



Spatial Disorientation Blamed for Fatal Helicopter Accident in Poor Weather

After successfully completing a night nonprecision approach in instrument meteorological conditions to a rural airport, the pilot had apparently intended to proceed visually to a nearby helipad, the official accident report said.

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After boarding two company employees at another location, the twin-turboshaft Agusta A109C helicopter was returning to base at 1805 hours local time when it impacted a field less than a mile (1.6 kilometers) from Myerstown/Decks Airport near Richland, Pennsylvania, U.S. The pilot and two passengers were killed. The helicopter, which struck the ground in a near-vertical attitude, was destroyed in the Jan. 18, 1995, accident.

The U.S. National Transportation Safety Board (NTSB) determined that the probable causes of the accident were “the pilot’s improper in-flight planning/decision and failure to maintain control of the [helicopter] after becoming spatially disoriented. Factors related to the accident were darkness and adverse weather conditions.” The helicopter was owned and operated by Leffler Transportation Co., the NTSB report said.

The report said that instrument meteorological conditions (IMC) prevailed at the time of the accident and that an instrument flight rules (IFR) flight plan had been filed for the flight. The report said that the flight originated at approximately 1300 from the Leffler company helipad in Richland and was en route to another helipad located about 70 nautical miles (130 kilometers) northwest of Richland and about one mile west of Williamsport-Lycoming [Pennsylvania] Airport (IPT). The Leffler helipad is located about five kilometers (three miles) east of Myerstown/Decks Airport.

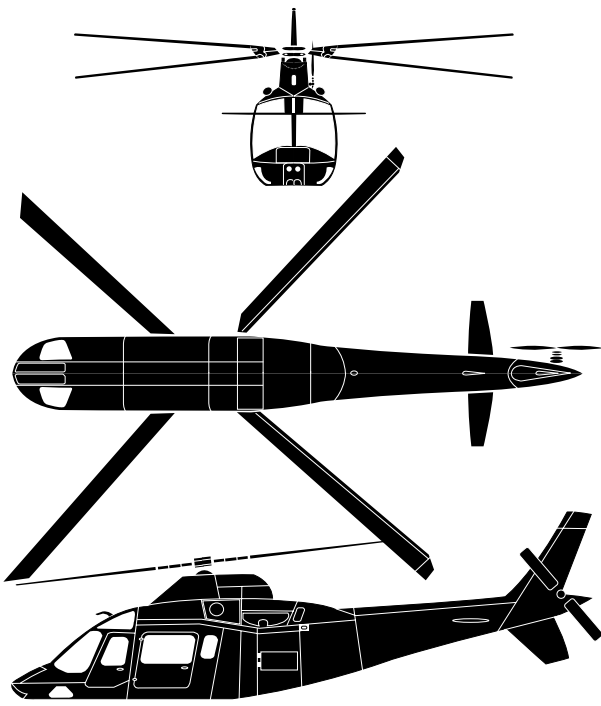
According to U.S. Federal Aviation Administration (FAA) air traffic control (ATC) records, initial contact was made with the accident helicopter at 1318 with the aircraft level at 4,000

feet (1,220 meters). At 1328, New York Air Route Traffic Control Center (ARTCC) cleared the accident helicopter direct to the Picture Rocks (PIX) nondirectional beacon (NDB), the final approach fix (FAF) for IPT.

Two minutes later, the helicopter was cleared to conduct the instrument landing system (ILS) Runway 27 approach to IPT. ARTCC then observed the helicopter turn away from the PIX beacon, and the “pilot complained of a bad signal from the radio beacon,” the report said. The helicopter was given a radar vector by New York ARTCC back toward the PIX NDB and the pilot then resumed his own navigation. At 1333, the helicopter flew over the PIX NDB and began a procedure turn. [The *Aeronautical Information Manual* defines “procedure turn” as “the maneuver prescribed when it is necessary to reverse direction to establish an aircraft on the intermediate approach segment or final approach course. The outbound course, direction of turn, distance within which the turn must be completed and minimum altitude are specified in the procedure. However, unless otherwise restricted, the point at which the turn may be commenced and the type and rate of turn are left to the discretion of the pilot.”]

