

Aircraft Accident/Incident Report No.: 150807

Date of Accident: August 7, 2015

Location: Saranac Lake, NY

NTSB File No.: ERA15FA297

Aircraft: Piper PA-46-500TP

Registration No.: N819TB

Serial No.: 4697117

Owner: Per FAA Registry:
Majestic Air LLC
[REDACTED]
Rochester, NY 14610-1613

Written by: Les Doud
Air Safety Investigator, Hartzell Propeller Inc.

Date: November 5, 2015

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ACCIDENT SYNOPSIS

Aircraft Damage: Destroyed
Injuries: Four persons on board, four fatal

Per the NTSB Preliminary Report:

"On August 7, 2015, about 1750 eastern daylight time, a Piper PA-46-500TP, N819TB, registered to Majestic Air LLC and operated by a private individual, was destroyed during collision with terrain, shortly after takeoff from Adirondack Regional Airport (SLK), Saranac Lake, New York. The private pilot and three passengers were fatally injured. The personal flight was conducted under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed and an instrument flight rules flight plan was filed for the planned flight to Greater Rochester International Airport (ROC), Rochester, New York.

The airplane was based at ROC and flew uneventfully to SLK earlier during the day of the accident. During the return flight, a witness, who was an airport employee, heard the pilot announce on the common traffic advisory frequency that the airplane was departing on runway 5. No further communications were received from the accident airplane and there were no eye witnesses to the accident. Due to smoke from a postcrash fire, which was observed by pilots in another airplane, the accident airplane was subsequently located about 1830 in a wooded area approximately .5 mile northwest of the departure end of runway 5. The airplane came to rest upright against several trees, oriented about a magnetic heading of 020 degrees. The beginning of a debris path was observed with several freshly cut tree branches. Red lens fragments from the left wing navigation light were embedded in one of the tree branches, consistent with a left-wing-low, nose-down impact. The debris path extended on a course about 195 degrees for 60 feet to the main wreckage, which had been partially consumed by the postcrash fire.

The cockpit was consumed by fire and no readable flight instruments were recovered. The right wing remained partially attached to the airframe and exhibited more fire damage near the wingtip. The right flap and aileron remained partially attached to the right wing. The left wing remained partially attached to the airframe and was bent aft and twisted. A section of flap and aileron remained attached and the left wing was consumed by fire. The horizontal and vertical stabilizer remained intact, with elevator and rudder attached, and exhibited fire damage. Flight control continuity was confirmed from the respective left and right aileron sectors to the mid cabin area, with the balance cable intact. Elevator and rudder control continuity were confirmed from their respective sectors at the control panel in the cockpit to their sectors in the empennage. Measurement of the flap actuator corresponded to a flaps-retracted setting and the landing gear actuator corresponded to a landing gear retracted position. Measurement of the rudder trim linkage corresponded to an approximate neutral setting. Measurement of the elevator jackscrew corresponded to an approximate 13.5 degree tab up (50 percent nose down) setting.

The propeller had separated from the engine and was located in a crater about 20 feet along the debris. One propeller blade was loose in the hub consistent with impact, while the other three remained attached. The propeller blades exhibited s-bending, chordwise scratching and leading edge nicks. The engine remained attached to the airframe and was separated for examination. Disassembly and examination of the engine revealed rotational scoring on both sides of the compressor turbine disc and blades. Rotational scoring was also observed on the both sides of the power turbine vane and baffle, and first stage power turbine disc and blades on the upstream face. The accessory gearbox and inlet were consumed by postcrash fire.

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The six-seat, low-wing, retractable tricycle gear airplane, serial number 4697117, was manufactured in 2001. It was powered by a Pratt and Whitney Canada PT6A-42A, 500-horsepower engine, equipped with a four-blade, controllable-pitch, and Hartzell propeller.

The pilot held a private pilot certificate with ratings for airplane single-engine land and instrument airplane. His most recent Federal Aviation Administration second-class medical certificate was issued on March 16, 2015. At that time he reported a total flight experience of 4,620 hours; of which, 60 hours were flown during the previous 6 months.

