

Logger Killed by Log during Helicopter Logging Operation in Washington State

Investigation: #99WA01101

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SUMMARY

On March 3, 1999, a 42 -year-old logger died when he was struck by a log at a helicopter logging landing site. The victim was assisting the loader operator by bucking and limbing logs at the log loading area, which was adjacent to the drop zone, when a turn of logs was brought into the landing by a helicopter. The victim left the log loading area and ran towards the drop zone to help with the turn. When the helicopter released the logs from its suspended hook, a tagged out choker hung up on one side of the double hook. Within seconds after it had hung up, the choker released, dropping a large Douglas fir log, which struck the ground, then the victim on the head. First aid and CPR were given to the victim immediately. The victim was airlifted to a local medical facility but he died in flight.

To prevent future similar occurrences, the Washington Fatality Assessment & Control Evaluation (FACE) Investigative team concluded that persons working in the logging and helicopter logging industry should follow these guidelines and requirements:

- **All ground personnel need to be in a safe zone when a helicopter approaches with a turn, until the chokers have been released from the remote controlled hook and the helicopter has left the landing's drop zone.**
- **After a turn has been dropped, chasers and other personnel must wait for the logs to settle before entering the drop zone.**
- **Consider using an audible and/or visual alarm system to establish an all clear signal to notify ground personnel that it is safe to enter the drop zone.**
- **Landings should be constructed to ensure that there are safe distances between people and support operations taking place near the drop zone.**
- **Consider conducting a research or engineering study on possible hook failure mechanisms.**
- **Proper personal protective equipment (PPE) needs to be worn by all ground crew personnel.**

INTRODUCTION

On March 3, 1999, the Washington FACE Program was notified by WISHA*, of the death of a 42-year-old logger in western Washington, earlier that day. The Washington FACE Field Investigators met with the WISHA enforcement representatives for the region in which the fatal event occurred. The WA FACE team then traveled to the event site with the enforcement inspector where they met with the representatives of the helicopter logging company involved in the event. Later in the investigation, the Washington FACE team also met with a Federal Aviation Administration (FAA) investigator and an insurance company representative who were also investigating the event.

The company involved in the event had a contract to conduct helicopter logging in a western Washington forest. They were into their second day of logging, of what was scheduled to be a three or four day operation. The event site was an area in the forest that had been cleared of trees and was being used as a drop zone and log loading area for the helicopter logging operation.

The drop zone and log loading areas were adjacent to one another. After the logs were dropped by the helicopter, a loader operator would move the logs from the drop zone to the loading area to prepare them for hauling.

The helicopter logging company had been in business for over 40 years and has over 500 employees in the US and has other affiliated operations outside the US with an additional 200 employees. The company employed a person to oversee their operations' health and safety processes and health and safety training on a full-time basis.

The company had a safety committee that met on a regular basis. They also held daily crew briefings at their job site. The company had written job descriptions that outlined the duties of each of its employees. They also had written job hazard analyses of each job, which outlined specific hazards and preventive safety measures.

The victim in this event was a 42-year-old male logger who was working as a knot bumper on the day of the event. His primary duties were to use a chain saw to cut branches, and if needed, cut (buck) logs, that were brought to the loading area, to the appropriate size and prepare them for hauling. The victim had been a logger for several years and had worked on the ground crew for this helicopter logging company on and off for about seven years.

The helicopter logging company indicated that the victim had received "retraining" the previous year on safety processes for workers involved with helicopter logging, including the position of knot bumper and issues related to drop zone safety.

On the morning of March 3, 1999, the victim was struck on the head by a log at the logging operation's landing site and suffered multiple serious injuries. The victim died of his injuries while being transported by helicopter to a local medical facility.

INVESTIGATION

On March 3, 1999, a Wednesday morning, the victim was working at a helicopter logging site in western Washington. The victim's employer, a commercial helicopter operations company, was harvesting a timber sale, on contract, in an area forest. The logging operation was expected to take approximately three to four days for completion. They were into late morning of the second day when the event took place.

