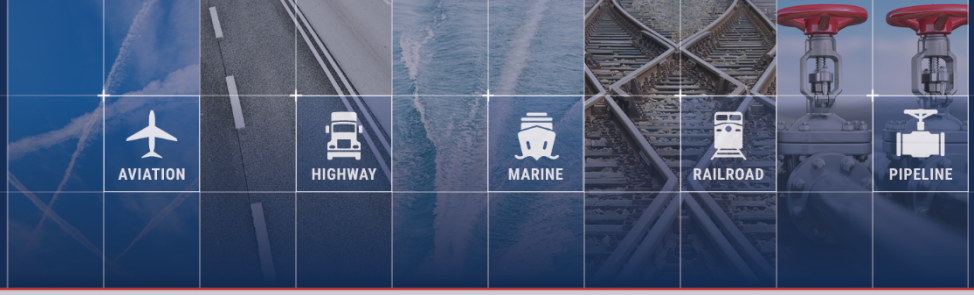

Aviation Investigation Final Report

Location:	Running Springs, California	**Accident Number:**	LAX05LA308
Date & Time:	September 21, 2005, 10:15 Local	**Registration:**	N814CE
Aircraft:	Eurocopter AS350B3	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 Serious
Flight Conducted Under:	Part 133: Rotorcraft ext. load		

Analysis

The helicopter was performing external load operations in the vicinity of tall trees when the main rotor impacted a tree and the helicopter descended nose first into the ground. At the time of rotor impact with the trees, the Vehicle Engine Monitoring Display (VEMD) recorded a high torque measurement (146 percent) and a low engine drive speed measurement (184 rpm), followed by a low torque (5.7 percent) and a high engine speed (511 rpm) and temperature (999C). As a result of the main rotor impact with trees the engine's torque twisted apart the engine to transmission drive shaft causing an engine over speed and over temperature condition. The operator was utilizing a 78.8-foot-long line for the external load operations, which in some cases put the main rotor of the helicopter below the treetops of the 80- to 90-foot trees. Examination of the helicopter revealed no evidence of a preimpact malfunction or failure of the control system or power plant.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain an adequate clearance from trees while performing long line external lift operations.

Findings

Occurrence #1: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: MANEUVERING

Findings
1. OBJECT - TREE(S)
2. (C) CLEARANCE - NOT MAINTAINED - PILOT IN COMMAND

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
3. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On September 21, 2005, at 1015 Pacific daylight time, a Eurocopter AS350B3, N814CE, collided with trees while performing external load operations 3 miles east of Running Springs, California. Southern California Edison operated the helicopter under the provisions of 14 CFR Part 133. The commercial pilot was seriously injured and the helicopter was substantially damaged. Visual meteorological conditions prevailed and no flight plan had been filed. The flight originated at the Ontario International Airport, Ontario, California.

The operator reported in the Pilot-Operator Accident Report that the helicopter was performing external load operations at a field site between Running Springs and the Snow Valley recreation area. The pilot had just set a steel cage at a pole site location, and released the load. As the helicopter departed the area, the main rotor blades impacted a tree and branches approximately 80-90 feet above ground level (agl). After the blade strike the helicopter descended, striking several trees with the main rotor blades. The helicopter impacted the ground at a 45-degree nose low attitude, coming to rest with the right aft passenger side on a large rock.

The Federal Aviation Administration (FAA) inspector that was on scene shortly after the accident said that the long line being used for the external load operation was 78 feet 10 inches long, and that the highest tree cut was 86 feet above the ground.

PERSONNEL INFORMATION

The commercial pilot held ratings for rotorcraft helicopter, and instrument helicopter. He also held a certified flight instructor certificate with a rotorcraft-helicopter rating. The pilot was issued a first-class medical certificate dated September 19, 2005, with the limitation that he wear corrective lenses. Southern California Edison reported that the pilot had 10,765 hours in rotorcraft, and 187 hours in this make and model.

An FAA inspector interviewed the pilot on November 2, 2005. The pilot stated that he could remember very little. He was staging equipment in the receiving area, heard a noise, and then woke up in the intensive care unit at the hospital.