The recorded weather at SLK, at 1751, was: wind from 360 degrees at 6 knots; broken ceiling at 6,000 feet; visibility 10 miles; temperature 20 degrees C; dew point 11 degrees C, altimeter 29.99 inches of mercury.

The propeller was retained for further teardown examination.”

SUMMARY AND ANALYSIS OF FINDINGS

The propeller was examined at Anglin Aircraft Recovery Services in Clayton, DE on September 17, 2015.

The propeller could not be separated from the propeller mounting flange due to lack of access to the mounting bolts from impact damage; therefore the propeller was disassembled while mounted to the propeller shaft. All four blades of the propeller were bent aft in varying degrees. The spinner dome was fractured, torn and deformed around the hub and blade shank areas. The propeller cylinder, piston, and pitch change rod were fractured from the hub as a unit. All four blades of the propeller showed rotational scoring. Two preload plates exhibited impact marks with the #3 preload plate showing blade angle information consistent with other information including the pitch change rod extension length and blade #3 damage.

It was found during the initial visual inspection the beta arm retaining pin had been installed backwards (see Photo #2); without this retaining pin installed correctly the beta arm/block could come out of the beta ring resulting in the prop feathering. However, detailed examination of the propeller components indicated the carbon block was in place and the propeller was not in feather at time of impact.

There were several indications the propeller was in the normal operating blade angle range at time of impact; the fork bumper mark on preload plate #3, the pitch change rod extension length, and blades #3 and #4 showed evidence of object impact at both positive and negative angles of attack. The preload plate mark and rod extension length equate a blade angle range of approximately 27-29°.

CONCLUSIONS

The propeller showed signs of power ON and blade angles in the normal operating range prior to the impact sequence.

There were no discrepancies noted that would preclude normal operation. All damage was consistent with high impact forces.

PROPELLER TEARDOWN REPORT**Date of Investigation:** September 17, 2015**Location:** Anglin Aircraft Recovery Services
4901 Holletts Corner Road
Clayton, DE 19938**Propeller Model:** HC-E4N-3Q hub with E8501B-3.5 blades**Representatives:** Les Doud Hartzell Propeller Inc.
Robert Gretz NTSB Investigator in Charge (IIC)**General Comments:**

The HC-E4N-3Q/E8501B-3.5 propeller is a 4-blade single-acting, hydraulically operated constant speed model with feathering and reverse pitch capability used on PT6A engine applications. Oil pressure from the propeller governor is used to move the blades to the low pitch (blade angle) direction. A feathering spring force and blade counterweight moment are used to move the blades to the high pitch/feather direction in the absence of governor oil pressure. The propeller incorporates a Beta mechanism that actuates when blade angles are lower than the flight idle position. The propeller utilizes an aluminum hub with aluminum blades. Rotation is clockwise as viewed from the rear.

Installation Data: From Hartzell Installation Data Sheet # 1649
(Data reference the 30-inch station)

Reverse:	-10.5 ± 0.5 degrees
Flight Idle:	19.0 ± 0.1 degrees
Feather:	84.5 ± 0.5 degrees

Service History: (TTSN at time of overhaul on 1/3/2013)

	<u>S/N</u>	<u>Date of manufacture</u>	<u>TTSN</u>	<u>TSO</u>
Hub	HH1347	9/21/2001	1105.6	UNKN
Blades	J65063	9/4/2001	1105.6	UNKN
	J65065	9/4/2001	1105.6	UNKN
	J65070	9/4/2001	1105.6	UNKN
	J65293	9/4/2001	1105.6	UNKN

Last overhaul: (from Propeller Logbook provided by NTSB IIC)

Date: January 3, 2013

Organization: Air Prop Specialists
3671 Industrial Park Drive
Marianna, FL 32446

Propeller Assembly Serial Number: HH1347 **Factory No.:** A57425

Blade Model: E8501B-3.5

S/N 1: J65063

S/N 2: J65065

S/N 3: J65070

S/N 4: J65293

Blade Orientation:

1-2-3-4 clockwise as viewed from the front of the propeller (in sequence of rotation). The hub serial number was between the # 1 and # 2 blades.

