



# National Transportation Safety Board Aviation Accident Final Report

<b>Location:</b>	Roswell, New Mexico	<b>Accident Number:</b>	FTW02FA017
<b>Date &amp; Time:</b>	October 19, 2001, 14:58 Local	<b>Registration:</b>	N111DT
<b>Aircraft:</b>	Aerospatiale AS350B2	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>		<b>Injuries:</b>	2 Fatal, 2 Serious
<b>Flight Conducted Under:</b>	Part 91: General aviation - Other work use		

## Analysis

After a maximum performance takeoff (to clear wires) from a parking lot, the helicopter departed the area to the west and climbed to an altitude of 5,500 feet msl. After selecting a landing zone, the pilot turned northwest toward the area and initiated a descent. The pilot's intention was to bring the helicopter to a high hover, allow the dust to settle, and then land. As the helicopter descended to about 200 feet agl, at an airspeed of 115-120 knots, the pilot initiated a right turn into the wind. As the helicopter was turning, the pilot realized the turn was "too steep" and tried to shallow the turn; however, the cyclic would not move. At one point the pilot tried to neutralize the cyclic with both hands but to no avail. The pilot did not remember any "stiffness" with the collective, and he did not hear a warning horn or see any lights illuminate. Subsequently, the helicopter impacted the ground. No pre-impact anomalies were observed during an examination of the airframe and engine. No anomalies were noted during the examination and testing of the hydraulic servos that would have prevented their operation.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The seizing of the cyclic control for an undetermined reason. A contributing factor was the lack of altitude for the pilot to regain control of the helicopter.

## Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION  
Phase of Operation: MANEUVERING

Findings

1. (C) ROTORCRAFT FLIGHT CONTROL, CYCLIC CONTROL - SEIZED
2. AIRCRAFT CONTROL - NOT POSSIBLE - PILOT IN COMMAND

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Occurrence #2: LOSS OF CONTROL - IN FLIGHT  
Phase of Operation: MANEUVERING

Findings

3. (F) ALTITUDE - LOW

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Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER  
Phase of Operation: DESCENT - UNCONTROLLED

Findings

4. TERRAIN CONDITION - GROUND

## Factual Information

### HISTORY OF FLIGHT

On October 19, 2001, at 1458 mountain daylight time, an Aerospatiale AS350B2 helicopter, N111DT, was destroyed during impact with terrain while maneuvering near Roswell, New Mexico. The commercial pilot and one passenger sustained serious injuries, and two passengers sustained fatal injuries. The helicopter was registered to and operated by Medical Air Transport, Inc., of Payson, Arizona. Visual meteorological conditions prevailed, and a company visual flight rule (VFR) flight plan was filed for the 14 Code of Federal Regulations Part 91 orientation flight. The local flight originated from the New Mexico State Police Office parking lot in Roswell, at 1451.

The pilot had been conducting landing zone training with the New Mexico State Police. Subsequent to the training being completed, the pilot took three members of the State Police on an orientation flight for the purpose of demonstrating the capabilities of the air medical helicopter to approach and land at the scene of an accident.

During a telephone interview, the pilot reported to the NTSB investigator-in-charge (IIC), that no anomalies were noted with the helicopter during preflight, start, run-up, takeoff, and the flight to the New Mexico State Police office. He further reported that no anomalies were noted during the accident flight run-up and takeoff. The pilot stated that after a maximum performance takeoff (to clear wires) to the southwest from the parking lot at the State Police Office, the flight departed the area to the west and climbed to an altitude of 5,500 feet msl. After selecting a landing zone, he turned northwest toward the area and initiated a descent. The pilot further stated that his intention was to bring the helicopter to a high hover, allow the dust to settle, and then land. As the helicopter descended to about 200 feet agl, at an airspeed of 115-120 knots, he initiated a right turn into the wind. As the helicopter was turning, he realized the turn was "too steep" and tried to shallow the turn; however, the cyclic would not move. At one point he tried to neutralize the cyclic with both hands but to no avail. He did not remember any "stiffness with the collective," he was more concerned with the cyclic. Also, he did not hear a warning horn or see any lights illuminate. Subsequently, the helicopter impacted the ground. The pilot reported that there was "nothing wrong with the engine."

During a telephone interview, the pilot reported to the FAA inspector, that during the accident flight he decided to show the officers how the helicopter would arrive on an accident scene. He started a descent and entered a right hand turn at a 25 to 35 degree bank angle. The pilot stated that it seemed to be about 2-G's positive as he tightened the turn to make the landing area. He further stated that "the turn was a little steep," and as he tried to shallow the turn, the cyclic control froze and would not move. He stated that he thought the airspeed was less than 100 knots.

During an interview, the surviving passenger reported to the FAA inspector, that the takeoff from the substation was near vertical to clear the area, then the aircraft accelerated and headed eastbound (into the wind) before turning westbound and proceeding along Highway 70. The officers were not wearing headsets, but could communicate with the pilot by speaking loudly.

