



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

September, 2015

AILERON SYSTEM EXAMINATION

WPR15FA158

This document contains 11 embedded photos.

A. ACCIDENT

Location: Spokane, Washington
Date: May 7, 2015
Aircraft: Piper PA-46-350P, Registration Number: N962DA, Serial #: 4636031
NTSB IIC: Elliott Simpson

B. EXAMINATION PARTICIPANTS:

Elliott Simpson
Aviation Accident Investigator
National Transportation Safety Board
Los Angeles, California

Mark E Durham
Maintenance Inspector
Federal Aviation Administration
Spokane, Washington

Ken Petschow
Rocket Engineering/JetProp
Spokane, Washington

C. SUMMARY

Examination of the aileron control system was conducted on September 9, 2015 at the facilities of Discount Aircraft Salvage, Deer Park, Washington.

The left wing aileron control system appeared to be correctly rigged with all control cables terminating at their correct locations, and following their appropriate routing paths. Examination of the right aileron control system revealed that the aileron balance and control cable routing had been crossed over in the area of the cabin floor, between the center pulleys and wing root pressure vessel seals. As such, the balance cable continued through the wing on a route to the drive side of the aileron sector wheel, and the drive cable conversely continued on a route to the balance cable side. Under this condition, the right aileron control directions would have been reversed (Image 1).

D. DETAILS OF THE INVESTIGATION

1.0 Aileron System Examination

Both ailerons were examined to confirm compliance with Piper Aircraft Service Bulletin 921. The aileron doublers had been installed, and no cracks were observed around the balance weight mounting holes.

The aileron quadrant assembly was examined at the aft face of the forward pressure bulkhead. The cable guard (82858-002) was installed, confirming compliance of Service Bulletin 1190B.

Service Letter 1131 described cleaning and lubrication procedures for the self-aligning and needle bearings of the outboard aileron sector wheel. Both bearings for the left and right wheels appeared intact and moved freely without any indication of binding (the right wheel had become impinged against its end stops during the accident sequence, and was subsequently freed during the examination (Photo 1).

Left Wing

The left wing center and aft spar had separated at the root, with the forward spar remaining attached to its mounting bolt and frame bracket, which had separated from the airframe. The wing remained largely intact, and had sustained leading edge crush damage to the outboard 6 ft including the tip.

The aileron remained attached at the inboard hinge, and separated at the outboard hinge where the tip had become bent upwards. The aileron control cable remained attached to upper portion of the control sector wheel; the cable continued, passing through the upper wing rib pass-through holes at the flap outboard hinge. The cable had separated at the wing root, about 6 inches outboard of the turnbuckle for the forward left aileron drive cable. Inboard of the separation, the drive cable was continuous to the control yoke assembly.

The aileron balance cable had become detached at the lower portion of the sector wheel. Its swage ball and mounting plate were intact and the cable remained continuous outside of the airframe, and passed through the fuselage at the correct lower cable pressure vessel seal. Within the airframe the cable remained attached to the turnbuckle of the corresponding right aileron balance cable.

Right Wing

The outboard portion of the right wing had separated along with its aileron. A cable remained attached to the lower balance cable attach point of the aileron sector wheel (Photo 2), however a tag on the cable identified it as "5038", which according to Piper maintenance instructions was the aileron drive cable (Photo 3). The cable passed over the outboard balance cable pulley (Photo 6) as well as through the balance cable pass-through holes along the lower portion of the trailing edge (Photo 4,5). The cable continued, where it separated about 4 ft outboard of the root.

(Photo 7). The inboard section of the cable passed through the fuselage at the lower balance cable pressure vessel seal. (Photo 8). Within the fuselage a part number label "5038" was on the cable, at the termination point of a turnbuckle (Photo 9). From the turnbuckle, the cable passed around the right side drive pulley, and was continuous through to the control yoke assembly (Photo 11).

There was no cable attached to the upper drive section of the aileron sector control wheel (Photo 2). A cable marked with the part number "5036" exited from the upper control cable pressure vessel seal, however, according to Piper maintenance instructions, this part number corresponded to the right hand aileron balance cable (Photo 10). Inboard of the seal, the cable was connected to the turnbuckle of the left wing balance cable (Photo 11).