Radar service was terminated and the helicopter was instructed to contact IPT Tower. Five minutes later, the helicopter reported to New York ARTCC crossing the PIX NDB inbound and was told to contact the tower.

“The pilot contacted the tower and continued the approach without further incident,” the report said. “At the completion of the approach, the helicopter proceeded to a helipad west of IPT.”



Agusta A109

The Agusta A109 high-speed, twin-engine helicopter first flew in 1971. The Italian-made Agusta is powered by two Allison turboshaft engines and has a gross weight of 2,720 kilograms (5,997 pounds). It has a service ceiling of 15,000 feet (4,572 meters), a maximum cruising speed of 152 knots (281 kilometers per hour) and a maximum range of 358 nautical miles (663 kilometers). The A109's cabin can accommodate seven passengers.

Source: *Jane's All the World's Aircraft*

At 1613, the Williamsport Automated Flight Service Station (AFSS) received a telephone call from the accident pilot, the report said. The pilot received an update on current weather conditions at Harrisburg-Olmstead (Pennsylvania, U.S.), Lancaster (Pennsylvania) and Reading (Pennsylvania) (MDT) airports, located near Myerstown/Decks Airport and his return destination, the Leffler helipad. The pilot then filed an IFR flight plan.

The report said that IPT tower received a radio call from the pilot at 1707 saying that he was ready to depart under visual flight rules (VFR) conditions from the helipad west of the airport. "The pilot stated that he would obtain his IFR clearance directly from New York ARTCC by radio when airborne," the report said.

The pilot contacted New York ARTCC at 1709 and requested the clearance. "When the New York controller asked [the pilot] if he could climb to 4,000 feet (1,220 meters) under VFR conditions, the pilot advised ARTCC that 1,800 feet (549 meters) was the highest he could climb. The New York

controller then informed [the pilot] that he could not issue an IFR clearance, and the pilot stated [that] he would return to IPT to 'pick it up.'"

The report said that IPT Tower cleared the helicopter to proceed back to the airport under special VFR. [The *Aeronautical Information Manual* defines special VFR operations as "aircraft operating in accordance with clearances within Class B, C, D and E surface areas in weather conditions less than the basic VFR weather minima. Such operations must be requested by the pilot and approved by ATC."] After returning to IPT, the helicopter received an IFR clearance from the tower and departed at 1727. The pilot contacted ARTCC and was then cleared to 6,000 feet (1,830 meters), the report said.

The pilot was then instructed to contact MDT approach control on another frequency. The MDT controller asked the pilot "what his on-course heading was to his 'landing site,'" the report said. "The pilot replied with 'on course is about ... 150 [degrees] I guess,' and stated that he was currently flying a heading of 180 degrees. The controller then inquired if the [pilot] was navigating direct to the 'site' via Loran [long-range navigation]. The pilot stated, 'Ah yes sir, and ah if we could go direct down to Ravine [very high frequency omnidirectional radio range (VOR)], we'll take that, and ah we could try the [Myerstown/Decks] approach.'"

The MDT controller then cleared the helicopter direct to the Ravine VOR and told the pilot to "plan the VOR approach to [Myerstown/Decks], altimeter three zero two zero," the report said.

After being cleared direct to Ravine VOR, the pilot was given a frequency change to another MDT controller and issued a clearance for the VOR/DME [distance measuring equipment] Alpha approach to Myerstown/Decks. At 1756, the pilot reported "one whiskey delta's VOR inbound," the report said. The controller replied, "Copter one whiskey delta, roger radar service terminated, frequency change to advisory approved forward your [IFR flight plan] cancellation via the telephone as soon as feasible after landing," the report said.

The pilot replied: "One whiskey delta." That was the final radio transmission heard from the pilot.

In a written statement to the NTSB, the MDT controller stated that he observed the helicopter on its approach to Myerstown/Decks. "The [helicopter] was approximately [4.8 kilometers (three nautical miles)] northwest of [Myerstown/Decks] on the approach course. Over the next few minutes I observed what appeared to be normal completion of that approach." He said that he lost radar contact after the helicopter descended below 700 feet (214 meters) mean sea level (MSL).

