19 May 2020

Mr. Gretz Robert National Transportation Safety Board

MEMO: MPS-20-011

SUBJECT: Teardown Inspection of Propeller from: Mooney M20M, N1031M, File #:(MPS: 2020-001, NTSB: ERA20LA038)

Subject propeller was installed on a Mooney M20M, N1031M, which crashed on 18 November 2019 near College Park, Maryland. McCauley was requested to assist in the examination of the propeller and with the interpretation of the damage indications.

The propeller was inspected at McCauley Propeller Systems Engineering Lab, Wichita, Kansas on 5 March 2020, with the following in attendance:

Ms. Christy Eckerman	Federal Aviation Administration-Wichita ACO
Mr. Jeff Janusz	Federal Aviation Administration-Wichita ACO
Mr. Kevin Stahl	Textron Aviation-McCauley Engineering
Mr. Travis Martin	Textron Aviation-McCauley Engineering Lab
Mr. Danny Ball	Textron Aviation-McCauley Engineering

The propeller arrived in a single open wooden pallet. On the pallet, the propeller assembly was secured with steel straps.

Blade numbering in the table below is based on the factory stamped socket numbering found near the propeller attach flange.

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

<u>Model:</u>	B3D32C417-X/G-82NRD-7
<u>Serial (S/N):</u>	001090 (2000 manufacture)
Blade 1 S/N:	UJ66043 (October 2000 Manufacture)
Blade 2 S/N:	UJ66050 (October 2000 Manufacture)
Blade 3 S/N:	UJ66052 (October 2000 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 (rotation at impact likely with low 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 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.
- 3. Two of the propeller links, A-4577, on blade 2 and blade 3 were found broken. They were examined and found to have failure indications consistent with tensile overload.



Figure 1: Blade 1 Reference



Figure 2: Blade 2 Overview



Figure 3: Blade 2 Section A Side 1 and Side 2

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Figure 4: Blade 2 Opposite Side to Section A, Smaller Pieces

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Figure 5: Blade 3 Overview



Figure 6: Blade 3 Section B-Side 1

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Figure 7: Blade 3 Section B-Side 2





Figure 8: Blade 3 Small Piece-Side 1



Figure 9: Blade 3 Small Piece-Side 2

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At NTSB request, the propeller was return shipped to: Anglin Aircraft Recovery Services, LLC, Clayton, DE.

Respectfully,

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Kevin S. Stahl Textron Aviation-McCauley Propeller Engineering