

ERA17FA140
Hartzell Propeller Air Safety Investigator Field Notes

Accident

NTSB File No. ERA17FA140

Date: 3/28/2017

Location: Dadeville, AL

Aircraft: Beechcraft A36 Bonanza, N8169Y, S/N E-2598

Propeller Examination

Location: Continental Motors Analytical Lab, Mobile, AL

Dates: May 15, 2107

Participants: Les Doud – Hartzell Propeller Air Safety Investigator

Joel Clark – Birmingham, AL FSDO Air Safety Investigator

Phillip Grice – Manager, Product Field Performance, Continental Motors Group

Propeller Description

Model: PHC-C3YF-1RF/F8068

Assembly S/N: QG943B

Blade S/Ns: L59279

L59280

L59276

Description: 82” diameter, Compact Series, 3-blade, single-acting, pressure to increase pitch. The blades and hub are of aluminum construction.

This propeller was manufactured on 4/1/2015 for the Hartzell Top Prop STC program. It was likely installed via STC SA10135SC or SA02556CH-D at an unknown date. The low pitch stop setting was 12.0 degrees at the time of manufacture.

The propeller logbook was not available at this examination so service history, Time Since New and Time Since Overhaul information is unknown.

As Received Condition

According to on-scene investigators the propeller assembly remained attached to the engine crankshaft mounting flange during the impact sequence. It was removed at the crash scene and shipped with the engine to the Continental Motors Analytical Lab in Mobile, AL in the condition shown in Photos #1 and #2. All three propeller blades were cut to facilitate shipping. The spinner dome and approximately 30% of one blade was consumed by the post-crash fire. One blade rotated by hand force in the hub. The propeller assembly displayed significant charring and sooting heat damage.

Photo #1 – Propeller As-Received



Photo #2 – Cut portion of blades as-received



Teardown Examination Findings

The propeller was disassembled to remove the blade stubs, blade retention hardware, pitch change mechanism and preload plates. The blades were labeled A-B-C (as labeled by on-scene investigators) with the assembly S/N between A and C.

All the propeller components exhibited significant heat damage. There was charring and sooting on two of the blades and the entire hub area. Blade C was approximately 30% consumed and appeared melted from mid-blade to the tip. Melted fragments of the spinner dome formed around one blade shank. The spinner bulkhead was bent and a segment aft of blade C was melted. The spinner forward bulkhead was bent and partially melted. The majority of plastic components including the Nyloc locking mechanisms in nuts had melted.

The propeller mounting flange showed some discoloration but all six studs were intact. Both dowel pins had been pulled from the hub and the dowel holes showed some deformation.

The cylinder was charred and sooted but was easily removed and otherwise appeared undamaged. There was charred, dark oil on the pressure side of the piston with no indication of a leak aft of the piston. The piston O-ring was intact but heat-hardened.

There was no indication of forceful contact between the low pitch stop screw and the top of the pitch change rod suggesting the propeller was not operating against the low pitch stop at time of impact. The piston and pitch change rod was removed by hand rotation force only and appeared undamaged except for oil/grease coking stains on the rod.

The hub halves separated easily and internal heat damage included heavy charring and evidence of grease coking/hardening on the hub surfaces, blade bearings and blade retention pockets (see Photo #3). The blade seals were also charred and hardened. The fork was sooted with pitch change knob block impact marks in the slots, including chatter marks in one slot.

The one blade that rotated freely (Blade B) had a fractured pitch change knob. The fracture appeared to be overload and the direction opposite low pitch.

The preload plate shelf on blade A retention pocket was damaged in the face side/trailing edge quadrant, suggesting impact forces lead-to-trail, opposite rotation direction (see Photo #4). The preload plate shelf on blade B was also damaged on face side/leading edge quadrant.

The preload plates were intact with only minor damage: the lip was partially fractured/sheared on preloads A and B. Preload plate B had a knob impact mark at 34 degrees equating to a blade angle of 14 degrees (see Photo #5).

Blade B had a leading edge “wave” near the tip consistent with tree impact/slices observed at the crash scene. This “wave” suggested a camber side strike consistent with a low/no power windmilling condition. Blade B also had some chordwise/rotational score marks on the camber side near the leading edge (see Photo #6). There were no discernable scoring marks on the face side of the blades.

Blade A and B were bent aft and Blade B was noticeably twisted towards low pitch. Blade bending and twisting damaged could not be determined on remaining portion of Blade C.

Photo #3 – Internal hub heat damage



Photo #4 – Blade A preload plate shelf damage



Photo #5 – Preload plate B impact mark



Photo #6 – Blade B chordwise/rotational score marks



Conclusions

The overall damage was consistent with low/no power. A preload plate impact mark, blade retention pocket damage and blade damage suggested the propeller was windmilling at low or no power near the low pitch stop at time of impact. The preload plate impact mark equated to a blade angle of 14 degrees suggesting the propeller was being governed and thus suggesting rotation to generate oil pressure. There were no discrepancies noted that would prevent or degrade normal propeller operation prior to impact. All damage was consistent with high impact forces.

Les Doud
Air Safety Investigator
Hartzell Propeller Inc.

O: [REDACTED]

C: [REDACTED]
[REDACTED]