NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

AIRFRAME AND ENGINE EXAMINATION

WPR14LA271

Accident Date: June 29, 2014
Exam Date: July 17, 2014

This document contains 31 embedded images
Photographs by Cessna, CMI, FAA, & NTSB

A. ACCIDENT

Location: Big Creek, Idaho
Date: June 29, 2014
Aircraft: Cessna 182Q, N132K, Serial # 18266782
NTSB IIC: Michael Huhn

B. EXAMINATION PARTICIPANTS:

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C. ACCIDENT SUMMARY

On June 29, 2014, about 0815 Mountain daylight time, a Cessna 182Q, N132K, was substantially damaged when it impacted trees and terrain during approach to Big Creek airport (U60), Big Creek Idaho. According to witnesses, the airplane had entered the traffic pattern, and was transitioning from the base leg to final when it descended into the trees about one-half mile short of the runway. The airplane came to rest inverted in an area forested by tall trees. The right wing had separated from the airplane during the impact sequence. The airplane was manufactured in 1979, and in 2008 was equipped with multiple modifications collectively referred to as the Peterson Katmai 300 conversion. These modifications included a Continental Motors IO-550 series engine and additional nose-mounted aerodynamic control surfaces. The airplane was also equipped with Wing-X wingtip extensions.

D. GENERAL INFORMATION

- FAA personnel were the only parties who examined the airplane on scene
- FAA arrived on scene July 1, 2014
- The wreckage was recovered by SP Aircraft of Boise ID via helicopter/airlift
- The wreckage was transported to the SP facility in Boise for subsequent examination by NTSB, FAA, Cessna, and CMI personnel
- Airport Elevation 5,743 feet msl
- Although there were reportedly several witnesses, to date no witness names or statements have been obtained by the investigation
- Details of the Peterson/Katmai and Wing-X conversions will be documented separately

E. ACCIDENT SITE INFORMATION (Provided by FAA airworthiness inspector)

- Aircraft came to rest in an inverted position in a heavily wooded area adjacent to the impact mark left by the engine and propeller
- A linear ground impact mark was noted in front of the left wing resting area
- Right wing fracture-separated from airplane at the root
    - The right wing was just aft & outboard of the left wing
    - The aileron crossover/balance cable was the only remaining attachment between the wing and the airplane
    - Multiple trees came to rest on top of the root area of the wing.
- Left wing remained attached to airplane
- Trees estimated to be about 50 feet tall
- Airplane impacted ground in a near vertical (nose down) pitch attitude
- Numerous broken and/or sections of 6-inch or more diameter trees were found in the debris field
- Photographs indicated that the left flap was extended to approximate 15 degrees
- Engine cowl flaps closed
- Nose gear (with fork and strut segment attached) was found approximately 40 feet forward of the main wreckage area.
    - The NLG wheel rim was flattened (out of round) on about a 30 degree sector
- Both main landing gear wheel/tire assemblies were fracture-separated from their respective landing gear struts.
- All engine controls were found in the full forward position
- Flap control handle found in the full up position, but the flap indicator was found near the 40 degree (full down) position
- Empennage bent to the left

Figure 1 - Entry Path Through Trees

Figure 2 - Wreckage In Situ (right wing in foreground)

Figure 3 - Forward Fuselage and Ground Impact Location

Figure 4 - Left Side of Fuselage (note flap extension angle)

F. AIRFRAME INFORMATION

1.0 General

- All major components were identified and accounted for at the recovery facility
- Right side of aircraft (right side of engine, right wing, and right horizontal) sustained the most significant impact damage
- Right wing was fracture separated from the root
    - Right flap and aileron remained attached to right wing
- Left wing was unbolted from the root by recovery personnel
    - The left flap was separated from the wing by recovery personnel
    - Left aileron remained attached to left wing
- Empennage was separated from the fuselage by recovery personnel
- Left horizontal stab remained attached to the empennage
- Right horizontal stab remained attached to the empennage but sustained deformation damage
- Engine mounts were all fractured/parted
- Engine remained attached to the airframe via control cables and wires
- The controllable pitch propeller was fracture-separated from the crankshaft propeller flange
- Observed/obvious differences from standard C-182Q included
    - IO-550 engine
    - Canards
    - Wingtip extensions (approx 2 feet per side)
    - Oversized MLG & NLG tires/wheels
    - Extended baggage compartment
    - Numerous upgraded ('glass panel') instruments
    - 3 position fuel selector valve (LEFT, BOTH, RIGHT)
    - Header tank
    - Non-Cessna throttle and propeller cockpit controls

Figure 5 - Fuselage and Items at Exam

Figure 6 - Empennage at Exam

Figure 7 - Left Wing (note aileron crossover cable tear-out)

Figure 8 - Right Wing (separated at impact)

2.0 Cabin/Cockpit

- Left front (pilot) seat was attached to seat tracks both adjustment pins were engaged in the #12 holes (counted from front end) and was intact
- Left front (pilot) seat incorporated a secondary anti-slip mechanism that was intact
- Forward sections of seat tracks were buckled upward