The event site, the landing, was a clearing in the forest used as a drop zone with an adjacent log loading area (see [Figure 1](#)). Surrounding the landing were designated safe zones. Safe zones are areas where logging support activities can take place, at a safe distance from the drop zone and log loading area. The safe zones are also out of the way of the flight path of the helicopter.

On that Wednesday morning, the logging operations started their second day of helilogging activities at approximately 7:00 AM. The crew briefing was held and issues related to the day's activities were reviewed. There were 25 people working the logging site and there were 10 people working around the landing area.

The victim worked as a knot bumper and assisted the loader operator in the log loading area. The victim's job as a knot bumper was to clear branches and knot ends from the logs at the loading area and buck the logs to size for hauling, as needed.

The weather that morning was wet with intermittent rain and snow showers. The temperature varied from the high 20's (°F) to the mid 30's (°F). The helicopter was operating under VFR** (Visual Flight Rules) conditions at the time of the event. All of the investigators reviewing this fatality, including the FAA investigator, indicated that the weather was not a principle factor in this event.

The helicopter involved in this event was a Sikorsky S-64E Airplane with a maximum external load capacity of 20,000 lbs (see [Photograph 1](#) for similar unit).

At approximately 11:15 on the morning of the event, the helicopter was in route to the landing to drop a large turn***. The turn was either the first or second turn in the helicopter's second fuel cycle that morning. A fuel cycle is the length of time the helicopter can fly turns per load of fuel.

The turn that was being delivered by the helicopter was a multiple tag of chokers and logs that were in a "christmas tree" type of suspended external load. The chokers were attached to a double hook under the helicopter, designated as the red & white hooks ([Photograph 2](#)), which could carry multiple lines attached to each hook. In this event the helicopter was carrying an unbalanced load, where there were more tagged logs on the red hook side than on the white hook.

As the helicopter flew in the turn and was positioned to make the drop at the landing, the white hook tag string extended beyond the landing area with the trailing logs lying off the southeast end of the landing. The top logs on the white hook string and the logs from the red hook were located near the sorting, loading and coiling area of the landing.

When the helicopter, being flown by the pilot, was in position to make the drop, the double hook was tripped by the co-pilot to release the chokers. The helicopter prepared to depart and head out for another turn when the pilots felt the helicopter pitch forward. The pilots recognized that one of the chokers had failed to release from one side of the hook.

A tagged out choker containing a bonus of a large fir and small pole log, had hung up on the white side of the hook. As one of the helicopter pilots was preparing to activate the manual release, which is the secondary hook release mechanism, the hook released the load on its own.

Within moments, the tagged line released from the hook, dropping the logs close to the victim, who was now in the drop zone. Witnesses to the event stated that the fir log involved in the event was at a 40-60 degree angle with the ground just prior to the choker falling free from the hook.

According to members of the helicopter operation's ground crew, just as the logs were released from the hook, the victim ran out from under the boom of the loader at the log loading area and headed toward the dropped logs at the landing. This was not the normal access point to enter the drop zone to unhook logs, according to the employer and the victim's co-workers ([Photograph 3](#)).

When the large fir log released from the hook, it pivoted toward the loader, and struck the ground and then the victim in the head. Members of the landing crew who had witnessed the event immediately rushed to the victim and started first aid and CPR.

This logging company was well prepared to address emergency situations with on-site personnel having training and certification in CPR and first aid. They recognized the severity of the injury and contacted a local emergency medical facility, describing the victim's injuries and informing them that they would be airlifting the victim to their facility using the company's support helicopter (The emergency medical facility had been pre-identified as part of their helicopter logging site emergency plan.). The victim died while in transport to the hospital.

The hook involved in the event had been tested earlier during the morning of the event as part of the daily check conducted by the helicopter logging crew. The hook and release mechanisms worked properly during the test. After the event, an inspection of the hook and the hook release mechanisms was conducted and were found to be working properly. The inspection did not provide clues as to why the choker had hesitated to release from the hook.

