

2.2 Conclusions

(a) Findings

1. The crew of Flight 527 were properly certificated and qualified for the flight.
2. The aircraft was properly certificated and maintained but at the initiation of Flight 527 it was unairworthy due to a defective torque piston in the right propeller.
3. Flight preparation was routine and the flight progressed with no apparent difficulty until it was near Marseilles, Ohio, at 2006.
4. Loads on the torque cylinder caused by the failed torque piston of the No. 3 blade of the right propeller exceeded the finite fatigue life of the cylinder and it failed in fatigue.
5. The loss of oil pressure in the right propeller due to the failed torque cylinder caused the propeller pitch to decrease at a rate which exceeded the propeller pitch lock capability.
6. The right propeller oversped, causing the blades to separate in overstress.

7. The No. 2 propeller blade of the right propeller penetrated the fuselage, destroying the structural integrity to the extent that together with the force of a right yaw attending the propeller separation, the fuselage failed along the line of the propeller penetrations.
8. The torque piston of the No. 3 blade had not been nitrided for surface hardening of the helical splines during manufacture.
9. The omission of the nitriding process was not detected by inspection.
10. The omission of the nitriding process was associated with the movement of 10 torque pistons from the normal production flow to the Allison laboratory and return to the production process.
11. The Allison quality control system lacked the accountability necessary to assure the requisite quality of the individual parts.
12. The metal contamination oil check to isolate defective torque pistons did not serve the intended purpose.
13. Allison underestimated the seriousness of the defective torque piston problem.

(b) Probable Cause

The Safety Board determines that the probable cause of this accident was the failure of the right propeller due to omission of the torque piston nitriding process during manufacture, and the failure of manufacturing quality control to detect the omission.

BY THE NATIONAL TRANSPORTATION SAFETY BOARD:

/s/ OSCAR M. LAUREL  
Member

/s/ JOHN H. REED  
Member

/s/ LOUIS M. THAYER  
Member

/s/ FRANCIS H. McADAMS  
Member

Joseph J. O'Connell, Jr., Chairman, did not take part in the adoption of this report.