Figure 9 - Pilot's Seat (note cabin integrity, plus deformed seat tracks)

- Right front (copilot) seat was impact separated from the aircraft (feet were spread but adjustment pins were intact)

Figure 10 - Copilot Seat Feet (seat unoccupied for accident but separated from tracks)

- Front seats utilized lap belts with Y-shaped shoulder harnesses
    - All were cut by first responder to assist in strapping the pilot to the rescue backboard
- Seat belt and harness anchor points remained intact
- Front seat belts were manufactured by AMSAFE
- Rear seats remained attached at all anchor points
- Rear seats utilized lap belts that remained intact and attached to their anchor points
- Occupiable volume of the cockpit/cabin was not compromised
- Transparencies
    - Windshield fractured and separated
    - Right side rear window was intact
    - Right side front window was intact
    - Left side rear window was fractured
    - Left side front window was open and fractured
- Right cabin door was separated (top hinge was fractured) from the airplane
    - It is unknown as to whether the first responders removed the right door at the accident site.
- Left cabin door was intact and closed

Figure 11 - Pilot Station (photo taken on-scene while airplane still inverted)

3.0 Instrument and Control Panel

- Instrument panel was displaced with the top part distorted forward
- Panel was post Cessna delivery aluminum face
- Avionics and instruments differed significantly from original stock Cessna configuration

Figure 12 - Instrument Panel (photo taken on-scene while airplane still inverted)

4.0 Instrument and Placard Markings/Readings

- Airspeed-Related Values (unless noted, placards/annotations were not standard Cessna-provided markings)

Speed	Observed	Cessna C-182Q POH
V_{NO}		143
V_A	111 KIAS (placard)	111 (2950 lbs) 100 (2450 lbs) 89 (1950 lbs)
V_{FE}	Standard Cessna Flap Switch Markings: 110 KIAS for up to 10º, 95 KIAS above 10º	140 (10°) 95 (10° - 40°)
V_{NE}	157 KIAS (placard re wing extensions)	179
V_X	57 (placard)	54 (SL) 62 (10,000')
V_Y	78 (placard)	78 (SL) 72 (10,000')

Marking	Observed Value (KIAS)	Cessna C-182Q POH (KIAS)
White Arc	45-95	45-95
Green Arc	48-143	48-143
Yellow Arc	143-179	143-179
Red Line	179	179

Figure 13 -Airspeed Indicator (note arcs and redline)

- Observed placard/notation above Airspeed Indicator:
  - "V_A 111KIAS"
  - "V_{NE} 157 KIAS with wing extensions"
- Observed placard/notation located to the left of the OAT gauge:
  - "V_X 57"
  - "V_Y 78"
  - "Vg 70"

Figure 14 - Airspeed Placards/Notations (note VNE discrepancy)

- Airspeed Indicator = 0
- Vacuum = 0
- OAT = blank (digital)
- Hobbs Meter = blank (digital)
    - 471.8 at initial application of 12VDC
    - Photos show 471.9 because device became operational upon power application

Figure 15 - Hobbs Meter Shortly After 12VDC Application

- Turn Coordinator = left wing 15° low, ball right
    - Instrument also functions as S-Tec autopilot pilot interface/control/annunciator
- Altimeter = 5,250’ 30.11 (Exam location (KBOI) elevation 2,871 msl, Altimeter setting at approx time of observation: 29.93)
- Garmin VOR OBS = 158° bars left and low
- VSI = 150 FPM climb

- AI = Impact damaged; unreadable
- 2 analog instruments (top center of panel) missing
    - Replaced by Aspen Evolution, which was removed by recovery crew
- EFIS switch "OFF"
- Audio selector panel impact damaged
- Garman GPSMap 695 (SN: IH700201) will be sent to NTSB recorders lab for data download
- JPI EDM 930 (SN: 01403) will be sent to NTSB recorders lab for data download
- No other cockpit units contained recoverable/relevant NVM
- ELT ARTEX ME406 (TSO C126/91A)
    - Device had been packaged and provided separately by first responders
    - Unknown where device was found
    - Switch found in ARM position when packaging opened at recovery facility
- Remote (panel-mounted) ELT switch (two-position: ARM and ON) was in ARM position
- Weight & Balance panel annotation:
    - GW 3,100
    - Empty 1,968
    - Useful 1,132
    - At 68g 724
    - At 84g 628

Figure 16 - Cockpit Placard/Notations re Weights

5.0 Cockpit Controls & Indications

- Cowl flap handle "CLOSED"
    - Cowl flaps also observed to be closed
- Fuel selector handle and valve: LEFT
    - Conflicts with Cessna POH and installed selector valve placard, which mandate "BOTH" for landing
- “Fuel off” knob full forward (located under mixture control)
- Mixture, Prop, & Throttle controls found full forward