WRECKAGE AND IMPACT

Safety investigators from American Eurocopter, Turbomeca USA, FAA, and Southern California Edison, examined the helicopter wreckage on October 26, 2005, under the supervision of the National Transporation Safety Board investigator-in-charge (IIC) at the Edison secured storage

location in Pomona, California.

The cockpit had an upward v-bend deformation in the floor decking on the right side behind the copilot's seat. This deformation allowed the nose and instrument panel of the helicopter to droop downward about 20 degrees. The aft cabin area and aft fuselage appeared to be not deformed. The engine cowling exhibited chard and black areas consistent with a high temperature thermal event on its upper surfaces. The air filter had crumbled and collapsed into the engine air intake plenum. The tail boom was collapsed in the middle just forward of the horizontal stabilizer. The tail rotor drive shaft forward of the bend had black soot all over it and the tail rotor drive shaft hanger bearings had been displaced aft of their respective mountings. The tail rotor drive shaft aft of the bend was painted light blue in color and the hanger bearings in this section were still in their respective mounts. The tail rotor was present, exhibited some skin creases on each blade, and evidence of blade cuff contact with the blade hub. The tail rotor gearbox sight glass showed fluid present in the reservoir. All three blades from the main rotor were separated from the rotor at the blade root, leaving blade attachment portions of the blade in the blade grip. The blue blade was fragmented in to three sections; a chordwise break 5 feet from the root, a break 7 feet from the root, and the last break 6.5 feet inboard from the blade tip. The yellow blade was buckled at the leading edge 3 feet from the root and 6 feet inboard from the tip. The red blade was buckled at the leading edge 6 feet 5 inches from the blade root and separated at a location 3 feet 7 inches inboard from the blade tip. The skids did not appear to be spread; both skids fractured and separated forward of ther forward cross tube attachment points. Approximately 55 gallons of fuel had been drained from the helicopter at the scene.

Removal of the engine cowling revealed a black sooted engine. The turbine wheel containment ring was deformed at the 5 o'clock position (looking aft to forward) and had dark bluish discolorations in areas. Twenty tail pipe flange-mounting bolts were displaced out of their respective attachment fitting holes from the 3 o'clock position to the 11 o'clock position. Pieces of the flange mounting bolts and turbine blades were found on the decking below the engine. The backside of the firewall exhibited dark discolored areas. The turbine wheel and blade roots were located in the engine minus all the turbine blades. The gas producer section was rotated by hand. The first stage of compressor blades were black in color and exhibited leading edge erosion on all blades. The magnetic drain plugs on modules 1 and 5 were removed and observed to have little to no particles attached to the magnet. The engine to transmission drive shaft had the appearance of having been twisted off at the transmission end in a clockwise manor with the twisted ends similar in appearance to a drill bit. The free wheel unit rotated in the clockwise direction but not in the counterclockwise direction.

The transmission rotated freely in the direction of normal rotation. Fluid was visible through the transmission fluid sight glass. The transmission had been displaced forward and rotated slightly in the counterclockwise direction.

Electrical power was applied to the helicopter, the Vehicle Engine Multifunction Display (VEMD) was energized, and the maintenance and fault pages were viewed and photographed.

It was observed that current data was also being received and displayed on the VEMD from the Digital Engine Control Unit (DECU).

TESTS AND RESEARCH

Engine Exam

Under the supervision of an FAA inspector the engine was removed from the airframe, crated, and shipped to Turbomeca USA, Grand Prairie, Texas. On January 5, 2006, technical representatives from Turbomeca USA, American Eurocopter, and Southern California Edison examined the engine under the supervision of the Safety Board investigator-in-charge.

Detailed notes documenting the engine examination and teardown are available in the official docket of this investigation. The examination revealed no evidence of a preimpact malfunction or failure of the power plant.

