National Transportation Safety Board
Aviation Accident Final Report

Location:	CLEVELAND, Ohio	**Accident Number:**	IAD02FA026
Date & Time:	January 18, 2002, 00:24 Local	**Registration:**	N626MB
Aircraft:	MBB BK-117 A-3	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal, 1 Serious
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

The medevac helicopter lifted off the hospital's roof-top helipad at night. The pilot made a right pedal turn to the northwest, facing a building that extended above the height of the helipad by approximately 10-feet. The paramedic said that when the helicopter was about 20-feet above the helipad, and while he was programming the GPS receiver, a "sudden gust" of wind push the helicopter from directly behind. He was not alerted to anything unusual until he looked up and noticed the helicopter's close proximity to a 16-floor brick building, located at the northern corner of the heliport, which extended above the height of the helipad by 4 floors. The paramedic yelled, "building, building, building!" to alert the pilot. The pilot then made a rapid right cyclic input to avoid hitting the building, but the helicopter struck the building, and fell about 13 floors to ground level. The paramedic did not see or hear any warning lights, horns or unusual noises, and was not aware of any mechanical problems with the helicopter. A police officer who flew two missions in the local area prior to the accident said the wind speed at 500 feet agl was at least 25 knots and gusting from the south/southwest. He stood on the primary helipad after the accident and said mechanical turbulence from the building was evident. An FAA inspector who also stood on the rooftop helipad after the accident said the wind gusts were about 20-30 knots from the southwest and they swirled around the heliport. Review of the helicopter flight manual revealed, "Directional controllability during take-off and landing is assured for flight condition with crosswind components up to 17 [knots].

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: pilot's failure to maintain directional control of the helicopter while hovering, which resulted in its collision with a building. Factors were the confined area, tail wind, and wind gusts.

Findings

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

Findings
1. OBJECT - BUILDING(NONRESIDENTIAL)
2. (C) DIRECTIONAL CONTROL - NOT MAINTAINED - PILOT IN COMMAND
3. (F) WEATHER CONDITION - GUSTS
4. (F) WEATHER CONDITION - TAILWIND
5. (F) TERRAIN CONDITION - CONGESTED/CONFINED AREA

Factual Information

HISTORY OF FLIGHT

On January 18, 2002, at 0024 eastern standard time, an MBB (Eurocopter) BK 117 A-3 helicopter, N626MB, operated by CJ Systems Aviation Group, was destroyed when it collided with a brick facade during a take-off from a roof-top helipad at the University Hospitals of Cleveland, Cleveland, Ohio. The certificated commercial pilot and the flight nurse were fatally injured, and the paramedic was seriously injured. Night visual meteorological conditions prevailed, and no flight plan was filed for the medevac flight conducted under 14 CFR Part 91.

At 0017, the medevac crew was notified of an emergency patient pick-up at the Lake West Hospital, Eastlake, Ohio.

According to the paramedic, he and the flight nurse gathered their medical equipment and walked out to the helicopter, which was on the primary (eastern most) helipad, facing southwest. They stowed their equipment onboard while the pilot conducted a pre-flight inspection of the helicopter.

After he stowed his medical equipment, the paramedic conducted his own pre-flight inspection of the helicopter, then sat in the left front pilot seat for departure.

With the crew onboard and the engines started, the pilot positioned the power levers for flight. As the helicopter ascended vertically, the pilot turned the nose of the helicopter to the right (northwest), so it faced a wall that extended 10-feet above the height of the helipads. The paramedic contacted dispatch and the pilot contacted Burke Lakefront Airport Control Tower.

When the helicopter was approximately 20-feet above the helipad, while the paramedic was programming the panel mounted GPS, he felt a "sudden gust" of wind push the helicopter from directly behind. He was not alerted by the wind gust, since it was normal to encounter them when departing from this heliport. The paramedic said he was not aware of anything unusual with the flight until he looked up, and noticed the helicopter's close proximity to a 16-floor brick building, which was located at the northern corner of the heliport and extended above the height of the helipad by 4 floors. He said the nose of the helicopter was also positioned further to the right than before.

