



# National Transportation Safety Board Aviation Incident Final Report

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<b>Location:</b>	Tacoma, WA	<b>Incident Number:</b>	SEA05IA115
<b>Date &amp; Time:</b>	06/02/2005, 0600 PDT	<b>Registration:</b>	N27PG
<b>Aircraft:</b>	Piper PA-46-350P	<b>Aircraft Damage:</b>	Minor
<b>Defining Event:</b>		<b>Injuries:</b>	1 None
<b>Flight Conducted Under:</b>	Unknown		

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## Analysis

During an annual inspection, a crack was found in the lower wing spar cap of the subject aircraft. That discovery was reported via email to the NTSB's Northwest Regional Office. It was later determined that a fatigue crack had initiated at a rivet hole on the horizontal surface of the right wing lower spar cap, and propagated through approximately 80 percent of that surface. The NTSB materials laboratory determined that there was no evidence of inclusions, discontinuities, corrosion pitting, or material defects at the crack origins. All dimensional measurements were within engineering drawing specifications, and hardness and conductivity parameters for the aluminum alloy specified for the wing spar cap material were within material tolerances. During the investigation it was determined that at the time the crack was detected, the aircraft had flown 5,273 hours. Of that total time, approximately 1,100 hours were flown as part of a low-level pipeline patrol mission. It was further determined that as part of the certification process, Piper Aircraft had determined that the "general use" safe time in service (TIS), adjusted with a scatter pattern of eight, was 10,723 hours for the wing structure. The certification process did not include determination of a safe time in service when any portion of the aircraft's life included being used in a "pipeline survey" mission profile. The investigation also determined that the two rivet holes through which the crack passed (one of which was the point of origin) were the locations where two of the rivets that held the lower wing skin on in an area addressed by Piper Service Bulletin 796B, Part One. This service bulletin was published by Piper to address "loose and working rivets along the lower spar cap." In part, the bulletin states, "If this condition exists, and is left uncorrected over an extended period of time, the structural integrity of the wing could be compromised." The actions delineated in this service bulletin had not been performed on this aircraft (N27PG) even though loose and working (smoking) rivets were found at the subject location on the lower skins of both wings.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be:  
The initiation and propagation of a fatigue crack, over 5,273 hours of cyclic in-flight usage,  
through approximately 80 percent of the aircraft's right wing spar lower cap.

## Findings

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Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION

Phase of Operation: UNKNOWN

### Findings

1. (C) WING,SPAR - FATIGUE
2. (C) WING,SPAR - FRACTURED

## Factual Information

On June 2, 2005, approximately 0600 Pacific daylight time, the NTSB Northwest Regional Office was notified via email that a significant crack had been found in the right wing spar lower cap of a Piper Malibu PA-46-350P, N27PG, during an annual inspection at Tacoma Narrows Airport, Tacoma, Washington. The crack in the spar cap, which had progressed through approximately 80 percent of the horizontal surface of the cap, was discovered in a follow-up inspection by a maintenance technician at PAVCO Flight Center, after that individual had found loose lower wing skin rivets directly below the area where the crack was located. The aircraft, which previously had been owned by Pacific Gas and Electric Company (PG&E), and had been occasionally used for low-level pipeline visual observation patrol, had accumulated 5,273 hours on its airframe. The current owner, who had operated the aircraft for the last five years, stated that he was not aware of any significantly hard landing since he had purchased the aircraft. A review of the log books did not show any indication of other airframe damage from any previous hard landing, and there was no other entry that indicated that the aircraft had been involved in any accidents or events that might be expected to have produced such a crack from a one-time overload. The wing spar lower cap was removed from the aircraft and submitted to the NTSB laboratory to determine the extent and mode of the failure.

