National Transportation Safety Board

FACTUAL REPORT
AVIATION

NTSB ID: SEA98FA084	Aircraft Registration Number: N16031
Occurrence Date: 06/02/1998	Most Critical Injury: Fatal
Occurrence Type: Accident	Investigated By: NTSB

Location/Time

Nearest City/Place	State	Zip Code	Local Time	Time Zone	
SHOSHONE	ID	83358	1610	MDT	

Airport Proximity: Off Airport/Airstrip	Distance From Landing Facility:

Aircraft Information Summary

Aircraft Manufacturer	Model/Series	Type of Aircraft
McDonnell Douglas	369FF /369FF	Helicopter

Revenue Sightseeing Flight: No

Air Medical Transport Flight: No

Narrative

Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:

*** Note: NTSB investigators either traveled in support of this investigation or conducted a significant amount of investigative work without any travel, and used data obtained from various sources to prepare this aircraft accident report. ***

HISTORY OF FLIGHT

On June 2, 1998, approximately 1610 mountain daylight time, a McDonnell Douglas 369FF, N16031, registered to Helitradewinds Inc., operated by Winco as a 14 CFR Part 133 external load, struck power lines and subsequently collided with the ground near Shoshone, Idaho. Visual meteorological conditions prevailed at the time and no flight plan was filed. The helicopter was substantially damaged. The commercial pilot was seriously injured. A crew member, who was standing on the left skid, and attached to the side of the helicopter via a safety harness, was fatally injured.

The operator reported that the purpose of the flight was to permanently attach the already strung fiber optic cable to existing power poles. The operator was hired by a construction company which was under contract to the Idaho Power Company to install 270 miles of fiber optic cable across the state.

In a written statement, the pilot reported that on the day of the accident, he remembered working at the tower where the accident occurred. The weather was visual conditions with a light wind out of the west southwest. The pilot recalled placing one of the linemen on the tower, then returning to the landing zone to pick up another lineman to take to the same tower. The pilot stated that he does not remember anything else beyond the approach to the tower, which he described as normal.

A witness, who was in his car and parked next to the highway, stated that the helicopter was hovering above the power lines and was picking up one of the lines on the top of the pole (fiber optic) with a "hook" or "shoe," and placing it from one spot to another. The witness stated that with the cable attached to the shoe, the helicopter lowered the line to the pole where a man on the pole seemed to attach the cable to the pole. When the helicopter lowered, the cable detached from the shoe. The witness stated that as the helicopter was lifting up, something "popped" and the cable "grabbed" the shoe. The helicopter twisted sideways and then continued to go over on its side. The rotor blades struck the power lines and the helicopter descended between the power lines. The witness stated that as the helicopter was descending through the power lines, the tail boom separated and the helicopter spun around about two times before colliding with the ground. The witness stated that there were no unusual sounds from the helicopter prior to the accident. The wind was blowing about five miles per hour and a light drizzle began to fall shortly after the accident. The witness stated that after the accident he was helping with the pilot, who stated that he had "no collective."

The lineman who was on the pole at the time of the accident was interviewed. The lineman reported that during the morning, travelers were hung on 12 to 16 poles in preparation for "pulling" the fiber optic cable through the travelers.

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After this task was accomplished, the workers broke for lunch. The lineman stated that after lunch, they rigged to "clip." The lineman described clipping as removing the fiber optic cable from the traveler and putting it in hardware that is permanently attached to the pole. Breeze dampers are then installed on the fiber optic cable about five feet away from either side of the pole for the purpose of absorbing vibration.

The lineman stated that he and another lineman were dropped off by the helicopter on two separate poles. The pilot then went to pick up the lineman who remained on the skid for the purpose of installing the vibration dampers.

The linemen stated that the linemen are transported from the landing zone to the work areas (poles) by standing on the left landing skid. Two linemen can be transported at one time. The linemen wear safety harnesses around their waists. A rope is attached to the harness. The other end of the rope attaches to one of two attach points on the left side of the fuselage. One point is located on the door post just behind the pilot's seat. The other point is located mid point, on the cabin floor. The door is removed. The linemen wear special boots with higher heels that are used to brace against the skid to prevent slipping. The top side of the skid is covered with a non-skid material.