The paramedic yelled, "building, building, building!" to alert the pilot. The pilot then made a rapid right cyclic input, which caused the helicopter to make a "hard nose over to the right." The paramedic said there was not enough room for the helicopter to complete the approximately 180-degree turn and clear the 16-floor building. The main rotor blades struck the 16-floor building first, followed by the left side of the helicopter. Then, the helicopter fell about 13 floors to a circular driveway at ground level.

Additionally, the paramedic did not see or hear any warning lights, warning horns, or unusual noises, and was not aware of any mechanical problems with the helicopter. He also said that the pilot did not report any problems during the flight.

A Trooper with the Ohio State Highway Patrol (OSHP) interviewed the paramedic on January 22, 2002. During the interview, the paramedic stated:

"Everything was normal and [the pilot] pulled pitch and we started to lift off. We were maybe about 20 feet off the pad when I felt a slight nudge. Almost instantly the tail started pulling left, the nose pulled right and went down in an arc motion. I started yelling, 'building, building', and we went into the building. I could see that [the pilot] was fighting to control it."

When asked if there were any weather concerns on the night of the accident, the paramedic stated that it was, "... clear as a bell. There was some wind gusts but it was cold as heck."

An officer with the Cleveland Police Aviation Unit stated that he flew two missions on the evening of January 17, 2002. He reported that when the flight ended around midnight, the ceilings, visibility, and flight conditions were good. The winds at the surface were at least 15 knots from the southwest throughout the evening, but were gusting to approximately 25 knots during the first flight. The surface winds calmed down during the second flight; however, the winds at 500 feet above ground level (agl) remained brisk throughout the evening. The wind speed was at least 25 knots and gusty.

The officer also stated that he encountered light "mechanical turbulence" during the flights, which was due to the south/southwesterly winds and the high ground that surrounded the Cleveland Metro area.

Additionally, the officer stood on the heliport about 0300 on the morning of the accident and noted that it was still very windy from the west/southwest and the "mechanical turbulence from the building was evident."

A Federal Aviation Administration (FAA) inspector also examined the heliport about 0300 on the morning of the accident. According to the inspector, the winds were out of the southwest, and were gusting between 20 and 30 knots. He said that as he walked around the edge of the heliport, he caught himself several times backing away from the edge due to the wind gusts. The inspector also stated that the wind seemed to swirl around the heliport.

According to the operator's dispatch records, the helicopter lifted off the helipad at 0024.

Review of air traffic control communications revealed that the helicopter contacted the Burke Lakefront Control Tower at 0024. The tower responded seven seconds after the initial call and attempted to contact the pilot, but there was no response. There were no distress or emergency calls made from the crew of the helicopter.

The accident occurred during the hours of darkness, approximately 41 degrees, 03 minutes north latitude, and 081 degrees, 36 minutes west longitude.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with ratings for rotorcraft-helicopter, airplane

single and multi-engine land, and instrument airplane and helicopter. He also held a flight instructor certificate for airplane single engine land and instrument airplane.

His most recent FAA second-class medical certificate was issued on February 13, 2001.

The pilot began his employment with the operator in October 2001. At that time, he reported 2,870 total flight hours and 2,599 hours in helicopters, of which, 640 hours were at night. He also reported a total of 467.6 hours in the BK-117, of which 143.2 hours were at night.

Examination of the pilot's flight duty time records since October 2001 revealed that he had flown the BK-117 a total of 41.7 hours; 24.4 hours at night, and made 114 night landings.

Review of the pilot's duty time records revealed that he was off duty from January 10-15, 2002. On January 16, 2002, he worked a 12-hour day shift from 0700-1900. On the day of the accident, he was scheduled to work a 12-hour night shift that began at 1900 on January 17, 2002 and ended at 0700 on January 18, 2002.

METEOROLOGICAL INFORMATION

Weather at Burke Lakefront Airport, about 3 nautical miles northwest of the accident site, at 0046, was reported as wind from 230 degrees at 10 knots, visibility 10 statute miles, ceiling overcast at 5,000 feet, temperature 26 degrees F, dewpoint 16 degrees F, and altimeter setting 30.08 inches Hg.

HELIPORT INFORMATION

The hospital's heliport was located on the roof of a 12-floor building and included two interconnected helipads that were 60 feet long 50 feet wide, and 30 feet apart. On the northwest side of the heliport, there were two attached buildings that extended above the height of the helipads by approximately 10 feet. A 16-floor brick building was also located near the north corner of the heliport and was attached to one of the shorter buildings, which housed the heliport's stabilization area.