Vehicle Engine Multifunction Display (VEMD) and Digital Engine Control Unit (DECU) Data

During the airframe examination the VEMD was powered up using the helicopters own battery power, and the maintenance pages directly relating to the accident flight were displayed and photographed in sequence. The DECU data was downloaded at the Turbomeca USA facility under the supervision of a Safety Board investigator. The following parameters are defined: N1 or Ng is the gas generator turbine speed defined as percent; N2 or Nf is the free turbine speed defined in rotor speed based rpm; T4 or T4.5 is the temperature of the gas passing through the turbine section in Celsius; and torque is defined in percent.

The VEMD Flight Report pages recorded that the accident flight was flight number 426 with a duration of 11 minutes. The diagnosis page data stated at 11 minutes 5 seconds there was a collective lever failure; Ng was 97.6 percent, torque was 120.1 percent, T4 was 842C, and Nf was 184 rpm. The AS350B3 flight manual and the Turbomeca Arriel 2B maintenance manual states that the normal ranges for these parameters are; N1 or Ng between 85 and 108.5 percent, N2 or Nf between 375 to 405 rpm, T4 maximum continuous of 849C or 941C for 10 seconds, and torque between 92.7 and 100 percent. It should be noted that the VEMD does not record Nf readings above 511 rpm and T4 readings above 999C. At 11 minutes 6 seconds there was an invalid Nf reading, Nf-B failure (511 rpm), and an Nf-A failure (511 rpm). At this time the torque is recorded at 5.7 and 2.7 percent. At 11 minutes 11 seconds a T4 sensor failure was detected (999C); torque is at 0.0 percent. The over limit page depicted the maximum torque recorded was 146 percent, maximum T4 readings were 972C and 999C, maximum Ng at 102.4 percent, and maximum Nf at 510 rpm. The VEMD record can be summarized by observing that there was an initial high torque value (120.1 percent) and a low Nf value (184rpm) followed by a high Nf value (511rpm), decreasing torque values (5.7 percent and below), which ended in an turbine (T4) over temperature (999C).

The DECU data revealed that at 766 seconds (12 minutes 46 seconds) after power-up there is

a collective pitch error and a T1 error. Two seconds later there is a N2 signal error. At 772 seconds (12min 52 sec), a T4 error is recorded. At 829 seconds, a torque measurement error is recorded. The same errors are recorded for times 1025 and 1511 seconds after start up.

The time discrepancy between the VEMD record and the DECU record is accounted for by the fact that the DECU starts recording as soon as battery power is applied to the system and the VEMD starts recording when N1 passes 60 percent.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	42,Male
Airplane Rating(s):		**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 1	**Last FAA Medical Exam:**	September 1, 2005
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 1, 2004
Flight Time:	10765 hours (Total, all aircraft), 187 hours (Total, this make and model), 10765 hours (Pilot In Command, all aircraft), 110 hours (Last 90 days, all aircraft), 57 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Eurocopter	**Registration:**	N814CE
Model/Series:	AS350B3	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	3847
Landing Gear Type:	Skid	**Seats:**	5
Date/Type of Last Inspection:	August 1, 2005 100 hour	**Certified Max Gross Wt.:**	6173 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo shaft
Airframe Total Time:	320.3 Hrs at time of accident	**Engine Manufacturer:**	Turbomeca
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	Arriel 2B
Registered Owner:	ICX Corporation	**Rated Power:**	728 Horsepower
Operator:	Southern California Edison	**Operating Certificate(s) Held:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KL35,6748 ft msl	**Distance from Accident Site:**	3 Nautical Miles
Observation Time:	11:30 Local	**Direction from Accident Site:**	270°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	230°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.28 inches Hg	**Temperature/Dew Point:**	19°C / -9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Running Springs, CA	**Type of Flight Plan Filed:**	None
Destination:	Running Springs, CA	**Type of Clearance:**	None
Departure Time:	10:15 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious	**Latitude, Longitude:**	34.219722,-117.052497

Administrative Information

Investigator In Charge (IIC):	McKenny, Van
Additional Participating Persons:	Dwane Day; Federal Aviation Administration; Riverside, CA Archie Whitten; Turbomeca USA; Grand Prairie, TX Lindsay Cunningham; American Eurocopter; Grand Prairie, TX Art Bradbury; Southen California Edison; Pomona, CA
Original Publish Date:	December 28, 2006
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=62518