



National Transportation Safety Board Aviation Accident Final Report

Location:	HOMER, AK	Accident Number:	ANC98FA019
Date & Time:	02/06/1998, 1245 AST	Registration:	N91029
Aircraft:	Cessna 207	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	1 Fatal
Flight Conducted Under:	Part 135: Air Taxi & Commuter - Non-scheduled		

Analysis

The certificated commercial pilot was departing on a 14 CFR 135 cargo flight. The airplane lifted off and climbed to about 200 feet. Instead of turning right toward the intended destination, the airplane began a left turn toward the runway. The angle of bank increased to about 45 degrees. The airplane then nosed down, and descended into snow covered terrain, about 200 yards north of the runway. Examination of the engine revealed the number six cylinder head was fractured, and slightly separated from the cylinder barrel. The area around the point of separation was blackened and oily. Similar discoloration was noted on the inside of the engine cowl. A metallurgical examination of the cylinder head revealed a fatigue fracture along a large segment of the thread root radius between the 5th and 6th threads. The engine's cylinder compression is part of the operator's approved airworthiness inspection program. The number six cylinder compression, recorded 121 hours before the accident, was noted as 60 PSI. The last engine inspection, 27 hours before the accident, did not include a record of the engine compression.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A fatigue failure, and partial separation of the number 6 engine cylinder head assembly, the operator's inadequate progressive inspection performed by company maintenance personnel, and the pilot's inadvertent stall during a maneuvering turn toward an emergency landing area.

Findings

Occurrence #1: LOSS OF ENGINE POWER(PARTIAL) - MECH FAILURE/MALF
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings

1. (C) ENGINE ASSEMBLY,CYLINDER - FATIGUE
2. (C) MAINTENANCE,AAIP/PROGRESSIVE PROGRAM - INADEQUATE - COMPANY MAINTENANCE PERSONNEL
3. (C) ENGINE ASSEMBLY,CYLINDER - SEPARATION

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: MANEUVERING - TURN TO LANDING AREA (EMERGENCY)

Findings

4. (C) STALL - INADVERTENT - PILOT IN COMMAND

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

Findings

5. TERRAIN CONDITION - SNOW COVERED

Factual Information

HISTORY OF THE FLIGHT

On February 6, 1998, about 1245 Alaska standard time, a wheel equipped Cessna 207 airplane, N91029, was destroyed by impact after colliding with terrain, at Homer, Alaska. The airplane was being operated as a visual flight rules (VFR) cross-country cargo flight under Title 14 CFR Part 135 when the accident occurred. The airplane was registered to, and operated by South Central Air Inc., Kenai, Alaska. The certificated commercial pilot, the sole occupant, received fatal injuries. Visual meteorological conditions prevailed. A VFR flight plan was filed for English Bay, Alaska.

At 1242:27, the pilot made radio contact with the in-flight position at the Federal Aviation Administration's (FAA) Homer Flight Service Station (FSS). The pilot filed a VFR flight plan, and announced his departure from Homer at 1244:03. Just after departure, an electronic locator transmitter (ELT) signal was heard at the FSS.

Witnesses reported the airplane departed runway 03, and climbed to about 100 to 200 feet above the ground. The airplane then began a left turn. During the turn, the bank angle increased, and the nose of the airplane dropped straight down. The airplane disappeared from view behind several trees.

The accident occurred during the hours of daylight, at latitude 59 degrees, 38.958 minutes north, and longitude 151 degrees, 28.309 minutes west.

CREW INFORMATION

The pilot held a commercial pilot certificate with airplane single-engine land, single-engine sea, and multiengine land ratings. The pilot also held a flight instructor certificate with airplane single-engine, and instrument airplane ratings. The most recent second-class medical certificate was issued to the pilot on September 16, 1997, and contained the limitation that the pilot must wear corrective lenses.

The pilot was hired by the company on June 15, 1997. On June 24, 1997, the pilot completed his initial Part 135 check ride.