Figure 17 - Engine Controls and Fuel Shutoff

- Flap position selector control/handle found positioned full up/retracted
- Flap position indicator found indicating 40 degrees (full down/extended)
- Flap position indicator system sustained impact damage behind panel
    - Cable fracture-separated from indicator lever/pointer
    - Housing partially crushed
- NOTE: Pilot's written statement dated July 9, 2014 reported that flaps had been set to 40 degrees on downwind leg

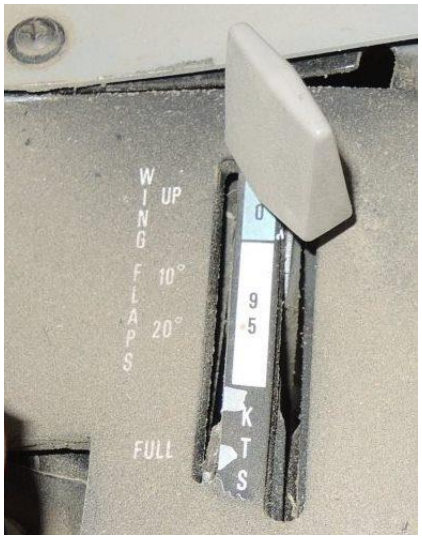


Figure 18 - Flap Control and Indicator

- Elevator Trim indicator slightly nose up
- Rudder Trim indicator: neutral
- Cabin heat & cabin air both OFF
- Master & alternator switches both ON
- Magneto switch OFF, key absent
- Avionics power ON
- Pitot heat ON
- Nav, beacon, strobe, taxi lights ON
- Landing light OFF
- All breakers in except NAV 2 and COMM 1
- Fuel pump (3 position: OFF, LOW, HIGH) found positioned to HIGH

6.0 Flight Controls

- Ailerons – Both remained attached to their respective mounts
    - Left aileron – Moved through its full range of travel
    - Right aileron stuck at approx neutral, but could be moved about 1/2 inch up and down
- Elevators – Both remained attached to their respective mounts
    - Range of motion restricted due to impact damage
- Elevator trim actuator measured 1 1/8”, which equates to 5° tab TE up
- Rudder – Remained attached to its mounts
    - Moved through full range of travel
- Continuity established for aileron, rudder, and elevator control cables
    - See attached drawings for cable cuts and fracture points
- Flaps – Right remained attached to right wing. Left remained attached to left wing at accident site but was removed during aircraft recovery.
- Flap jack screw measured 3 1/4”, which equates to 15° flaps down
- Right flap was approximately 15° down and was fixed into position due to impact damage

Figure 19 - Right Wing Root (note flap deflection)

Figure 20 - Right Wing (separated at impact)

- Left flap witness marks on flap inboard end and fuselage indicated that left flap was extended approximately 15° down at impact

