National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: May 13, 2008

In reply refer to: A-08-21

The Honorable Robert A. Sturgell
Acting Administrator
Federal Aviation Administration
Washington, D.C. 20591

On May 28, 2004, a turbocharger-equipped[1] Cessna T206H, operated by the Drug Enforcement Agency as a public use operation under 14 *Code of Federal Regulations* (CFR) Part 91, crashed in Homer Glen, Illinois, after the pilot reported a loss of engine power while at cruise flight at 1,150 feet above ground level. Witness reported that they heard several attempts to restart the engine and that black smoke billowed from the aircraft during each attempt. The airplane struck trees as it descended and crashed into a garage attached to a house. A postcrash fire and explosion ensued, and the pilot was fatally injured.[2]

During the National Transportation Safety Board's investigation, it was discovered that the turbocharger had failed and the turbine wheel seized. These findings prompted the Safety Board to examine the guidance in the Cessna T206H pilot operating handbook (POH) regarding how to address a turbocharger in-flight failure. This examination revealed that the in-flight emergency procedures lacked information to assess the difference between an engine and a turbocharger failure and did not provide any clear guidance or instructions on how to handle a turbocharger failure once a pilot identified the problem. The Board determined that the probable cause of this accident was, in part, "the seized turbocharger…. [c]ontributing factors were the inadequate emergency procedures by the manufacturer."[3]

The Safety Board addressed the lack of such information in POHs when it issued Safety Recommendation A-94-81 in April 1994 as a result of its investigation of a 1992 accident involving a Cessna T201L, which sustained a partial loss of engine power during cruise flight and subsequently crashed short of the runway as the pilot attempted to execute an emergency

[1] A turbocharger is a device attached to a reciprocating engine to increase the compression of airflow intake.

[2] More information on this accident, CHI04GA130, is available at the National Transportation Safety Board's Web site at <http://www.ntsb.gov/ntsb/brief.asp?ev_id=20040608X00756&key=1>.

[3] The full probable cause statement for this accident reads as follows: "The seized turbocharger, the altitude/clearance not maintained/obtained during approach to a forced landing on an agricultural field, and the unsuitable landing area encountered by the pilot. Contributing factors were the inadequate emergency procedures by the manufacturer, the trees, and the residential area."

landing at Temple Bar Airport, Temple Bar, Arizona. Unable to determine the cause for the partial loss of power, the pilot turned on the fuel boost pump while descending for the emergency landing, and the engine lost additional power. The cockpit and cabin areas filled with smoke just before the airplane reached the airport, and the pilot secured the engine. Two of the five persons on board were killed, and the other three were seriously injured.[4] Safety Recommendation A-94-81 asked the Federal Aviation Administration (FAA) to "require the amendment of pilot operating handbooks and airplane flight manuals applicable to aircraft equipped with engine turbochargers by including in the 'Emergency Procedures' section information regarding turbocharger failure. The information should include procedures to minimize potential hazards relating to fire in flight and/or loss of engine power."

In a July 3, 1995, response, the FAA stated that it agreed with the intent of Safety Recommendation A-94-81 but did not believe that there was sufficient basis to issue an airworthiness directive applicable to all AFMs or POHs with turbocharger installations. The FAA indicated, however, that it would take the following actions: 1) revise the AFM policy regarding minimum safe operating procedures following turbocharger failures during the next revision of Advisory Circular (AC) 23-8A,[5] "Flight Test Guide for Certification of Part 23 Airplanes;" 2) provide copies of Safety Recommendation A-94-81 to all aircraft certification offices and direct each office to provide the recommendation to each holder of a type certificate or supplemental type certificate having a turbocharged engine installation; 3) request type certificate or supplemental type certificate holders to revise their AFMs, POHs, or AFM supplements, as appropriate, to comply with Safety Recommendation A-94-81; and 4) provide the Safety Board a copy of the revised General Aviation Manufacturers Association (GAMA) Specification No. 1, "Specification for Pilots Operating Handbook," to address safe operating procedures following turbocharger failures.[6]

Until the next revision to AC 23-8A was accomplished, the FAA issued a policy letter dated February 16, 1995, which added turbocharger failure procedures to the established list of systems that should be considered when evaluating the emergency procedures section of the AFM. In an August 15, 1997, response, the Safety Board classified Safety Recommendation A-94-81 "Closed—Acceptable Alternate Action" based on the FAA's issuance of the policy letter, as well as the FAA's agreement to revise AC 23-8A.

The Safety Board notes, however, that the intent of Safety Recommendation A-94-81 has still not been fully realized. In connection with its investigation of the May 28, 2004, accident in Homer Glen, Illinois, the Safety Board also reviewed a representative sampling of POHs for

[4] The Safety Board determined that the probable cause of the accident was "a fatigue failure of the turbocharger's turbine shaft due to inadequate maintenance and the pilot's improper in-flight planning/decision after experiencing the turbocharger failure. Contributing to the failure was the lack of written instructions or emergency procedures in the Cessna T201L [POH] relating to turbocharger malfunctions or failures." More information on this accident, LAX92FA092, is available on the Safety Board's Web site at <http://www.ntsb.gov/ntsb/brief.asp?ev_id=20001211X13999&key=1>.

[5] On August 14, 2003, the FAA issued AC 23-8B, which superceded AC 23-8A.