The passenger further reported that "the pilot remarked that the aircraft was very maneuverable, and asked if they wanted to see what the aircraft could do." The passenger also reported that she "did not think the pilot was showing off, or that any of the maneuvers were violent, or there was any reason to be concerned for her safety."

#### PERSONNEL INFORMATION

The pilot was issued a private pilot certificate on August 10, 1993, for single-engine land airplanes, and on June 4, 1996, he was issued a private pilot rotorcraft-helicopter certificate. On April 28, 1997, he was issued a commercial rotorcraft-helicopter certificate. On September 3, 1999, the pilot completed initial AS350 helicopter ground and flight training, which was administered by American Eurocopter, Grand Prairie, Texas. There were no restrictions or limitations listed on the pilot's FAA second class medical certificate issued on August 23, 2000. On the application for this medical certificate, the pilot reported having accumulated a total of 1,200 flight hours, of which 800 hours were in the previous six months.

On September 28, 2001, the pilot demonstrated competency in the Eurocopter AS350 helicopter in accordance with FAR 135.295(b). A review of the pilot's flight logbook revealed that as of October 19, 2001, the pilot had logged a total flight time of 1,529.0 hours, of which 1,327.6 hours were in helicopters and 445.7 hours were logged in the same make and model as the accident helicopter. The pilot had also logged 55.2 hours in night conditions and 1.4 hours in simulated instrument conditions.

#### AIRCRAFT INFORMATION

The 1990-model Eurocopter AS350B2 helicopter (S/N 2400) had a three-bladed main rotor system, a two-bladed tail rotor, and was powered by a Turbomeca Arriel 1D1 turboshaft engine (S/N 9082), rated at 732-horsepower.

A review of the maintenance records revealed that the helicopter underwent its most recent 100-hour inspection on September 19, 2001, at a total airframe time of 2283.9 hours, and engine total time of 2,176.7 hours. As of October 15, 2001, the airframe had accumulated a total of 2,356.4 flight hours and the engine a total of 2249.2 hours. No evidence of uncorrected maintenance discrepancies was noted in the records.

The helicopter's hydraulic system consists of a pump, which is connected by belt drive to the main rotor transmission, a hydraulic fluid reservoir, a pressure regulator, and main rotor control and tail rotor control hydraulic servos. A panel mounted hydraulic test switch activates an electric solenoid valve, usually activated when the helicopter is on the ground and the rotor turning, that will create a voluntary system pressure drop in order to test the hydraulic warning circuits (light and warning horn) and the main rotor servo accumulators. The tail rotor servo does not utilize an accumulator. A collective mounted hydraulic cut-off switch, when activated, will simultaneously open electric solenoid valves on each servo, discharging any residual servo pressure. The collective switch is utilized following accumulator discharge to prevent control load feedback in the event of a seized servo.

#### METEOROLOGICAL INFORMATION:

At 1453, the Roswell Industrial Air Center Airport (ROW), located 12 nautical miles southeast of the accident site, reported the wind 100 degrees at 7 knots, clear skies, temperature 81 degrees Fahrenheit, dew point 39 degrees Fahrenheit, and altimeter 29.96 inches of Mercury. The NTSB IIC calculated the density altitude as 6,107 feet msl.

#### WRECKAGE IMPACT INFORMATION

The accident site was located using a global positioning satellite (GPS) receiver at 33 degrees 25 minutes 13.6 seconds north latitude and 104 degrees 39 minutes 32.2 seconds west longitude. The accident site was approximately one mile north of US Highway 70's mile post 325 on the Marley Ranch, approximately 4.3 miles west of Roswell, at an elevation of 3,822 feet.

Examination of the accident site revealed that the helicopter's rotor blades struck the ground seven times on a magnetic heading of 340 degrees for a distance of 76 feet. There was a large ground scar approximately 40 feet beyond the last rotor blade scar. The helicopter came to rest on its right side about 375 feet from the initial rotor blade scar. The tail boom was separated from the fuselage and was found approximately 140 feet prior to the fuselage, and the tail rotor intermediate drive shaft was found between the tail boom and the fuselage. Both skids and cross tubes were separated from the fuselage. The fuel tank was found approximately 20 feet beyond the fuselage. There were numerous items of wreckage strewn about the area.

The main rotor gearbox was laying on the ground but attached to its support platform. All three main rotor blades were fractured, and several pieces of the blades were found where the main rotor blades initially struck the ground. Cyclic and collective pitch control continuity was established from the cockpit to the main rotor. Tail rotor pitch control could not be established within the fuselage due to impact damage.

Examination of the hydraulic accumulators revealed that the left lateral accumulator pressure was 27.5 psi, the right lateral accumulator pressure was 0.0 psi, and the fore and aft accumulator pressure was 0.0 psi. The hydraulic pump drive belt was found fractured and so was the spare drive belt. The hydraulic test switch was found unplugged. This would mean the warning horn would not sound, and the hydraulic panel light would not illuminate if hydraulic pressure was lost. The left and right lateral servos along with the fore and aft servo were secured for further examination and testing.

The engine remained attached to the engine deck, and engine continuity was confirmed.