As Received: See Photos #1-#4. The propeller had separated from the engine with the propeller shaft and a portion of the propeller gearbox, including the propeller governor and tach generator still attached. The propeller could not be separated from the propeller mounting flange due to lack of access to the mounting bolts from impact damage. The hydraulic section (cylinder, piston, and feathering spring) of the propeller had fractured and was found in the crash debris; the piston and spring were retained in the cylinder by crimping damage to the lower/aft cylinder wall. The spinner dome was crushed, torn and deformed around the propeller hub and counterweights. Two of the four counterweights fractured from their mounting bosses. Blade #3 was loose in its retaining pocket and could be rotated by hand approximately 20 degrees from feather. All other blades could not be rotated by hand. The beta rod between blades #1 and #4 was bent and therefore cut flush with the forward hub half to facilitate propeller disassembly.

Spinner Dome: Crushed and torn.

Spinner Bulkhead: S/N JU-139. Spinner bulkhead was bent aft and could not be removed and prevented access to the spinner bulkhead S/N.

Propeller Cycling: Propeller cycling was not possible due to impact damage.

Engine/Propeller Mounting: The propeller was mounted to the propeller shaft and could not be removed due to impact damage. The engine propeller shaft and associated bearings fractured from the engine gearbox. The aft hub half remained attached to the engine flange after propeller disassembly.



Photo #1 – As received – Aft View of Assembly

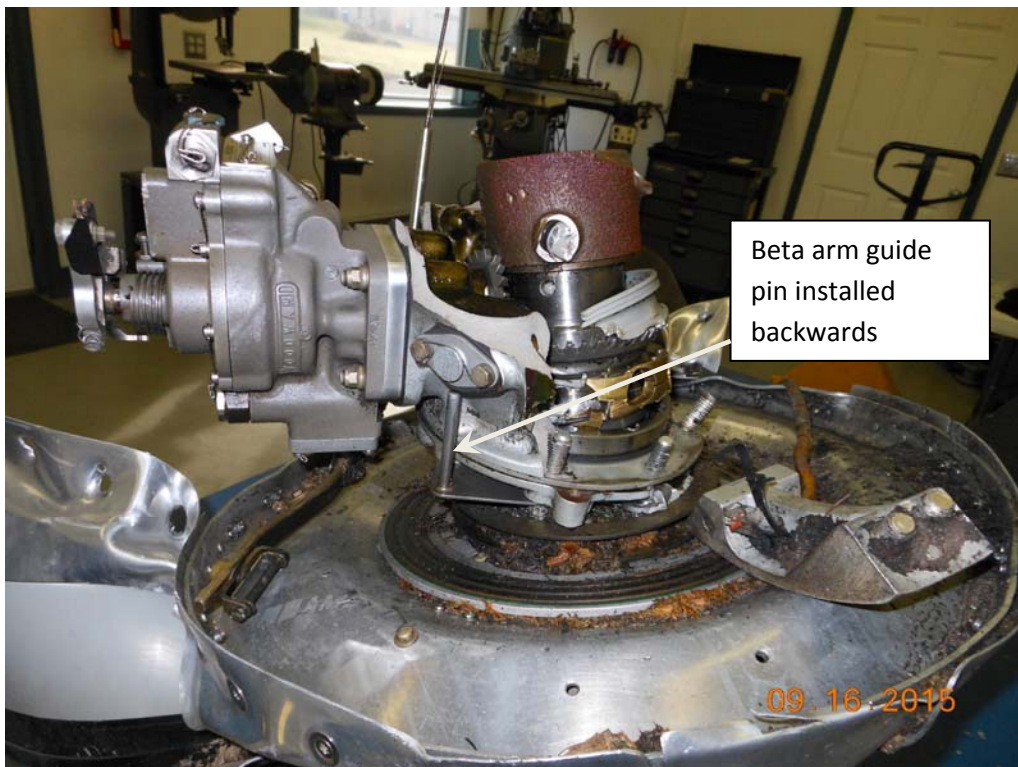


Photo #2 – As received – Propeller Shaft



Photo #3 – As received – Front View of Assembly



Photo #4 – As received – Fractured Hydraulic Unit

Pitch Change Mechanism/Hydraulic Section:

Cylinder: P/N D-488 Rev. N, S/N 4537 The cylinder fractured from the hub mounting threads during the impact sequence. The hub mounting thread material was retained in the cylinder along with the piston and spring by impact deformation and crimping damage of the lower/aft cylinder wall (see Photo #5).

