# Aviation Investigation Final Report

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| **Location:** | Cameron Park, California | **Accident Number:** | LAX04LA274 |
| **Date & Time:** | July 21, 2004, 15:40 Local | **Registration:** | N103RW |
| **Aircraft:** | Finke Rotorway Exec 162F | **Aircraft Damage:** | Destroyed |
| **Defining Event:** | | **Injuries:** | 1 Fatal |
| **Flight Conducted Under:** | Part 91: General aviation - Flight test | | |

## Analysis

Witnesses said the helicopter was in cruise flight when it pitched up, rolled left to an inverted attitude while portions of the airframe separated, then it descended straight down to ground impact. Wreckage examination found evidence that the main rotor blades (MRB) diverged from their plane of rotation, and mast bumping occurred. Thereafter, the blades impacted the tail boom, which separated from the helicopter. The helicopter became uncontrollable, rolled inverted, and descended into a residence. Portions of both the helicopter and residence were consumed in the post impact fire. The pilot-builder held a repairman certificate for his experimental category helicopter. The pilot had replaced RotorWay's main rotor blades with blades manufactured by another company. During assembly of the helicopter, each MRB was attached to its respective blade yoke with a single retention nut/bolt assembly. The subsequent wreckage examination revealed that the nut that secured one of the MRBs to its retention bolt was missing. The retention bolt was examined, and its threads were not stripped; the bolt was intact. During the MRB installation, the nut had likely been inadequately torqued, and thereafter, it had worked off the bolt during flight. With the bolt loose, the MRB was free to diverge from its normal rotation plane, thus rendering the helicopter uncontrollable.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The owner-builder's improper main rotor blade (MRB) maintenance/installation by under torquing the blade retaining nut.

## Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: CRUISE

Findings
1. (C) ROTOR SYSTEM,MAIN ROTOR HUB RETAINING NUT - UNDERTORQUED
2. (C) MAINTENANCE,INSTALLATION - IMPROPER - OWNER/BUILDER
3. ROTOR SYSTEM,MAIN ROTOR BLADE RETAINING PIN/BOLT - LOOSE PART/BOLT/NUT/CLAMP/ETC
4. (C) MAST BUMPING - ENCOUNTERED - OWNER/BUILDER
5. MISC ROTORCRAFT,MAIN ROTOR/TAIL BOOM CONTACT - SEPARATION
6. AIRCRAFT CONTROL - NOT POSSIBLE - OWNER/BUILDER
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Occurrence #2: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: DESCENT - UNCONTROLLED

Findings
7. OBJECT - RESIDENCE

## Factual Information

HISTORY OF FLIGHT

On July 21, 2004, about 1540 Pacific daylight time, the pilot flying a Finke RotorWay Exec 162F, N103RW, experienced an in-flight malfunction while cruising over Cameron Park, California. The experimental helicopter entered an uncontrolled descent and impacted a private residence about 1 mile south-southeast of the Cameron Park Airport. The helicopter was substantially damaged during the impact sequence, and it was destroyed along with a residence during the post impact ground fire. The commercial pilot, who was also the helicopter's owner-builder, was fatally injured. No one on the ground was injured. Visual meteorological conditions prevailed at the time of the test flight, and no flight plan was filed. The flight was performed under the provisions of 14 CFR Part 91, and it originated from the airport about 1539.

Three witnesses reported to the National Transportation Safety Board investigator that they observed portions of the accident flight. According to the witness who was located about 1 mile north of the crash site, a few days before the accident he had observed the pilot performing maintenance on the helicopter. On July 21, the witness observed the pilot takeoff from the Cameron Park Airport using runway 31. Seconds after becoming airborne the helicopter turned left, and the pilot cruised in a southerly direction about 200 feet above ground level. The witness further stated that after about 45 seconds, he heard an unusual sound as though rotor blades were departing the helicopter. Then, the helicopter rolled inverted and rapidly descended.

The second witness was located about 0.3 miles west of the crash site. This witness reported that his attention was drawn toward the helicopter upon hearing an unusual engine noise. The witness reported that he observed the helicopter pitch upward and appeared to stall. Thereafter, the helicopter banked left until rolling inverted, whereupon portions of the airframe separated from the remainder of the helicopter, and the helicopter descended straight down.

