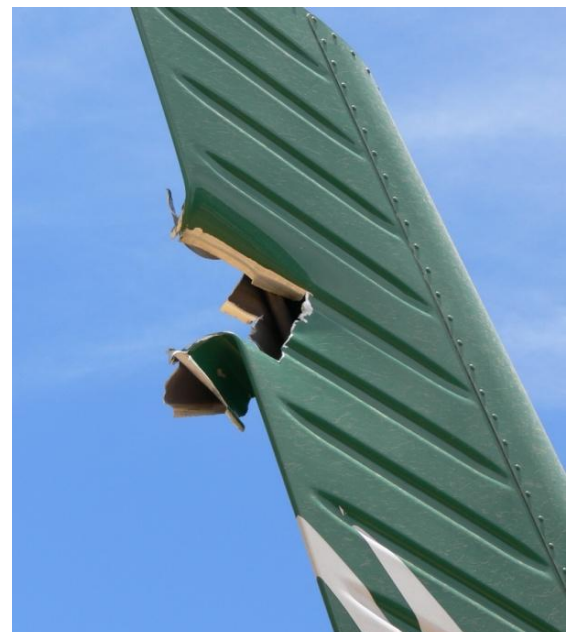
20 km SE of Orange, New South Wales

8 December 2009

After the pilot of NFO had landed to refuel, he noticed damage to the trailing edge of the helicopter's vertical fin (Figure 1). In addition, the plastic navigation light cover on top of the vertical fin was broken. The pilot reported the damage to the pilot of LXC. Examination of LXC did not reveal any apparent damage. There were no injuries.

There was significant bushfire activity in NSW on the day of the occurrence. The pilots of NFO and LXC had been tasked by the Rural Fire Service of NSW and were operating under the operational control of that organisation. In the period leading up to the occurrence, both pilots had been conducting firefighting activities along with another helicopter and two aeroplanes, and were

Figure 1: Damage to the vertical fin of VH-NFO



under the control of an Air Attack Supervisor (AAS)². However, a higher priority task required the AAS, the other helicopter and the two aeroplanes to depart, leaving only NFO and LXC on task.

An 800 L Bambi® bucket³ was attached to the cargo hook of NFO by the bucket's 7.5 m long suspension cables. A 1,300 L Water hog® bucket³ was attached to LXC via a 15.2 m line. That positioned the bucket, including its suspension cables, about 75 ft (23 m) below LXC. The pilot of LXC advised that his usual practice was to use a 150 ft (45.7 m) line but had opted for the shorter line on this occasion because of windy conditions.

The pilots stated that the fire front was aligned approximately north to south and was moving west. The wind was southerly and, while there was significant smoke east of the fire front, there was good visibility to the west. The fire was advancing rapidly and had progressed to within 150 to 200 m of a house and other buildings. There were two small dams about 50 m apart about 100 m north-west of the buildings, from which the pilots were dipping and refilling their buckets. They were flying right circuits to and from the dams and conducting firebombing runs from north to south.

The pilot of NFO later reported that, as he initiated the water drop from an altitude of about 100 ft above ground level, he felt 'a slight jolt' through the helicopter and immediately rolled right, away from the fire line. In his peripheral vision, he saw a yellow coloured object flash past the left door and initially thought it was a water bombing aeroplane that had not reported its bombing run.

The pilot of NFO considered that his helicopter was performing normally and continued with the firefighting task. Similarly, LXC also continued on task. The damage to NFO was discovered later during a refuelling stop.

Immediately before the occurrence, the pilot of LXC was refilling his bucket from the western-most

dam, while the pilot of NFO was behind him using the other dam. The pilot of NFO completed his refill first and informed the pilot of LXC that he was departing the dam⁴. The pilot of LXC subsequently reported that he was also departing his dam. The pilot of NFO recalled that he thought LXC was at least 'a couple of hundred metres' behind him as he conducted his run and did not see LXC at any time. He believed that LXC had caught up with NFO during the run, resulting in the collision.

The pilot of LXC recalled that when he reported he was departing the dam, he turned towards the fire, and decided to track towards the southern end of the fire front where it had 'spotted'⁵. He did not see NFO but thought that his turn placed him ahead of NFO by about 300 m. He believed that NFO had overtaken LXC close on the right side, and that the collision occurred as NFO turned sharply away from LXC.

Pilot information

The pilot of NFO had 18,500 hours flying experience, including more than 4,000 hours in firefighting operations. His experience on AS350 helicopters was about 4,000 hours.

The pilot of LXC had about 6,500 hours flying experience in helicopters, including about 1,500 hours in aerial firefighting. His experience on BK117 helicopters was about 400 hours.

The control position for both helicopters was the front right seat.