CAUSE OF DEATH

The medical examiner listed the cause of death due to or as a consequence of blunt force injury to the head, chest, and abdomen.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: All ground personnel need to be in a safe zone when a helicopter approaches with a turn, until the chokers have been released from the remote controlled hook and the helicopter has left the landing's drop zone.

Discussion: Helicopter logging has long been recognized as a fast paced and hazardous business. There have been numerous fatalities in the industry killing both helicopter and/or ground crew members.

Adherence to specific health and safety requirements and guidelines is extremely important in preventing injury and death in logging operations. Slight deviations in safe logging practices or errors in judgment can and have led to disastrous consequences, such as what happened in this helicopter logging fatality.

It is the responsibility of the employer to ensure that definitive, clear directions and instruction are given to their workers regarding the safe performance of their duties while working at a helicopter logging site. Safe areas or safe zones need to be identified and established when developing the log landing site. Loggers need to be trained and educated in the appropriate safe practices of working around or at a landing.

In this event, the victim left the loading area, the safe area where he was working, and ran toward the drop zone where he was struck by a log. The victim's duties were to work as a knot bumper in the log loading area. According to the employer, the victim was not asked to perform the duties of a chaser or assist the chasers in the drop zone.

Safe zones are specifically designed and located around the landing to provide safe areas for ground personnel to work. These zones should be designed so that workers are not exposed to the hazards of the log landing area, the helicopter flight path, and the drop zone. Safe zones also provide protection in the event that the helicopter experiences an emergency and must set down at the landing. The distance between the drop zone and the safe zones need to be at least 1½ times the length of the longest log being landed. If shorter logs are being landed, additional distance is needed so ground personnel will be "in the clear". This is because the workers need to be clear of the helicopter regardless of the size of the logs and keep a safe distance from the suspended and dropped logs in case of unanticipated movement of the logs. It is important that ground personnel not enter the drop zone until the helicopter has released its load, the logs have settled, and the helicopter has left the air space above the landing.

Prior to each day's operation, a briefing with the pilots and ground crew must be conducted to establish the plan of operation for that day's activity. The briefing should define tasks and responsibilities of the team and also define what to do in non-routine situations, such as a hook failure. The briefing should also review emergency procedures.

The employer needs to establish controls, processes, and practices that state the work rules for a helicopter landing site. The work rules should be strictly enforced to prevent serious injury events like the one that happened at this landing site.

Recommendation #2: After a turn has been dropped, chasers and other personnel must wait for the logs to settle before entering the drop zone.

Discussion: One of the recognized hazards in both conventional and helicopter logging is the exposure to falling/shifting logs while they are being harvested, transported, or processed. According to National Institute of Occupational Safety and Health (NIOSH)¹, the leading cause of death in the logging industry is from being struck by falling or rolling logs, limbs and branches. These account for about 60% of all logging fatalities. The Bureau of Labor Statistics (BLS)² in a 1984 study indicated that the second leading "location" for injuries in the logging industry occurs at the "landing" site.

In this event, the victim left his work area, the log loading area, and ran to the drop zone, just as a turn was being dropped by a helicopter. One of the tagged chokers hung up momentarily and did not release from the hook. When the choker did release, the log from that choker bounced on the ground then struck and critically injured the victim.

It is not known why the victim ran into the drop zone to help unhook the turn. His job did not require him to enter the drop zone, though he was an experienced chaser and was familiar with that part of the logging operation. One hypothesis is that he may have been waiting for more logs to limb or buck in his job and was trying to help move the drop zone process along. Flying in turns by helicopter is a fast paced operation and it is important to clear the drop zone as soon as possible so logs don't pile up and create processing delays and thus other hazards. Time is money in the helicopter logging business, as it is expensive to keep a helicopter in the air and there are many incentives for workers to perform their jobs quickly and to help each other as a team.

The chaser's duties are to unhook chokers once they have been landed so they can be moved to the loading area (i.e. loading deck) and to get the chokers ready to be returned out into the field for the new turns to be flown in. It is imperative that all ground personnel remain in a safe area until the drop has been completed, the helicopter has left the landing and the logs have stabilized and are settled on the ground. The Helicopter Association International has developed guidelines³ for the integration of ground and flight activities that state that ground personnel should allow "logs to settle before removing chokers and be watchful because logs may roll..."