The lineman stated that when the helicopter returned with the lineman on the skid, the pilot positioned the helicopter at the pole and next to the fiber optic cable. An external belly-mounted side pull hook assembly is used. The line (rope) was draped up and over the left landing skid and forward of the front leg. The external line is approximately five feet-five inches in length. A metal shoe is attached to the end of the external line which hangs down about four inches from the skid. The shoe is metal, and 11 inches in length, and four and a half inches wide. The shoe is "U" shaped width-wise and cradles the cable. The lineman stated that the pilot positioned the helicopter to pick up the fiber optic cable in this shoe and positioned it in the suspension shoe on the pole for him so that he could then place a pin in the suspension shoe. The pilot then descended to remove the fiber optic cable from the external line shoe. The lineman stated that he was positioned with his back to the helicopter, with the cable over his left shoulder, and was in the process of putting in a cotter key on the pin, when the helicopter moved out and behind him to start installing the vibration dampers. The lineman stated that everything up to this point was normal, when he heard a "clicking" sound. The lineman stated that "It sounded like the blades. It made a clicking sound like it just hit something." The lineman further described the noise as, "It sounded like a bike, like when you stick cards in the spoke or something like that." The lineman stated that out of the corner of his eye, he saw pieces of the helicopter flying. The lineman stated that the helicopter was behind him and should have been beside him so he knew that it was into the wires. The lineman ducked down on the pole, and when he jumped clear, the pole was "kind of shaking" and the fiber optic cable was cut. When he looked up, the helicopter was already on the ground.

The other lineman, who was on another pole, stated that he was in the process of clipping when he felt his pole move. The fiber optic cable went slack, and when he turned around, the fiber optic cable was severed and the helicopter was already spinning and into the wires.

PERSONNEL INFORMATION

The pilot reported that he began employment with Winco on April 2, 1998. The pilot flew with another pilot on board until April 24, 1998. After this time, all flights were a solo operation. The pilot's flight logbook indicates that a total time of 145 hours had been logged in the 90 days preceding the accident. The pilot stated that he had never done this type of work prior to April 1998.

The pilot reported that his prior flight experience, beginning in 1991, consisted of tuna spotting from a fishing vessel, and long-line external load operations for logging and fire suppression.

At the time of the accident, the pilot had accumulated a total flight time of approximately 5,646 hours, with approximately 907 hours in this make and model helicopter.

WRECKAGE AND IMPACT INFORMATION

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The terrain surrounding the accident site was rolling-to-flat grassland with short-to-medium shrub brush vegetation. Highway 93 was within two hundred feet of the main accident site. The transmission lines ran in a north/south direction. The crew was working southerly at the time of the accident.

The main fuselage structure was located approximately 30 feet east of the power lines. The fuselage was laying on its right side. The structure had collapsed and the windshield was broken out. The instrument panel was no longer supported and laying next to the structure. The tailboom had separated forward of the tailboom attachment flange. One main rotor blade was laying lengthwise on top of the structure. Within 50 feet of the main wreckage, the tail rotor drive section, another main rotor blade, and the tailboom and portion of the tail cone were located. The remaining three main rotor blades were located up to 300 feet away from the wreckage. The tail rotor blades were located up to 700 feet away from the wreckage. One tail rotor blade was in two pieces, the other tail rotor blade was separated into three pieces. Both blades displayed wire strike signatures at the separation points. See wreckage diagram and photos.

The main rotor blades all separated at the main rotor hub assembly. Each blade is color coded and was numbered for the purpose of reference. Each blade was severely deformed. White blade number 1 displayed evidence of wire strike signatures. Blue blade number 2 displayed evidence of blue paint transfer, and was broken into two pieces. Yellow blade number three displayed evidence of striking and partially wrapping around the tailboom. Impact signatures matching rivet indents from the tailboom were noted on the blade. Green blade number four was twisted and found on top of the main wreckage structure. Red blade number 5 displayed evidence of wire strike signatures at the blade tip. The top of the dog house was damaged and evidence indicates main rotor contact to the aft boom fairing. Each of the main rotor blade pitch change links were damaged either in tension or were bent. Further impact damage was noted to the main rotor feathering bearings which displayed rotational strikes; the hub subassembly was damaged. The main rotor hub assembly turned freely on the mast and the swashplate double-row bearing rotated freely.

