Log 2341

National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: October 13, 1992

In reply refer to: A-92-102 through -104

Honorable Thomas Richards
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On May 1, 1991, at approximately 0653 mountain daylight time, a twin engine Piper Model PA-31-310 airplane, N7407L, crashed and burned near Bennett, Colorado. The pilot, the only occupant aboard, was killed. The airplane had departed Centennial Airport, Englewood, Colorado, approximately 8 minutes before the accident. Shortly after departure, the pilot declared an emergency indicating that he was returning to the airport because he had lost the cowl on the left engine. Two witnesses observed the airplane pass overhead at a very low altitude. They stated that the left engine was not running and that the airplane was rocking back and forth. Shortly thereafter, the airplane banked sharply to the right, passed over a line of trees, and crashed. Both upper and lower left engine cowl assemblies were found about 2 miles from the accident site.

The National Transportation Safety Board's investigation of the accident disclosed that the three primary cowl fasteners on the outboard side of the left upper cowl were in the unlocked position. These fasteners and three others on the inboard side of the left upper cowl normally engage eye-bolts in the lower cowl assembly. Four studs (screws) are used, two on each side, to attach the upper and lower fiberglass nose cowl assemblies, but the two rear studs were missing. Eight of 13 studs securing the upper and lower rear portions of the cowls to the firewall-nacelle bulkhead were torn out with sheet metal still attached; the remaining five studs were missing.

The pilot preflight procedure relating to engine cowls outlined in Piper PA-31 Pilot Operating Handbooks states: "Engine cowl and baffles - inspect." However, a visual observation of the cowl fasteners as typically conducted in a preflight inspection is not sufficient to determine that the fasteners are secured. For example, the single-slotted primary side fasteners are normally aligned longitudinally in the locked position, but can be rotated 180 degrees to an unlocked position. As a result, they may provide

ambiguous indications since there are no paint stripes, arrows, or other marks on the cowl to indicate whether the fasteners are locked or unlocked. A very small pin centered within the slotted fastener is forced outward when the fastener is engaged, but the pin does not protrude beyond the surface of the fastener and is not readily visible. Nor do the fasteners pop away from the cowl in the unlocked position as do certain other types of spring-loaded cowl fastener devices. Additionally, there is no way to ascertain that the nose cowl studs or the studs attaching the upper and lower cowls to the firewall-nacelle bulkhead are tight and securely fastened without using a screwdriver. These studs may be attached to their receptacles and appear secured but could be loose on the cowl (not screwed in completely) and subsequently back out because of engine cowl vibration. An associate of the pilot of N7407L indicated that loss of these studs in N7407L had been a continuing problem.

Additionally, several maintenance-related, mechanical aspects of PA-31 engine cowls need to be addressed to ensure their continued in-flight integrity. For example, the threaded eyebolts in the lower cowl need to be adjusted properly to ensure that the upper and lower cowlings are snug and securely fastened. Otherwise, engine cowl vibration will tend to loosen the forward and aft cowl stud fasteners. The studs securing the nose cowl assemblies are longer than the rear cowl fasteners and should not be interchanged since the longer studs will bottom in the receptacles before adequately engaging or clamping the cowl surface. There are stud collars or washers embedded in the cowls or used with the studs to ensure proper clamping action. However, it is difficult to determine whether the stud collars or washers are present, because they are located on the extreme upper and lower portions of the cowl and they may be obscured by paint.

A review of Federal Aviation Administration (FAA) service difficulty reports (SDR) and accident incident data (AID) concerning PA-31 engine cowls discloses at least 22 reports of in-flight loosening or separation of the cowls. One report indicated that the "top and bottom cowl flew off left engine, struck and broke the left passenger window." Another report stated that the "right hand cowling assembly came off in flight and damaged the right hand horizontal stabilizer." In the accident involving N7407L, the cowls struck and damaged the upper portions of the vertical fin and rudder.

