Aviation Investigation Final Report

Location:	BAKER, Oregon	**Accident Number:**	SEA98FA055
Date & Time:	March 30, 1998, 09:10 Local	**Registration:**	N171HH
Aircraft:	Enstrom F28F	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

The pilot stated that he had lifted off from a road in open terrain so that a truck could get by. He stated that the lift-off was smooth. He noticed some shaking when he began forward flight. He increased the load on the rotor disk and the shaking became so violent that he couldn't see the ground. He dropped the collective and reached the ground. He said that the only way he could describe the situations was that 'it was like being in the spin cycle of a washing machine when all of the weight is on one side.' The helicopter had recently been imported to the US from Canada, and recertified with a US airworthiness certificate. The helicopter had been involved in a hard-landing accident in Japan on June 10, 1994. Damage to the aircraft at that time included the left skid, deformation of the fuselage and twisting of the tail boom. All three main-rotor blades had terrain impact The helicopter was later exported from Japan to Canada, where the importee stated that it was received in a repaired condition. No reference to the accident or its required repair was made in the Canadian maintenance or journey logs. No record was found for accomplishment of an inspection, as outlined in the Enstrom Maintenance Manual, for main rotor blade strike or hard landing inspections. The Safety Board materials laboratory inspected fragments from the steel tube pylon assembly, consisting of pieces of steel tubing that are welded to each other to form a frame structure for the helicopter. The steel tubes provide reinforcement for the four attachment points of the main transmission and other attachment points for the engine. Two of the steel tubes exhibited fatigue cracking, and completely separated during operation of the helicopter.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: Fatigue failure of the steel tubing pylon structure. Factors include inadequate inspection by maintenance personnel of damage after a previous accident.

Findings

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

Findings
1. (C) NACELLE/PYLON - FATIGUE
2. (F) MAINTENANCE,INSPECTION - INADEQUATE - OTHER MAINTENANCE PERSONNEL

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

Findings
3. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On March 30, 1998, approximately 0910 Pacific standard time, N171HH, an Enstrom F28F helicopter, sustained substantial damage when it impacted terrain while maneuvering about 25 miles east of Baker, Oregon. The commercial pilot, the sole occupant, was uninjured. Visual meteorological condition prevailed for the flight, which was to be conducted under 14 CFR 91. The ELT actuated, but did not assist in location of the accident site. There was no fire.

The pilot stated that he had just completed a contract flight for the Oregon state fish and game department. He had lifted off from a road in open terrain so that a truck could get by. He stated that the lift-off was smooth. He noticed some shaking when he began forward flight. He increased the load on the rotor disk and the shaking became so violent that he couldn't see the ground. He dropped the collective and reached the ground. After getting out of the helicopter, he noted that two main rotor blades were wrinkled and the third blade had shed all of its skin. He said that the only way he could describe the situations was that "it was like being in the spin cycle of a washing machine when all of the weight is on one side."

AIRCRAFT INFORMATION

The helicopter had recently been imported from Canada, and recertified with a US airworthiness certificate, on March 18, 1998. All three main-rotor blades were replaced with new rotor blades at the time of US certification.

The helicopter had been involved in a hard-landing accident in Japan on June 10, 1994. Damage to the aircraft at that time included the left skid, deformation of the fuselage and twisting of the tailboom. All three main-rotor blades had terrain impact, and had deformation ranging between ten and 250 centimeters from the blade tips. Total time in service of the helicopter at the date of the accident was recorded as 266 hours 01 minute. The helicopter was later exported from Japan to Canada, where the importee, Galaxy Helicopters, stated that it was received in a repaired condition. Canadian journey logs brought forward logbook entries for flights (appearing to have occurred in Japan) on May 23, 1994, May 28, 1994, and May 29, 1994, with a total aircraft flight time of 266.01 hours. The accident flight of June 10, 1994 was not recorded or brought forward in the journey logs. No reference to the accident or its required repair was made in the Canadian maintenance or journey logs. The Canadian maintenance logs state that the last entries in Japan were at 243.4 hours time in service, when the drive belt, lamiflex bearings, and tail rotor thrust bearings were replaced, and Airworthiness Directives were reviewed. Also carried forward was an entry March 10, 1994, at 243.4 hours time in service, when a 100 hour inspection was completed. No record was found for accomplishment of an inspection, as outlined in the Enstrom Maintenance Manual, for

main rotor blade strike or hard landing inspections.