The main rotor collective control was found to move from full up to full down, with some upper restrictions noted. The collective jack shaft was damaged four inches from the torque tube. The pilot's twist grip was not damaged and the collective friction functioned correctly.

The cyclic control fractured at the base attach point. There was no damage noted to the cyclic stick friction, interconnect torque tube or the one-way unilock. The aft bracket to the longitudinal and lateral trim motors was fractured. Both trims were positioned near center.

All cyclic, collective main rotor, N2 governor, N1 control and anti-torque flight control linkage exhibited continuity. Overload bends and fractures to assorted control tubes, rod end bearings, mounting points, mixer assemblies and support brackets were noted as a result of impact damage.

Extensive impact damage was noted to the tailboom and tail cone section. The tail cone section exhibited buckling and torsional distortion. Two circular gouges were noted on the trailing edge of the vertical stabilizer, above and below the anti-collision light support. The indentations were consistent with the diameter of the transmission cable. Torsional damage was noted to the tailrotor driveshaft. Compression damage corresponding to main rotor blade strike signatures was identified on the tailboom. The driveshaft was broken in five locations.

The directional control pedals for the pilot were still properly attached to the posts as designed, however impact damage was noted. Impact damaged was noted to the control rod and bungee located under the center seat.

Crush damage to the air inlet fairing was noted and foreign object debris was present in the engine inlet areas. Further inspection of the engine revealed that the gas producer turned, with some resistance to rotation with each revolution. The N2 system was free and turned smoothly. All impeller vanes displayed leading edge foreign object damage. Governor control continuity was established. It was noted that it was restricted in the minimum direction and the pointer read 80 degrees. Throttle control continuity was established to the engine compartment.

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The linkage was sheared just forward of the fuel control throttle arm rod. The fuel control pointer was at 0 degrees, however, this was not observed until after the wreckage was recovered to the hangar. A large amount of grass was found in the inlets of both the left and right particle separators. Grass was also found protruding from the assembly seams of the vortex tunnels.

TESTS AND RESEARCH

The fiber optic cable measured approximately 5/8 inch in diameter. The cable consisted of 22 strands. Fifteen solid aluminum strands measuring .11 inch in diameter surrounded seven inner strands. The solid aluminum core strand measured .14 inch diameter. Six strands surround the core. Other strands, around the core strand, consisted of three solid aluminum strands measuring .14 inch in diameter, and three strands of tubes measuring .14 inch in diameter. Each tube housed fiber optic strands.

During the investigation, the fiber optic cable was removed from the top of the pole. The cable measured approximately 24 feet-six inches from the cut end to the separated end. Evidence of scraping damage on several of the outer strands started about nine feet from the cut end and traveled along the length of the cable to the frayed end. Four outer strands were noted to have separated at a closer distance to the cut end than the others. Strand 1 broke approximately 11 feet-six inches from the cut end. The end of the strand was necked down, with one half of the strand partially flattened. Strand 2 broke approximately 11 feet-11 inches from the cut end. The end of the strand was necked down. A gouge starting approximately at six inches from the end ran along the length of the strand. Strand 3 broke approximately 14 feet-four inches from the cut end. The end was necked down with flattening on one side of the strand. Other flattening signatures were noted about ten inches from the cut end. Strand 4 broke approximately 14 feet-four inches from the cut end. The end was necked down with one side of the strand flattened. Continued scraping damage was noted to about 15 feet from the cut end. The remaining eighteen strands separated at approximately the same point.

Both separated ends of the fiber optic cable were sent to the National Transportation Safety Board Materials Laboratory, Washington D.C., for examination. The technician reported that three of the outer .11 inch diameter strands separated in a tensile mode with a reduction in area, and a typical cup or cone feature at the fracture. The remaining 19 strands received varying amounts of mechanical damage prior to failure.

The Transmission Oil Pressure, Fuel Level Low, and Engine Out caution/warning indicators were removed and sent to the National Transportation Safety Board Materials Laboratory to view the filaments in the four mini-lamps for each indicator. The technician reported that the filaments in the four mini-lamps installed in the Fuel Level Low indicator revealed no evidence of stretching or fractures. Electrical continuity was established with an ohm meter that indicated that the filaments were intact.