The report said: "A set of parallel railroad tracks [runs] east and west near [Myerstown/Decks]. The Leffler helipad ... [is] located about [five kilometers (three miles)] east of the airport, along the railroad tracks. A witness, midway between

the airport and [the Leffler helipad], reported seeing a helicopter, about 1750, proceeding west along the railroad tracks at approximately 150 feet (46 meters) above ground level [AGL]. The helicopter circled the witness's barn once, then proceeded west along the railroad tracks at a high rate of speed. The witness [said the helicopter was just below the clouds and] estimated the cloud base to be about 400 feet [122 meters]."

Another witness told the NTSB that a helicopter circled over his house, which was located about two-tenths of a mile northwest of Myerstown/Decks. "He observed the helicopter depart to the northwest at about 200 feet [61 meters] AGL, and lost sight of it when "he (the helicopter) then flew into a dense cloud."

In a written statement to the NTSB, the witness said: "One second later I lost the sound of the rotor, but the 'jet engine' screamed. He then seemed to be circling because the sound of the rotor returned only to fade once again. That same sound occurred maybe two or three times after which the rotor sound stopped and the engine's rpms [revolutions per minute] increased rapidly. It was then because of the glow of the lights of Lebanon [Pennsylvania, U.S.], I could see the aircraft drop from the clouds, and from my angle it appeared to be vertical and continued that way until I heard the impact and then the explosion. I ran into the house and told my wife to dial 911 [emergency]. I jumped into my van ... I could see the flames, at which time I knew there was nothing I could do to perhaps be of assistance to the victims."

The NTSB said that two additional witnesses heard a helicopter circling overhead about a mile northwest of the airport just after 1800. "One of the witnesses stated that when the helicopter flew overhead, it was in the clouds [about 200 feet to 300 feet (61 meters to 92 meters) AGL] and he could not see it," the report said. "This witness, and [the second] witness near [Myerstown/Decks], both observed the helicopter descend out of the clouds in a steep descent, and impact the ground." In a follow-up telephone interview with an NTSB accident investigator, one of these witnesses said that he saw the helicopter "coming out of the clouds very fast, almost straight down, in a very steep angle."

The helicopter impacted a field about 1.6 kilometers (three-fourths of a mile) northwest of Myerstown/Decks near the VOR/DME Alpha final approach course to Myerstown/Decks (Figure 1, page 4).

"The helicopter was contained in an impact hole about [3.7 meters (12 feet)] in diameter, and was destroyed during impact and postcrash fire," the report said. "The major components above ground level were the last 12 feet of the tail boom, with the tail rotor gear box, hub and blades; one main-rotor blade standing vertical from the impact hole, attached to the main-rotor hub, and both main landing wheels."

The report said that the debris path indicated a magnetic bearing of 150 degrees. It said that debris found within 15 meters (50 feet) of the wreckage hole included the "pilot's door,

windshield fragments, numerous layers of composite material from the main-rotor blades and a briefcase."

The report added: "Excavation of the impact hole revealed helicopter components buried [two meters (seven feet)] down in the ground."

Postaccident analysis revealed that both engines were operating at the time of impact. No pre-impact airframe failure or other anomalies were found, the report said. The aircraft was approved for "single pilot, VFR and IFR land operation, under day and night during nonicing conditions."

The report said that there was no weather-reporting facility at Myerstown/Decks, but the report included weather reported from three local airports at 1750:

- Harrisburg-Olmstead, located about 34 kilometers (21 miles) southwest of Myerstown/Decks. "Ceiling indefinite 600-foot [183-meter] sky obscured, visibility two miles [3.2 kilometers] with light drizzle and fog. Temperature 44 [degrees F (24 degrees C)], dewpoint 44 [degrees F], winds 090 at seven knots [13 kilometers per hour]."
- Lancaster, located about 23 kilometers (14 miles) south of Myerstown/Decks. "Ceiling measured 700-foot [214-meter] overcast, visibility two miles with light rain and fog. Temperature 43 [degrees F (24 degrees C)], dewpoint 41 [degrees F (23 degrees C)], winds 090 at six knots [11 kilometers per hour]."
- Reading, located about 26 kilometers (16 miles) east of Myerstown/Decks. "Partial obscuration, ceiling measured 900-foot [275-meter] overcast, visibility two miles with fog. Temperature 46 [degrees F (26 degrees C)], dewpoint 41, winds 360 at six knots."

