OAS-35A
(12/12)

# Interagency Aviation Lessons Learned



**Subject: Fire Whirls**

**Area of Concern: Wildland Aerial Firefighting Operations**

**Distribution: All Aviation Operations**

**Discussion:** Just prior to dropping water on a spot fire, the helicopter pilot noticed an eight foot tall fire whirl on the edge of the fireline. A fire whirl, also known as a fire devil or fire tornado is where fire and wind simultaneously rotate vertically. Fire whirls may occur when intense rising heat and turbulent wind conditions combine to form whirling eddies of air. These eddies can tighten into a tornado-like structure that sucks in burning debris and combustible gases.

While climbing away from the drop, the pilot felt the aircraft's climb rate rapidly increase without any control input. In response, he lowered the collective (reduced power) in an attempt to arrest the climb, but the aircraft kept climbing. The pilot then heard a loud "bang" and felt "tightness" in the controls. Once the aircraft was stabilized, the pilot looked down to check on the bucket but was unable to see it. When he looked towards the back of the aircraft, he noticed the Bambi bucket draped over the tail boom with the 100 foot cable still attached and just a few feet away from the tail rotor.

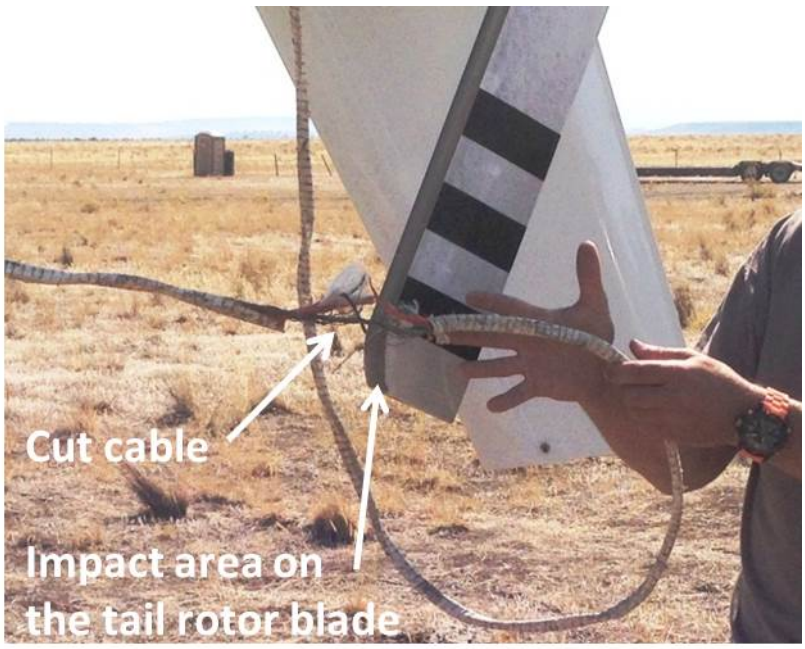
During the short period of time between the large power reduction and level off, the bucket continued its ascent along with the cable. The bucket and cable wrapped around the tail boom, missing the main rotor blades and impacting the tip of just one tail rotor blade!

Fire whirls usually move slowly. They can set objects in their paths ablaze and can hurl burning debris great distances. The winds alone generated by a fire whirl can also be dangerous. Large fire whirls can create wind speeds on the surface of more than 100 mph - strong enough to knock down trees. In one study, a fire whirl updraft was measured at 204 mph using video analysis!

While there are no defined procedures for what to do in the event of encountering a fire whirl, other very experienced helicopter pilots opined that the best procedure is to "hold what you have." In other words, avoid large control inputs (power or otherwise) and maintain forward speed in order to fly out of the pronounced updraft as soon as possible.

The Aviation Safety Department at Bell Helicopter said "There have been cases where the line/cable has come in contact with the tail rotor, when there is an empty bucket or line without anything on the end. However this is the first time we have heard of the line becoming completely wrapped around the tail boom."

Many buckets are now attached using a synthetic long line instead of a cable making the line approximately 60 pounds lighter.




Fire whirls are very dangerous but visually recognizable. Miracles like this won't happen every time - so keep alert, maintain a safe distance and advise other air and ground resources if you see one!

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