Piston: The piston was trapped in the cylinder due to impact deformation and crimping damage to the lower cylinder wall. No attempt was made to remove the piston and feathering spring.



Photo #5 –Retained Piston/Feathering Spring

Pitch Change Rod: The pitch change rod is fractured in three parts; the portion forward of the fork connecting the piston, the small threaded segment in the fork, and a short segment aft of the fork that remained in the propeller before disassembly. The pitch change rod was extended approximately 1.34" beyond the feather stop (see Photo #6).



Photo #6 – Pitch Change Rod Extension

Fork: The #1 and #3 blade forward tangs are bent forward and cracked. The beta rod guide fork is bent aft on the #1 and #2 legs indicating the fork had been forced forward during the impact sequence. There were impact marks on the fork surfaces consistent with pitch change knob contact during the impact sequence. The bumper against blade #1 was fractured. The bumper plastic tips against blades #3 and #2 were smashed/deformed. There was a gouge on the aft fork tang of #4 slot.

Feathering Spring/Guides: Not removed and not examined.

Pitch Stops:

Reverse Pitch Stop: The reverse stop sleeve was in place and intact with the lock nut in place and safetied.

Feather Stop: The feather stop nuts were in place and safetied.

Hub Assembly: The two hub halves remained bolted together and except for the fractured cylinder mounting threads, showed no visual external fractures or cracks. The aft/inboard internal webs of blade sockets #1, #2 and #4 were fractured in the inboard direction. (see Photo #7). Blade socket #3 showed a blade shank impact mark on the aft/trailing edge side of the blade aperture.

The forward hub half socket #4 had some internal scoring/gouging in the bearing radius. There was an impact mark on the inboard web adjacent to preload plate #1 corresponding to the pitch change knob bracket location (see Photo #8).