The NTSB reviewed the company's operations specifications, which stated that there "will be no [VFR] operations [except when necessary for takeoff and landing] unless the visibility is at least one-half mile [eight-tenths of a kilometer] by day or one mile [1.6 kilometers] at night, at an altitude of 1,200 feet [366 meters] or less in uncontrolled airspace." The report noted that there is no published instrument approach procedure to the Leffler helipad. "Presumably, [the pilot] planned to proceed VFR from the airport to the helipad."

The pilot, 57, held a commercial pilot's certificate with ratings for airplane single- and multi-engine land, rotorcraft helicopter and instrument airplane and helicopter. His second-class medical certificate was issued May 11, 1994. The pilot's log book was not located, but the NTSB estimated that his total flight time was about 11,000 hours, of which about 250 hours were in the Agusta. "Instrument currency could not be determined," the report said.

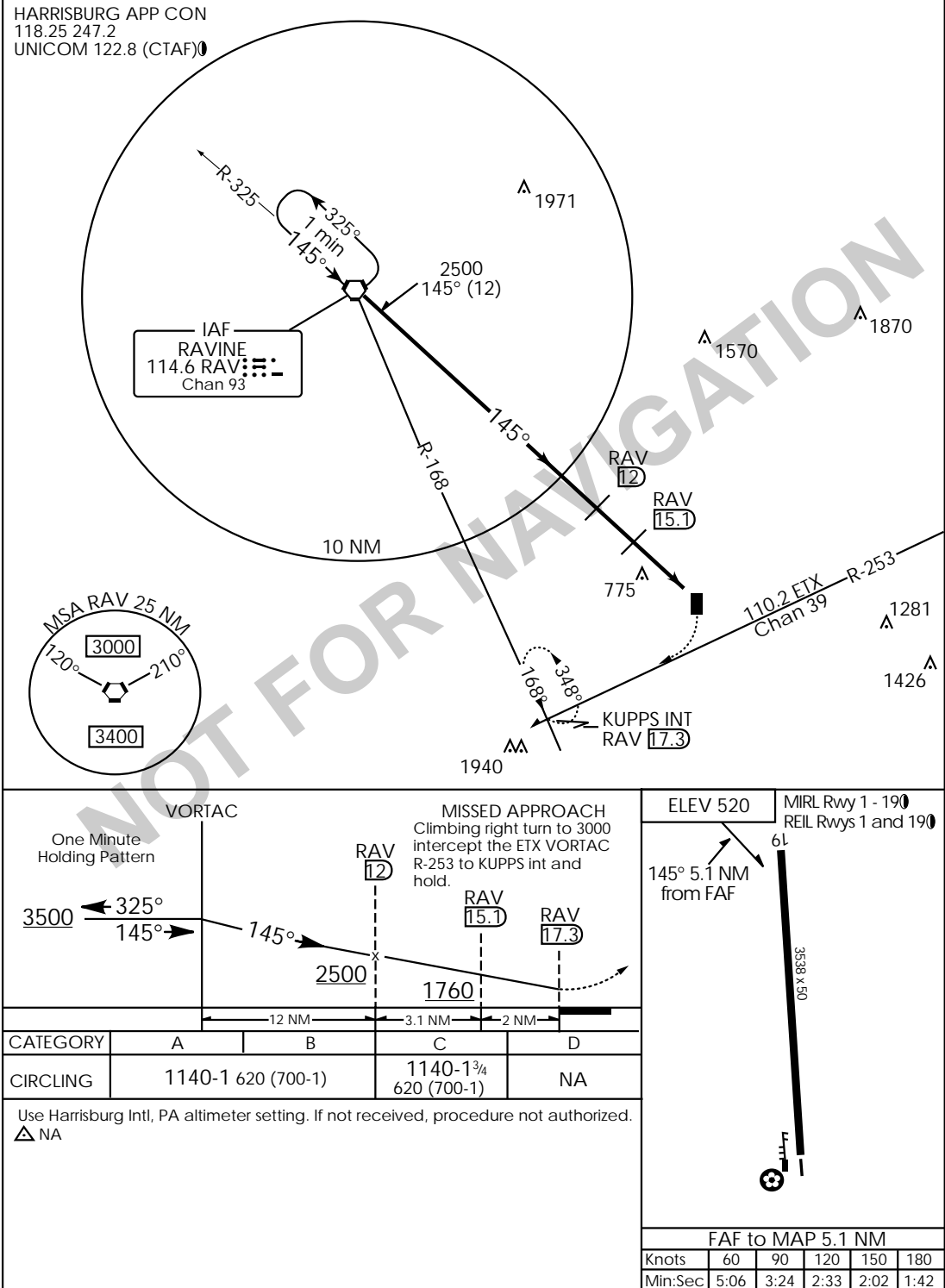
The pilot completed initial Agusta 109 training in June 1993 at the Agusta Training Department at Philadelphia, Pennsylvania, U.S., and completed a two-day recurrent ground course for the A109C in October 1994, the report said. An