Wreckage examination

Examination by the Australian Transport Safety Bureau (ATSB) of a series of photographs of the damaged vertical fin of NFO revealed that the impact was about 50 cm from the arc of rotation of the tips of the tail rotor blades (Figure 2).

Examination of the damaged skin sections following their removal for repair confirmed that the damage displayed the characteristics of a high energy impact. It was evident that the direction of impact was horizontal and from right to left (looking forward).

2 The NSW Fire Agencies Aviation Standard Operating Procedures described an Air Attack Supervisor (AAS) as skilled and experienced in fire behaviour and aerial suppression and the planning of air attack operations. The AAS's responsibilities included directing firebombing aircraft over a fire. In all cases, the AAS operated from an airborne platform, usually a helicopter, positioned above the fire and clear of firefighting aircraft.

3 Collapsible firefighting buckets that allowed the carriage and delivery of water or foam to a target fire or hotspot.

4 The term normally used was 'out of the dip'.

5 The commencement of small sections of fire ahead of the main fire as a result of flying debris or sparks.

Figure 2: Damage in relation to tail rotor



The direction of rotation of the main rotor blades of LXC was anticlockwise (viewed from above). Photographs of the main rotor blade tips of LXC did not show any evidence of contact with foreign material. The tail structure and blade tips were constructed from materials of significantly different strength. The blade tips were high strength titanium alloy and the tail skin was a thin aluminium alloy.

Procedures

The pilots indicated that they were not aware of any written procedures or guidelines that related to mutual separation during operations when there was no AAS present. They indicated that most pilots usually called 'out of the dip' when departing their water pick-up point(s). Beyond that, pilots sometimes advised their intentions and/or position by radio. However, the extent to which that occurred varied.

The pilots of NFO and LXC reported that they were in radio contact throughout the period they were engaged in the firefighting task. Firefighting aircraft operating at other locations were also operating on the same frequency, and there were reports of some 'double transmissions'.

The NSW Fire Agencies Aviation Standard Operating Procedures included, at Appendix 1.3.1A, a table titled *Triggers Matrix, Guidelines to assist in the establishment of Aircraft Units*. The matrix indicated that an AAS should be present for firefighting operations involving two or more 'fire attack machines'.

Recorded information

The ATSB obtained data from the global positioning system (GPS) units that were fitted to both helicopters. At the time of publication of this report, and due to apparent limitations in the

extent of data from one of the GPS units, it had not been possible to determine conclusively the relative tracks, speeds, and altitudes of the helicopters prior to the collision. However, the data clearly showed that the turning radius of NFO, which was fitted with a standard line to its bucket, was significantly less than that of LXC, with the 15.2 m line attached to its bucket.

Ongoing investigation activities

The investigation is continuing, and will include consideration of:

- separation assurance when no AAS is present
- mixing long and short line operations when no AAS is present
- situational awareness training (including as it relates to separation from other air traffic) for pilots involved in aerial firefighting operations
- analysis of GPS data from both helicopters
- cockpit resource management training.

SAFETY ACTION

Civil Aviation Safety Authority

The following text summarises information received from the Civil Aviation Safety Authority (CASA) on 11 February 2010.

The aerial firefighting industry has expanded considerably in recent years, outgrowing its agricultural industry roots, and developing into a distinct industry sector. It now encompasses light aircraft on spotting and incendiary dropping duties, through specialist helicopters, to converted airliners dropping large quantities of fire control agents. The fire authorities are becoming more aviation focussed, and have set up their own central aviation agency, the National Aerial Firefighting Centre (NAFC).

CASA advised that following the 2009 summer bushfire season, Australian state fire authorities raised several issues with CASA concerning the regulation, approval, and oversight of operators engaged in firefighting operations. One issue was that the existing Pilot Training and Competence Rules for firefighting were not considered adequate.

CASA established a Fire-Fighting Review team on 20 July 2009. The project team included three CASA staff, one fire authority staff member, two

industry representatives and one consultant to draft a proposed manual. The project was expected to run from 16 November 2009 to 7 May 2010.

In its report of 13 August 2009, the Review made a number of recommendations, including:

Recommendation 6 – Standard Operations Manual Sections for Fire-fighting:

That a project be set up in conjunction with National Aerial Firefighting Centre (NAFC) to develop a standard operations manual section for fire-fighting operations.

The anticipated benefits from the development of a standard operations manual for firefighting operations included:

- Improve standardisation between state fire authorities thus reducing potential confusion for operators moving between authorities.
- Improve and standardise the training and experience requirements for pilots.
- Raise the standards of some operators by improving their procedures.
- Standardise refuelling hand signals.

On 11 February 2010, CASA advised that the Review was consulting with stakeholders on a draft operations manual and on an implementation plan for the manual. CASA approval, and NAFC acceptance, of the plan was expected to be completed by 23 April 2010, and the manual delivered in early May 2010.