

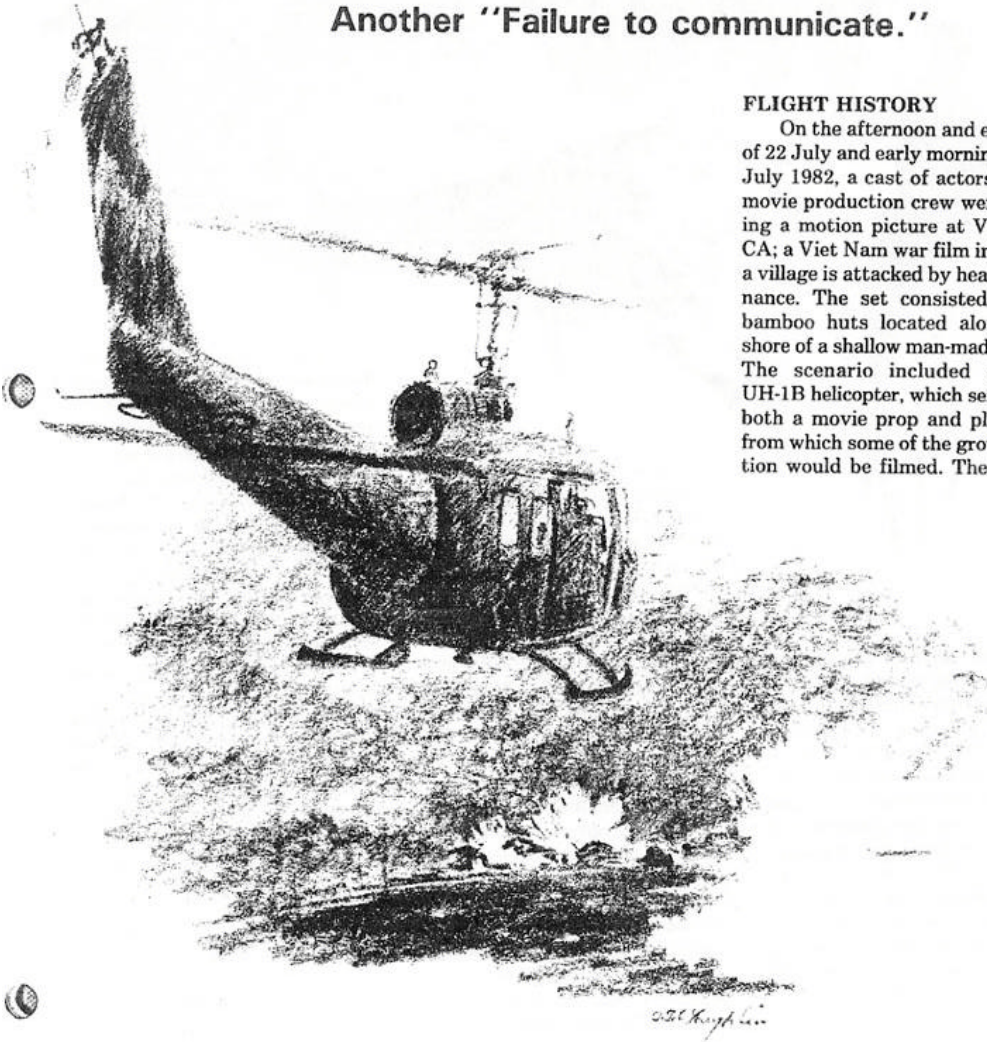
Mishap With A Moral

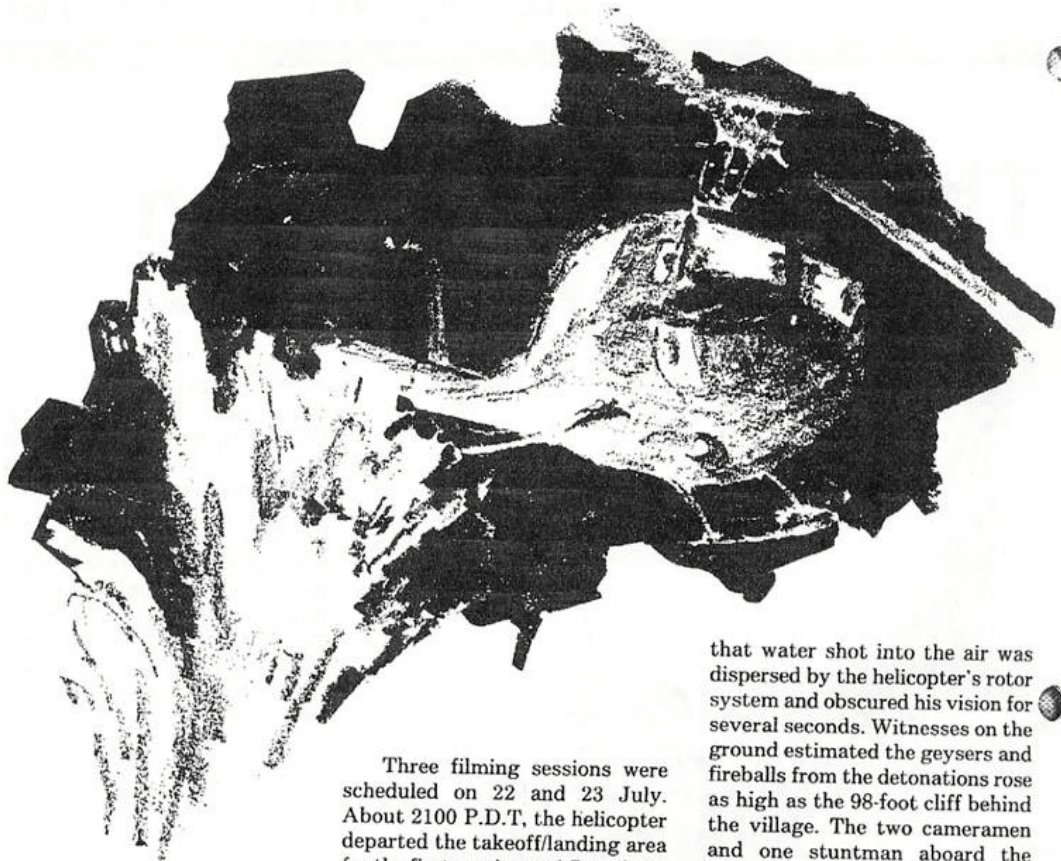
The Cost of Illusion

Another "Failure to communicate."

FLIGHT HISTORY

On the afternoon and evening of 22 July and early morning of 23 July 1982, a cast of actors and a movie production crew were filming a motion picture at Valencia CA; a Viet Nam war film in which a village is attacked by heavy ordnance. The set consisted of 11 bamboo huts located along the shore of a shallow man-made river. The scenario included a Bell UH-1B helicopter, which served as both a movie prop and platform from which some of the ground action would be filmed. The movie





production required the detonation of special effects explosive devices prepositioned on the ground to simulate the attack.

The film director was in charge of the filming sequence. He determined the desired effects and discussed these and placement of explosives with the special effects coordinator. The coordinator, in turn, instructed special effects technicians on the placement of explosive devices. During filming, the technicians detonated the devices on cue from the coordinator.

Three filming sessions were scheduled on 22 and 23 July. About 2100 P.D.T, the helicopter departed the takeoff/landing area for the first session and flew about 600 feet east to the movie set. The helicopter was used as a camera platform during this session, hovering above the set while filming the ground scene. Special effects devices were detonated to simulate the ordnance as specified in the script. At the end of the scene, the helicopter returned to the takeoff/landing area.

The helicopter returned to the set about 2330 for the second filming session. During this flight, the pilot hovered the helicopter over the set while more special effects explosives were added. One device in the water detonated while the helicopter was almost directly above it. The pilot noted afterward

that water shot into the air was dispersed by the helicopter's rotor system and obscured his vision for several seconds. Witnesses on the ground estimated the geysers and fireballs from the detonations rose as high as the 98-foot cliff behind the village. The two cameramen and one stuntman aboard the helicopter stated, during post-accident interviews, they were concerned about the exposure of the helicopter to the heat generated by detonations during this filming session.