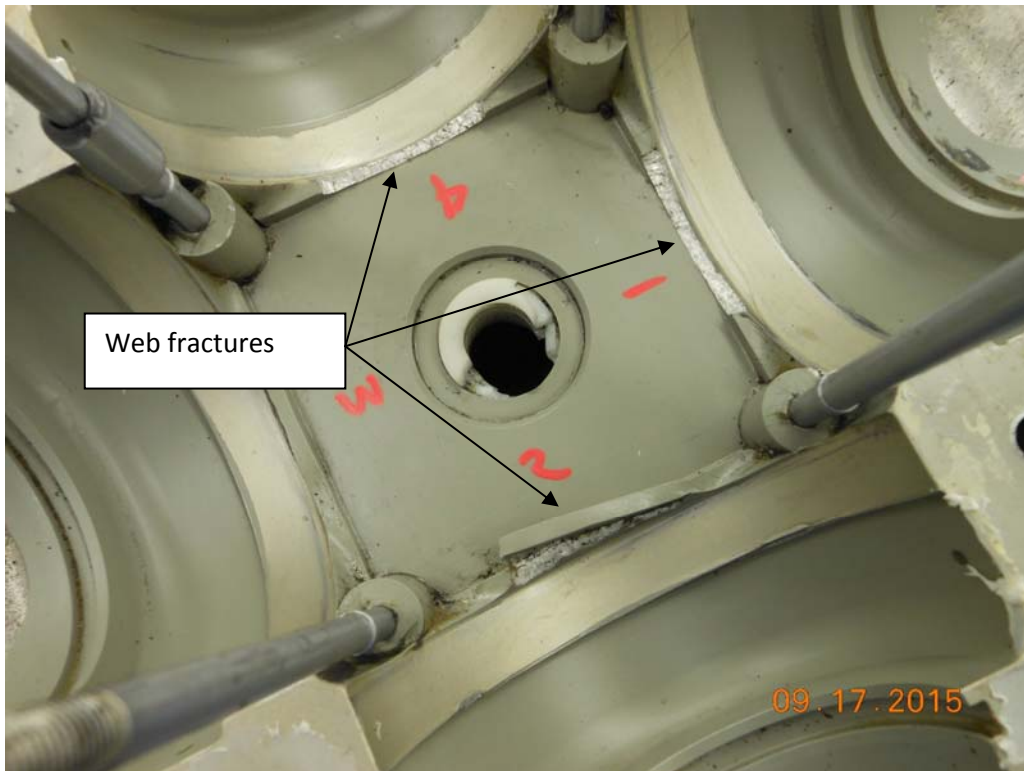


Photo #7 – Aft Hub Internal

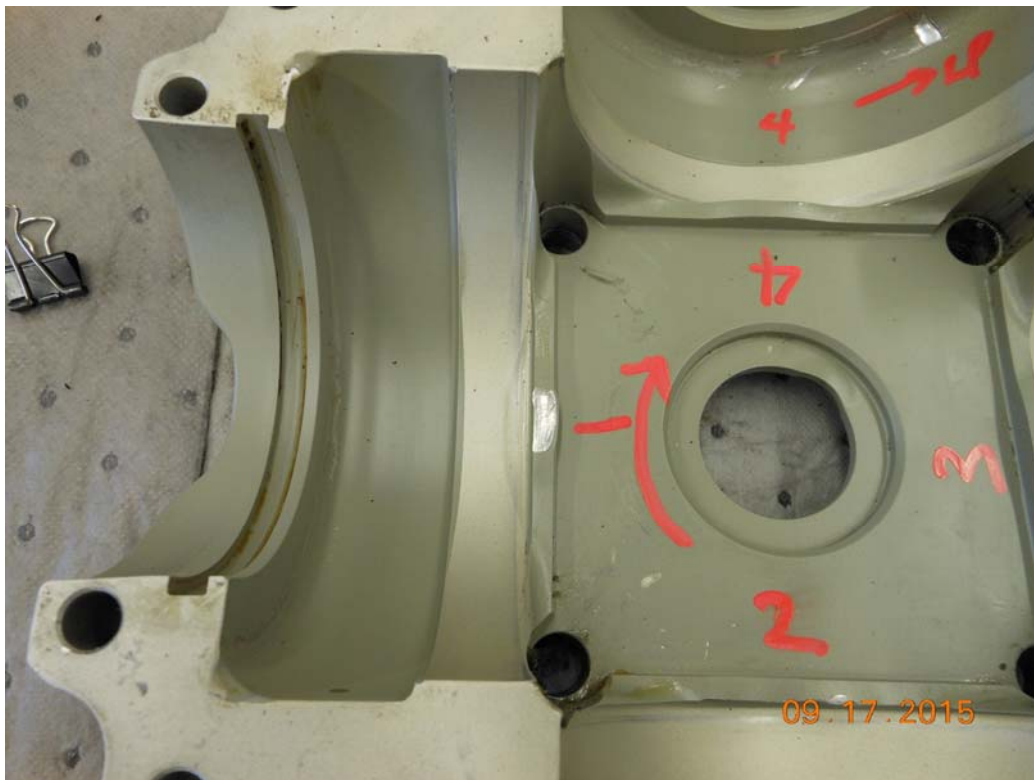


Photo #8 – Forward Hub Internal

Blade Bearings: The #4 hub-side, forward/leading edge quadrant bearing race was fractured in multiple pieces with ball impression marks. The #2 hub-side, forward/leading edge quadrant bearing race had an approximately 1" long piece fractured with ball impression marks. All other bearing races were intact and the blade-side bearing retention rings were in place.

Preload Plates: The #1 and #3 preload plates had distinct fork bumper impact marks (See Photo #9).

1 The #1 preload plate had hub contact marks on forward and aft chamfers with lip deformation along the trail/aft quadrant. The preload plate had a fork bumper impact mark at 37° forward of the hub split line. There was impact damage from the pitch change knob bracket in the slot on the forward/low pitch end.

2 The #2 preload plate lip had some deformation along the aft (face side) edge. There were hub contact marks on forward and aft chamfers. There was no evident impression mark made by the fork bumper.

3 The #3 preload plate had hub contact marks on the forward chamfer. The preload plate had a fork bumper impact mark at 10° forward of the hub split line. There was also impact damage from the beta rod/guide fork on the forward chamfer.