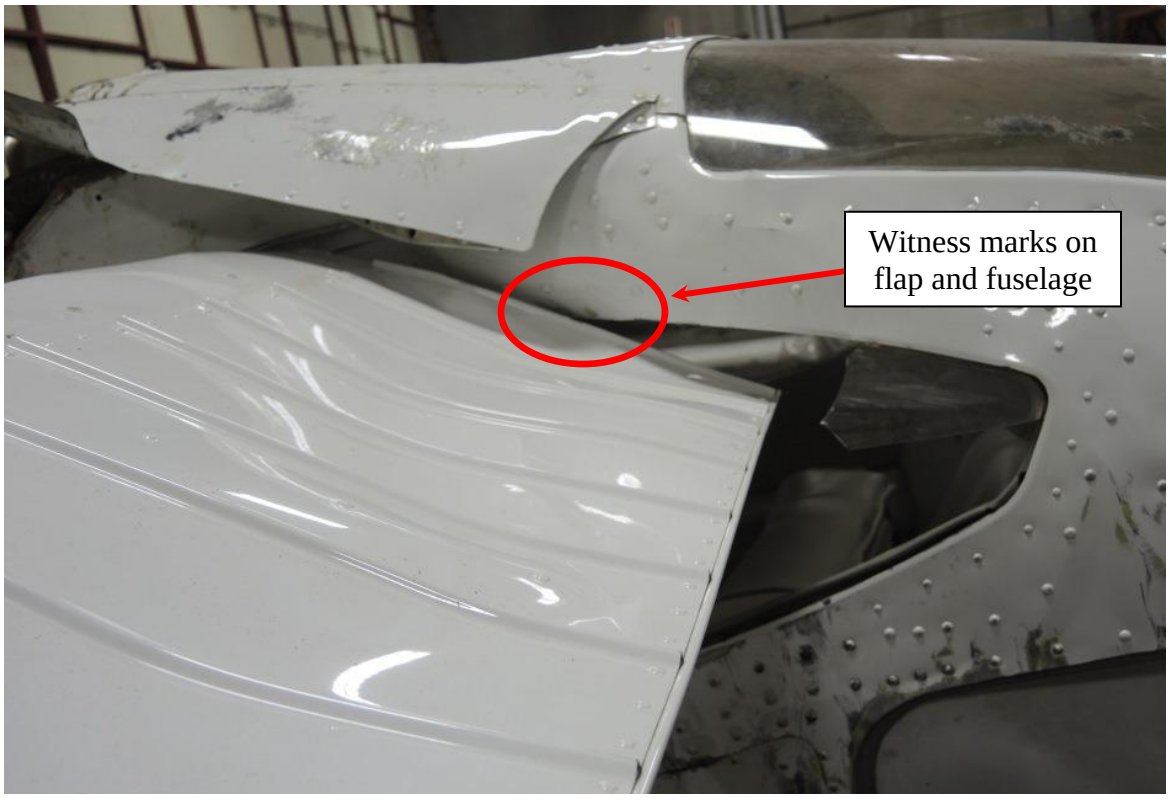


Figure 21 - Left Flap (manually positioned to align witness marks)

- Peterson canards:
  - Two total, one per side, located approximately mid height on engine cowl
  - Each canard consisted of a fixed LE segment and movable TE segment.
  - Both movable portions remained affixed to their stationary segments
  - Left canard impact damaged with the TE in down position
  - Right canard displaced aft with TE in a slight up position
  - Movable portions are actuated by left side control yoke through push-pull rods and pivots, including a transverse torsion bar.
  - Per pilot, directionality is "opposite elevator": Elevator TEU = canard TED, and vice versa
  - Rod end at left canard was fracture separated from its actuation rod
  - Right side movable canard controls were intact

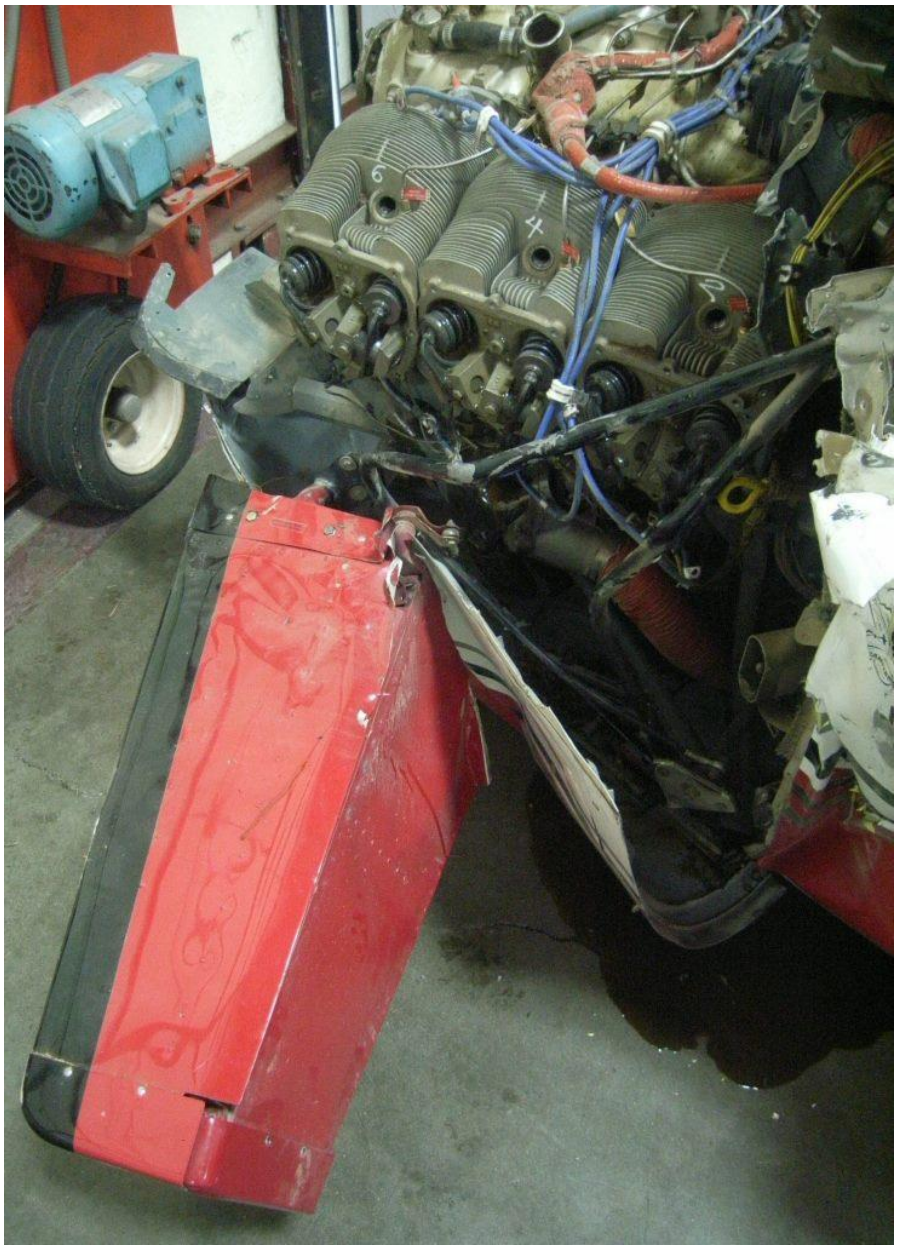


Figure 22 - Left Canard (outboard end displaced aft)