At the postflight debriefing following the 2330 filming session, the helicopter pilot talked to the director about the unexpected eruption of water and further related his concern to the unit production manager (UPM) regarding the potential hazard caused by debris from the explosions. The UPM, who had been aboard the helicopter during the second filming session, assured the pilot he would advise the film director. Filming activity was sus-

pended about 2345 for a one-hour break. When the UPM returned he assured the pilot that the helicopter would remain over water and there would be nothing to be concerned about.

Preparations for the third filming session resumed. The script required an adult actor to carry two children from the village and wade across the river while special effects devices detonated. The helicopter would hover above the river and make a 180-degree left turn to provide the appropriate camera angle. The scene would be filmed from cameras both on the ground and in the helicopter. Two stuntmen aboard the helicopter would fire blank rounds from machine guns on both sides of the craft. The script called for total destruction of the village by explosives while the helicopter remained over the north shore of the river. A rehearsal of the scene would be held before the final filming.

Before the rehearsal, the helicopter pilot walked through the movie set to review the scenario. He personally checked security of the cardboard and palm roofs of the village huts. He was concerned the helicopter rotor downwash might dislodge these roofs and cause them to be swept up into the rotor system. The pilot did not receive, nor did he actively seek, any information from the coordinator or the UPM regarding the sequence, timing, or positioning of special effects explosions. He relayed to the coordinator that "as long as debris is not allowed to enter the rotor system and nothing is set off under the helicopter, it doesn't matter which structures you have rigged for a firebomb." During interviews conducted by the Safety Board following the accident, the UPM indicated he had assured the pilot the helicopter would not be over any explosive devices during the filming sequence.

About 0200 on the 23d, the pilot flew the helicopter to the movie set to participate in a rehearsal of the scene. The helicopter was initially positioned about 40 feet above the center of the river. There were no burst simulators detonated during the rehearsal. The turbulence generated by the helicopter rotor system during its left turn obscured visibility to the extent that one of the technicians obtained a welder's hood to protect his eyes. No other difficulties were noted.

About 0218, the helicopter took off again to film the scene. Onboard were the pilot, two stuntmen, the UPM, and two cameramen. The UPM sat in the left front seat to operate a spotlight; one cameraman was on the left side, and the two stuntmen with machine guns were positioned by the side doors. The other cameraman stood in the passenger compartment. According to the cameraman on the left side, the helicopter initially appeared to follow the same route as it had during rehearsal. When the helicopter passed over the dam, the cameraman climbed out on the left skid. He realized the helicopter was much lower than it had been during rehearsal and was over the village on the south shore rather than near the center of the river. The cameraman on the north shore of the river stated the helicopter arrived over the sampan area at a height of about 40 feet. As the helicopter hovered, the director shouted commands through a megaphone, which included a command for the helicopter to "get lower." The director later stated he did not recall having given that command. According to the assistant director, who had a VHF communications radio and was standing near the director, the director asked for the helicopter to descend. Later, the assistant director could not recall having trans-

mitted the directions to descend to the UPM, and the UPM could not recall having received the directions. The pilot stated that after arriving over the set at 60-70 feet, he descended to align his main rotor with a strata line on the adjacent cliff at a height of about 35 feet. He then heard directions over VHF to descend. A review of film from the camera on the north shore showed that after the helicopter descended and stabilized in a hover, the special effects charges began to explode.

After three explosions, the helicopter began a level left turn to permit the cameraman on the left skid to film actors as they waded across the river. A fourth special effects device detonated and followed less than 0.1 second later by a fifth detonation. As the fifth device detonated, a column of gasoline and sawdust mixture raised and erupted into a fireball which engulfed the tail section of the helicopter.

The helicopter stopped the left turn and stabilized on a magnetic heading of about 009-degrees for less than 1 second. The helicopter then began a right ascending turn until it left the film frame. About 2 seconds later, the helicopter reappeared in the film frame in about a 20-degree tail down attitude and continued turning to the right and descending. The tail rotor assembly was missing. The helicopter crashed on the north side of the river in a "noseup" 45-degree left bank attitude, while still turning to the right. The helicopters' main rotor blades continued to turn and struck the adult actor and the two children.