There was approximately 90 feet of clearance between the center of the primary helipad and the closest point of the 16-floor building.

The heliport was equipped with lighting for night operations. A lighted 20-knot windsock was located on the roof of one of the 10-foot high buildings and on top of the 16-floor building.

According to the operator's Director of Safety, there were four primary and two alternate approach and departure paths to and from the heliport. These points were contained within a 190-200 degree arc. It was the pilot's responsibility to determine the proper approach and departure alignment based on the existing wind conditions and heliport traffic.

The Director of Safety also described a normal departure procedure from the primary helipad. He said that the pilot would lift the helicopter into a low hover [3-5 foot skid height above the pad], perform a quick scan of the instrument panel, and then a crewmember would contact the

company dispatcher. When the dispatcher acknowledged the call, the helicopter would ascend to an approximate 20-foot skid height for a radio call to Burke Lakefront Control Tower prior to departing. He explained that this out of ground effect hover allowed line-of-sight reception for the belly mounted radio antenna and skid clearance over the 10-foot high buildings. The Director of Safety also said that it was normal procedure to depart the hospital environment only after two-way communication was established with Burke Lakefront Control Tower.

The FAA inspector who examined the heliport environment a few hours after the accident stated that one of the perimeter lights on the southeast corner of the primary helipad was out of service, but sufficient lighting existed for take-off and landing.

WRECKAGE AND IMPACT INFORMATION

The wreckage was examined on January 19-20, 2002. The helicopter came to rest at the base of the hospital, below the primary helipad. All major components of the helicopter were accounted for at the accident site.

Impact marks were observed on the southwest facade of the 16-floor building about 25-feet above the height of the helipad. A corner section of this building was knocked out, and there were four 5- to 7-inch-wide fan-shaped impact marks located below and to the left of the damaged corner. The fan-shaped marks were gray and yellow in color. Descending below and to the right of the fan-shaped marks were blue and white colored paint transfers.

Impact marks were also found on the hospital's stabilization area roof, located between the heliport and the 16-floor building, and on a 10th-floor outcropping above the wreckage site.

The heliport, as well as ledges, outcroppings, and rooftops were littered with helicopter debris. Among the debris were the yaw CSAS actuator, tail rotor drive shaft, a tail rotor blade tip, main rotor tip cap, sections of an end plate, blue paint chips, pieces of brick, gray pieces of main rotor blade, a main rotor blade internal weight, foam, and composite material.

The main wreckage came to rest on its left side, and faced approximately 122 degrees magnetic. The cockpit and fuselage were consumed by post-impact fire. The main rotor system, transmission, engines, and tandem hydraulic unit had also sustained extensive fire damage.

Flight control continuity could not be confirmed due to the extent of fire damage. However, all of the flight controls and their respective bell cranks, control rods, levers, and associated hardware were accounted for from the cockpit to each respective control surface.

Three of the four main rotor blades remained partially attached to the main rotor head, but had separated from extensive fire damage outboard of the pendulum vibration damper. Each of the three blades came to rest near the main wreckage, and were destroyed by fire. The fourth blade was located at the base of the 16-floor building and was separated from the main rotor at the root fitting. The outboard section of the blade exhibited broom straw fractures, and there were white and green colored transfers marks along the top surface of the blade.

Examination of the tandem hydraulic unit revealed that it was set to the primary system.

The #1 engine was beneath the #2 engine. The #1 engine's turbine/compressor section was separated from the gearbox module. The compressor intake blades exhibited damage, and some metal debris was found along the rim of the intake. The main drive shaft was separated from both diaphragms but did not display impact damage.

The #2 engine was intact, but exhibited damage to the tailpipe and accessories. The main drive shaft was fractured between the transmission and engine. The fractured ends were twisted.

The tail boom was separated from the main fuselage at the forward attachment point. The vertical fin, tail rotor, left horizontal stabilizer and its end plate had separated from the tail boom. However, the right horizontal stabilizer and its end plate remained attached. A small horizontal impact mark was noted at the base of the vertical fin and a main rotor tip cap was found entangled in vertical fin structure located near the fin's leading edge.

