



## Pacific Southwest Aviation Lessons Learned Rotor Strike Incident August 9<sup>th</sup>, 2012



At approximately 1800 PST, a Boeing Vertol 107, type 1 helicopter experienced a main rotor-blade strike while descending into a new dip site. The aircraft was providing support to the Chips Fire on the Plumas National Forest when the incident occurred. This fire was being managed by a Type 1 Incident Management Team, with an air attack and helicopter coordinator on scene to provide aerial supervision.

Earlier in the day the aircraft had been working an area of slop over utilizing Yellow Creek Dipsite, where they had been assigned most of the day. This site was surrounded by trees, and the aircrew mitigated the hazards by establishing a protocol where the Second in Command (SIC) would call out, "right side of aircraft clear" for the Pilot in Command (PIC) upon descending in the dip site.

Later in the day the helicopter was diverted to a new spot-fire that had emerged. The aircrew scouted for new dip sites close to the spot fire. In previous days, the aircrew had anticipated this potential need and had been looking for alternate dip sites along the Yellow Creek Stream. They had identified some suitable spots.

### Sequence of Events:

Upon arrival to the new spot-fire, the aircrew noted two other helicopters were also assigned: a Kmax was dipping out of a dip site close to the spot-fire location; and a Firehawk was using "Yellow Dip" (the one used most of the day). The aircrew opted not to utilize the closest dip site in order to avoid any conflict with the other helicopters and hazards associated with rotor wash. The aircrew located one of their potential alternate dip sites, which was located downstream from the spot fire and away from the other dip sites, thus de-conflicting the airspace.

Prior to descending into the new dip site, the crew completed both a high and low recon. The crew did identify obstacles including the tree that would end up being the incident tree. The incident tree was located on the co-pilots side. Visibility was good and the air was clean. The PIC conducted a 'pre-descent briefing' noting and verbalizing a tall tree that would be on the SIC side of the aircraft. On final while completing a low recon the PIC again verbalized the tall tree and asked the SIC to call the aircraft's altitude above the tree.

The PIC held a stable hover over the dip site and began a slow descent. As the helicopter got closer, the PIC utilized the bucket's shadow to judge the distance of the bucket above the water. With the bucket 10 to 15 feet above the stream, the PIC glanced across the flight deck to see if he could observe the top of the tree. The PIC continued to descend slowly (at this point the PIC estimated the bucket to be 5 feet above the water) and the PIC heard the SIC call out 20 feet, as the bucket touched the water the PIC heard 10 feet, and maintained tension on the long line. As the PIC was about to turn the pumps on, he heard an odd noise and immediately raised the collective, this is when he heard the SIC saying "zero, zero".

The PIC mis-interpreted the call-outs to be the helicopters vertical distance from the tree, not horizontal distance from trees. The PIC stated that had he known the call-outs were referring to horizontal distance he would have gone to a different location.

The SIC stated, "I had been clearing the right side of the aircraft all day. I understood that to be the tactic agreed to safely descend into this new dip site location. As we moved closer to the site and lost altitude down to bucket height, I noticed we were getting horizontally close to the tree line. I began to call out the horizontal distance as we edged closer to the trees. I remember calling out 15 feet, then 10 feet, then 5 feet, then finally zero feet zero feet zero feet as the helicopter blades came in contact with the top on a tall pine tree. The PIC pulled pitch and we climbed out away from the treetops and headed toward more open terrain. When discussing the event with the PIC, it was discovered that he had not heard the five and multiple zero foot callouts from me. I can only surmise that either the intercom malfunctioned at that particular time or in the excitement of the moment, I neglected to depress the intercom footswitch when calling out those last distances before blade contact."

The aircrew did not experience any excess vibration; and reported no RPM decay. The PIC tried different maneuvers at different airspeeds to attempt to identify any abnormal flight characteristics, but none were identified. The aircrew then notified air attack (AA) they were returning to base, the crew did not convey to AA that an incident had occurred. Helicopter landed without further incident.

### **Lessons Shared:**

When both pilots were asked what they would share with a new firefighting pilot to prevent the same incident, this is what they said:

PIC: "The need to get water closest to the fire just isn't that great."

SIC: "When going into a dip site, regardless if it's the first time or not, be sure that you understand, concur, and repeat the expectations of the pilot in command."

### **Talking Points:**

**All helicopter managers should review the following with their crew and pilot(s):**

- Review Interagency Helicopter Operations Guide, "External Load Operations". *See Below*
- Master Spec Contract calls out the following in C-10 – Operations - (9) When conducting external load operations, rotors will remain above the canopy or helicopter will operate within an opening no less than 1 ½ times the main rotor diameter (e.g. an aircraft with a 48' main rotor diameter would require a 72' diameter opening).
- Review the External Loads Risk Assessment that is provided in the Aviation Risk Management Workbook and assure that hazard mitigations have been accomplished.
- Rotor strikes can have a significant effect on the safety of flight operations and ground safety. Pilots did not report rotor strike information to air attack or the helibase prior to landing. This lack of communication prevents ground personnel from being able to prepare for an incoming emergency aircraft, eliminates the opportunity for aerial supervision to assign an aircraft to follow the distress aircraft back, and it prevents discussion of alternate locations for safe landing that may provide a greater safety margin for ground, flight crews and other aircraft.
- Helibase and airtanker briefings should include: If an incident occurs during flight operations (including rotor strike), the flight crew will advise the aerial supervision on scene or helibase as soon as possible.
- There was a communications breakdown – call-out criteria for safe operations (horizontal vs. vertical), although the crew engaged in what could be considered a 'pre-descent briefing', there was a misunderstanding regarding the desired call-outs.
- Challenge and Response Techniques should be utilized to assure a fail safe Crew Resource Management environment. One possible way to prevent this mis-understanding from occurring when in close proximity to a known hazard is by: Use part of the US Coast Guard model of calling out distance above and laterally from obstacles, essentially each time a clearance is called out, it is followed by what is being measured, for example: vertical clearance is called "20 above" and is followed by a lateral "30 right".
- Always use 100% percent of your experience when making operational decisions, in order to prevent you from having to operate at 100% of your ability.



### External Load Operations.

Landing zone rotor clearance standards for external load operations where aircraft must descend below any obstacles/barriers.

1. The performance of external load missions must be contingent upon proper assessment and
2. preparation of the delivery site by first removing and mitigating hazards.
3. The selection of dip/snorkel sites may require concurrence of agency personnel such as resource advisors. While it may not be feasible to approve every dipsite, check first.
4. In areas of sloping terrain or with obstacles rising to one or more sides of the cargo pickup/delivery area, or dipsite, the pilot shall maintain rotor clearance from all obstacles equivalent to the IHOG Chart 8-1 landing area safety circle requirements. When specified clearance cannot be maintained, the pilot shall decline the mission until hazards are removed, additional line can be added or a better location can be identified.
5. The safety circle is generally recognized as 1 ½ times the rotor diameter.
6. When obstacles present a risk of contact with aircraft or rotor blades, the pilot should decline the mission until hazards are removed, additional line can be added, or a better location can be identified. Pilots have the final say in accepting and/or denying any mission.
7. If the helicopter is within ½ rotor diameter of the highest obstacle, the pilot should consider adding another length of line.

All questions can be addressed to: Yolanda R. Saldana, Pacific Southwest Aviation Safety Manager





# Main Rotor Blade Strike Reference Map