VOR/DME Alpha Final Approach to Myerstown/Decks Airport

MYERSTOWN/DECKS (9D4)
MYERSTOWN, PENNSYLVANIA

VOR/DME-A

AL-9093 (FAA)



VOR/DME-A

40°21'N-76°20'W

MYERSTOWN, PENNSYLVANIA
MYERSTOWN/DECKS (9D4)

VOR = Very high frequency omnidirectional radio range DME = Distance measuring equipment

Source: U.S. National Transportation Safety Board

Figure 1

Transcript of Air Traffic Control Recordings of Communication with Accident Helicopter

Time	Source	Content
1743:58	N1WD	Harrisburg Approach, one whiskey delta is level at six thousand, sir.
1744:02	MDT-H	One whiskey delta roger altimeter is three zero two seven.
1744:04	N1WD	Three zero two seven.
1744:32	MDT-H	Helicopter one whiskey delta what is your on-course heading to your landing site?
1744:40	N1WD	Ah on course is about one forty ah yeah I'm sorry about one fifty I guess.
1744:47	MDT-H	OK that's what you're flying now?
1744:49	N1WD	We're about one eight zero at this time.
1744:51	MDT-H	OK well then how are you navigating then — are you going direct to this place or ah is that how you're doing it — Loran?
1745:00	N1WD	Ah yes sir and ah if we could go direct down to Ravine we'll take that and ah we could try the Deck [Myerstown/Decks Airport] approach.
1745:29	MDT-H	OK one whiskey delta understand you want to do the approach to Deck—ah proceed direct Ravine plan the VOR approach to the Deck Airport. Altimeter three zero two zero.
1745:39	N1WD	Three zero two seven direct Ravine one whiskey delta.
1748:07	MDT-H	Helicopter one whiskey delta descend and maintain four thousand.
1748:12	N1WD	Whiskey delta's down to four thousand out of six.
1750:12	MDT-H	Helicopter one whiskey delta contact Harrisburg approach one two six point four five.
1750:17	N1WD	One two six point four five one whiskey delta, thanks sir.
1750:27	N1WD	Harrisburg Approach, helicopter one whiskey delta's with you descending through four thousand nine hundred for four.
1750:34	MDT-L	Copter one whiskey delta roger cross ah the Ravine VOR at or above three thousand cleared ah VOR DME Alpha approach to Deck.
1750:43	N1WD	OK one whiskey delta.
1755:35	MDT-L	Copter one whiskey delta do you have the eight hundred number to Harrisburg for cancellation at Deck?
1755:42	N1WD	That's a negative sir.
1755:44	MDT-L	All right ah I'll give it to you when you're ready.