The third witness was located about 0.3 miles southeast of the crash site. When he observed the helicopter it was upside down. The helicopter appeared to be rotating or spinning around and pieces were falling off the helicopter like confetti. The witness stated that a portion of the tail appeared to have separated in flight. No evidence of smoke or fire was observed.

PERSONNEL INFORMATION

The commercial pilot held ratings for airplane single engine and multiengine land, instrument airplane, and rotorcraft-helicopter. The pilot received the private pilot rotorcraft-helicopter rating on July 7, 2003.

On the pilot's Federal Aviation Administration (FAA) certificate application form he reported 96 total helicopter flying hours. Of this time, his total dual and solo time was 30 and 66 hours, respectively. According to a member of the pilot's family, all of the pilot's helicopter flight time was acquired flying the accident model of helicopter.

The pilot was also FAA certificated as a repairman, experimental aircraft builder. The repairman certificate bore the limitation that his inspection authority was limited to his (the accident) helicopter.

According to FAA records, on December 1, 2003, when the pilot was issued a third-class aviation medical certificate, he reported a total flight time of 7,624 hours. The pilot also reported having flown 49 hours during the preceding 6 months.

The pilot's personal flight record logbook indicates that between July 5 and 8, 2003, he received about 5.5 hours of dual flight instruction in the RotorWay 162F helicopter. Thereafter, he piloted the same model of helicopter at least 14 additional hours prior to the accident flight. No flight time was found recorded in the pilot's logbook between April 2004 and the accident flight.

## AIRCRAFT INFORMATION

On October 18, 2001, the FAA issued a Special Airworthiness Certificate to N103RW. The helicopter's category designation was Experimental. Operating limitations, issued November 26, 2001, were a part of the certificate. One of the limitations required the pilot to remain in flight test, following a major change to the helicopter, for a minimum of 5 hours during which flight was only permitted over a sparsely populated area.

According to records maintained by RotorWay International, on May 17, 2004, the pilot notified the company via telephone that he had experienced a severe vibration and that he had installed after market main rotor blades (not manufactured by RotorWay) in his helicopter. The pilot stated that the tail boom had been damaged from the vibration.

As directed by the Safety Board investigator, and under the on-scene supervision of the FAA, RotorWay International's Vice President of Customer Service participated in the wreckage examination. The participant reported that during the accident flight the pilot had been flying a helicopter that departed from RotorWay's design. In pertinent part, the main rotor blades had not been manufactured by RotorWay. RotorWay provides metal main rotor blades. The accident blades appeared composed of a fiber glass-like material.

## WRECKAGE AND IMPACT INFORMATION

According to the FAA airworthiness inspector who responded to the accident site, portions of the helicopter were found separated from the main wreckage. Specifically, the tail rotor drive pulleys were found in a golf course, several blocks northwest of the main wreckage. The last 3

feet of the tail boom, including the tail rotor, was found about 80 feet south of the crash site. A 5-foot-long section of the tail boom was also found about 270 feet southeast of the crash site. An aft portion of the tail boom's right side was observed crushed. The indentation resembled the shape of a main rotor blade.

## MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed by the El Dorado County Coroner's Office, Placerville, California. The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicology tests on specimens from the pilot. Results of the tests did not reveal the presence of carbon monoxide, cyanide, ethanol, or any screened drugs.

## TESTS AND RESEARCH

The helicopter was examined by the FAA and RotorWay participants. The RotorWay participant confirmed that the helicopter had been partially assembled using RotorWay supplied parts, in addition to components from other sources that were not supported by RotorWay. According to the participant, during assembly of the helicopter, each main rotor blade is attached to a blade yoke with a single retention nut/bolt assembly.

The wreckage examination of one of the two main rotor blades revealed that the nut used to secure the retention bolt was missing. The respective bolt was examined. Its threads did not appear stripped, and the bolt was intact. The participant reported that if the nut had come loose in flight, the blade would be free to diverge from its normal clockwise plane of rotation. Thereafter, the rotor could strike the tail boom's right side causing boom separation.

During the examination, deformation was evident in the third bulkhead area of the tail boom's right side. The deformation was consistent with the tail boom having been impacted by a main rotor blade, according to the RotorWay participant.

Also, the rotor blade strap assemblies of both blades showed bending signatures on the lower/longer strap. According to the RotorWay participant, this signature occurs when blades contact the main rotor shaft (mast bumping).