In view of the above, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an airworthiness directive applicable to Piper PA-31 series airplanes requiring at the next annual or 100-hour inspection, whichever occurs first: (1) an inspection of engine cowl-nacelle assemblies to ensure that all fasteners (long/short) and receptacles are present and correctly

installed, that all fastener washers/collars are installed, and that the lower cowl eyebolts are adjusted properly to minimize vibration of the cowl; and (2) application of prominent decals and/or paint stripes on the cowls to indicate the open and locked positions of the primary inboard and outboard eyebolt fasteners. (Class II, Priority Action) (A-92-102)

Publish an article in Advisory Circular (AC) 43-16, "General Aviation Airworthiness Alerts," emphasizing the hazards of in-flight engine cowl separation and the importance, during preflight, of ensuring that cowl assemblies are properly secured. The article should note, in the case of Piper PA-31 series and other airplanes with similar cowl fasteners, that a closer examination and the use of a screwdriver may be necessary to ascertain and ensure proper closure. (Class II, Priority Action) (A-92-103)

Require the Piper Aircraft Corporation to amend all applicable PA-31 Pilot Operating Handbooks by including under the preflight walk-around inspection procedure a specific means to ascertain and ensure that all engine cowl fasteners are securely fastened. (Class II, Priority Action) (A-92-104)

Chairman VOGT, Vice Chairman COUGHLIN, and Members LAUBER, HART, and HAMMERSCHMIDT concurred in these recommendations.

By: Carl W. Vogt
Chairman

National Transport Safety Board
Washington, D. C. 20594

Brief of Accident

File No. - 2008 5/01/91 BENNETT.CO A/C Reg. No. N7407L Time (Lcl) - 0653 MDT

----Basic Information----
Type Operating Certificate-NONE (GENERAL AVIATION)
Type of Operation -BUSINESS
Flight Conducted Under -14 CFR 91
Accident Occurred During -DESCENT

Aircraft Damage
DESTROYED
Fire
ON GROUND

Injuries	Fatal	Serious	Minor	None
Crew	1	0	0	0
Pass	0	0	0	0

----Aircraft Information----
Make/Model - PIPER PA-31B-310
Landing Gear - TRICYCLE-RETRACTABLE
Max Gross Wt - 6500
No. of Seats - 6

Eng Make/Model - LYCOMING TIO-540-A2B
Number Engines - 2
Engine Type - RECIP-FUEL INJECTED
Rated Power - 310 HP

ELT Installed/Activated - YES/NO
Stall Warning System - YES

----Environment/Operations Information----
Weather Data
Wx Briefing - NO RECORD OF BRIEFING
Method - N/A
Completeness - N/A
Basic Weather - VMC
Wind Dir/Speed- 150/003 KTS
Visibility - 50.0 SM
Lowest Sky/Clouds - CLEAR
Lowest Ceiling - NONE
Obstructions to Vision- NONE
Precipitation - NONE
Condition of Light - DAYLIGHT

Itinerary
Last Departure Point
ENGLEWOOD,CO
Destination
DES MOINES,IA

ATC/Airspace
Type of Flight Plan - NONE
Type of Clearance - NONE
Type Apch/Lndg - FORCED LANDING

Airport Proximity
OFF AIRPORT/STRIP

Airport Data
Runway Ident - N/A
Runway Lth/Wid - N/A
Runway Surface - N/A
Runway Status - N/A

----Personnel Information----
Pilot-In-Command
Certificate(s)/Rating(s)
PRIVATE
SE LAND,ME LAND

Age - 45
Biennial Flight Review
Current - YES
Months Since - 5
Aircraft Type - C421

Medical Certificate - VALID MEDICAL-NO WAIVERS/LIMIT

Flight Time (Hours)

Total	6200	Last 24 Hrs	UNK/NR
Make/Model	UNK/NR	Last 30 Days	UNK/NR
Instrument	199	Last 90 Days	150
Multi-Eng	300	Rotorcraft	UNK/NR