Maintenance in Canada signed off as performed on September 11, 1995, included installation of a main rotor transmission and installation of new lamiflex bearings (about 22 hours after they were previously replaced).

The first flight after import to Canada, as recorded in the journey logs, was on June 1996: a 1.5 hour local flight, with a total time of 267.5. Log entries related to the Canadian certification "for the purpose of importing and C of A application" were signed September 11, 1995.

WRECKAGE AND IMPACT INFORMATION

The scene of the accident was not visited until after the wreckage was removed from the scene. However, some ground scars and brush strikes were observed and noted. A graphic depiction of those scars and other impacts, as provided by the Enstrom party to the investigation, is attached.

TESTS AND RESEARCH

The NTSB materials laboratory inspected the remains of one main rotor blade for evidence of delamination. All separations in the areas of adhesive bonding were characterized as "adhesive separations." (See attached report.)

Additionally, as described in the attached report, the materials laboratory inspected fragments from the steel tube pylon assembly, consisting of pieces of steel tubing that are welded to each other to form a frame structure for the helicopter. The steel tubes provide reinforcement for the four attachment points of the main transmission and other attachment points for the engine. Stereo microscope examination of one fragment, noted as fragment "5" revealed that crack arrest markings typical of fatigue cracking emanated from multiple origins at the tow of a weld in the area. Fatigue propagation was away from the weld and extended around a total of approximately 120 degrees of the tube circumference. The mating fragment, fragment 11, revealed similar fracture features.

Another pylon fragment, fragment "10," also contained crack arrest markings typical of fatigue cracking that emanated from a weld.

Areas of mechanical damage on mating pylon fragments "5" and "11" and on fragment "10" were found to be consistent with severe re-contact with the mating fracture surfaces after complete separation of the tubes at the fatigue crack locations.

ADDITIONAL INFORMATION

Enstrom maintenance manual guidance concerning inspections after blade strikes with obvious blade damage requires (in part):

A) That the main rotor gearbox be returned to the factory for disassembly and inspection. B) That the main rotor hub, including damper assemblies, be returned to the factory for disassembly and inspection. C) That the pylon structure at the gearbox mounting areas be inspected for broken or bent tubes. D) That all blades be inspected for distortion.

Enstrom maintenance manual guidance concerning inspections after hard landings requires (in part) that the pylon be inspected at the landing gear attach points at the pylon, pylon to gearbox, pylon to cabin, and pylon to tail cone for any deformation or hardware failures. The upper cabin mount fittings should be dye checked for cracks.

The wreckage was released to the owner's representative on February 4, 1999. At the time of release, the wreckage was stored at Pendleton Air Services, Pendleton, Oregon.

Pilot Information

Certificate:	Airline transport	**Age:**	54,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	May 13, 1997
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	16000 hours (Total, all aircraft), 600 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Enstrom	**Registration:**	N171HH
Model/Series:	F28F F28F	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal; Restricted (Special)	**Serial Number:**	758
Landing Gear Type:	Skid	**Seats:**	3
Date/Type of Last Inspection:	March 18, 1998 Annual	**Certified Max Gross Wt.:**	2600 lbs
Time Since Last Inspection:	39 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	433 Hrs	**Engine Manufacturer:**	Lycoming
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	HIO-360-F1AD
Registered Owner:	HERMAN'S HELICOPTERS	**Rated Power:**	225 Horsepower
Operator:		**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	BKE	**Distance from Accident Site:**	
Observation Time:	08:50 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 20000 ft AGL	**Visibility**	40 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	0°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	8°C / 6°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:		**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	09:45 Local	**Type of Airspace:**	

Airport Information

Airport:		**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	44.829048,-117.760925(est)

Administrative Information

Investigator In Charge (IIC):	Stockhill, Michael
Additional Participating Persons:	MIKE MISNICK; BOISE , ID
Original Publish Date:	January 10, 2000
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=42708