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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

ISSUED: September 24, 1981

Forwarded to:

Honorable J. Lynn Helms
Administrator
Federal Aviation Administration
Washington, D.C. 20591

SAFETY RECOMMENDATION(S)

A-81-119 and -120

On December 30, 1980, a Summit Airlines Convair 580, N531SA, was being operated as a scheduled domestic cargo flight between Norfolk, Virginia, and Baltimore, Maryland. After departing Norfolk, Virginia, the aircraft began to pitch-up beyond the normal 8° climb attitude as it was climbing through 500 feet mean sea level. The captain reported that he pushed the yoke forward but the aircraft did not respond. The flightcrew regained a level attitude by reducing power to flight idle and retracting the flaps. The crew reapplied power and continued the flight to Baltimore-Washington International Airport. The flight controls responded normally during the remainder of the flight and during landing.

Examination of the aircraft disclosed that the 12 aluminum rivets which secured the left elevator torque tube to the torque tube collar in the empennage had failed. The failed rivets allowed the left elevator torque tube to rotate freely and independently of the pilot's control movements. There was no other elevator or elevator control damage.

The fracture surfaces of portions of eight torque tube collar rivets were examined by an independent engineering testing company. The examination revealed that: (1) the failures were caused essentially by shear stress at various locations along the shank of the rivets; (2) before the failure, the shanks of all the rivets were offset between 0.005 and 0.015 inch, indicating a looseness in the connection; and (3) the hardness of the aluminum rivets indicated that the rivets had been heat-treated.

A review of the Federal Aviation Administration (FAA) Service Difficulty Records between 1976 and 1981 revealed 20 incidents (excluding this incident) which involved elevator control malfunctions or control failures in Convair 580 aircraft. Eight incidents involved elevator flutter, buffet, or vibration usually in cruise at speeds above 180 knots. Three of the elevator flutter/buffet incidents involved N531SA. In all 20 incidents, other empennage control system components were replaced, but the torque tube collar rivets were not changed. According to FAA personnel, the elevator flutter problem is a fleet-wide problem which has been related to improperly fitted elevator/stabilizer shroud (aerodynamic seal) doors. The Safety Board concludes that the failed rivets were a result of shear forces which occurred after the rivets had been weakened previously during earlier inflight flutter/buffet incidents.

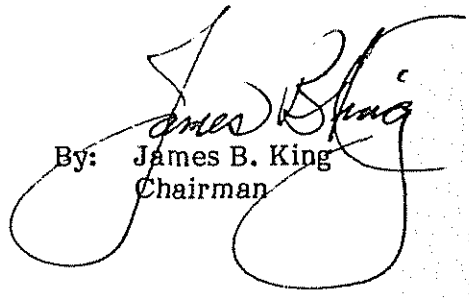
As a result of the December 30, 1980, incident, Summit Airlines maintenance personnel immediately published a Fleet Campaign Directive outlining mandatory procedures for the inspection of the torque tube collar rivets on all Summit Convair 580 aircraft. In addition, General Dynamics-Convair Division issued Service Bulletin 640(340D) 27-6, dated February 23, 1981, which recommends inspection and/or replacement of the elevator torque tube attachment fasteners. The inspection and rework outlined in the service bulletin are applicable to all Convair 340, 440, 640, and Allison-powered 340/440 (CV-580) aircraft.

Currently, about 135 aircraft in the United States are affected by Service Bulletin 640(340D) 27-6. Most are high-time aircraft, such as N531SA, and many may have elevator torque tubes secured by aluminum rivets. Some aircraft which have had elevator torque tube overhauls or bearing changes may have close-tolerance bolts or tapered pins which were authorized as replacements for the aluminum rivets in the March 2, 1956, General Dynamics-Convair 340/440 Newsletter Review and as republished in April 1959.

In view of these circumstances and the potential serious consequences of an elevator torque tube fastener failure, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an Airworthiness Directive to require mandatory compliance with provisions of General Dynamics-Convair Division Service Bulletin 640(340D) 27-6, dated February 23, 1981. (Class II, Priority Action) (A-81-119)
>
> Determine the cause of and take appropriate action to prevent elevator vibration/flutter in Convair 340, 440, 640, and 580 aircraft. (Class II, Priority Action) (A-81-120)

KING, Chairman, DRIVER, Vice Chairman, and McADAMS, GOLDMAN, and BURSLEY, Members, concurred in these recommendations.



By: James B. King
Chairman