## ADDITIONAL INFORMATION

An acquaintance of the accident pilot reported to the Safety Board investigator that the pilot had detected a vibration when previously operating the helicopter. Thereafter, maintenance had been accomplished that included replacing the main and tail rotor blades.

On July 27, 2004, all recovered wreckage was released to the company that recovered the wreckage. The Safety Board investigator notified the pilot's family via telephone of the wreckage release and the storage location.

## Pilot Information

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| **Certificate:** | Commercial | **Age:** | 62,Male |
| **Airplane Rating(s):** | Single-engine land; Multi-engine land | **Seat Occupied:** | |
| **Other Aircraft Rating(s):** | Helicopter | **Restraint Used:** | |
| **Instrument Rating(s):** | Airplane | **Second Pilot Present:** | No |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | Yes |
| **Medical Certification:** | Class 3 Without waivers/limitations | **Last FAA Medical Exam:** | December 1, 2003 |
| **Occupational Pilot:** | | **Last Flight Review or Equivalent:** | |
| **Flight Time:** | 7624 hours (Total, all aircraft), 96 hours (Total, this make and model) | | |

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | Finke | **Registration:** | N103RW |
| **Model/Series:** | Rotorway Exec 162F | **Aircraft Category:** | Helicopter |
| **Year of Manufacture:** | | **Amateur Built:** | Yes |
| **Airworthiness Certificate:** | Experimental (Special) | **Serial Number:** | 6235 |
| **Landing Gear Type:** | Skid | **Seats:** | 2 |
| **Date/Type of Last Inspection:** | November 1, 2002 Condition | **Certified Max Gross Wt.:** | 1500 lbs |
| **Time Since Last Inspection:** | 100 Hrs | **Engines:** | 1 Reciprocating |
| **Airframe Total Time:** | 200 Hrs at time of accident | **Engine Manufacturer:** | Rotorway |
| **ELT:** | | **Engine Model/Series:** | 162F |
| **Registered Owner:** | William J. Finke | **Rated Power:** | 150 Horsepower |
| **Operator:** | | **Operating Certificate(s) Held:** | None |

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual (VMC) | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | AUN,1531 ft msl | **Distance from Accident Site:** | 17 Nautical Miles |
| **Observation Time:** | 15:50 Local | **Direction from Accident Site:** | 330° |
| **Lowest Cloud Condition:** | Clear | **Visibility** | 10 miles |
| **Lowest Ceiling:** | None | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | 8 knots / | **Turbulence Type Forecast/Actual:** | / |
| **Wind Direction:** | 240° | **Turbulence Severity Forecast/Actual:** | / |
| **Altimeter Setting:** | 29.9 inches Hg | **Temperature/Dew Point:** | 35°C / 11°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | Cameron Park, CA (O61 ) | **Type of Flight Plan Filed:** | None |
| **Destination:** | (O61 ) | **Type of Clearance:** | None |
| **Departure Time:** | 15:39 Local | **Type of Airspace:** | Class G |

## Airport Information

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| **Airport:** | Cameron Airpark O61 | **Runway Surface Type:** | |
| **Airport Elevation:** | 1286 ft msl | **Runway Surface Condition:** | Unknown |
| **Runway Used:** | | **IFR Approach:** | None |
| **Runway Length/Width:** | | **VFR Approach/Landing:** | None |

## Wreckage and Impact Information

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| **Crew Injuries:** | 1 Fatal | **Aircraft Damage:** | Destroyed |
| **Passenger Injuries:** | | **Aircraft Fire:** | On-ground |
| **Ground Injuries:** | N/A | **Aircraft Explosion:** | None |
| **Total Injuries:** | 1 Fatal | **Latitude, Longitude:** | 38.668334,-120.980003 |

## Administrative Information

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| **Investigator In Charge (IIC):** | Pollack, Wayne |
| **Additional Participating Persons:** | Paul Cloutier; Federal Aviation Administration; Sacramento, CA<br>Tom Smith; Rotorway International; Chandler, AZ |
| **Original Publish Date:** | December 20, 2005 |
| **Last Revision Date:** | |
| **Investigation Class:** | Class |
| **Note:** | |
| **Investigation Docket:** | https://data.ntsb.gov/Docket?ProjectID=59751 |