The NTSB Materials Laboratory inspection of the lower wing spar cap determined that the crack surface features were consistent with a fatigue crack that had initiated at both the aft and forward surfaces of the aft rivet hole on the horizontal surface of the cap, at a location 28.63 inches from its outboard end. The crack was 1.53 inches in length on the cap's upper surface, and 1.53 inches in length on its lower surface. The surface of the crack was relatively flat, with smooth, well defined, curving arrest lines. There was no evidence of inclusions, discontinuities, corrosion pitting, or material defects at the origins of the crack. All dimensional measurements were within engineering drawing specifications, and the hardness of 81.3 HRB, and conductivity of 39.7 percent IACS were within the typical range for the aluminum alloy specified for the wing spar cap material.

During the investigation it was determined that at the time the crack was detected, the aircraft had flown 5,273 hours. Of that total time, approximately 1,100 hours were flown as part of a low-level pipeline patrol mission. It was further determined that as part of the certification process, Piper Aircraft had determined that the "general use" safe time in service (TIS), adjusted with a scatter pattern of eight, was 10,723 hours for the wing structure. The certification process did not include determination of a safe time in service when any portion of the aircraft's life had involved a "pipeline survey" mission profile.

The investigation also determined that the two rivet holes through which the crack passed (one of which contained the points of origin) was the location where two of the rivets that held the lower wing skin on in an area addressed by Piper Service Bulletin 796B, Part One. This service bulletin was published by Piper to address "loose and working rivets along the lower spar cap." In part, the bulletin states, "If this condition exists, and is left uncorrected over an extended period of time, the structural integrity of the wing could be compromised." The actions delineated in this service bulletin had not been performed on this aircraft (N27PG) even though loose and working (smoking) rivets were found at the subject location on the lower skins of both wings.

## Pilot Information

Certificate:	Age:
Airplane Rating(s):	Seat Occupied:
Other Aircraft Rating(s):	Restraint Used:
Instrument Rating(s):	Second Pilot Present:
Instructor Rating(s):	Toxicology Performed:
Medical Certification:	Last FAA Medical Exam:
Occupational Pilot:	Last Flight Review or Equivalent:
Flight Time:	

## Aircraft and Owner/Operator Information

Aircraft Make:	Piper	Registration:	N27PG
Model/Series:	PA-46-350P	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	4622104
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	Annual	Certified Max Gross Wt.:	4300 lbs
Time Since Last Inspection:	0 Hours	Engines:	1 Reciprocating
Airframe Total Time:	5273 Hours as of last inspection	Engine Manufacturer:	Lycoming
ELT:	Installed, not activated	Engine Model/Series:	TIO-540-AE2A
Registered Owner:	Wade H. Perrow	Rated Power:	350 hp
Operator:	Wade H. Perrow	Operating Certificate(s) Held:	None

## Meteorological Information and Flight Plan

Conditions at Accident Site:	Condition of Light:
Observation Facility, Elevation:	Distance from Accident Site:
Observation Time:	Direction from Accident Site:
Lowest Cloud Condition:	Visibility
Lowest Ceiling:	Visibility (RVR):
Wind Speed/Gusts: /	Turbulence Type Forecast/Actual: /
Wind Direction:	Turbulence Severity Forecast/Actual: /
Altimeter Setting:	Temperature/Dew Point:
Precipitation and Obscuration:	
Departure Point:	Type of Flight Plan Filed:
Destination:	Type of Clearance:
Departure Time:	Type of Airspace:

## Airport Information

Airport:	Runway Surface Type:
Airport Elevation:	Runway Surface Condition:
Runway Used:	IFR Approach:
Runway Length/Width:	VFR Approach/Landing:

## Wreckage and Impact Information

Crew Injuries: 1 None	Aircraft Damage: Minor
Passenger Injuries: N/A	Aircraft Fire: None
Ground Injuries: N/A	Aircraft Explosion: None
Total Injuries: 1 None	Latitude, Longitude: 47.268056, -122.578056

## Administrative Information

Investigator In Charge (IIC):	Orrin K Anderson	Report Date:	10/03/2006
Additional Participating Persons:	Patrick Padden; Seattle FSDO		
Publish Date:	02/05/2013		
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 <a href="mailto:pubinq@ntsb.gov">pubinq@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</a> .		

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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](#).