Figure 23 - Right Canard

7.0 Fuel System

- POH = 46 G per tank, Total Usable = 88 G
- POH Limitation "Takeoff and land with fuel selector handle in BOTH position"
- POH Limitation "Operation on either left or right tank limited to level flight only"
- Standard Cessna fuel selector is 4-position valve (OFF, LEFT, RIGHT, and BOTH)
- Accident airplane fuel selector was 3-position (LEFT, RIGHT, and BOTH)
    - Two stops had been added to what appeared to be the standard Cessna fuel selector panel to prevent handle travel to the standard Cessna OFF position, and thereby limited travel to selection of LEFT, RIGHT, or BOTH tanks
    - It was/was not determined whether the original Cessna 4 position valve was replaced with a 3 position valve

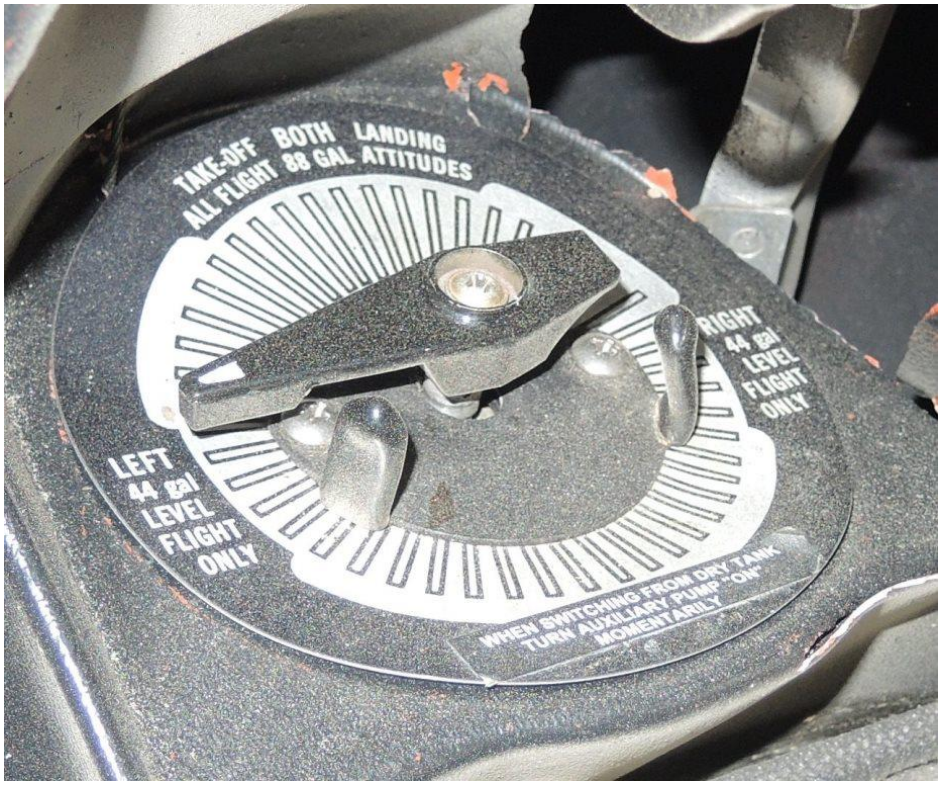


Figure 24 - Fuel Selector (note stops)

- A "FUEL SHUTOFF" push-pull knob was located just below the mixture control
    - There were no markings or placards to indicate function positions (eg "Fuel Off-Pull" etc)
- Accident airplane had header tank between pilot and co-pilot rudder pedals, forward of the pedestal but aft of the firewall
- Placard forward of fuel caps = 34.5 G fuel load fill to bottom of filler neck extension, service with 100/130 aviation gasoline, capacity 46 G

Figure 25 - Right Fuel Tank Filler Port/Cap (note misspellings in placards)

- Wing fuel tanks did not contain fuel at time of exam (no record of any immediate post accident, on-site observations)
- Right tank cap was in place with lanyard and pliable seal intact
- Left tank cap was separated but found in bag of miscellaneous debris
- Firewall-mounted fuel strainer was removed and opened
    - Fuel screen was unobstructed
    - Bowl did not contain fuel or debris/contamination
    - Slight corrosion at bowl bottom (consistent with that observed on other airplanes of this vintage)

G. ENGINE & PROPELLER INFORMATION

- Continental Motors IO-550-D24
    - SN: 833251-R
- There were no external signs of operational distress on the crankcase and cylinders
- Engine mounts were fractured with the exception of aft left mount.
- Propeller was fracture-separated from crankshaft propeller flange, and propeller mounting bolts remained with the propeller flange
    - Hub and Blades: McCauley
    - Hub Model D3A34C4 01C
    - Hub S/N 080396