1755:45	N1WD	Ready to copy.
1755:48	MDT-L	Ah it's one eight hundred niner three two zero seven one two.
1755:55	N1WD	Copy sir.
1756:44	N1WD	One whiskey delta's VOR inbound.
1756:47	MDT-L	Copter one whiskey delta roger radar service terminated frequency change to advisory approved forward your cancellation via the telephone as soon as feasible after landing.
1756:54	N1WD	One whiskey delta.
N1WD	=	The accident helicopter
MDT-H	=	Harrisburg-Olmstead ATC Tower — Harrisburg Arrival radar position
MDT-L	=	Harrisburg-Olmstead ATC Tower — Lancaster Arrival radar position

Source: U.S. National Transportation Safety Board

autopsy was performed on the pilot, and a toxicological report was negative for drugs and alcohol.

Myerstown/Decks Airport is located in a valley floor about 24 kilometers (15 miles) wide that runs northeast to southwest with hills “ranging from 1,000 feet to 1,800 feet (305 meters to 549 meters) high on both sides,” the report said. The airport elevation is 520 feet (159 meters) MSL. The airport is equipped with pilot-controlled lighting. “When tested, the lights activated.”

The report quoted, without comment, from a U.S. Army field manual on aeromedical training for flight crews on the subject of spatial disorientation:

“Spatial disorientation is an individual's inaccurate perception of position, attitude and motion relative to the center of the earth. When it occurs, pilots are unable to see, believe, interpret or process the information on the flight instruments. Instead, they rely on the false information their senses provide.”

The FAA addressed the problem of spatial disorientation in Advisory Circular (AC) 60-4A:

“Surface references and the natural horizon may at times become obscured, although visibility may be above [VFR] minimums. Lack of natural horizon or surface reference is common on overwater flights, at night and especially at night in extremely sparsely populated areas, or in low-visibility conditions. A sloping cloud formation, an obscured horizon, a dark scene spread with ground lights and stars, and certain geometric patterns of ground lights can provide inaccurate visual information for aligning the aircraft correctly with the actual horizon. The disoriented pilot may place the aircraft in a dangerous attitude. Other factors which contribute to disorientation are reflections from outside lights, sunlight

shining through clouds and reflected light from the anticollision rotating beacon.”

One of the witnesses told NTSB accident investigators that he remembered seeing a “steady red and a steady white light” on the helicopter, but “there was no strobe light flashing.”

The AC said that pilots should understand the elements that contribute to spatial disorientation and recommended the following steps to prevent it:

- “Before ... [flying] with less than [4.8 kilometers (three miles)] visibility, obtain training and maintain proficiency in aircraft control by reference to instruments;
- “When flying at night or in reduced visibility, use ... flight instruments in conjunction with visual references;
- “Maintain night currency ... [and] include cross-country and local operations at different airports;
- “Study and become familiar with unique geographical conditions in areas [of operation];
- “Check weather forecasts before departure, en route and at destination. Be alert for weather deterioration;
- “Do not attempt [VFR] flight when there is a possibility of getting trapped in deteriorating weather; [and,]
- “Rely on instrument indications unless the natural horizon or surface reference is clearly visible.” ♦

Editorial note: This article was based on U.S. National Transportation Safety Board Factual Report Aviation,

no. NYC95FA050. The 64-page report included charts, diagrams, photos and witnesses’ statements.

About the Author

Joel S. Harris holds an airline transport pilot certificate and a flight instructor certificate with ratings in both helicopters and airplanes. He is an FAA-designated pilot proficiency examiner, FARs Part 135 check airman and safety counselor. He is director of pilot standards at FlightSafety International’s West Palm Beach Learning Center in Florida, U.S., and has given more than 10,000 hours of flight, simulator and ground school training to professional helicopter pilots.

Further Reading from FSF Publications

Harris, J.S. “Helicopter Strikes Water on Approach After Pilots Lose Altitude Awareness.” *Helicopter Safety* Volume 22 (July–August 1996).

Harris, J.S. “Every Helicopter Pilot Must Be Prepared for Inadvertent Entry into Instrument Meteorological Conditions.” *Helicopter Safety* Volume 22 (March–April 1996).

Harris, J.S. “Failure to Intercept Final Approach Course, Improperly Performed IFR Approach Cited in Fatal Collision with Terrain.” *Helicopter Safety* Volume 21 (May–June 1995).

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