1.1 Airframe Examination Photos



Photo 1 - Right Wing Aileron Sector Wheel

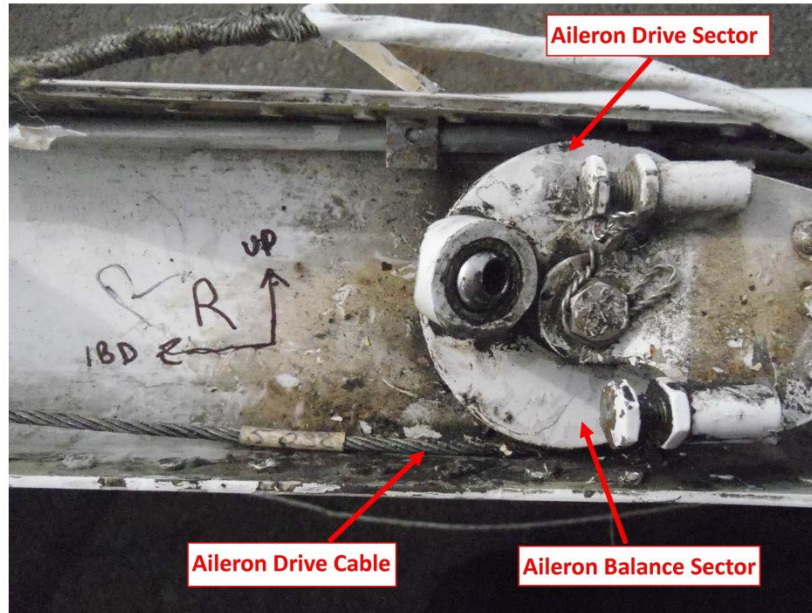


Photo 2 - Right Wing Aileron Sector Wheel with Drive Cable in Balance Cable Location

