NTSB File No. CEN23LA107

Hartzell Air Safety Investigator Field Report

April 10, 2023

Accident Date: February 12, 2023
Location: Lakeway, TX
Aircraft: Mooney M20K
Aircraft Registration: N304MA
Aircraft Hobbs: 2763.7

Propeller & Turbo Examination

Location: Aircraft Salvage of Dallas
1361 Ferris Rd.
Lancaster, TX 75146
Exam Date: April 4, 2023
Participants: Les Doud – Hartzell Air Safety Investigator
Mike Hodges – NTSB Investigator in Charge

Propeller Description

Propeller Model and S/N
Model: PHC-J3YF-1RF/F7663AK-2R
Assembly S/N: FP1240B
Date of Manufacture: 8/17/2000
Blade S/Ns: J49361, J49363, J49362 (new with original build in 2000)

The propeller is a 76" diameter, 3-blade, single-acting, hydraulically operated constant speed model. Oil pressure from the propeller governor moves the blades to the high pitch (blade angle) direction. Centrifugal twisting moments from the blades and a small return spring move the blades to the low pitch stop in the absence of governor oil pressure. The propeller utilizes aluminum blades and an aluminum hub. Rotation is clockwise as viewed from the rear.

Installation Data: Reference Hartzell Installation Data Sheet No. 659 and STC SA1505GL for additional installation data.

Propeller Governor
McCauley Model No.: C290D3-L/T46
S/N: 970944

Turbocharger System Description

The TSIO-360-SB engine on the M20K uses a variable absolute pressure turbo controller that senses deck pressure, compares it to a reference absolute pressure, and adjusts the wastegate butterfly (controlling turbocharger speed) to maintain manifold pressure at varying altitudes. It is directly linked to the engine throttle, and through a system of cams and followers, adjusts itself to varying power settings, achieving the optimum deck pressure for a given throttle movement.

A Pressure Relief Valve (PRV), set slightly in excess of maximum deck pressure is provided to prevent damaging overboost in the event of a system malfunction.

Turbcharger (Red, Field Overhaul data tag from Main Turbo Systems Inc.)
Cust. P/N: 649151-1
P/N: 466642-9001
S/N: TFO192

Wastegate (Black, Teledyne Continental Motors/Garrett/Allied Signal data tag)
Cust. P/N: 649006-7
S/N: ZEN30182

Controller (Red, Factory Rebuilt data tag from Garrett/Allied Signal)
Cust. P/N: 640655-34
MFR P/N: 481008-9034
S/N: BBO38003

Pressure Relief Valve (Black, Teledyne Continental Motors/Garrett/Allied Signal data tag)
Cust. P/N: 643511-3
P/N: 481066-3
S/N: ZBN04812

Accident Summary and Exam Findings

While enroute from Kestrel Airpark (1T7), Spring Branch, Texas to Outlaw Field Airport (CKV), Clarksville, Tennessee, the pilot reported the engine had a low manifold pressure reading and then the engine sustained a total loss of power. The ADS-B data showed that the airplane performed a 180° turn as it approached the Colorado River just to the north of Bee Cave, Texas. The pilot then maneuvered the airplane north toward the Lakeway Airpark (3R9), Lakeway, Texas.

The pilot performed a forced landing to a golf course just to the north of 3R9. During the forced landing sequence, the airplane impacted trees and a wood fence, and came to rest near commercial electrical power equipment. The airplane came to rest upright on the main landing gear, and the pilot was able to egress from the airplane without further incident. The airplane sustained substantial damage to the fuselage and to both wings.

The aircraft wreckage was recovered to Air Salvage of Dallas in Lancaster, TX. The wreckage was examined on April 4-5, 2023. The propeller spinner dome was removed before this examination. The propeller with blades numbered is shown in Photo #1.

The bottom of the fuselage was wet with oil starting aft of the cowling, behind the left cooling exhaust tunnel continuing to the tail bulkhead. The origin appeared to be from the engine breather and drains hoses in the left cooling exhaust tunnel (Photo #2). The engine/turbo exhaust exited the right tunnel that appeared dry (Photo #3). The exhaust tailpipe internal surface appeared dry with no indication of excessive oil in the exhaust flow. The engine oil dipstick was removed and only had one small drop of oil on the tip.

Powerplant control continuity was verified from the cockpit controls to the throttle valve, turbo controller, propeller governor and fuel metering unit.

Photo #1 – Propeller

Photo # 2 – Left exhaust tunnel, looking aft (breather and drain tubes seen upper right)

Photo #3 – Right exhaust tunnel, looking aft with engine exhaust pipe

There were no indications of oil leaking from the propeller, propeller mounting flange or governor and governor mounting pad. The governor was removed and the pump shaft rotated smoothly by finger force and produced gurgling sounds (Photo #4). The governor control arm rotated smoothly. The governor gasket screen was clear/no debris.