[6] On October 12, 1996, GAMA issued revision 2 to Specification No. 1 incorporating the Safety Board's suggestions for inclusion of emergency procedures for turbocharger failures.

other airplane makes and models[7] and determined that procedures addressing turbocharger failures have either not been incorporated in the emergency procedures section or, if included, are incomplete, potentially leading to an incorrect identification and response to a turbocharger failure that could result in a total loss of engine power. A query of the Safety Board's accident database revealed that from May 1, 1993, to the present, 23 accident/incidents have occurred involving aircraft engine turbochargers, resulting in 23 fatalities and 3 injuries; 15 of these accidents/incidents have occurred (resulting in 9 fatalities) since 1997, when Safety Recommendation A-94-81 was closed (a list of these 23 accidents is enclosed). Moreover, from May 1, 1993, to the present, the FAA has received 44 service difficult reports regarding aircraft turbocharging systems.

Although GAMA Specification No. 1 has been revised to incorporate the intent of Safety Recommendation A-94-81, the information contained in the specification (as well as in AC 23-8B) is not mandatory, and no regulatory requirement has been established to mandate the incorporation of the recommended safety information into the appropriate POHs. The Safety Board is concerned that, without an FAA requirement, manufacturers of aircraft equipped with turbochargers still have not voluntarily included emergency procedures for turbocharger failures and that accidents/incidents continue to occur. Therefore, to achieve the full intent of Safety Recommendation A-94-81, the Board recommends that the Federal Aviation Administration:

> Require manufacturers of aircraft equipped with engine turbochargers to amend their pilot operating handbooks and airplane flight manuals to include in the "Emergency Procedures" section information regarding turbocharger failure and, specifically, procedures to minimize potential hazards relating to fire in flight and/or loss of engine power. (A-08-21)

Chairman ROSENKER, Vice Chairman SUMWALT, and Members HERSMAN, HIGGINS, and CHEALANDER concurred with this recommendation.

[*Original Signed*]

By: Mark V. Rosenker
Chairman

Enclosure

[7] The sampling of POHs were as follows: Cessna Aircraft Company (Models 340A, TU206G, T207A, T210M and T182), Piper Aircraft Inc. (PA-31-350, PA-32-301T, PA-32RT-300T, PA-34-220T, and PA-28RT-201T), and Hawker Beechcraft (Baron 58P and B36TC).

Fixed Wing Aircraft Accidents/Incidents Involving Exhaust System, Turbocharger As Cause/Factor/Finding

NTSB No	Date	Location	Aircraft	Regist No	Total Fatalities	Total Serious	Acc/Inc
ATL93LA108	10-Jun-93	ATTALLA, AL	CESSNA 421B	N699DT	0	0	ACC
MIA94FA057	21-Jan-94	TITUSVILLE, FL	CESSNA 421C	N777BE	3	0	ACC
FTW95LA018	16-Oct-94	FREDERICKSBURG, TX	PIPER PA-23-250	N821AC	0	0	ACC
FTW95FA082	05-Jan-95	HURLEY, NM	BEECH A60	N3LP	3	0	ACC
FTW95LA119	22-Feb-95	SANTA ROSA, NM	BEECH 60	N100BL	0	0	ACC
LAX95FA319	02-Sep-95	BEAVER DAM, AZ	CESSNA 421C	N6234G	8	0	ACC
CHI96LA060	20-Dec-95	INDIANAPOLIS, IN	CESSNA T210N	N5083C	0	0	ACC
LAX96LA180	28-Apr-96	MAMMOTH LAKES, CA	Cessna 320	N5752X	0	0	ACC
FTW98FA216	16-May-98	VERNON, TX	Beagle Aircraft B-206	N1885S	3	0	ACC
FTW98FA276	19-Jun-98	NEPHI, UT	Beech A36	N3861K	2	0	ACC
FTW98LA350	08-Aug-98	ALAMOSA, CO	Piper PA-31-350	N27196	0	0	ACC
DEN99LA131	30-Jul-99	FAIRPLAY, CO	Cessna T210F	N6125R	0	1	ACC
CHI01LA010	14-Oct-00	TECUMSEH, MI	Piper PA-32R-301T	N289JG	0	0	ACC
LAX04FA001	01-Oct-03	Corona, CA	Piper PA-32R-301T	N481CA	2		ACC
LAX04FA187	13-Apr-04	Concord, CA	Piper PA-28RT-201T	N2920C		1	ACC
CHI04GA130	28-May-04	Homer Glen, IL	Cessna T206H	N9548D	1		ACC
CHI04LA183	09-Jul-04	Mason City, IA	Cessna 340A	N60PP			ACC
DFW05IA048	29-Dec-04	Natchitoches, LA	Beech A36	N920GL			INC
SEA05LA032	30-Dec-04	Hamilton, MT	Aerostar 601	N601DF			ACC
ATL05LA094	05-Jun-05	Tazewell, TN	Piper PA-32R-301T	N341MA		1	ACC
ATL05LA118	30-Jun-05	Fort Payne, AL	Piper PA-31P	N4200N			ACC
SEA06FA054	22-Feb-06	Bow, WA	Beech 58P	N469MD	1		ACC
DEN06LA062	13-Apr-06	Hope, NM	Piper PA-46-350P	N82LL			ACC
23					23	3	