



20 March 2019

Mr. Alexander Lemishko
National Transportation Safety Board

MEMO: MPS-19-012

SUBJECT: Teardown Inspection of Propellers from:
Cessna 421C, N2655B,
File #:(MPS: 2018-05, NTSB: CEN17FA248)

Subject propellers were installed on a Cessna 421C, N2655B, which crashed on 1 July 2017 near Catawba, Wisconsin. 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 14 March 2019, with the following in attendance:

Alexander Lemishko	National Transportation Safety Board-IIC
Eleazar Nepomuceno	National Transportation Safety Board
Christy Eckerman	Federal Aviation Administration-Wichita ACO
Jeff Janusz	Federal Aviation Administration-Wichita ACO
Henry Soderlund	Textron Aviation-Air Safety Investigation
Travis Martin	Textron Aviation-McCauley Engineering Lab
Danny Ball	Textron Aviation-McCauley Engineering

The propellers arrived together in a single wooden crate constructed over a wooden pallet. Inside the crate, there were two partial propeller assemblies. Additionally, there was a large bag containing an assortment propeller spinner, prop heat, and airframe components.

The installed position of the two propellers on the airframe was unknown at the time of teardown, and the two propellers were labeled "A" and "B" for purposes of distinction. After the examination, investigators present at the accident scene indicated that the propeller Labeled "A" was installed on the RH and "B" was installed on the LH.

Blade numbering in the table below is based on the factory stamped socket numbering. For listing purposes, Individual blades free of the hubs (loose) were assigned to the "A" or "B" propellers by serial numbers. Additionally, the loose



blades in propeller “B” were assigned a socket number in the propeller based on factory build convention (installed lowest serial to highest starting in socket 1).

The model number and serial numbers of the propellers are as follows: *(Dates of manufacture for the serialized components are shown parenthetically in italics, missing or obscured alphanumerics are indicated by brackets)*

	<u>Propeller “A”:</u>	<u>Propeller “B”:</u>
<u>Model:</u>	3FF32C5{XX-X}/G-90UMB-0	3FF32C501-C/G-90UMB-0
<u>Serial (S/N):</u>	993216 <i>(1999 mfg)</i>	{XXXX} <i>stamped area missing</i>
<u>Blade 1 S/N:</u>	TA003 <i>(1/1999 mfg)</i> <i>In hub and marked “A”</i>	UH30049 <i>(8/2000 mfg)</i> <i>Out of hub and marked “A”</i>
<u>Blade 2 S/N:</u>	TA008 <i>(1/1999 mfg)</i> <i>Out of hub and marked “C”</i>	UH30050 <i>(8/2000 mfg)</i> <i>Out of hub and marked “C”</i>
<u>Blade 3 S/N:</u>	SJ021 <i>(10/1998 mfg)</i> <i>In hub and marked “B”</i>	UH30064 <i>(8/2000 mfg)</i> <i>In Hub and marked “B”</i>

After the examination, the following conclusions are drawn:

1. Both propellers had damage resulting from the impact sequence. There were no indications of any type of propeller failure or malfunction prior to impact.
2. Both the LH and RH propellers had indications consistent with some amount of rotational energy absorption (rotation at impact, above “windmilling” power levels) during the impact sequence. Exact engine power levels were not determined.
3. Neither propeller had impact signature markings or component positions indicating blades in the feathered blade position at impact. Both propellers had several indications of operating higher than the “latch” angle position (“latch” angle is ~20 degrees reference angle measured at the 30” blade radial station. “feather” angle is ~85 degrees measure at the same blade station) during the impact sequence.

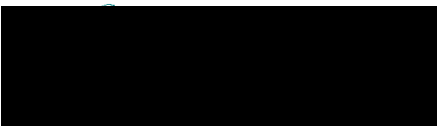


The conclusions noted above are based on a variety of observations, some of which are noted below:

1. Both propellers 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. Both LH and RH propeller's blade butts have damage and witness marks from contact with adjacent pitch change hardware during the accident sequence. The position of these marks indicates a propeller blade angle ~10-20 degrees above latch angle, but below feather during the impact sequence.
3. Both the LH and RH propeller blade bending, twisting, paint scuffing, and overall propeller assembly damage is typical of that associated with mid-level rotational energy absorption (rotation with above "windmilling" power) during the impact sequence.
4. Both LH and RH propellers had intact latch screw arrowheads, cylinder damage, and component positions indicating operation above latch blade angle during the impact sequence.
5. Both propellers had evidence of field service events including hub and cylinder paint.

At NTSB request, the propellers were return shipped to: Wentworth Aircraft, Crystal Lake, MN.

Respectfully,



Danny L. Ball
Textron Aviation-McCauley Propeller Engineering