According to the Pilot/Operator report (NTSB form 6120.1/2) submitted by the operator, the pilot's aeronautical experience consisted of about 1,358 hours, of which 48 hours were accrued in the accident airplane make and model. In the preceding 90 and 30 days prior to the accident, the report listed a total of 132 and 57 hours respectively.

According to the operator, in the three days preceding the accident, the pilot accrued 7.7 hours of flight time.

AIRCRAFT INFORMATION

The airplane had accumulated a total time in service of 11,192.2 hours. The airplane is maintained on an Approved Airworthiness Inspection Program (AAIP). The most recent inspection (event 4), was accomplished on January, 9, 1998, 27.2 hours before the accident.

The engine had accrued a total time in service of 2,559.5 hours. The maintenance records note that a major overhaul was accomplished at the operator's maintenance department on April 11, 1996, 954.4 hours before the accident. At that time, the engine was converted to a nonturbo-charged model.

According to the operator's AAIP inspection schedule, a compression test of the engine's cylinders is required during Event 2, and Event 4, inspections. Event 2 and 4 inspections also include an inspection of the engine cylinders for any defects. During the most recent Event 4 inspection, the engine compression was not noted in the maintenance records. The operator's Event 4 inspection sheet did contain an employee's initials on the appropriate line for the compression check and cylinder inspection.

During the previous Event 2 inspection, on October 9, 1997, 121.5 hours before the accident, the engine compression was noted as follows: Cylinder Number 1, 69 psi; Number 2, 65 psi; Number 3, 62 psi; Number 4, 60 psi; Number 5, 72 psi, Number 6, 60 psi.

The engine cylinders utilized for the engine overhaul were obtained from Divco Inc., Tulsa, Oklahoma. A NU-Chrome finish was applied to each cylinder bore by Aircraft Cylinders of America, Inc., Tulsa.

METEOROLOGICAL INFORMATION

The closest official weather observation station is Homer, Alaska. On February 6, 1998, at 1253, an Aviation Routine Weather Report (METAR) was reporting in part: Wind, calm; visibility, 10 statute miles; clouds, 7,000 feet broken, 9,000 feet overcast; temperature, 39 degrees F; dew point, 34 degrees F; altimeter, 29.49 inHg.

COMMUNICATIONS

Review of the air-ground radio communications tapes maintained by the FAA at the Homer FSS, revealed the pilot communicated with the flight service station specialist at the in-flight position. The pilot obtained a terminal forecast at 0847:55 while using the call sign of N178SC. The pilot filed a VFR flight plan for the accident flight at 1242:27.

A transcript of the air to ground communications between the pilot, and the Homer FSS, is included in this report.

AERODROME AND GROUND FACILITIES

The Homer Airport is equipped with a single hard-surfaced runway on a 030 to 210 degree magnetic orientation. Runway 03 is 7,401 feet long by 150 feet wide. The airport elevation is 78 feet msl.

WRECKAGE AND IMPACT INFORMATION

The National Transportation Safety Board investigator-in-charge (IIC) examined the airplane wreckage at the accident site on February 6 and 7, 1998. The fuselage of the airplane was observed in a near vertical nose down attitude in snow covered terrain. The longitudinal axis of the fuselage was oriented on a magnetic heading of 045 degrees. (All heading/bearings noted in this report are oriented toward magnetic north.)

All of the airplane's major components were found at the main wreckage area. Both wings exhibited extensive spanwise leading edge aft crushing, and were oriented with the leading edge down, on about a 45 degree angle. The right wing lift strut remained attached to the wing and its lower attach point. The left wing lift strut was attached to the wing, but was separated from its fuselage attach point. The wing carry-through was broken, and crushed in an aft direction. The fuselage was oriented in a near vertical attitude. The fuselage was buckled just aft of the rear window.

The flight control surfaces remained connected to their respective attach points. Due to the impact damage, the flight controls could not be moved by their respective control mechanisms, but the continuity of the flight control cables was established to the cabin/cockpit area.

The flap jackscrew was not extended.