4 The #4 preload plate lip was deformed and sheared along the aft (face side) edge. There was no fork bumper impression mark. There are hub contact marks on forward and aft chamfers and some scrape marks on the chamfers near the hub split line.

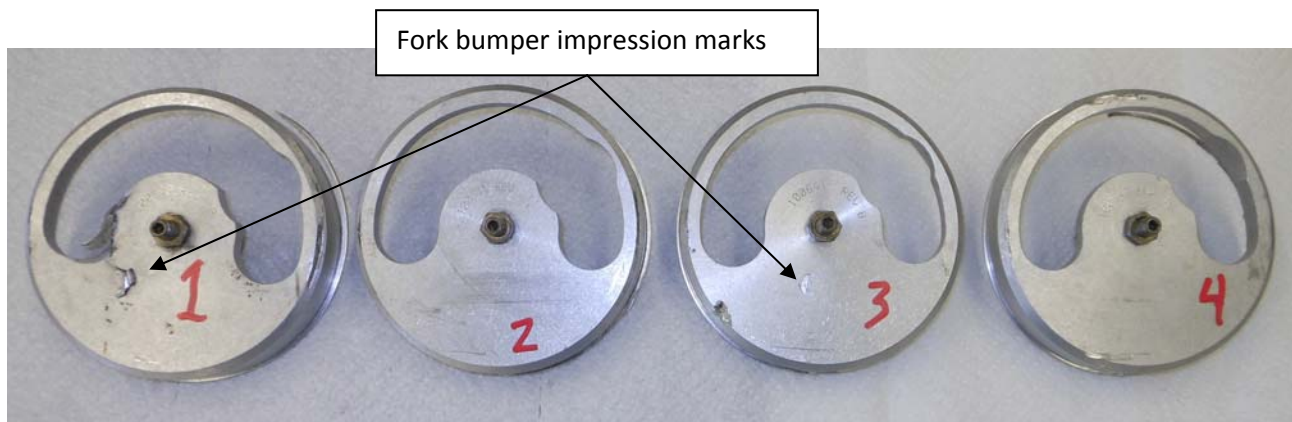


Photo #9 – Preload plates

Propeller Blades: (See Photos #10 through #12)

1

paint, camber side - Chordwise scoring.
 paint, flat side - Chordwise scoring outboard (OB) of boot.
 bend - Bent aft starting from approximately 9-10" outboard of butt.
 twist - Leading Edge (LE) down, toward low pitch.
 lead edge damage - Gouge OB of boot, boot OB LE split.
 trail edge damage - None.
 knob condition - Fractured (bracket screw heads pulled off). Dowel hole deformation indicated twisting load towards low pitch. The knob bracket is bent towards Trailing Edge (TE).
 counterweight - Retained by mounting bolts but loose, mounting boss fractured near one mounting bolt hole indicating load inboard toward hub.

2

paint, camber side - Chordwise scoring.
 paint, flat side - Chordwise scoring 6" from tip.
 bend - Bent aft starting from approximately 9-10" from butt.
 twist - Twisting (LE down) towards low pitch.
 lead edge damage - Boot LE split.
 trail edge damage - 1" gouge/tear 6" from tip.
 knob condition - In place but forward screw head fractured, bracket bent towards TE. Roller bearing cracked but could be rotated with noticeable ratcheting/resistance.
 counterweight - Fractured from mount but retained near hub by de-ice wires and portions of spinner dome/bulkhead. Mounting holes showed deformation opposite rotation and inboard

3

paint, camber side - Chordwise scoring.
 paint, flat side - Chordwise scoring 13" from tip.
 bend - Bent aft starting 9-10" from butt.
 twist - Favors LE up but not remarkable.
 lead edge damage - No remarkable LE damage, localized bending LE up 13" from tip.
 trail edge damage - No remarkable TE damage.
 knob condition - Knob bracket fractured (mounting screw heads popped), dowel pin hole deformation in both directions, knob bracket feet bent in both directions.
 counterweight - Intact.