The company involved in this fatal event also had guidelines that specifically addressed expected activity related to a turn being delivered to the landing. Their guidelines apply to all ground personnel working around the landing and specifically for the chaser, knot bumper and loader operator positions. Instructions for the chasers and the knot bumpers in the guidelines state, "Watch all turns coming into the landing. Do not turn your back to the turn until all chokers release from the hook and the hook has left the landing." When interviewed, ground crew personnel, including the chasers and loader operator at the site, were all very familiar with these landing operations safety guidelines.

With any logging operation, it is very important that the logging plan be discussed with all of the crew before it is implemented. The employer must ensure that there is effective supervision and clear instruction in the safe performance of their employee's job duties. The company and

supervisors need to be clear on who is responsible for the various site activities, and how they coordinate those activities within the team framework. The instruction needs to define where the safe zones are located and how they are set up. The instruction must also include the importance of being in a safe zone when a helicopter is approaching with a turn until the logs have been clearly released from the remote hook and have settled.

The employer needs to ensure that all employees have been trained in external load helicopter logging operations. A thorough understanding of safe landing procedures must be established with the pilots, chasers and other workers who may enter the landing, such as the knot bumper and loader operator.

Recommendation #3: Consider using an audible and/or visual alarm system to establish an all clear signal to notify ground personnel that it is safe to enter the drop zone.

Discussion: The logging industry uses a variety of signaling methods and devices during the harvesting, transporting, and processing of logs. The signaling methods are both audible and visual means to convey a multitude of messages to co-workers in the sometimes loud and spread out work environment.

Hand and audible signals used in yarding and loading operations are some examples of communication methods used in the logging industry. Examples of some signals are different whistle blows to request specific individuals to come to the yarding site such as a foreman or a rigger. The signals can also inform the logger of a fire, an emergency hazard condition or if someone has been injured. Helicopter logging operations use a combination of both radio and hand signals.

Logging can be a very noisy and fast paced work activity. The noise and pace of the operation is even more heightened when a helicopter is carrying logs to the landing. When conducting helicopter logging, it is critical to have a good communication system in place in order to have an effective, productive, and safe operation. The employer should discuss and review with the air and ground crews, the communication and signaling system to be used.

Two-way radios are the primary communication devices used in helicopter logging. All ground crew personnel involved in the logging operation should know how to use the radio system. Many radios today have "hands free" capability, with an earpiece and collar mounted speaker-microphone or can be self-contained in a combination earpiece/speaker headset, to allow workers to have their hands free to perform their work activities. In addition to the use of two-way radios, an effective system of hand signals should be in place and be known by the ground crew and pilots. Hand signals not only compliment radio communication but also provide a back up communication method in the event of a radio failure. Helicopters are also equipped with a warning siren that can be activated to signal an emergency that might be occurring. This could have been activated during this event to warn the ground crew of a potential mishap.

In this event, during the routine landing of a turn, a choker hung up on the hook and a ground crew worker was killed when he entered the drop zone before a large fir log was stable on the ground.

To help prevent future events of this type, it is recommended that a plan of action be developed which includes a landing communication process that would use both radio and hand signals, to clearly inform workers when it is safe or not safe to enter the drop zone. One person on the ground should be designated to provide the communication coordination between the pilots and the ground crew.

When a turn enters the landing, it becomes the work area for the chaser. The lead chaser along with the pilot, are responsible for ensuring that the turn is landed properly and the load has stabilized on the ground prior to unhooking. The lead chaser should work with the loader operator to help clear the landing and get the logs moved to the loading deck.

Precise voice commands and hand signals should be established to avoid any misunderstandings, and all communication should be pertinent and brief defining what activity or action is to be taken. If each member of the landing crew were equipped with a radio, including the loader operator and the knot bumper, they could hear and wait for, an "all clear" signal before entering the landing. There should be routine and continual communication between the pilot and the ground crew signal person (i.e. lead chaser), as turns are landed.