- The three all-metal propeller blades remained attached to the propeller hub
    - They all sustained s-bending and blade twisting
    - All exhibited leading edge paint erosion near the blade tips
- The propeller spinner was deformed around the hub on one side with the very tip of the spinner being bent over the deformed area
- Oil cooler was impact damaged and deformed upward. The outboard cap of the oil cooler was partially separated on the bottom side and wood fragments were imbedded in the cap and cooling fins.
- The #5 rocker cover was fractured and the pushrod holes were fractured.
- The oil filler cap was deformed and found hanging from its lanyard
- The magnetos remained secured to the topside of the engine.
- The #5 bottom ignition lead was damaged.
- The rocker covers remained secured to their respective cylinders and all remained intact with the exception of the fractured #5 cover.
- All rockers, springs and valve keepers remained intact and well oiled. There were no signs of operational distress with any of the cylinder head components. All rockers were observed to move through their normal range during crankshaft rotation.
- All six cylinders were ECi cylinders.
- All top, and the #5 bottom, spark plugs were removed
- All spark plugs displayed a worn out condition with normal combustion deposits)
    - A borescope inspection of the cylinders revealed no anomalies with the barrels, pistons, valves or valve seats.
    - Oil was present in the odd-side barrels
    - The crankshaft was rotated utilizing a bar tool that was positioned into the propeller flange dowel holes. Manual rotation of the propeller flange confirmed crankshaft and camshaft continuity (as evidenced by movement of all valves, the movement of all six pistons, and the audible snapping of the magneto impulse coupling)
    - Thumb compression was obtained on all six cylinders
    - Sparks were obtained on all six top ignition leads, in firing order, during crankshaft rotation
- The oil filter was properly secured to the engine
- The oil filter was removed and opened for filter inspection
    - Examination of the filter element revealed no visible signs of contamination
    - Date/time annotations on the filter: 5/29/14 461.5 hrs
- The propeller, throttle and mixture control cables remained attached to their respective component control levers. The cables ends were removed from the throttle and mixture control levers on the fuel metering unit to facilitate removal of the metering unit.
- The throttle and mixture levers remained secured to their respective shafts.
    - Movement of the control levers resulted in corresponding motions of the respective shafts and cams, with no binding noted
    - The throttle lever on the metering unit was capable of rotating throughout a 360-degree range, as it was disconnected from the throttle rod and link assembly. The mixture lever on the metering unit was capable of rotating between the idle cutoff to full rich stop pins

- The metering unit was removed from the throttle body and was disassembled
    - No anomalies noted with any internal components
    - Fuel poured from one of the fittings during metering unit removal
    - The inlet fuel screen was clean
    - The mixture and throttle cams were intact, with no obstructions noted
    - The O-rings were intact
    - The metering plug was in place and no anomalies were noted
- The fuel pump remained secured to the accessory drive section of the engine, with all the fuel lines secured to their fittings
- The fuel pump was removed
    - The drive gear and drive coupling were found to be intact
    - Manual rotation of the gear while the drive coupling was installed in the drive shaft resulted in free rotation of the pump shaft
- The fuel pump was disassembled
    - No anomalies were noted with the internal components
    - The internal diaphragm was intact
    - The fuel pump vanes were intact
    - Light corrosion was noted in the pump housing
    - The adjustable orifice control fitting was fractured
- The fuel manifold remained secured to the topside of the engine and the fuel injection lines remained secured to the fuel manifold and their respective injectors
- The fuel manifold was removed and fuel poured from the inlet fitting
- The manifold valve was disassembled, and no anomalies were noted with the internal components
    - The spring was intact and in place
    - The diaphragm was intact and pliable (date stamped 2008)
    - The plunder remained secured to the diaphragm
    - The screen was clean
    - The residual fuel in the manifold was blue in color
- Refer to separate CMI report for additional details and images

H. COCKPIT/PILOT DOCUMENTS

- No POH or other operational guidance/information (aside from a "homemade" checklist) was located in the airplane or amongst the recovered items
    - NOTE: The recovered checklist contained some unusual, unclear, or incorrect information. The checklist items are addressed in a separate document.
- No performance guidance/documentation was located in the airplane or amongst the recovered items
- Aside from the notations on the instrument panel, no weight and balance information, guidance, or documentation was located in the airplane or amongst the recovered items
- Several miscellaneous items that were artifacts or possibly instructional material – (Decals/stickers, cases, brochures, charts, etc) of mountain and/or "back country" flying courses and/or associations were found in the airplane or amongst the recovered items

Figure 26 - Stickers on Left Cowl

- A copy of a "Flight Training" magazine article entitled "Getting Down in a Hurry-Forward Slips" (dated January 2003)) was found in the recovered items
    - In his written statement to the FAA re the accident, the pilot noted that he attempted to use a slip to increase his descent rate on the base and/or final legs