Examination of the tail rotor revealed that the gearbox was intact and did not bind when manually rotated. Both tail rotor blades were attached at the hub. However, only about 7 inches of one blade remained and exhibited broom straw fractures. The other blade was relatively intact, but the tip exhibited broom straw fractures, and the cap was separated. The outboard face of the blade exhibited chordwise scoring over the entire surface area. At the tip, the paint was exfoliated and a gray colored composite material was exposed. Both pitch links were intact, but the outboard tips exhibited scoring. One of the tail rotor outboard compensating weights was bent, and the other was broken off at the arm.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot on January 18, 2002, by the Cuyahoga County Medical Examiner's Office, Cleveland, Ohio.

The FAA Toxicological Accident Research Laboratory, Oklahoma City, Oklahoma, performed a toxicological examination on the pilot.

ADDITIONAL INFORMATION

Review of the BK-117A-3 Flight Manual, page 2-8, stated, "Directional controllability during take-off and landing is assured for flight condition with crosswind components up to 17 [knots]."

During examination of the heliport environment, it was observed on several occasions that the windsock mounted on the roof of the 10-foot high building and on top of the 16-floor building frequently indicated different wind speeds and directions.

Examination of aerial photographs taken within several minutes of each other on the day of the accident also revealed the windsocks indicating different wind speeds and directions. In one photograph, the windsock on the 10-foot high building appeared halfway extended and indicated wind out of the east-southeast. The windsock mounted on the 16-floor building appeared fully extended, and indicated wind out of the northwest. In a second photograph, the

windsock mounted on the 10-foot high building was limp, and the windsock mounted on the 16-floor building appeared to be fully extended and indicated winds out of the northwest.

Additionally, a handheld anemometer was used to register wind speed and force on the primary helipad. Over the course of several minutes, rapid changes in wind speeds were noted.

According to the operator's Director of Safety, an anemometer had been installed on the roof of the 16-floor building to assist a crane during construction of the heliport. Upon completion of the construction, the anemometer remained installed but was disconnected. After the accident, the anemometer was reconfigured, and a third windsock was installed on the roof of the hospital's stabilization building to provide additional wind information to pilots arriving and departing the heliport.

The helicopter wreckage was released to the operator on January 31, 2002.

Pilot Information

Certificate:	Commercial	**Age:**	51,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	February 13, 2001
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	October 1, 2001
Flight Time:	2870 hours (Total, all aircraft), 467 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	MBB	**Registration:**	N626MB
Model/Series:	BK-117 A-3	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	7109
Landing Gear Type:	Skid	**Seats:**	6
Date/Type of Last Inspection:	December 23, 2001 AAIP	**Certified Max Gross Wt.:**	7056 lbs
Time Since Last Inspection:	39.6 Hrs	**Engines:**	2 Turbo shaft
Airframe Total Time:	5952 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Installed, not activated	**Engine Model/Series:**	LTS-101-SER
Registered Owner:		**Rated Power:**	650 Horsepower
Operator:		**Operating Certificate(s) Held:**	Commuter air carrier (135)
Operator Does Business As:		**Operator Designator Code:**	BAQA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	BKL,584 ft msl	**Distance from Accident Site:**	3 Nautical Miles
Observation Time:	00:46 Local	**Direction from Accident Site:**	340°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Overcast / 5000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	230°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.07 inches Hg	**Temperature/Dew Point:**	-3°C / -9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	CLEVELAND, OH (NONE)	**Type of Flight Plan Filed:**	Company VFR
Destination:	EASTLAKE, OH (NONE)	**Type of Clearance:**	None
Departure Time:	00:24 Local	**Type of Airspace:**	Class D

Wreckage and Impact Information

Crew Injuries:	2 Fatal, 1 Serious	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-ground
Total Injuries:	2 Fatal, 1 Serious	**Latitude, Longitude:**	41.509998,-81.608612

Administrative Information

Investigator In Charge (IIC):	Yeager, Leah
Additional Participating Persons:	LARRY KING; CLEVELAND, OH KEN ARNOLD; AMERICAN EUROCOPTER CORPORATION; GRAND PRAIRIE, TX J HEFFERNAN; CJ SYSTEMS AVIATION GROUP; WEST MIFFLIN, PA
Original Publish Date:	May 13, 2003
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=54041