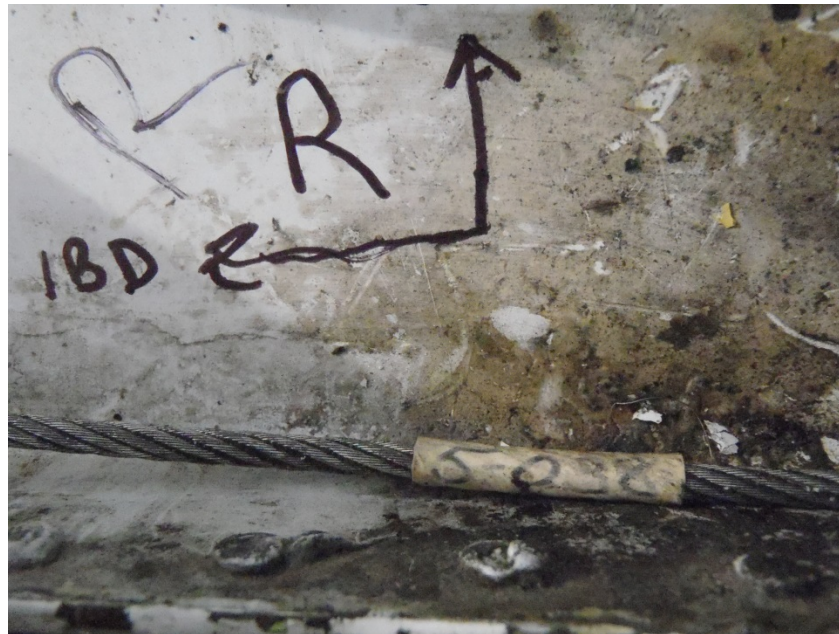


Photo 3 - Right Aileron Drive Cable in Balance Cable Location



Photo 4 - Right Aileron Drive Cable at Balance Cable Pass-Through

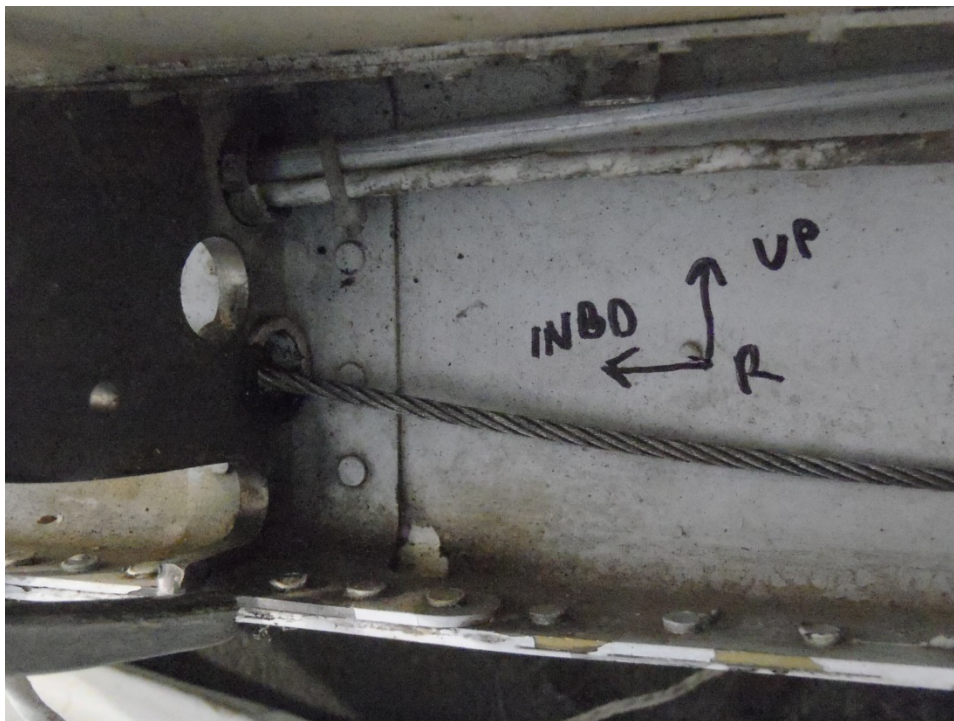


Photo 5 - Right Aileron Drive Cable at Balance Cable Pass-Through