The airplane's point of rest was in an area of small spruce trees. The tops of the surrounding trees were undamaged. One small tree, between 1 to 3 inches in diameter, was located near the forward portion of the airplane. It was severed into numerous sections. Each section was between 16 to 12 inches long. The ends of each section displayed a sharp cut oriented on about a 45 degree angle to the vertical axis of each section.

The airplane had a vertical cargo net/barrier installed behind the pilot's seat. The net is normally installed by inserting metal fittings attached to the net, into metal anchors attached to the airframe, just aft of the cabin door opening. Several of the net straps were pulled from their attach fittings. None of the net anchors were damaged.

The elevator trim tab actuator was found extended beyond the trailing edge down limit. Rescue personnel that initially responded to the accident scene, reported the trim tab was observed in a neutral position. During rescue efforts, the tail of the airplane was pulled downward, and the elevator trim cable was cut by rescue personnel.

The propeller bolts attaching the prop to the engine crankshaft were sheared. The blades were loose in the hub. One propeller blade was almost straight, but it exhibited slight torsional twisting, and slight forward bending about 4 inches inboard from the tip. The second blade exhibited about 70 degree aft bending about 8 inches outboard from the hub, and slight torsional twisting. The paint on the cambered side of the blade at the point of bending was missing. The third blade exhibited slight aft bending, and slight torsional twisting.

The engine cowling, fuselage firewall, and the instrument panel were crushed and displaced aft. The engine was partially buried in the ground about a 45 degree angle. It sustained impact damage to the underside, and lower front portion of the engine. The engine oil sump was crushed upward against the case. Wood slivers were found imbedded in the engine oil cooler. The exhaust tubes were crushed, and folded producing sharp creases that were not cracked or broken along the crease.

Hand rotation of the engine crankshaft produced rotation of the accessory section of the engine. During rotation, the magneto impulse coupling was heard to produce a "snap."

The top portion of the number six engine cylinder displayed cracking, and a separation of a segment of cylinder cooling fins, adjacent to the joint between the cylinder barrel and cylinder head. The bottom edges, and the forward face of the cylinder head cooling fins, were undamaged. The number six cylinder also had an opening between the cylinder head and cylinder barrel. The opening was about 1/2 inch wide and about 5 inches long. The cylinder head was canted outward from the cylinder barrel at the top of the head, and inward at the bottom of the head, about 5 to 10 degrees. The cylinder head, adjacent to the opening, exhibited black, oily residue.

Examination of the inside surface of the engine cowling, adjacent to the number 6 cylinder, revealed a blackened, and oily appearance.

The gascolator bowl was punctured, and no fuel was contained in the bowl. The gascolator screen was free of contaminants. Fuel was noted in the fuel line attached to the engine driven

pump.

MEDICAL AND PATHOLOGICAL INFORMATION

A postmortem examination of the pilot was conducted under the authority of the Alaska State Medical Examiner, 5700 E. Tudor, Anchorage, Alaska, on February 9, 1998.

TESTS AND RESEARCH

On February 24, 1998, an external engine examination was conducted at Alaskan Aircraft Engines Inc., Anchorage, Alaska. Disassembly of the engine revealed the presence of pine needles, and a small pine cone wedged in the previously noted crack along the top of cylinder number six. The edges of the cylinder head crack exhibited a mix of gray/black oily residue. The entire head of the cylinder was loose from the barrel. The outer/aft bolt hole flange on the number six intake tube was cracked. The cylinder's rocker arm boss had numerous stamped numbers and letters, including DIV 448. The outer surface of the cylinder barrel sleeve that is inserted into the engine case had the following inscribed: poop-15478-199, 8/92, C46460I 198.

The fuel servo intake screen exhibited a slight accumulation of fibers. The oil filter was free of contaminants. Examination of the oil pump disclosed several small metal slivers on the pump gears. Light scoring was noted on the interior of the pump housing.

The engine driven fuel pump produced a small amount of fuel upon hand rotation. The fuel pump drive coupling was intact. The manifold screen was free of contaminants, and the diaphragm was undamaged.

