National Transportation Safety Board
Aviation Accident Final Report

Location:	Crete, IL	**Accident Number:**	CHI05LA173
Date & Time:	07/01/2005, 1350 CDT	**Registration:**	N997SA
Aircraft:	Robinson R22 Beta	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	2 None
Flight Conducted Under:	Part 91: General Aviation - Instructional		

Analysis

The helicopter sustained substantial damage following an in-flight fire, hard landing, and subsequent ground fire. The pilot's accident report stated, "We were flying ... when I noticed clutch light on. The light stayed on for longer than 7 [seconds] and my decision was to pull clutch circuit breaker to save other belt. I took over the controls when the clutch light went on and I started to set my self up for emergency landing. ... At the same time I noticed smoke inside the cockpit and the smoke was filling inside fast. ... At about 1100 MSL I noticed low rpm light and horn went on, so I lowered the collective and entered autorotation. ... We exited the aircraft and could see the flames above the belts about 3 feet tall." Burnt pieces of alternator and drive belts were recovered from the site. A separated section of a recovered drive belt measured about a foot in length. The bottom quarter of the dipstick had oil on it when removed. The oil cooler exhibited damage on its lower and inboard surfaces, along the aft edge. The lower aft corner of the cooler was separated at its seam there. A dark media covered the engine in the area adjacent to the oil cooler. An oil like media was found on the tail rotor's guard and on the vertical stabilizer. The tailcone was burned away at its forward end. No pre-impact failures of the flight control system were found. The landing gear exhibited downward yielding.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The separation of the drive belt, during cruise, leading to the puncturing of the oil cooler and subsequent fire. An additional cause was the pilot's restricted lookout during the emergency landing resulting in the hard landing.

Findings

Occurrence #1: FIRE
Phase of Operation: CRUISE

Findings
1. (C) ROTOR DRIVE SYSTEM,MAIN ROTOR DRIVE BELT - SEPARATION
2. (C) LUBRICATING SYSTEM,OIL COOLER - PUNCTURED

Occurrence #2: FORCED LANDING
Phase of Operation: EMERGENCY DESCENT/LANDING

Occurrence #3: HARD LANDING
Phase of Operation: EMERGENCY DESCENT/LANDING

Findings
3. (C) VISUAL LOOKOUT - RESTRICTED - PILOT IN COMMAND

Factual Information

HISTORY OF FLIGHT

On July 1, 2005, about 1350 central daylight time, a Robinson R22 Beta helicopter, N997SA, operated by Sun Aero Helicopters, Inc., sustained substantial damage following an in-flight fire, hard landing, and subsequent ground fire near Crete, Illinois. The instructional flight was operating under 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed at the time of the accident. No flight plan was on file. The instructor pilot and student pilot reported no injuries. The local flight originated from the Lansing Municipal Airport (IGQ), near Lansing, Illinois, about 1330.

The pilot's accident report stated:

> We were flying five nautical miles south of the Lansing (IGQ) Airport on 090 heading when I noticed clutch light on. The light stayed on for longer than 7 [seconds] and my decision was to pull clutch circuit breaker to save other belt. I took over the controls when the clutch light went on and I started to set my self up for emergency landing. We turned 180 degrees to the right and as I was turning I was looking for the place to land. At the same time I noticed smoke inside the cockpit and the smoke was filling inside fast. We were flying at about 1600 MSL [feet above mean sea level] at that point. When we were coming down the amount of smoke in the cockpit accumulated to degree that it was hard for us to see and breathe. At about 1100 MSL I noticed low rpm light and horn went on, so I lowered the collective and entered autorotation. At about 30 feet above ground I started to flare and at about 5 feet leveled off and pulled the collective to cushion the landing. When I executed the collective pull the aircraft ascended slightly then the aircraft came down. When we were on the ground I turned all switches and fuel valve off. We exited the aircraft and could see the flames above the belts about 3 feet tall.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with a helicopter rating and he held a flight instructor certificate for helicopters. He held a Federal Aviation Administration (FAA) second-class medical certificate issued on February 15, 2005, with no limitations. He reported that he had accumulated 348 hours total flight time and 290 hours in the same make and model helicopter.

The student pilot held a private pilot certificate with an airplane single-engine land rating. He held a FAA third-class medical certificate issued in May 2005, with limitations for corrective lenses

AIRCRAFT INFORMATION

N997SA, serial number 1029, was a Robinson R22 Beta, two-place, two-bladed, single main rotor, single-engine helicopter, with a spring and yield skid type landing gear. The primary structure of its fuselage was welded steel tubing and riveted aluminum sheet. The tailcone was a monocoque structure consisting of an aluminum skin. The instructor pilot reported that a Lycoming O-320-B2C, serial number L-15317-39A, engine rated at 160 horsepower, powered the helicopter.

Cooling is supplied by an engine-mounted fanwheel enclosed by a fiberglass scroll. The scroll ducts cooling air to the engine-mounted shroud which in turn directs the air to the cylinders, external oil cooler, alternator, and main rotor gearbox. Mounted on the engine crankshaft flange is the lower sheave and fanwheel. Above the lower sheave is the clutch sheave. Two vee-belts are installed between the lower and clutch sheaves. The external oil cooler is mounted adjacent to the lower sheave.