Photo 6 - Aileron Drive Cable at Outboard Balance Cable Pulley



Photo 7 - Right Aileron Drive Cable

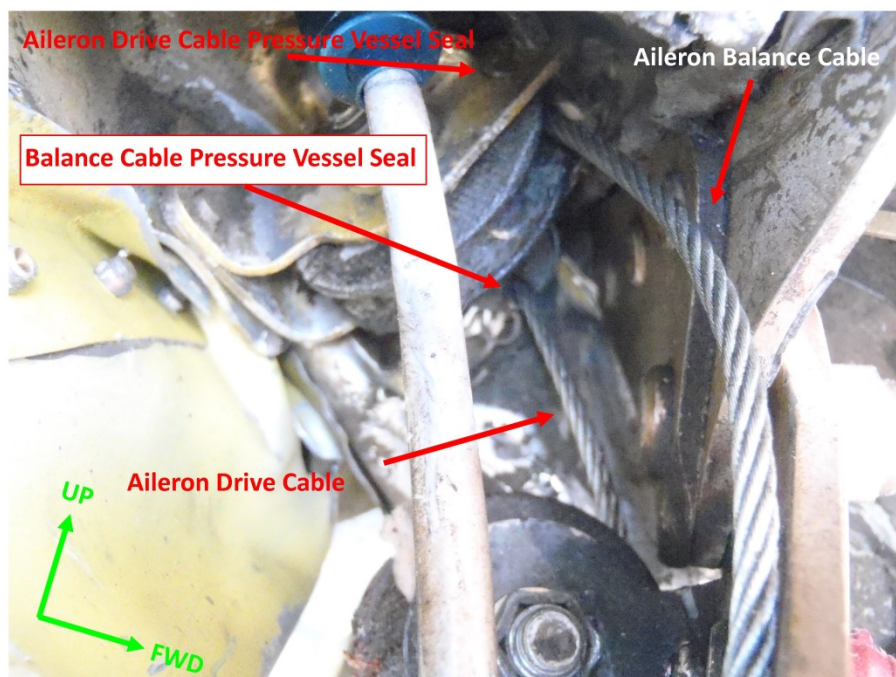


Photo 8 - Aileron Cables at Outer Side of Pressure Vessel Seals

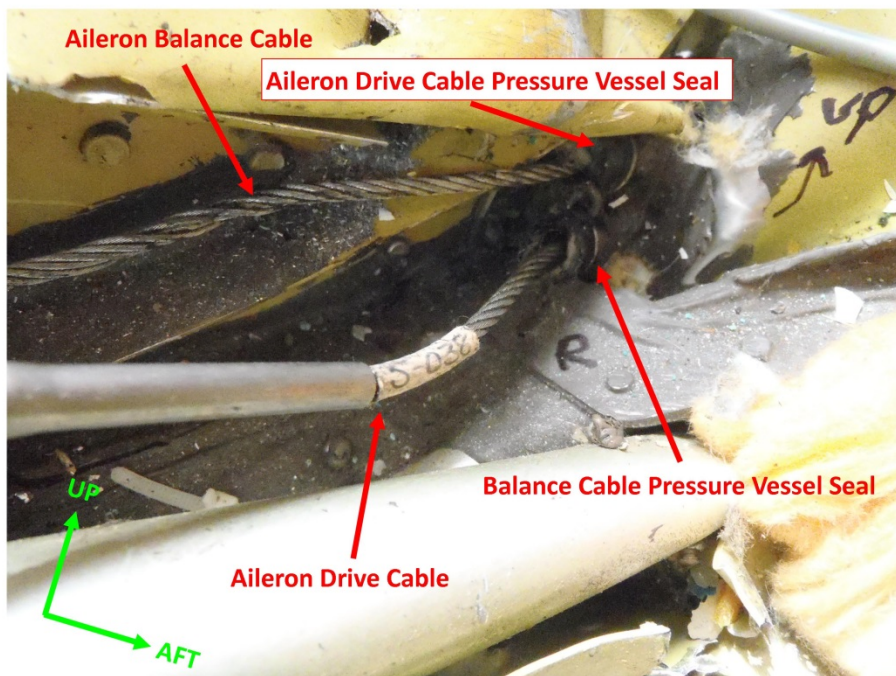


Photo 9 - Aileron Cables at Inner Side of Pressure Vessel Seals