Since there often are no marked boundaries that specifically delineate the landing area safe zones, no barriers or restrictions or hazard warning tape defining the landing work areas, it becomes more important to have a communication system that effectively helps coordinate the activities at the landing. To assist in this, employees should follow the company's policy of the log loader, knot bumper, and chasers stopping work and waiting for the turn to come in, the logs dropped and settled, and the helicopter has left the area. This also requires enforcement from company management.

The coordination between the helicopter pilots and the ground crew in helicopter logging has little margin for error due to the fast paced nature of the operation. It is time well spent to closely review all areas of the operation and to eliminate any potential for misunderstanding or a lack of understanding of how the various logging crews and job functions are going to coordinate the various landing processes. A good communication system would help ensure a safe operation.

Recommendation #4: Landings should be constructed to ensure that there are safe distances between people and support operations taking place near the drop zone.

Discussion: In the process of helicopter logging, the landing is probably the most active area in the operation. Turns can be cycled into the landing every 3 to 5 minutes. Because the landing is such an active part of the process, it is important that the landing be properly planned and laid out and support activities associated with it be clearly outlined. The drop zone in the landing

needs clear separation from the work areas surrounding it and needs to be situated so the workers are not endangered by turns being landed.

In planning the landing, the position of the ground crew needs to be set up in a safe location. The landing needs to be of sufficient size to safely drop the longest logs and be large enough to allow for the safe movement of workers and equipment working in, and around the landing.

At the event site landing, the distance between the point of impact where the victim was struck by the tree and the log loading area was about 40 feet. The distance from the mechanical loader to the point of impact, was approximately 17 feet. The distance from the chaser's safe zone to the point of impact was approximately 70 feet.

On the morning of the fatal event, the victim ran into the drop zone from under the boom of the loader. Traveling from behind the loader, as he did, may have prevented the victim from clearly seeing the choker hang up on the hook. It was noted by the victim's coworkers that this was not the usual or expected path to take to unhook turns at the landing.

One consideration in the development of a landing drop zone, is to consider the landing crew's line of vision to the drop zone. In this case the chasers located in a safe zone along the edge of the landing were positioned so that they clearly saw the choker hang up on the hook as the helicopter was dropping its turn. The victim coming from the loading area may not have seen this.

In examining the distance between the drop zone and the safe zone, it appears that the drop was set up too close to the loading area's safe zone. It appears as if the pilot may have been trying to land the turns as close to the chasers and loading area as possible in order to save time clearing the drop zone for the next turn.

The turn involved in the fatal event was large, with several of its logs extending beyond the landing. With the logs located off the landing, it would make it more difficult for the ground crew to clear the landing and get out of the way before the next turn.

Recently Washington State removed the requirement in WAC 296-54-559, Standards for Logging Operations⁴, which had stated that the drop zone shall be not less than 125 feet from the loading or decking area. The current standard requires that "The landing drop zone must be large enough for the longest logs to be landed without endangering the landing crew".

If the logs had been dropped further from the loading area, then it is possible that the fatal log would have settled on the ground prior to the victim being able to reach that spot and a near hit (i.e. near miss) might have been the result instead of a fatality.

Recommendation 5: Consider conducting a research or engineering study on possible hook failure mechanisms.

Discussion: A remotely actuated hook is a key piece of equipment used in helicopter logging operations. The hook involved with this fatality failed or more accurately the choker hung up on the hook during the release process. It appeared, via the fatality investigation, that the hook release device activated properly but for some unknown reason, the choker failed to release from the hook. The hook was inspected in the field after the event and it performed the way it was designed with both the electrical and manual release mechanisms working with no apparent problems noted.

A few weeks after the event, the hook was totally taken apart at the helicopter operation's facility and underwent a complete internal physical inspection and overhaul. There were no signs of unusual wear or damage to the hook. There was no sign of debris that might have gotten into the mechanism causing it to fail. The hook was found to be in excellent working condition with no indications as to why the load hung up on the hook.