Figure 27 - Magazine Article Copy re Slips

- Two separate loose papers with the handwritten, underlined annotation "Brains" were found in the recovered items. The handwriting style of the two was consistent, and appeared to be from the same person (Ref photo 1851)

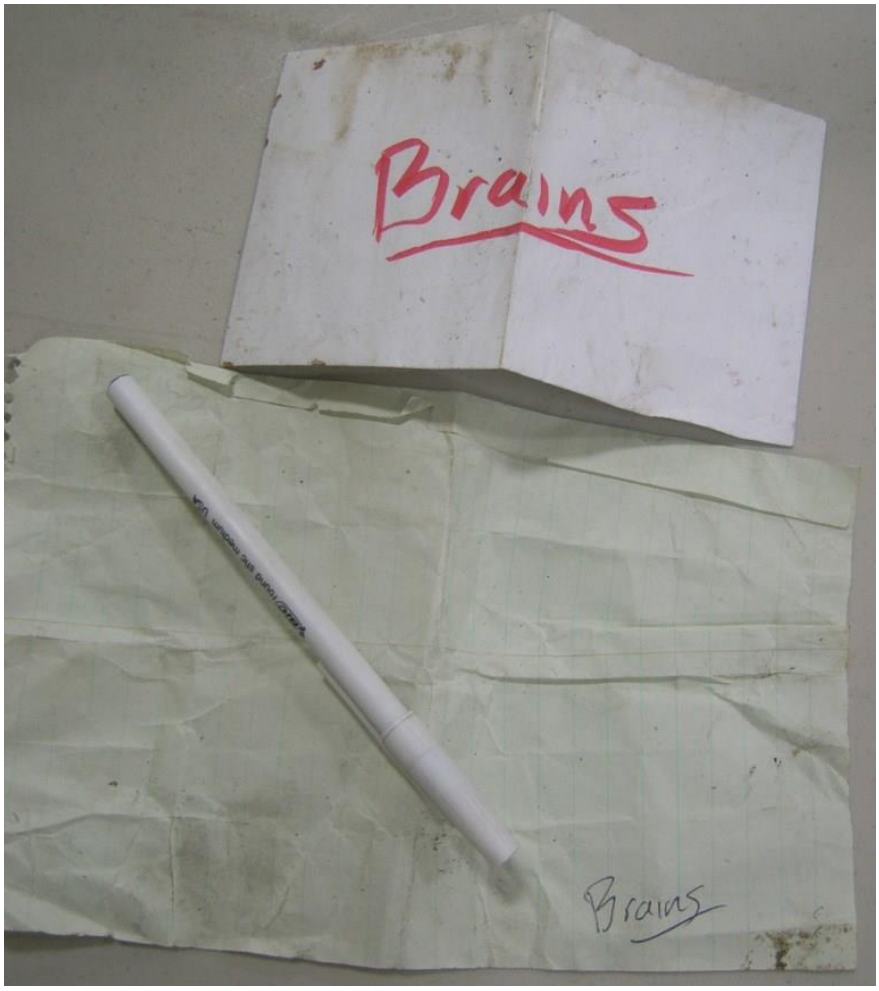


Figure 28 - Two Notepages (found in loose items)

I. ADDITIONAL OBSERVATIONS

1.0 Tree Fragments

The airplane impacted in a region of numerous soft-wood (pine) trees, and multiple trees were cut or broken by the airplane. At least two tree segments that had cuts consistent with propeller slashes were observed in the recovered items.

- Paint transfers of color consistent with the propeller blades were observed on at least one wood fragment
- The cut orientations were typically 45 degrees or less from the tree vertical axis

- One segment of a tree trunk, approximately 6 inches in diameter and 12 inches long, was cut from the tree at both ends. The cuts were consistent with propeller slashing.