#### SURVIVAL ASPECTS

The pilot and center rear passenger, who sustained serious injuries, used all crashworthiness restraints (lap belts and shoulder harness). It was determined that the left and right rear passengers, who sustained fatal injuries, used their lap belt restraints; however, it could not be determined whether they used their shoulder harness restraints.

## TESTS AND RESEARCH

According to American Eurocopter, the main function of the hydraulic actuators in the main rotor flight control system is to reduce the force required to fly the aircraft, and to isolate the pilot from these forces. The aerodynamic forces are constantly changing and result in rotor blade stress, which increase as a function of speed, gross weight, density altitude, angle of attack, and positive maneuvering (g-loading). Since the hydraulic output (pressure) is essentially constant, the maximum force the actuators can isolate from the pilot remains constant, and under certain circumstances may be exceeded. In level flight, and at airspeeds less than Vne (never exceed velocity), hydraulic systems have the capability to isolate the pilot from the main rotor forces. But, as airspeed and/or g-loading increase, the forces can increase to the point that they exceed the opposing force generated by the flight control hydraulic actuators, and servo transparency or "jack stall" occurs. Jack stall results in uncommanded aft and right cyclic and down collective motion accompanied by pitch-up and right roll of the helicopter. The maneuver, often abrupt and a surprise to the pilot, tends to be self-correcting since the rapid loss of airspeed due to the pitch-up and down collective causes an equally quick reduction in feedback forces. Pilots rarely fly at speeds beyond Vne, but do occasionally induce jack stall as a result of excessive maneuvering. If jack stall is unexpectedly encountered during maneuvering, the pilot should decrease the severity of the maneuver and reduce collective.

On December 4, 2001, the hydraulic servos (S/N PM262, S/N FU408 and S/N CL203) were x-rayed at the General Inspection Laboratories, Inc, of Cudahy, California under the supervision of an NTSB investigator. On December 5, 2001, the hydraulic servos (S/N PM262, S/N FU408 and S/N CL203) were tested at Hawker Pacific Aerospace of Sun Valley, California under the supervision of the NTSB investigator. No anomalies were noted during the examination and testing of the hydraulic servos that would have prevented their operation.

## ADDITIONAL DATA

The helicopter was released to the owner's representative.

### Pilot Information

<b>Certificate:</b>	Commercial; Private	<b>Age:</b>	31, Male
<b>Airplane Rating(s):</b>	Single-engine land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	Helicopter	<b>Restraint Used:</b>	
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 Valid Medical--no waivers/lim.	<b>Last FAA Medical Exam:</b>	September 18, 2001
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	September 28, 2001
<b>Flight Time:</b>	1529 hours (Total, all aircraft), 446 hours (Total, this make and model), 30 hours (Last 90 days, all aircraft), 23 hours (Last 30 days, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Aerospatiale	<b>Registration:</b>	N111DT
<b>Model/Series:</b>	AS350B2	<b>Aircraft Category:</b>	Helicopter
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	
<b>Landing Gear Type:</b>	Skid	<b>Seats:</b>	5
<b>Date/Type of Last Inspection:</b>	September 19, 2001 100 hour	<b>Certified Max Gross Wt.:</b>	4961 lbs
<b>Time Since Last Inspection:</b>	72.5 Hrs	<b>Engines:</b>	1 Turbo shaft
<b>Airframe Total Time:</b>	2283.9 Hrs	<b>Engine Manufacturer:</b>	Turbomeca
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	Arriel 1D1
<b>Registered Owner:</b>		<b>Rated Power:</b>	732 Horsepower
<b>Operator:</b>		<b>Operating Certificate(s) Held:</b>	
<b>Operator Does Business As:</b>		<b>Operator Designator Code:</b>	W76A

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	ROW,3669 ft msl	<b>Distance from Accident Site:</b>	12 Nautical Miles
<b>Observation Time:</b>	14:53 Local	<b>Direction from Accident Site:</b>	120°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	7 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	100°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	29.95 inches Hg	<b>Temperature/Dew Point:</b>	27° C / 4° C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Roswell, NM	<b>Type of Flight Plan Filed:</b>	Company VFR
<b>Destination:</b>		<b>Type of Clearance:</b>	Unknown
<b>Departure Time:</b>	14:51 Local	<b>Type of Airspace:</b>	Class G

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Serious	<b>Aircraft Damage:</b>	Destroyed
<b>Passenger Injuries:</b>	2 Fatal, 1 Serious	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	2 Fatal, 2 Serious	<b>Latitude, Longitude:</b>	33.420276, -104.658889

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Wigington, Douglas
<b>Additional Participating Persons:</b>	Patrick MacQuarrie; FAA FSDO; Albuquerque, NM Archie Whitten; Turbomeca Engine Corporation; Grand Prairie, TX Ken Arnold; American Eurocopter; Grand Prairie, TX
<b>Original Publish Date:</b>	May 30, 2003
<b>Note:</b>	
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=53639">https://data.nts.gov/Docket?ProjectID=53639</a>

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The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).