4

paint, camber side - Chordwise scoring, OB de-ice boot abraded, peeled back.
 paint, flat side - Chordwise scoring 13" and 22-24" from tip, OB de-ice boot peeled off.
 bend - Bent aft 9-10" from butt, bend edgewise LE-to-TE.
 twist - Twisting (LE down).
 lead edge damage - No remarkable dents or gouges, localized bending LE down 4" from tip. Localized bending up 13" from tip.
 trail edge damage - No remarkable damage.
 knob condition - Knob bracket intact, bearing freely rotates.
 counterweight - Fractured but recovered near propeller, hole deformation opposite rotation/direction of flight and OB.



Photo #10 – Blades-Camber Side



Photo #11 – Blades-Face Side



Photo #12 – Blades-Leading Edge View

PHOTOGRAPHIC SUMMARY

NOTE: The following digital photographs are original and unedited and available on compact disc. The numbering sequence may not be chronological as some may have been deleted if out-of-focus, too dark, redundant, etc. Photos used in the text of this report are taken from photos on this list but may have been adjusted from the original. Modifications to images used in the report are limited to cropping, magnification, file compression, or enhancement of color, brightness, or contrast for the sole purpose to improve clarity of the report. No other alterations are permitted.

<u>Picture File Name</u>	<u>Description</u>
DSCN1232.JPG	As received/recovered prop assembly - aft view
DSCN1233.JPG	As received/recovered prop assembly - side view A
DSCN1234.JPG	As received/recovered prop assembly - side view B
DSCN1235.JPG	As received/recovered prop assembly - side view C
DSCN1236.JPG	As received/recovered prop assembly - front/cylinder attach area
DSCN1237.JPG	As received/recovered prop assembly - prop shaft/mounting area A
DSCN1238.JPG	As received/recovered prop assembly - prop shaft/mounting area B
DSCN1239.JPG	As received/recovered prop assembly - prop shaft/mounting area D
DSCN1240.JPG	As received/recovered prop assembly - side view D
DSCN1241.JPG	As received/recovered prop assembly - prop governor/beta valve
DSCN1242.JPG	As received/recovered prop assembly - front view A
DSCN1243.JPG	As received/recovered prop assembly - front view B
DSCN1244.JPG	As received/recovered prop assembly - front view blades #1 & #2
DSCN1245.JPG	As received/recovered prop assembly - front view C
DSCN1246.JPG	As received/recovered prop assembly - front view D
DSCN1247.JPG	As received/recovered prop assembly - front view E
DSCN1248.JPG	As received/recovered prop assembly - front view from above A
DSCN1249.JPG	As received/recovered prop assembly - front view from above B
DSCN1250.JPG	As received/recovered prop assembly - front view from above C
DSCN1251.JPG	As received/recovered prop assembly - front view from above D
DSCN1252.JPG	Front view with spinner dome removed A (beta rod already cut)
DSCN1253.JPG	Front view with spinner dome removed B
DSCN1254.JPG	View from front through front hub half pitch change rod hole
DSCN1255.JPG	View from above showing blade numbers and orientation
DSCN1256.JPG	Hub internal view with front hub half removed A
DSCN1257.JPG	Hub internal view with front hub half removed B
DSCN1258.JPG	Hub internal view with front hub half removed C
DSCN1259.JPG	Hub internal view with front hub half removed D
DSCN1260.JPG	Hub internal view with blades 1,2,4 and fork removed A
DSCN1261.JPG	Hub internal view with blades 1,2,4 and fork removed B
DSCN1262.JPG	Hub internal view with blades 1,2,4 and fork removed C
DSCN1263.JPG	Front hub internal A
DSCN1264.JPG	Front hub internal B
DSCN1265.JPG	Front hub blade socket #3 impact mark
DSCN1266.JPG	Fork with fractured bumper A
DSCN1267.JPG	Fork with aft portion of pitch change rod A
DSCN1268.JPG	Blade butt #1
DSCN1269.JPG	Blade butt #2
DSCN1270.JPG	Blade butt #3