Examination of the lamps for the Transmission Oil Pressure and the Engine Out indicators revealed that all of the filaments were severely stretched. The filament in one of the lamps for the Engine Out indicator was fractured. Electrical continuity with an ohm meter indicated that the filaments in the remaining seven lamps were intact.

ADDITIONAL DATA/INFORMATION

The engine was removed and transported to Air Services International, Inc., Scottsdale, Arizona, for inspection and teardown. Upon initial inspection, ferrous chips on the upper detector of the magnetic chip plugs were found that originated from the No. 1 bearing (compressor forward support). In order to facilitate an engine run, the bearing was removed and replaced with a new one. Damage to the bearing was noted to the inner race, inner race balls and ball retainer.

The engine was installed in a test cell. Initial attempts to start the engine resulted in hung starts and it would not accelerate to idle setting. The air lines were inspected and one fitting at the air accumulator was found loose. The fitting was torqued to specifications and the engine then successfully started. The engine was tested to obtain five power points. A compressor surge was noted during the initial run-up to maximum power. The engine was then shut down and the compressor and turbine modules were disassembled.

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Heavy foreign object damage was noted to the compressor impeller vane leading edges. The compressor diffuser assembly also displayed substantial foreign object damage. Evidence of debris ingestion was noted on the inside surface of the first stage nozzle shield. Mild rotational contact was noted to the compressor shroud and turbine wheel seals/blade path surfaces. No abnormal conditions were noted in the turbine module.

The number 1 bearing was further examined by the Rolls-Royce Allison metallurgical Lab. The outcome of the examination found no evidence of progressive failure or oil starvation damage. The evidence indicated that the deep, localized gouging was a result of instantaneous loading.

A worker from the power company stated that the power pole height is approximately 85 feet. The tower is constructed of two wooden vertical poles. Two wooden beams placed parallel to one another run horizontally with one at the top of the vertical poles, and the other about four feet below. Two transmission wires each were attached to stand-off insulators that hang down another approximately four to five feet from three points on the lower beam. See Photos. These sets of transmission wires are approximately 1 1/8 inch in diameter. The three sets of wires are located eight to ten feet below the location of the fiber optic cable. On the opposite pole from the pole in which the fiber optic cable was being attached, a conductor cable was strung. After the accident, the fiber optic cable and the ground wire were severed. The middle and far side sets of wires were damaged. It was noted that the far side wires were more severely damaged than the middle set. The core cable of the far side wires remained intact, however, all of the exterior strands were severed and pushed back along the core cable. See photos. Only a few of the exterior strands on the middle set were severed. The set of wires directly below where the helicopter was operating was not damaged. There was no evidence found of impact damage to the tower itself. The traveler that the lineman on the pole was working on at the time, was found at the base of the tower.

At the time of the interview with the pilot, the pilot was asked to describe a normal operation. The pilot stated that he is seated on the left side. Up to two lineman can be transported standing on the left side skid. The pilot reported that normally a counterweight on the right side, to compensate for the weight on the left, is not necessary. He had not experienced any problems with cyclic authority even when there were two people on the left skid. The pilot stated that if travelers are picked up off the towers, they are placed on the right side of the cabin floor.

The pilot stated that when the vibration dampers are installed, he positions the helicopter with the cable on the left side, parallel to the wire, about one to two feet away, and with the wire positioned about level with the belly of the helicopter. The pilot stated that he adjusts for the comfort level of the lineman. Communication between the pilot and the lineman is usually done with hand signals. The external line is positioned in front of the forward skid leg and in his full view. The pilot stated that when the lineman is actually installing the dampers, he pushes down on the wire and that motion can move the helicopter. The pilot stated that he makes control movements to compensate for this action.

The wreckage was transported by Specialty Aircraft, Redmond, Oregon, for security. The wreckage was released to Specialty Aircraft on December 22, 1998.