Photo 10 - Right Aileron Balance Cable

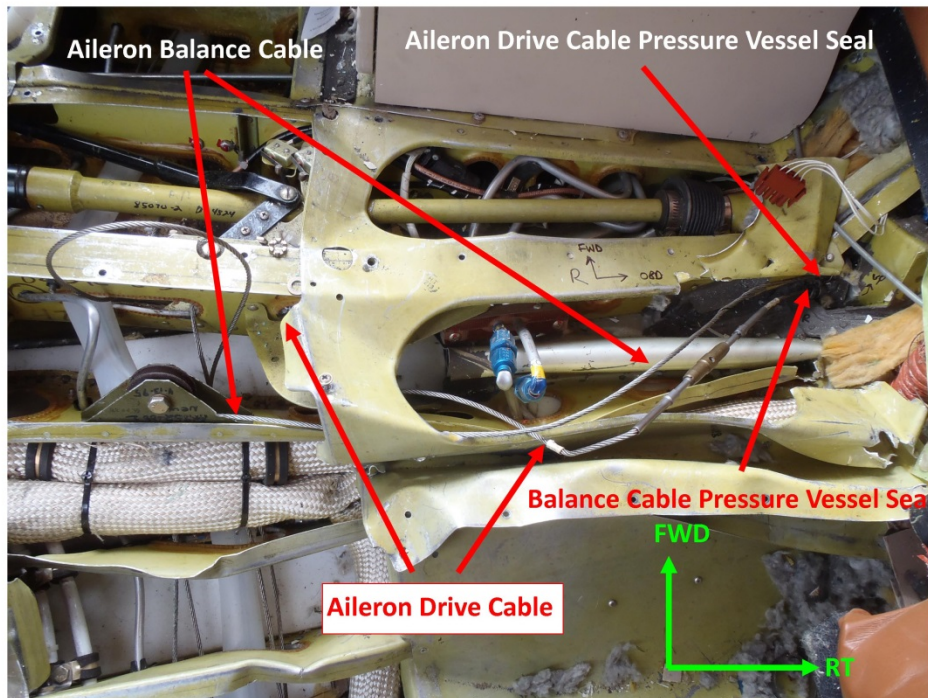


Photo 11 - Aileron Control Assembly at Wing Center Section

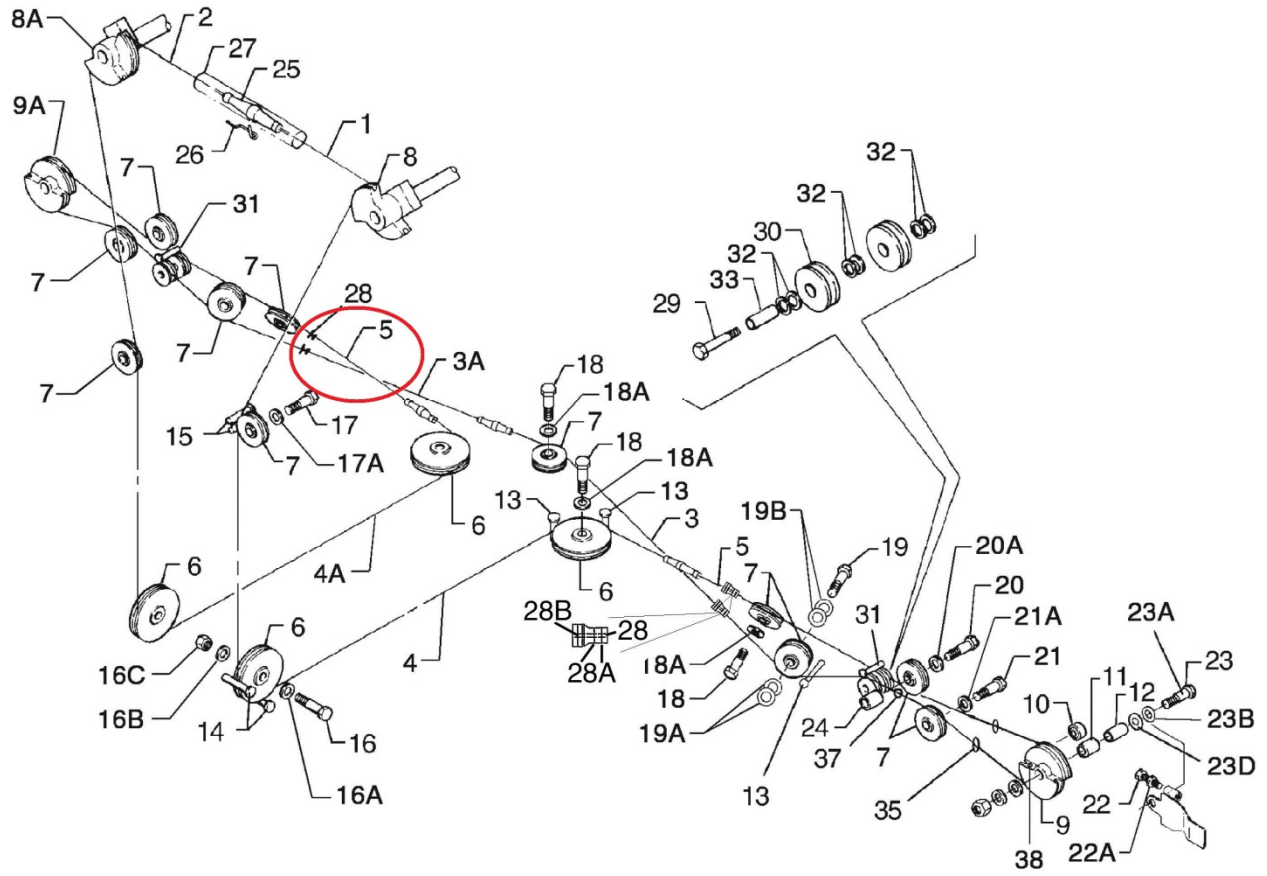


Image 1 - Aileron Control System with Area of Cable Reversal Highlighted - Pressure Vessel Seal (28)

Submitted by: Elliott Simpson