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DSCN1271.JPG	Blade butt #4
DSCN1272.JPG	Blade #2 bracket and knob bearing
DSCN1273.JPG	Blade #4 knob bracket
DSCN1274.JPG	Table of parts
DSCN1275.JPG	Preload #1 with bearings and knob bracket
DSCN1276.JPG	Preload #2 with bearings and counterweight
DSCN1277.JPG	Preload #3 with bearings and knob bracket
DSCN1278.JPG	Preload #4 with bearings and counterweight
DSCN1279.JPG	#4 fractured bearing race
DSCN1280.JPG	Fractured hydraulic unit A
DSCN1281.JPG	Fractured hydraulic unit B
DSCN1282.JPG	Misc hub parts and seals
DSCN1283.JPG	Fork with aft portion of pitch change rod B
DSCN1284.JPG	Fork slot #1
DSCN1285.JPG	Fork slot #4 A
DSCN1286.JPG	Fork slot #3
DSCN1287.JPG	Fork slot #4 B
DSCN1288.JPG	Fork slot #2
DSCN1289.JPG	Fork fractured bumper
DSCN1290.JPG	Propeller S/N
DSCN1291.JPG	Propeller Model No.
DSCN1292.JPG	Factory S/N
DSCN1293.JPG	Hub socket #4 bearing radius marks
DSCN1294.JPG	Spinner bulkhead S/N
DSCN1295.JPG	Beta arm guide pin, beta ring area A
DSCN1296.JPG	Beta arm guide pin, beta ring area B
DSCN1297.JPG	Fractured prop shaft A
DSCN1298.JPG	Fractured hydraulic unit C
DSCN1299.JPG	Fork top view
DSCN1300.JPG	Pitch change rod extension A (out of focus)
DSCN1301.JPG	Pitch change rod extension B (out of focus)
DSCN1302.JPG	Pitch change rod extension C (out of focus)
DSCN1303.JPG	Counterweight #1 mounting A
DSCN1304.JPG	#1 pitch change knob bracket placement/relative bend
DSCN1305.JPG	#3 pitch change knob bracket placement/relative bend
DSCN1306.JPG	Blade #2 face side tip A
DSCN1307.JPG	Blade #2 face side tip B
DSCN1308.JPG	Blade #3 face side tip
DSCN1309.JPG	Blade #4 face side
DSCN1310.JPG	All blades face side
DSCN1311.JPG	Blade #4 shank-to-tip view
DSCN1312.JPG	All blades camber side A
DSCN1313.JPG	All blades camber side B
DSCN1314.JPG	All blades camber side C
DSCN1315.JPG	All blades camber side D
DSCN1316.JPG	Counterweight #1 mounting B
DSCN1317.JPG	Counterweight #2 mounting boss
DSCN1318.JPG	Counterweight #4 mounting boss
DSCN1319.JPG	All blades leading edge view A
DSCN1320.JPG	All blades leading edge view B
DSCN1321.JPG	Blades #3 and #4 camber side relative edgewise bending

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DSCN1322.JPG	All preload plates
DSCN1323.JPG	Preload #1 with protractor A
DSCN1324.JPG	Preload #1 with protractor B
DSCN1325.JPG	Preload #2
DSCN1326.JPG	Preload #1 with protractor
DSCN1327.JPG	Preload #4
DSCN1328.JPG	Preload #4 aft side damage
DSCN1329.JPG	Fwd hub half internal damage A
DSCN1330.JPG	Fwd hub half internal damage B
DSCN1331.JPG	Fwd hub half pitch change rod hole
DSCN1332.JPG	Aft hub half internal damage
DSCN1333.JPG	spinner dome fragments
DSCN1334.JPG	Misc assembly parts
DSCN1335.JPG	Pitch change knob bracket #1
DSCN1336.JPG	Pitch change knob bracket #3
DSCN1368.JPG	Beta ring A
DSCN1369.JPG	Beta ring B
DSCN1370.JPG	Beta ring C
DSCN1371.JPG	Beta ring D
DSCN1372.JPG	Beta ring E
DSCN1373.JPG	Beta ring F
DSCN1374.JPG	Beta ring G
DSCN1375.JPG	Beta ring H
DSCN1376.JPG	Beta ring I
DSCN1377.JPG	Beta ring J
DSCN1378.JPG	Spinner bulkhead circumferential mark A
DSCN1379.JPG	Spinner bulkhead circumferential mark B
DSCN1380.JPG	Erroneous shot (Dave Moore from Philly FAA FSDO in view)
DSCN1381.JPG	Beta arm tip wear