Aviation Investigation Final Report

Location:	ONTARIO, California	**Incident Number:**	LAX94IA181
Date & Time:	April 4, 1994, 18:15 Local	**Registration:**	N174SW
Aircraft:	FAIRCHILD SA-227AC	**Aircraft Damage:**	Minor
Defining Event:		**Injuries:**	1 Minor, 11 None
Flight Conducted Under:	Part 135: Air taxi & commuter - Scheduled		

Analysis

The aircraft was climbing at 1,000 feet per minute to a cruising altitude of 21,000 feet. Passing 19,800 feet, a loud 'bang' was heard and the captain was partially sucked through the broken left side window. After about 4 seconds, he was able to pull himself back into the aircraft unassisted. He declared an emergency and landed the aircraft without further incident. A review of the maintenance records revealed that an applicable airworthiness directive requiring an inspection of the windows was complied with within the last 143.8 flight hours. The technical representative for Fairchild stated that maintenance personnel who conducted the AD inspection and service bulletin inspections may have failed to detect the crack, due to the subtle inspection procedures employed. The approved inspection procedures allow for two methods: 1) removal of the outer frame retainer for direct viewing of the screw holes, and 2) using a 90-degree prism seated in mineral oil for an indirect view of the screw holes. The airline was using the second method.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: the failure of maintenance personnel to detect a crack in the windscreen which exceeded the operational limits for pressurized flight. A factor in the accident was the inadequacy of the inspection method published by the manufacturer.

Findings

Occurrence #1: DECOMPRESSION
Phase of Operation: CLIMB - TO CRUISE

Findings
1. (C) WINDOW,FLIGHT COMPARTMENT WINDOW/WINDSHIELD - FRACTURED
2. (C) MAINTENANCE,INSPECTION - INADEQUATE - COMPANY MAINTENANCE PERSONNEL
3. (F) INADEQUATE SURVEILLANCE,INADEQUATE PROCEDURE - MANUFACTURER

Factual Information

On April 4, 1994, at 1815 Pacific daylight time, Skywest Airlines Flight 5435, a Fairchild SA-227AC, N174SW, experienced rapid decompression resulting from the loss of the pilot's side windscreen. The aircraft was owned and operated by Skywest Airlines Inc., and was on a scheduled commuter flight under 14 CFR Part 135 of Federal Aviation Regulations. Visual meteorological conditions prevailed at the time and an IFR flight plan had been filed for the operation. The aircraft sustained minor damage. The captain, a certificated airline transport pilot, sustained minor injuries. Neither the first officer nor any of the remaining ten passengers were injured. The flight originated from Los Angeles, California, at 1750 on the day of the mishap as a nonstop flight to Yuma, Arizona.

The captain stated the aircraft had been cleared to climb from 17,500 feet to flight level 210 and was climbing at 1,000 feet per minute. The cabin altitude controller had been set for a cruise altitude of 23,000 feet. As the aircraft reached 19,800 feet, he heard a loud "bang" and felt himself being sucked suddenly and violently through the broken left side window. As a result, the captain's head, arms, and upper chest were forced through the opening. In the process, he struck his left side on the windscreen lower frame. After about 2 to 4 seconds, he was able to pull himself back into the aircraft, unassisted. He stated that, although he was wearing his seat belt, he was not wearing his shoulder harness at the time of the incident.

The captain declared an emergency and landed the aircraft at Ontario airport without further incident. A postincident inspection of the aircraft revealed several cuts on the left propeller deicing boots.

A review of the maintenance records revealed that an applicable Airworthiness Directive AD 93-19-06 requiring an inspection of the windscreen had been complied with within the last 143.8 flight hours. The AD incorporates Fairchild Aircraft Service Bulletin 227-56-002 for inspection procedures to be utilized.

The Fairchild Service Bulletin provides two methods in order to comply with the inspection requirements. The first requires the removal of the outer retainer which permits a direct visual examination of the windscreen surface.

The second method requires that an oiled 90-degree face of a prism be placed on the window surface so that a constant film extends across the contacting prism face and windscreen surface. The inspector then looks into the 90-degree prism surface which is perpendicular to the face placed against window. The image of the hole area covered by the retainer frame then appears in the prism.