Instrument Rating(s) - AIRPLANE

----Narrative----
SHORTLY AFTER TAKEOFF, WHILE CLIMBING TO CRUISE ALTITUDE, THE PILOT REPORTED THE LEFT ENGINE COWL ASSEMBLY HAD COME OFF. WITNESSES OBSERVED THE AIRPLANE AT LOW ALTITUDE & NOTED THAT IT WAS "YAWING, SPUTTERING, AND ROCKING BACK AND FORTH." THEY INDICATED THE LEFT ENGINE WAS NOT RUNNING & THAT THE AIRPLANE BANKED SHARPLY TO THE RIGHT & DISAPPEARED BEHIND TREES BEFORE CRASHING. AN INVESTIGATION REVEALED THE LEFT PROPELLER HAD NOT BEEN FEATHERED. THE LEFT ENGINE COWLING WAS FOUND 1.8 MILES FROM THE ACCIDENT SITE. THE THREE PRIMARY (EYEBOLT) COWL FASTERERS ON THE OUTBOARD SIDE OF THE LEFT UPPER COWL WERE FOUND UNLOCKED & SEVEN OTHER COWL ATTACHING STUDS (SCREWS) WERE MISSING. THE COWLING HAD BEEN REMOVED 16 DAYS BEFORE THE ACCIDENT TO INSTALL AN OIL/AIR SEPARATOR. THIS WAS THE FIRST FLIGHT SINCE THAT WORK WAS PERFORMED. THE MECHANIC, WHO DID THE WORK, SAID HE NOTED SEVERAL COWL STUD FASTENERS WERE MISSING & THAT HE HAD NOTIFIED THE PILOT. THE PILOT WAS REPORTED TO HAVE REPLIED THAT HE HAD SOME FASTENERS & WOULD TAKE CARE OF THE PROBLEM.

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Occurrence #1 AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation CLIMB - TO CRUISE

Finding(s)
1. COOLING SYSTEM,COWLING - UNLATCHED
2. AIRCRAFT PREFLIGHT - INADEQUATE -
3. AIRCRAFT/EQUIPMENT INADEQUATE - MANUFACTURER
4. ACFT/EQUIP, INADEQUATE AIRCRAFT MANUALS - MANUFACTURER
5. CONDITION(S)/STEP(S) INSUFFICIENTLY DEFINED - MANUFACTURER
6. COOLING SYSTEM,COWLING - SEPARATION
7. VERTICAL STABILIZER SURFACE - BENT

Occurrence #2 LOSS OF ENGINE POWER
Phase of Operation CLIMB

Finding(s)
8. 1 ENGINE - SWITCHED OFF
9. PROPELLER FEATHERING - NOT ATTAINED - PILOT IN COMMAND

Occurrence #3 FORCED LANDING
Phase of Operation DESCENT - EMERGENCY

Occurrence #4 LOSS OF CONTROL - IN FLIGHT
Phase of Operation DESCENT - UNCONTROLLED

Finding(s)
10. AIRSPEED(VMC) - NOT MAINTAINED - PILOT IN COMMAND
11. AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND

Occurrence #5 IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation DESCENT - UNCONTROLLED

----Probable Cause----

The National Transportation Safety Board determines that the Probable Cause(s) of this accident was: IN-FLIGHT SEPARATION OF THE LEFT ENGINE COWL ASSEMBLY THAT WAS NOT PROPERLY LATCHED, AND FAILURE OF THE PILOT TO MAINTAIN MINIMUM CONTROL SPEED, WHICH RESULTED IN HIS LOSS OF AIRCRAFT CONTROL. FACTORS RELATED TO THE ACCIDENT WERE: AN INADEQUATE PREFLIGHT INSPECTION, INADEQUATE MARKINGS/ALIGNMENT INDICATIONS TO ASSURE THAT THE COWL FASTENERS WERE LOCKED, AND AN INSUFFICIENTLY DEFINED PROCEDURE IN THE FLIGHT MANUAL FOR CHECKING THE COWL FASTENERS.