Photo #4 – Propeller governor

Propeller Examination

All three blades were secure in the hub and could not be rotated via hand force. Shop air pressure was applied at the governor mounting pad to actuate the propeller. All three blades of the propeller actuated in unison from the low pitch stop to the high pitch stop indicating mechanical continuity in the pitch change mechanism. When air pressure was removed the propeller returned to the low pitch stop without assistance. The spinner dome was removed prior to this examination and appeared undamaged. All six propeller mounting nuts were present and secure.

The propeller was not removed from the engine/aircraft for further examination. Blade #1 was bent aft with no remarkable twisting. It had some chordwise/rotational abrasion on the camber side. Blade #2 was bent aft to a lesser degree than Blade #1 and had no remarkable twisting. There was some chordwise/rotational abrasion in the mid-blade region. The abrasion on both Blade #1 and #2 transitioned from chordwise/rotational to spanwise. Blade #3 was bent aft the least amount with no other remarkable damage.

There was no other remarkable damage to any other propeller components.

Turbocharger Component Examination

The turbocharger appeared intact and undamaged. All oil hoses to/from the turbo appeared secure with no evidence of oil leaks. There was no excessive residual oil in the turbo Center Housing. The turbo compressor inlet, compressor discharge, turbine inlet and turbine exhaust were dry with no evidence of an oil leak (Photo #5). There was no evidence of oil leaking into the intercooler or intake manifold. The turbine wheel spun freely and smoothly by finger force showing continuity to the compressor wheel with no remarkable lateral or longitudinal freeplay. The turbo was not disassembled for further examination.

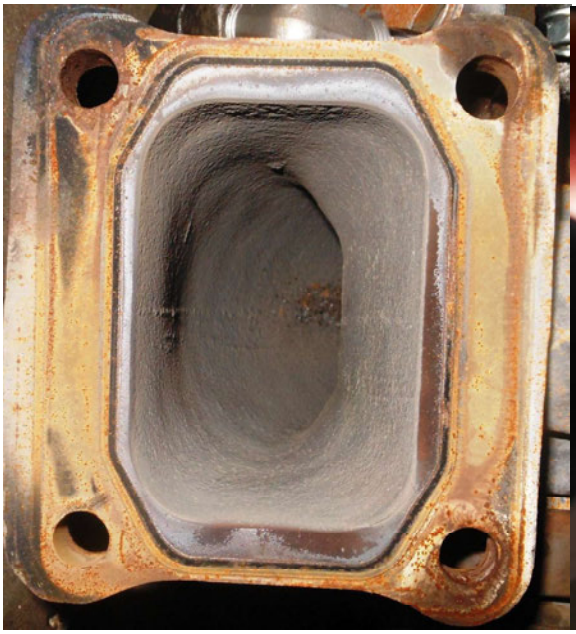
The PRV appeared undamaged (Photo #6) and was removed from the intake manifold/upper deck. The PRV valve head was actuated by hand/finger force; it moved smoothly without binding and returned to the closed position by the internal spring force.

The wastegate and actuator were removed from the exhaust assembly and actuated with shop air. It actuated smoothly, freely and returned to the open position without assistance and no signs of sticking (Photo #8). There was no evidence of oil leakage on the actuator body (Photo #7).

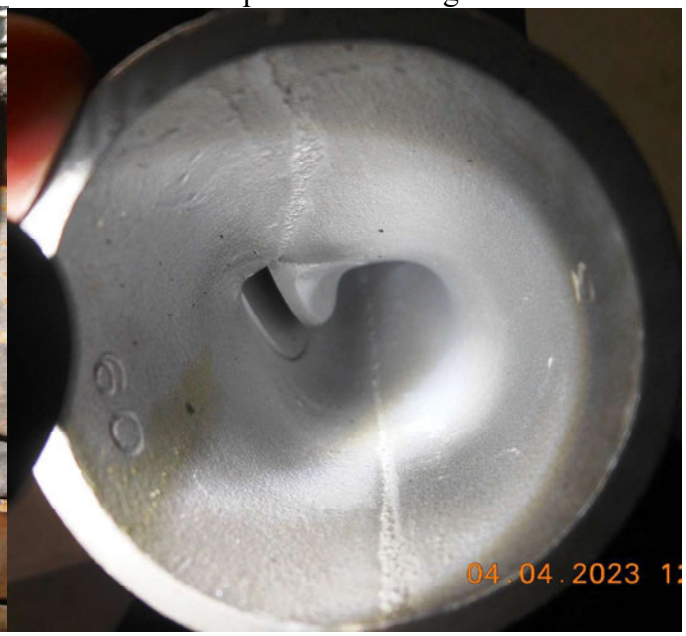
The Variable Absolute Pressure Controller was not removed from the intake manifold/upper deck (Photo #9). The control arm rotated freely. There were no indications of oil leaking at the controller or any oil hoses between the controller and wastegate actuator.