The remote hook is operated by a primary control mechanism, an electrically activated switch, controlled by the non-flying helicopter pilot, who sits in the load control area of the helicopter. The remote hook can also be manually activated in the event the electrical control is not working. On occasion, if both the electrical release and the manual release fail to disengage the load, then the ground crew can be called upon, using very specific guidelines, to manually release the chokers from the hook. This maneuver can only be done with the hook on the ground or eye-level, which ever is safer.

During the investigation, the logging crew working the site informed us that periodically chokers would hang up during the operation. When this occurred, the load would momentary hang up, and then release, as it did in this event. At no time during the day and a half that they were logging at the site, did the hook entirely fail to release.

Although the hook was inspected in the field immediately after the event and at the helicopter company's facility, it was not examined under load. At the time of the inspection, the FACE field investigator recommended that research be conducted related to various stress factors that are applied to the hook under load.

The hook is designed to facilitate the release of a load in a vertical or near vertical position. The following are questions that should be answered to better understand the potential failure mechanism that occurred in this event.

1. How does the hook operate under various load stressors?
2. What happens with different load configurations?
3. Does having a double hook affect the ability to release loads?
4. How does the hook function when the helicopter is traveling in a forward motion with the load under tailing conditions?
5. What happens when the load applies unequal stress in opposite directions on the hook?

These load stresses may have occurred during the fatal event when the chokers briefly hung up on the hook and failed to immediately release.

The hook should be tested under a variety of dynamic and static load conditions. Through the tests, it may be possible to learn the conditions and limitations of the hook system. The lessons learned should then be transferred to either a redesign of the hook system and/or to better load management practices to prevent hook hang ups in the field.

Recommendation #6: Proper personal protective equipment (PPE) needs to be worn by all ground crew.

Discussion: There is little question that the use of personal protective equipment is an important element in logging safety. The hazards of logging are well known and documented. Personal protective equipment can provide a level of safety that can make a difference between injury and a glancing blow with no injury. Although personal protective equipment is the lowest level of prevention methodology in the hierarchy of controls, PPE still has a valuable role to play in an employer's health and safety process.

In order for personal protective equipment to play a role in injury prevention, an employer must ensure that the right type of PPE for the job is selected and used, and the use of PPE must be supervised and enforced. In general, PPE that is used in the logging industry includes items such as, high visibility hard hats with chin straps, high visibility vests, hearing protection, logging boots, gloves, goggles, safety glasses, face shields, and leg protectors.

The victim in this event, working as a knot bumper, ran out of the loading area adjacent to the drop zone, and was apparently going to help the chasers with a turn that was being landed. It was noted by witnesses that he ran into the landing with his head down, holding on to his hard hat. He was subsequently struck and killed by a log that had hung up momentarily on the helicopter hook.

There are two questions potentially related to the appropriate choice of PPE.

1. Why was he not looking at the turn as he ran towards it? and
2. Why was he holding on to his hard hat?

We may never know the answers to these questions but it may be that the answers lie in the types of personal protective equipment the victim was wearing.

The victim was wearing a hard hat with a winter liner that was attached to the hard hat by Velcro, but did not have a chin strap. This would help keep the liner in place but may not keep the hard hat on if it were subject to wind and helicopter rotor wash. Given the strong rotor wash the victim would have experienced in this area, he was probably trying to keep the wind and debris out of his eyes and hardhat on his head.

A chinstrap should have been used, such as those worn by construction workers, the military, as well as loggers to keep their hardhats and helmets on during their rigorous activities, including the loading and unloading of helicopters. A chinstrap for his hardhat would have kept it on his head.

If the victim had worn goggles or a combination of a face shield and safety glasses he may have been able to look more directly at the turn, to observe the logs being dropped. He then might have seen that the choker had hung up on the hook and had waited until it was safe to enter the drop zone.

Forestry work has long been recognized as a hazardous profession. Mechanization has changed and improved safety in some aspects of the industry but it has also introduced new hazards. The risk of serious injury and death remains high for forest industry workers even with the introduction of new technology.