Both magnetos produced spark at all terminals upon hand rotation.

The number 6 engine cylinder was sent to the National Transportation Safety Board's Materials Laboratory for examination. A Safety Board metallurgist reported the aluminum head assembly fractured, and separated from the steel cylinder barrel at the threaded joint between the two, between fin number 3 and 4 of the head. No damage was noted to the bore of the barrel. Slight thread damage was noted on the barrel exterior. No damage was noted to the combustion chamber surfaces, or the valves. The area of the separation was covered by a dark, heavy layer of material that was consistent with combustion products.

The cylinder head also exhibited a circumferential crack extending about 90 degrees between fin numbers five through eight. A portion of the head, adjacent to the crack, comprising several cooling fin segments, was broken away from the head. The separated fin segment also spanned about 90 degrees circumferentially.

Magnified optical examination of the fracture surfaces on the head assembly found fatigue progression features at both the head fracture, and crack areas. The fracture site exhibited fatigue initiation at multiple origins along a large segment of the thread root radius between the 5th and 6th threads. The fatigue then progressed through the head wall and spread circumferentially in both directions. The progression split into two fronts. One angled inboard to the inboard face of the head, allowing the separation of the fin segment from the head. The second fatigue front continued circumferentially, and slightly outboard, forming the crack segment. The fatigue features in the crack area were much coarser than those in the fracture region, suggesting high stress propagation. In total, the fatigue circumscribed about 135 degrees of the cylinder diameter.

WRECKAGE RELEASE

The Safety Board released the wreckage, located at Homer, to the owner's representatives on February 24, 1998. The number six engine cylinder was retained by the Safety Board for examination until its release on August 25, 1998.

Pilot Information

Certificate:	Flight Instructor; Commercial	Age:	36, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land; Single-engine Sea	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	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:	09/16/1997
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:	1358 hours (Total, all aircraft), 48 hours (Total, this make and model), 1192 hours (Pilot In Command, all aircraft), 132 hours (Last 90 days, all aircraft), 57 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	Registration:	N91029
Model/Series:	207 207	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	T20700020
Landing Gear Type:	Tricycle	Seats:	1
Date/Type of Last Inspection:	01/09/1998, AAIP	Certified Max Gross Wt.:	3800 lbs
Time Since Last Inspection:	27 Hours	Engines:	1 Reciprocating
Airframe Total Time:	11192 Hours	Engine Manufacturer:	Continental
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	IO-520F
Registered Owner:	SOUTH CENTRAL AIR INC.	Rated Power:	300 hp
Operator:	SOUTH CENTRAL AIR INC.	Operating Certificate(s) Held:	Commuter Air Carrier (135); Flag carrier (121); On-demand Air Taxi (135)
Operator Does Business As:		Operator Designator Code:	SOCA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	HOM, 78 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	1253 AST	Direction from Accident Site:	0°
Lowest Cloud Condition:	Unknown / 0 ft agl	Visibility	10 Miles
Lowest Ceiling:	Broken / 7000 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	Calm /	Turbulence Type Forecast/Actual:	/
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29 inches Hg	Temperature/Dew Point:	4° C / 1° C
Precipitation and Obscuration:			
Departure Point:	(HOM)	Type of Flight Plan Filed:	VFR
Destination:	ENGLISH BAY, AK (KEB)	Type of Clearance:	None
Departure Time:	1244 AST	Type of Airspace:	Class E

Airport Information

Airport:	HOMER (PAHO)	Runway Surface Type:	Asphalt
Airport Elevation:	78 ft	Runway Surface Condition:	Dry
Runway Used:	3	IFR Approach:	None
Runway Length/Width:	7401 ft / 150 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC):	SCOTT R ERICKSON	Report Date:	02/15/2001
Additional Participating Persons:	SCOTT NORMAN; ANCHORAGE, AK ANDREW HALL; WICHITA, KS MICHAEL GRIMES; LANCASTER, CA ERIC BOYCE; KENAI, AK		
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.nts.gov/pubdms/ .		

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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](#).