The special effects coordinator and technicians stated after the accident that radio communication was provided only between the coordinator and technician who detonated the first device. The other technicians were instructed to begin detonating their

explosives when they heard the machine guns aboard the helicopter begin to fire. Although the special effects coordinator stated each technician was responsible for ensuring his area was clear before firing his explosives, the technician who detonated the explosives nearest the helicopter stated the safety of the helicopter was not discussed. Nor was he made aware of the helicopters' proposed flight path. The technician also stated his vision was restricted by the welder's hood.

The helicopter came to rest on its left side on a magnetic heading of 345-degrees. The helicopter's structure, flight controls, and rotating assemblies, except the tail rotor assembly, remained intact. There was no evidence of any pre-existing malfunction or failure.

ANALYSIS

The Safety Board's investigation concentrated on those aspects of the accident which directly related to loss of control of the helicopter and its subsequent crash.

The investigation revealed clear evidence that control was lost following separation of the tail rotor assembly. The time of separation was evident in the sound frequency spectrum analysis of the audio tape of the accident sequence. The sound analysis distinctly showed a decay of the tail rotor rpm about 1.7 seconds after reversal of the helicopter's rotational left turn. This speed decay can be associated only with separation of the tail rotor assembly since there was no concurrent decay in main rotor or engine rpm.

Damage to, or separation of a portion of a tail rotor blade creates severe control problems. If tail rotor damage occurs at a high enough altitude, the pilot may be able to enter an autorotative descent (engine no longer driving the rotor system). However, in this

mishap, the pilot had neither time nor altitude to establish an autorotative descent. Consequently, when the tail rotor assembly separated, the helicopter was not controllable and a crash was inevitable.

Regardless of the specific damage to the tail rotor blades, which caused loss of the tail rotor assembly, the Safety Board finds damage was the direct consequence of the helicopter's close proximity to the detonation of special effects explosions. Specifically, detonation of the fourth and fifth devices caused the separation of the tail rotor assembly.

Although the Safety Board considers safety precautions taken by the motion picture industry during filming of stunts, combat scenes, or other dangerous activities beyond its investigative purview, it is concerned about events which led to exposure of the helicopter to the hazards of the explosions.

The pilot in command is ultimately responsible for safety of flight. None of the personnel involved, except the pilot, had knowledge of helicopters and their vulnerability to damage from debris and heat from special effects explosions. This should have prompted the pilot to initiate measures necessary to ensure the helicopter would be safely separated from the prepositioned special effects. These measures should have included, at a minimum, an insistence on a joint briefing between the director, pilot, and special effects technicians, as to the exact maneuver the helicopter would perform. They should have discussed timing of the maneuver and cueing of the detonations to the helicopter completing the left turn and moving across the river. Further, as an added precaution, the pilot should have insisted on direct radio communication with the technicians to keep them ap-

prised of his progress and to warn them in the event alterations of the intended maneuver became necessary. In this case, however, the crew did not discuss specific measures. Instead, the pilot relied on assurances from the UPM and special effects coordinator that nothing would explode beneath the helicopter. Additionally and apparently in response to commands from the director, the pilot modified the maneuver and flew lower over the surface of the river and closer to the huts than originally planned. The operation evidently lacked the precise planning and coordination needed to conduct it safely, particularly with changes in the scenario.

PROBABLE CAUSE

The National Transportation Safety Board determine the probable cause of the accident was detonation of debris-laden, high temperature and special effects explosions too near a low-flying helicopter. This led to separation of the tail rotor assembly and uncontrolled descent. The proximity of the helicopter to special effects explosions was due to failure to establish direct communications and coordination between the pilot in command and the film director in charge of the filming operation.

APPLICATION TO MAC

How often have you heard the words communication and coordination when people analyze aircraft mishaps? This incident was another case where everyone worked toward the same goal but failed to consider the needs of each individual involved in the effort. The degree of success an aircrew experiences in communicating with the remainder of the world directly affects not only crew safety but, as shown in this mishap, the safety of those on the ground as well.

Adapted from: NTSB/AAR-84-14