The instructor pilot reported that the last annual inspection was dated May 25, 2005. The pilot reported that the helicopter had accumulated 48 hours of time since the last inspection and that it had accumulated 2,398 hours of total time.

The helicopter was overhauled by Helicopter Specialties, Inc., on February 21, 2005. Logbook entries showed that the helicopter had accumulated 2,199.5 hours of total time. The Hobbs meter was reported to have read 1,279.8 hours at that inspection.

METEOROLOGICAL INFORMATION

At 1325, the recorded IGQ weather was: Wind 290 degrees at 8 knots gusting to 16 knots; visibility 10 statute miles; sky condition broken 5,000 feet; temperature 25 degrees C; dew point 13 degrees C; altimeter 29.86 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The helicopter came to rest in a field about 7.5 miles south of IGQ at latitude 41 degrees 25.823 minutes N and longitude 87 degrees 32.598 minutes W. Burnt pieces of alternator and drive belts were recovered from the site. A separated section of a recovered drive belt measured about a foot in length.

A FAA inspector and representatives from the engine and helicopter manufacturer examined the wreckage. The examination of the helicopter revealed that about the bottom quarter of the dipstick had oil on it when removed. The oil cooler exhibited damage on its lower and inboard surfaces, along the aft edge. The lower aft corner of the cooler was separated at its seam there. A dark media covered the engine in the area adjacent to the oil cooler. An oil like media was found on the tail rotor's guard and on the vertical stabilizer. The tailcone was burned away at its forward end. No pre-impact failures of the flight control system were found. The landing gear exhibited downward yielding. The Hobbs meter was reported to have read 1,477.4 hours. The belt tension actuator, lower sheave, lower actuator bearing, and the starter ring had been removed prior to the examination and their alignment and tension settings could not be measured.

FIRE

The instructor and student observed flames about three feet tall above the drive belts. The instructor tried to put out the fire with an extinguisher. A local fire department was on-scene within five minutes and extinguished the fire.

ADDITIONAL DATA/INFORMATION

The parties to the investigation included the FAA, Robinson Helicopter Company (RHC), and Textron Lycoming.

The aircraft wreckage was released to a representative of the flight school.

Subsequent to the accident, a representative of the helicopter manufacturer stated:

> Robinson Helicopter now allows the use of three different types of oil cooler[s] on the R22 helicopter. Two of these coolers [are Part numbers A649-1 and A649-2]. The third oil cooler [is Part number C649-1]. The C649-1 oil cooler has been delivered as standard equipment on R22 helicopters Serial Number 2571 and on. The C649-1 oil cooler is of a substantially different design from the [other two] oil coolers. It is believed to be more robust and resistant to seam compromise (leading to leakage) from contact with other objects. RHC is phasing out the A649-2 oil cooler on the R22 helicopter by purging in-house stock of these oil coolers, requiring all factory overhauled aircraft be changed to the C649-1 oil cooler, and revising the R22 Parts Catalog to reflect the C649-1 oil cooler only. In addition, the parts catalog and maintenance manual will be revised so that R22's overhauled in the field will also get a C649-1 oil cooler as part of

the overhaul kit.

Flight Instructor Information

Certificate:	Flight Instructor; Commercial	**Age:**	30, Male
Airplane Rating(s):	None	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without Waivers/Limitations	**Last FAA Medical Exam:**	02/01/2005
Occupational Pilot:		**Last Flight Review or Equivalent:**	01/01/2005
Flight Time:	348 hours (Total, all aircraft), 290 hours (Total, this make and model), 260 hours (Pilot In Command, all aircraft), 120 hours (Last 90 days, all aircraft), 40 hours (Last 30 days, all aircraft)		

Student Pilot Information

Certificate:	Private	**Age:**	, Male
Airplane Rating(s):	Single-engine Land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With Waivers/Limitations	**Last FAA Medical Exam:**	05/01/2005
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Robinson	**Registration:**	N997SA
Model/Series:	R22 Beta	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	1029
Landing Gear Type:	Skid	**Seats:**	2
Date/Type of Last Inspection:	05/01/2005, Annual	**Certified Max Gross Wt.:**	1370 lbs
Time Since Last Inspection:	48 Hours	**Engines:**	1 Reciprocating
Airframe Total Time:	2398 Hours at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Not installed	**Engine Model/Series:**	O-320-B2C
Registered Owner:	Sun Aero Helicopters Inc.	**Rated Power:**	160 hp
Operator:	Sun Aero Helicopters Inc.	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	IGQ, 620 ft msl	**Distance from Accident Site:**	
Observation Time:	1325 CDT	**Direction from Accident Site:**	
Lowest Cloud Condition:		**Visibility**	10 Miles
Lowest Ceiling:	Broken / 5000 ft agl	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots / 16 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	290°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.86 inches Hg	**Temperature/Dew Point:**	25°C / 13°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	CHICAGO, IL (IGQ)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	1330 CDT	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	In-Flight and On-Ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	41.432778, -87.781667

Administrative Information

Investigator In Charge (IIC):	Edward F Malinowski	**Report Date:**	05/30/2006
Additional Participating Persons:	Thomas Duellman; Federal Aviation Administration; West Chicago, IL Greg Erikson; Textron Lycoming; Wayne, IL Ken Martin; Robinson Helicopter; Torrance, CA		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		