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Landing Facility/Approach Information

Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
		Ft. MSL	0		

Runway Surface Type:

Runway Surface Condition:

Approach/Arrival Flown: NONE

VFR Approach/Landing: None

Aircraft Information

Aircraft Manufacturer	Model/Series	Serial Number
McDonnell Douglas	369FF /369FF	52FF

Airworthiness Certificate(s): Normal

Landing Gear Type: Skid

Amateur Built Acft?	Number of Seats:	Certified Max Gross Wt.	Number of Engines:
No	2	3100 LBS	1

Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:
Turbo Shaft	Allison	250-C30	425 HP

- Aircraft Inspection Information

Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time
100 Hour	05/1998	42 Hours	5350 Hours

- Emergency Locator Transmitter (ELT) Information

ELT Installed?/Type	ELT Operated?	ELT Aided in Locating Accident Site?
Yes /	Yes	No

Owner/Operator Information

Registered Aircraft Owner	Street Address	City	State	Zip Code
HELITRADEWINDS INC	32299 S. GOODTIME RD	MOLALLA	OR	97038

Operator of Aircraft	Street Address	City	State	Zip Code
WINCO	32299 S. GOODTIME RD	MOLALLA	OR	97038

Operator Does Business As:

Operator Designator Code: IZWL

- Type of U.S. Certificate(s) Held:

Air Carrier Operating Certificate(s):

Operating Certificate:

Operator Certificate: Aircraft External Load

Regulation Flight Conducted Under: Part 133: Rotorcraft Ext. Load

Type of Flight Operation Conducted: Other Work Use;Unknown; Unknown; Unknown

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First Pilot Information

Name	City	State	Date of Birth	Age
On File	On File	On File	On File	32

Sex: M | Seat Occupied: Left | Occupational Pilot? Civilian Pilot | Certificate Number: On File

Certificate(s): Flight Instructor; Commercial

Airplane Rating(s): Single-engine Land

Rotorcraft/Glider/LTA: Helicopter

Instrument Rating(s): Airplane; Helicopter

Instructor Rating(s): Helicopter

Current Biennial Flight Review?

Medical Cert.: Class 2 | Medical Cert. Status: Valid Medical--no waivers/lim. | Date of Last Medical Exam: 03/1998

- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Mult-Engine	Night	Instrument Actual	Instrument Simulated	Rotorcraft	Glider	Lighter Than Air
Total Time	5646	907	106		40	3	47	5538		
Pilot In Command(PIC)	4300	907								
Instructor										
Instruction Received										
Last 90 Days	145	145			1			145		
Last 30 Days	108	108						108		
Last 24 Hours	4	4						4		

Seatbelt Used? Yes | Shoulder Harness Used? Yes | Toxicology Performed? No | Second Pilot? No

Flight Plan/Itinerary

Type of Flight Plan Filed: None

Departure Point	State	Airport Identifier	Departure Time	Time Zone
GOODING	ID	GNG	0800	MDT

Destination	State	Airport Identifier
Local Flight		

Type of Clearance: None

Type of Airspace: Class G

Weather Information

Pilot's Source of Wx Information:

No record of briefing

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Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
TWF	1553	MDT	4151 Ft. MSL	22 NM	200 Deg. Mag.

Sky/Lowest Cloud Condition: Thin Overcast 4900 Ft. AGL

Condition of Light: Day

Lowest Ceiling: Overcast 4900 Ft. AGL

Visibility: 10 SM

Altimeter: 29.00 "Hg

Temperature: 13 °C

Dew Point: 11 °C

Weather Conditions at Accident Site: Visual Conditions

Wind Direction: 270

Wind Speed: 18

Wind Gusts: 21

Visibility (RVR): 0 Ft.

Visibility (RVV) 0 SM

Precip and/or Obscuration:

Accident Information

Aircraft Damage: Substantial

Aircraft Fire: None

Aircraft Explosion None

- Injury Summary Matrix	Fatal	Serious	Minor	None	TOTAL
First Pilot		1			1
Second Pilot					
Student Pilot					
Flight Instructor					
Check Pilot					
Flight Engineer					
Cabin Attendants					
Other Crew	1				1
Passengers					
- TOTAL ABOARD -	1	1			2
Other Ground	0	0	0		0
- GRAND TOTAL -	1	1	0		2

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Administrative Information

Investigator-In-Charge (IIC)

DEBRA J. ECKROTE

Additional Persons Participating in This Accident/Incident Investigation:

JERRY MCCLELLIN
BOISE, ID

JACK A MITTEER
MESA, AZ

ADRIAN BOOTH
MESA, AZ

CAROL M HORGAN
INDIANAPOLIS, IN