Helicopter logging is relatively expensive compared to conventional logging techniques especially when considering the up-front costs (Many aspects of helicopter logging can balance costs when dealing with environmental issues, road building, soil damage and riparian impacts.). Because of costs however, there can be a great deal of pressure on employees to work quickly to process the logs in the most cost effective manner.

Helicopter logging can be performed safely but it needs to be a well coordinated operation where safety processes and practices are followed closely by both employees and management.

Acknowledgments

In conducting the Helicopter Logging Fatality Investigation, the Washington State FACE Investigation Program requested that the contents of this report be reviewed by key representatives from labor, the logging industry, private consultants and Washington State and Federal agencies, prior to its publication.

Though we are not able to acknowledge specific individuals for their invaluable input into this document, we would like to recognize the following for their help and support to the FACE process:

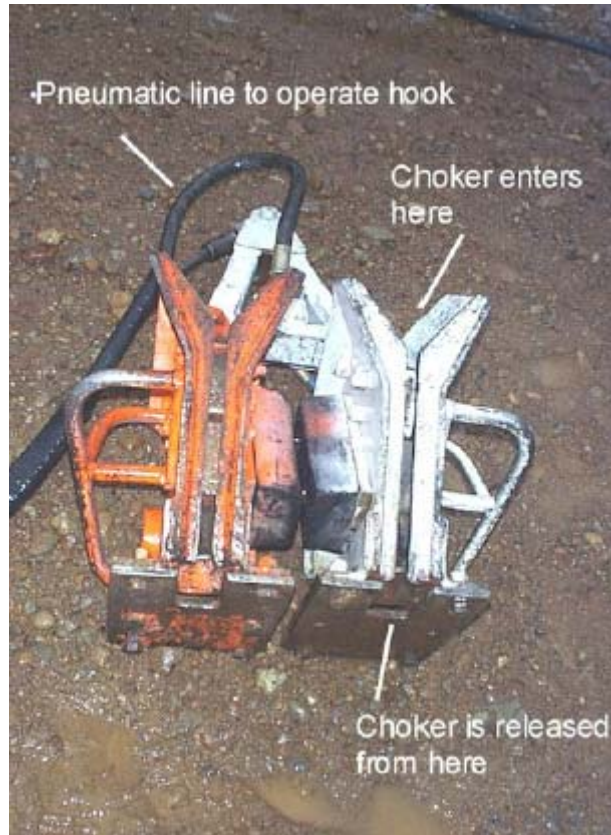
- The Employer involved in the incident
- WISHA enforcement
- WISHA policy & technical services staff
- Federal Face Program Management (NIOSH)
- Alaska Field Station (NIOSH)
- Washington Contract Loggers Association
- Helicopter Logging Safety Committee

- Safety & Health Assessment & Research for Prevention (SHARP)
- Washington State Attorney Generals Office



Photograph 1. Helicopter similar to that used in this event.

(Source: <http://www.foresters.org/photos/helicopter.htm>)



Photograph 2. The hook used in the fatal event.



Photograph 3. The event site and log that struck the worker.

