



8 April 2021

Mr. Eric Alleyne  
National Transportation Safety Board

MEMO: MPS-21-015

SUBJECT: Teardown Inspection of Propellers from:  
Cessna 421, N731PF,  
File #:(MPS: 2019-09, NTSB: ERA19FA283)

Subject propeller was installed on a Cessna 421, N731PF, which crashed on 29 September 2019 near Deland, Florida. 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 6 April 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
Mr. Casey Love	Remote and Virtually Present	Textron Aviation-Air Safety Investigation
Mr. Henry Soderlund	Remote and Virtually Present	Textron Aviation-Air Safety Investigation
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. Eric Alleyne	Remote and Virtually Present	National Transportation Safety Board

The propellers arrived inside a single wooden crate. Inside the crate, there were two propeller assemblies. Both of the propeller assemblies had all of the propeller blades cut off post impact. The blades were all cut off approximately twelve inches outboard of the propeller hub. The cut off outboard sections of the blades were not included with the wreckage.

The installed position of the two propellers on the airframe was provided by the National Transportation Safety Board.



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

	<b>Left Hand Propeller</b>	<b>Right Hand Propeller</b>
<u>Model:</u>	<b>3AF34C92-R/S-90LF-0</b>	<b>3AF32C92-XR/S-90LF-0</b>
<u>Serial (S/N):</u>	<b>779619</b> <i>(1977 manufacture)</i>	<b>751090</b> <i>(1975 manufacture)</i>
<u>Blade 1</u> <u>(S/N):</u>	<b>K117374YS</b> <i>(prior to 1980 manufacture)</i>	<b>K79706YS</b> <i>(prior to 1980 manufacture)</i>
<u>Blade 2</u> <u>(S/N):</u>	<b>K117377YS</b> <i>(prior to 1980 manufacture)</i>	<b>K79709YS</b> <i>(prior to 1980 manufacture)</i>
<u>Blade 3</u> <u>(S/N):</u>	<b>K117381YS</b> <i>(prior to 1980 manufacture)</i>	<b>K79716YS</b> <i>(prior to 1980 manufacture)</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 sequence.
2. The propellers 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. Both LH and RH 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 propellers had witness marks from contact between the blade counterweights and the propeller hub during the impact 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.



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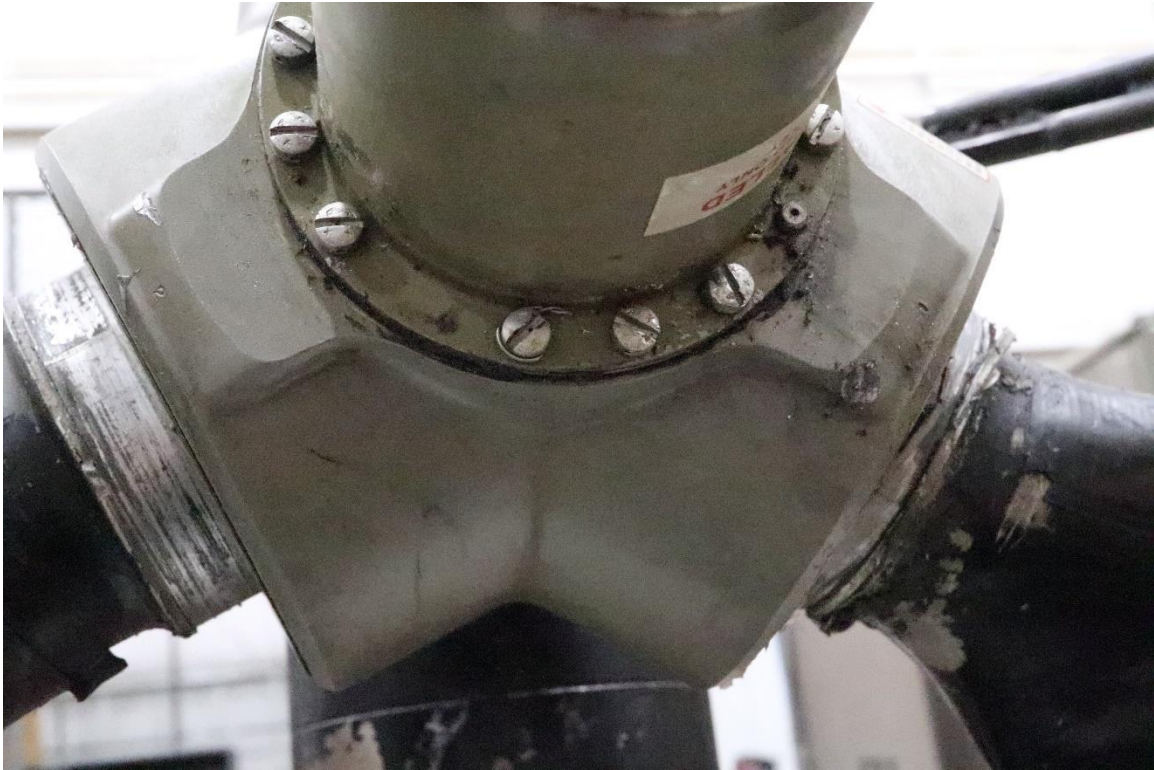
4. Both propellers had all six attach stud threaded holes stripped and the studs were not present in the hub for the tear down. Both propellers had stud attach holes that were elongated during the impact sequence. The direction of the elongated holes is consistent with low amounts of rotational energy during the impact sequence.
5. Both LH and RH propellers had intact latch screw arrowheads.
6. Both propellers had evidence of field service events including hub and cylinder paint.
7. The RH propeller had unknown counterweight cheek weight attach bolts used on all three blades. The bolts found on the propeller were silver-grey in color and had a shorter length than the correct A-2513-45 counterweight cheek weight attach bolt. No attempt was made to identify the unknown bolts.



**Figure 1: Left Hand Propeller Engine Flange**



**Figure 2: Right Hand Propeller Engine Flange**



**Figure 3: Left Hand Propeller Counterweight Witness Marks**



**Figure 4: Right Hand Propeller Counterweight Witness Mark**



**Figure 5: Right Hand Propeller Counterweight Cheek Weight Attach Bolt Comparison**



At NTSB request, the propeller was return shipped to: Florida Air Recovery,  
Jacksonville, Florida.

Respectfully,

*Kevin S. Stahl*  
[Redacted signature]

Kevin S. Stahl  
Textron Aviation-McCauley Propeller Engineering