



National Transportation Safety Board

Powerplants and Maintenance Issues

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Powerplants and Maintenance Issues

- Right Propeller
- Right Engine
- Time Between Overhauls
- Approved Airworthiness Inspection Program
- Engine Maintenance Issues
- Conclusions



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Air Sunshine Flight 527, Cessna 402C, N314AB, Treasure Cay, Bahamas

Right Propeller

Manufacturer – McCauley Propeller Systems
Piqua, Ohio

Model – 3AF32C505-C

Characteristics:

- Three Bladed
- Dual Acting
- Constant Speed
- Full Feathering



Right Propeller Findings

- External
 - All propeller blades and counterweights were in place and intact.
 - Blade angles measured 82.2°, 82.4°, and 82.3°.
 - Feather angle is 82.2° ($\pm 0.3^\circ$).
- Internal
 - All internal components were intact and undamaged.



Right Propeller Conclusions

The propeller was fully feathered when the airplane contacted the water.

- Measured blade angles
- Lack of damage to blades and internal operating mechanisms



Right Engine

Manufacturer – Teledyne Continental Motors
Mobile, Alabama

Model – TSIO-520-VB

Characteristics

- Turbocharged, fuel-injected, air-cooled, reciprocating engines
- Rated for 325 horsepower, at a power setting of 2,700 RPM with 39 inches of mercury manifold pressure up to an altitude of 12,000 feet.



Right Engine Findings

- The No. 2 cylinder was separated from the engine, and its piston was fragmented.
- The No. 2 cylinder was generally intact.
- Cylinder hold-down studs (10)
 - Three studs were intact with their threads undamaged.
 - Six studs were fractured in high stress fatigue.
 - Two loose hold-down nuts were recovered from the engine compartment.



Engine Maintenance Issues

- The right engine had accumulated 2,270.6 hours time since overhaul (TSO) at the time of the accident.
- TCM Service Information Letter SIL 98-9A recommends a 1,600 hour TBO interval.
- Air Sunshine was operating to a TBO of 2,400 hours in accordance with FAA Aviation Safety Inspector Handbook 8300.10.
- A requirement for Air Sunshine to obtain these TBO increases was that they develop their own Approved Aircraft Inspection Program (AAIP).



Engine Maintenance Issues

- Differential compression tests
 - Theory
 - The last differential compression test of the No. 2 engine was performed during a Phase 1 inspection on June 12-14, 2003.
 - The results indicated that there were two cylinders with abnormally low readings and a third, the No. 2 cylinder, that held no pressure at all.



Engine Maintenance Issues

- Engines last overhauled in December 1999.
- No logbook entries for any cylinder changes since the time of the last overhaul.
- The No. 6 cylinder had been removed and replaced between the last engine overhaul and the accident flight.
- The results of the last differential compression test (6/03) would have been enough justification to have removed, inspected, and replaced the No. 2 cylinder while troubleshooting the low reading.



Right Engine Conclusion

The simultaneous loosening of two or more of the right engine No. 2 cylinder hold-down nuts resulted from the application of insufficient torque, which was most likely applied by Air Sunshine maintenance personnel during undocumented maintenance.



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