Photo #5 – Turbocharger

Turbine inlet



Compressor Discharge



Turbine/exhaust discharge

Compressor inlet

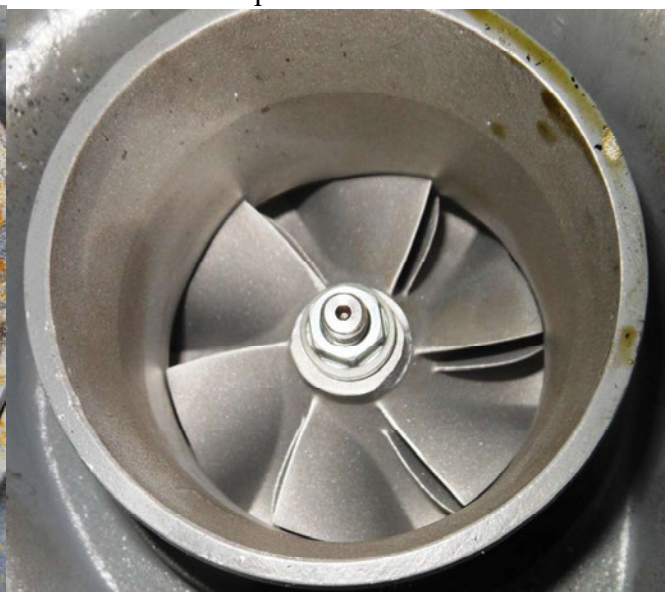
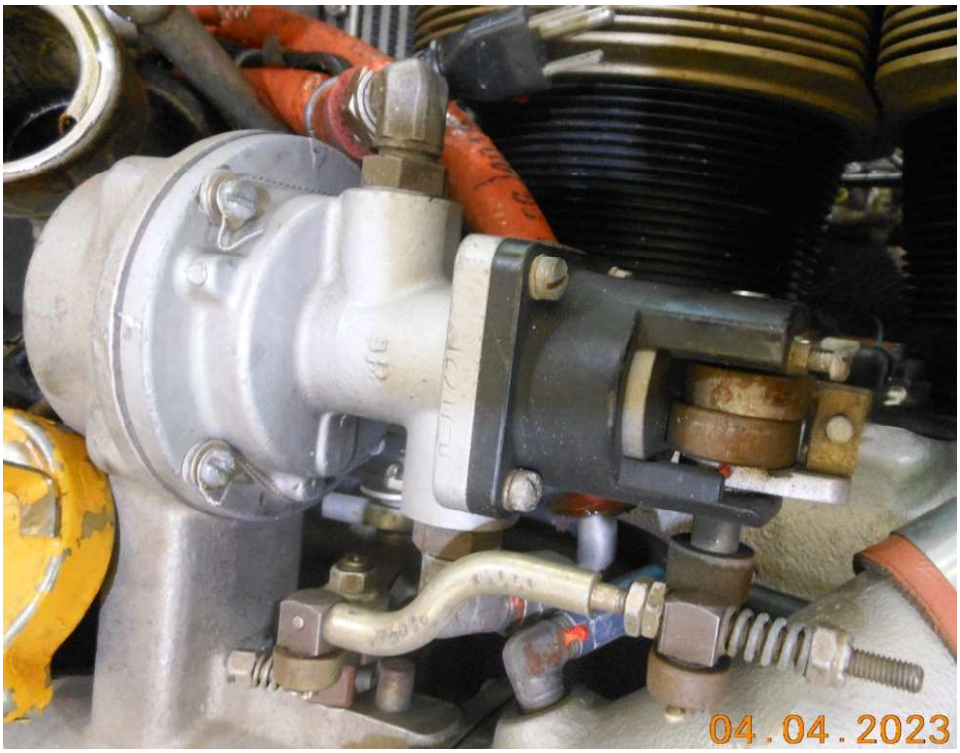


Photo #6 – Pressure Relief Valve

Photo #7 – Wastegate actuator

Photo #8 – Wastegate valve

Photo #9 – Variable Absolute Pressure Controller



Conclusions

The propeller damage was consistent with a propeller windmilling with power OFF when it struck objects. There were no discrepancies noted on the propeller that would prevent or degrade normal operation. All damage was consistent with high impact forces.

The turbocharger system appeared intact, undamaged and functional with no evidence of oil leaking from any hoses, fittings or components.

[redacted]

Les Doud
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[redacted]