



23 March 2021

Mr. Stephen Stein
National Transportation Safety Board

MEMO: MPS-21-001 Rev A

SUBJECT: Teardown Inspection of Propellers and Governors from:
Mooney M20J, N201HH,
File #:(MPS: 2020-08, NTSB: WPR20LA144)

Subject propeller was installed on a Mooney M20J, N201HH, which crashed on 13 May 2020 near Phoenix Deer Valley Airport (DVT) Deer Valley, Arizona. McCauley was requested to assist in the examination of the propellers and with the interpretation of the damage indications.

The propellers were inspected at McCauley Propeller Systems Engineering Lab, Wichita, Kansas on 27 and 28 January 2021, with the following in attendance:

Mr. Kevin Stahl	In-person and Present	Textron Aviation-McCauley Engineering
Mr. Travis Martin	In-person and Present	Textron Aviation-McCauley Engineering-Lab
Ms. Christy Eckerman	Remote and Virtually Present	Federal Aviation Administration-Wichita ACO
Mr. Jeff Janusz	Remote and Virtually Present	Federal Aviation Administration-Wichita ACO
Mr. Stephen Stein	Remote and Virtually Present	National Transport Safety Board

The propeller arrived on a single wooden pallet inside a cardboard box. Inside the cardboard box, there was one propeller assembly.

The model number and serial numbers of the propellers are as follows: *(Dates of manufacture for the serialized components is shown parenthetically in italics)*

Model: **B2D34C214-B/G-90DHB-16E**
Serial (S/N): **922202** *(1992 manufacture)*
Blade 1 (S/N): **GE380** *(1986 manufacture)*
Blade 2 (S/N): **GF184** *(1986 manufacture)*



After the examination, the following conclusions are drawn:

1. The propeller had damage resulting from the impact sequence. There were no indications of any type of propeller failure or malfunction prior to impact sequence.
2. The propeller had indications consistent with low amounts of rotational energy absorption (low rotation at impact likely with little to no engine power) during the impact sequence. Exact engine power levels were not determined.

The conclusions noted above are based on a variety of observations, some of which are noted below:

1. The propeller had sudden-failure type damage that is typically associated with impact forces; and gross part deflections. The investigation found no evidence of any type of fatigue failure.
2. The propeller has witness marks from contact between the blade actuation pin assembly and the piston during the accident sequence. The position of all these marks indicates an approximate propeller blade angle of low pitch position at impact.
3. The propeller blade bending, twisting, paint scuffing, and overall propeller assembly damage is typical of that associated with low amounts rotational energy absorption during the impact sequence.
4. All six attach bolts were visually straight with no heavy damage indications.
5. An unknown white-colored material was found inside the propeller. The white colored material was found on the B-3905 actuating pin assembly, A-3902 link, B-3414 pin, and C-3418 piston. These parts call for A-1637-3 or A-1637-4 lubricant. The A-1637-3 lubricant is brown in color and A-1637-4 lubricants is black in color. Neither were not found on these parts. The material was photographed. No attempt was made to chemically identify the material.
6. A second unknown white-colored material was found on the C-5270 bearings. The bearings call out A-1637-3 lubricant. The A-1637-3 lubricant



is brown in color and was not found on the bearings. The material was photographed. No attempt was made to chemically identify the material.

At NTSB request, the propeller was return shipped to: Air Transport Phoenix, Arizona.



The governor of the propeller was tear down inspected at McCauley Propeller Systems Engineering Lab, Wichita, Kansas on 27 January 2021, with the following people in attendance:

Mr. Kevin Stahl	In-person and Present	Textron Aviation-McCauley Engineering
Mr. Travis Martin	In-person and Present	Textron Aviation-McCauley Engineering-Lab
Ms. Christy Eckerman	Remote and Virtually Present	Federal Aviation Administration-Wichita ACO
Mr. Jeff Janusz	Remote and Virtually Present	Federal Aviation Administration-Wichita ACO
Mr. Stephen Stein	Remote and Virtually Present	National Transportation Safety Board

The installation gasket that sealed this governor to the engine was shipped separately. The gasket was inspected at McCauley Propeller Systems Engineering Lab, Wichita, Kansas on 4 February 2021, with the following people in attendance:

Mr. Kevin Stahl	In-person and Present	Textron Aviation-McCauley Engineering
Mr. Travis Martin	In-person and Present	Textron Aviation-McCauley Engineering-Lab
Mr. Jeff Janusz	Remote and Virtually Present	Federal Aviation Administration-Wichita ACO
Mr. Stephen Stein	Remote and Virtually Present	National Transportation Safety Board

The model number and serial numbers of the governor is as follows: *(Date of original manufacture for the serialized components is shown in italics)*

Model: **C290D5-B/T17**
Serial (S/N): **762895** *(1976 Manufacture)*
MPS P/N: **D-20611-1**

The governor arrived packed in a cardboard box, packed in bubble wrap. The provided wreckage consisted only of a governor. The installation gasket was shipped separately. The gasket arrived in a cardboard box in a plastic bag. The provided wreckage consisted of the gasket and an airplane component, the governor adapter assembly.

After the examination, the following conclusions are drawn:



1. No indications of any type of governor failure or malfunction prior to impact were found in the governor.

The conclusions noted above are based on a variety of observations, some of which are noted below:

1. No attempt was made to operationally test either governor due to the presence of debris and contaminants from the impact sequence.
2. An unknown particulate material was found in the governor's oil ports. Samples of the material were swabbed with Q-tips and bagged. The samples were sent to the National Transportation Safety Board for identification.
3. Metal particles were found on the idler gear and drive gear. The particles were found to be magnetic. Samples of the material were swabbed with Q-tips and bagged. The samples were sent to the National Transportation Safety Board for identification.
4. The installation gasket was determined not to be a McCauley part.

At the conclusion on the examination, the governor was sent to Air Transport, Phoenix, Arizona. The material samples were sent to the National Transportation Safety Board, Washington, DC.

Respectfully,



Kevin S. Stahl
Textron Aviation-McCauley Propeller Engineering