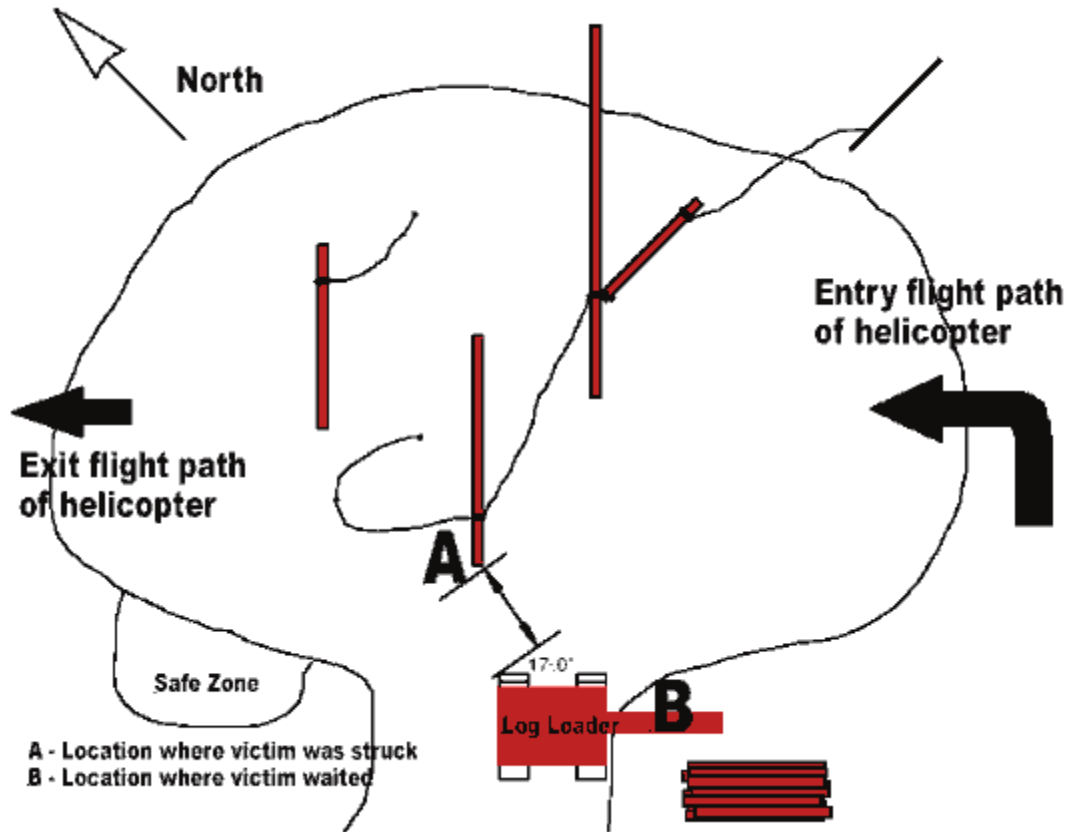


Figure 1. Layout of the drop zone and log loading area.

* Washington Industrial Safety and Health Act (WISHA) which is the OSHA State Plan program in Washington State.

** Visual Flight Rules define the aircraft operating guidelines given the meteorological conditions within the flight area. For helicopters to be operating in VFR conditions and at less than 1,000 feet above ground level during the day, the flight visibility has to be greater than one mile and the helicopter has to be operated clear of clouds.

*** A turn is defined as a log or a group of logs that are attached by chokers, connected to a hook from the helicopter. The logs are transported from the location where the logs were felled and then dropped at the landing by helicopter.

Appendix

Applicable Regulations

In reviewing the WISHA standards, there are defined requirements that deal with helicopter logging/log landing operations. Although the investigation of this incident was not regulatory in nature, we offer the following code requirements for information and reference purposes. This is not intended to be a complete list of regulatory guidelines that address these issues:

Prior to daily logging operations, a briefing must be conducted. The briefing must set forth the plan of operation for the pilot(s) and ground personnel. Anytime a change in operating procedure is necessary, affected personnel must be notified.

WAC 296- 54-581 (1)

Employees and equipment must remain in the clear and employees must never be under a suspended load.

WAC 296- 296-54-581 (2)

The location of the drop zone, decking areas, loading areas, and designated safety zones must be established by a pilot and a responsible supervisor taking into consideration current operating conditions.

WAC 296- 296-54-581 (4)

Employees must wear high visibility hard hats secured by a chinstrap.

WAC 296- 296-54-581 (5) (a)

There must be reliable communication available between the helicopter, woods crew, landing, and service areas. In the absence of radio communication there must be a designated signal person.

WAC 296- 296-54-581(8)

The landing drop zone must be large enough for the longest logs to be landed without endangering the landing crew.

WAC 296- 296-54-58110 (1)

Landing crew must remain in the clear until the load is placed flat on the ground and chokers are released from the hook.

WAC 296- 296-54-58110 (2)

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