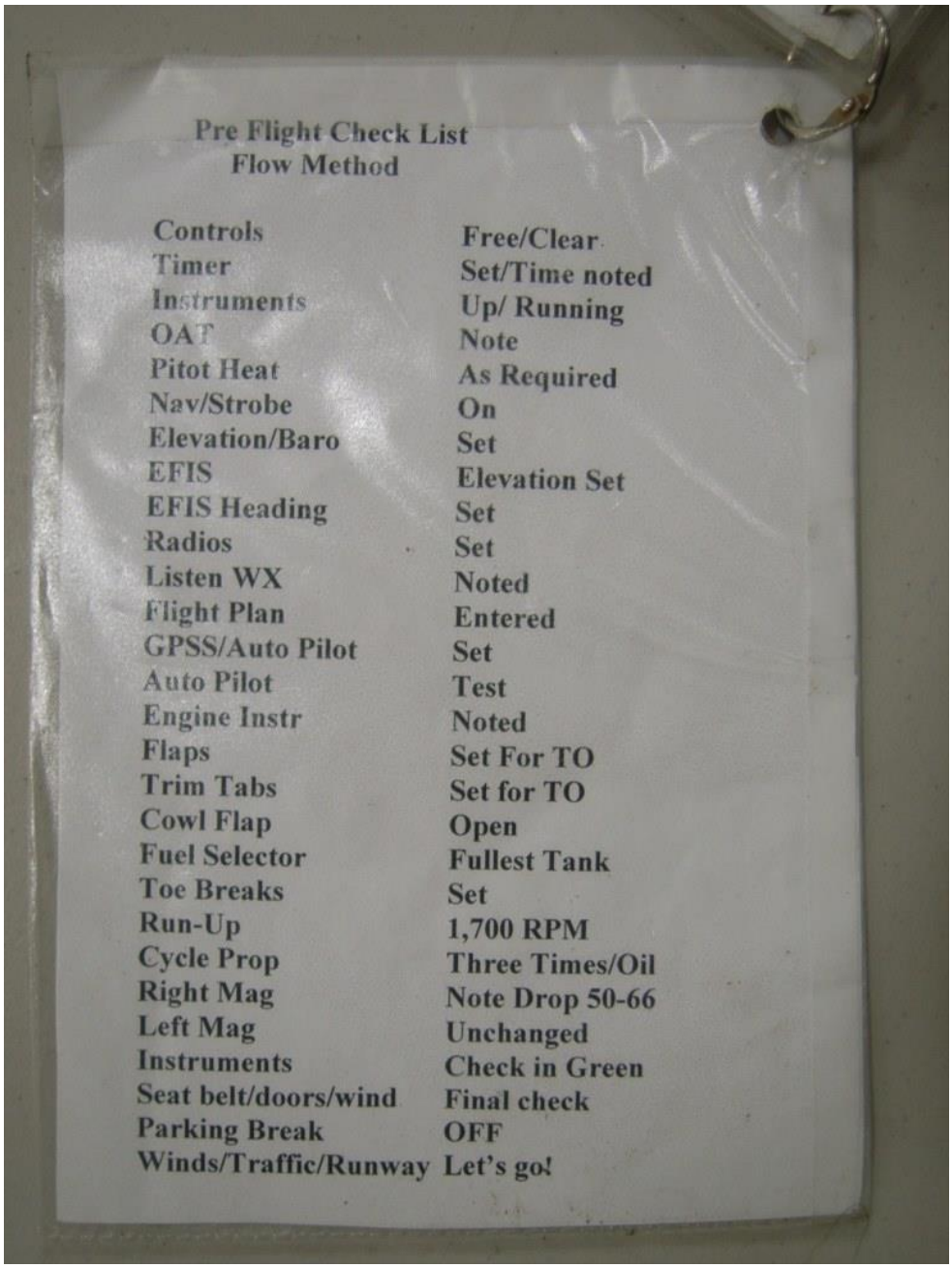
Figure 29 - Tree Fragment with Both Ends Cut

2.0 Discrepancies & Incongruities

Overall, the airplane was a like-new, well-kept example with numerous expensive optional or post-delivery modifications and accessories. However, certain items were observed, or found to be missing, which were incongruent (from a cost/economics standpoint) with the airplane's general condition and/or level of outfitting. These included

- Absence of a POH or any operational reference documents, exclusive of the handmade checklists and multiple cockpit placards
    - The pilot reported that he did have a POH on board, but none was observed in the recovered wreckage during the examination
- Conflicting operational guidance (primarily airspeed information)
- Home-made checklists, which varied in quality and accuracy (For details see separate document)
- A homemade cockpit control lock
- Misspelled words in the fuel placards on the wings, suggesting that they were not produced/obtained commercially
- An AN machine screw installed in a Tinnerman ('speed nut') fitting on a wing panel
- Worn center electrodes in several spark plugs
    - Comparison of the electrodes' appearance with Champion guidance revealed that guidance indicated that the spark plugs should be replaced when worn to that degree

Figure 30 - Home-made Cockpit Control Lock



Pre Flight Check List
Flow Method

Controls	Free/Clear
Timer	Set/Time noted
Instruments	Up/ Running
OAT	Note
Pitot Heat	As Required
Nav/Strobe	On
Elevation/Baro	Set
EFIS	Elevation Set
EFIS Heading	Set
Radios	Set
Listen WX	Noted
Flight Plan	Entered
GPSS/Auto Pilot	Set
Auto Pilot	Test
Engine Instr	Noted
Flaps	Set For TO
Trim Tabs	Set for TO
Cowl Flap	Open
Fuel Selector	Fullest Tank
Toe Breaks	Set
Run-Up	1,700 RPM
Cycle Prop	Three Times/Oil
Right Mag	Note Drop 50-66
Left Mag	Unchanged
Instruments	Check in Green
Seat belt/doors/wind	Final check
Parking Break	OFF
Winds/Traffic/Runway	Let's go!

Figure 31 - Home-made Checklist (Note fuel selector and magneto references)