Under the second method, the image of an unfractured hole appears as a frosty cylinder. If the

hole is countersunk, the cylinder will appear to have a cone on one end. The image of a hole with a crack extending from the hole to the surface of the window will appear as a frosty or reflective projection extending from the hole. The image of a crack which has progressed from one hole to another will appear as a frosty or reflective irregular surface which may, in some cases, completely bypass adjacent holes to progress into yet another hole once or twice removed from the hole of origin. Cracks which exceed 4.3 inches require the removal and replacement of the windscreen with a serviceable replacement or placing a restriction on the aircraft prohibiting pressurized flight.

According to the operator, the method chosen to comply with the AD was the prism seated with mineral oil procedure.

The aircraft was examined on April 5, 1994, by a Federal Aviation Administration (FAA) airworthiness inspector and a technical representative from Fairchild Aircraft. The technical representative stated that an inspection of the remaining fragments of the windscreen showed evidence that a crack had originated in the upper forward corner and then had propagated aft, migrating from screw hole to screw hole across the top of the windscreen. According to the representative, the initial cracking was wholly within the frame and, as such, would not have been visible to a casual observer.

Fairchild Aircraft Service Bulletin 227-56-002 is more restrictive than the AD in that it requires the windscreen be removed and replaced if a crack from a single screw hole exceeds 0.30 inches. The maximum combined length of multiple cracks between two adjacent screw holes shall not exceed 0.30 inches before replacement is required. Finally, if a maximum of three screw holes exhibit cracking in excess of 0.299 inches, replacement is also required. Any cracks that are detected which are less than 0.30 inches require that the windscreen be inspected every 25 flight hours.

It was the Fairchild representative's opinion that this crack had originated prior to the inspection and had propagated slowly, which he based on residue found on the forward 6.5 inch portion of the crack surface and the prior history windscreen cracking on this aircraft make and model. He offered an explanation for why the crack was not detected during the inspection. He stated that the maintenance personnel may have failed to detect the extent of the crack, due to the indirect prism/mineral oil viewing procedure employed.

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	39,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	January 12, 1994
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	6425 hours (Total, all aircraft), 3545 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	FAIRCHILD	**Registration:**	N174SW
Model/Series:	SA-227AC SA-227AC	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal; Provisional (Special)	**Serial Number:**	AC620
Landing Gear Type:	Retractable - Tricycle	**Seats:**	21
Date/Type of Last Inspection:	April 1, 1994 Continuous airworthiness	**Certified Max Gross Wt.:**	14500 lbs
Time Since Last Inspection:	13 Hrs	**Engines:**	2 Turbo prop
Airframe Total Time:	19936 Hrs	**Engine Manufacturer:**	GARRETT
ELT:	Installed, not activated	**Engine Model/Series:**	TPE 331-11
Registered Owner:	PROVIDENT BANK TRUSTEE	**Rated Power:**	1000 Horsepower
Operator:	SKYWEST AIRLINES INC.	**Operating Certificate(s) Held:**	Commuter air carrier (135)
Operator Does Business As:		**Operator Designator Code:**	SWIA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	ONT ,943 ft msl	**Distance from Accident Site:**	53 Nautical Miles
Observation Time:		**Direction from Accident Site:**	140°
Lowest Cloud Condition:	Scattered / 20000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	240°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	17°C / 12°C
Precipitation and Obscuration:	N/A - None - Haze		
Departure Point:	LOS ANGELES , CA (LAX)	**Type of Flight Plan Filed:**	IFR
Destination:	YUMA , AZ (YUM)	**Type of Clearance:**	IFR
Departure Time:	17:50 Local	**Type of Airspace:**	Class A

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 Minor, 1 None	**Aircraft Damage:**	Minor
Passenger Injuries:	10 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor, 11 None	**Latitude, Longitude:**	34.019237,-117.579383(est)

Administrative Information

Investigator In Charge (IIC):	Crispin, Robert
Additional Participating Persons:	DICK LLOYD; RIVERSIDE , CA
Original Publish Date:	March 27, 1995
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=28559