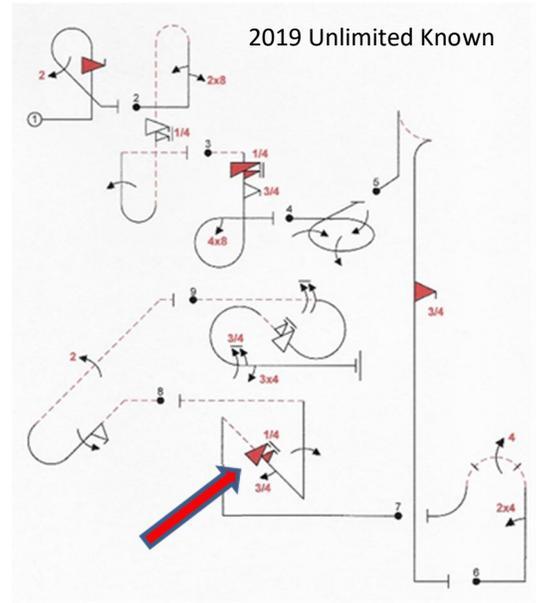


# Cracked Torque Tube – Sharing another Experience

By Hugo Ritzenthaler

Early spring 2019 I started practicing the Unlimited Known sequence in my Pitts S-1-E. Figure 7 contained a 1 1/4 outside snap roll from inverted followed by an opposite 3/4 roll to upright on a 45 down-line. Right after initiating the outside snap and making about one rotation, the aircraft went kind of out of control and continued in the snap configuration for about another 1 1/2 rotations. I continued my practice flight for another few figures and landed. I assumed I made a botched outside snap roll, although I never over-snapped to this degree before.



Following this practice flight, I checked the flight controls to see if there was any binding. All felt normal. Up in the air, the aircraft was flying straight and level with hands and feet off the flight controls. But when flying rolls, I noticed that the ailerons felt kind of mushy and heavier stick pressure was needed to make a roll. Furthermore, the roll rate had slowed considerably down. It did not feel like flying the Pitts that I flew by then for more than 20 years. It seemed like the airplane wanted to talk to me.

Over the following weeks I consulted with some of the experts out in the field about my rolling problem. The suggestion was to inspect the torque tube, heavy stick pressure would not show up during straight and level flight, but would be noticed when trying to deflect ailerons, in case of a crack, the pressure on the ailerons would open the crack during stick deflection and not roll the aircraft as expected.

Not actually to my surprise, when reviewing the articles in the IAC Technical Brief books, I came across two articles right in front of the first edition of the Tech Brief book series that described torque tube issue.

**THINK SAFETY**

By Sam Burgess

While practicing for the contest, it was noted that the ailerons were mushy on an 8 point slow roll. Upon completing the maneuver, it was noted that it was necessary to position the control stick about one half left of center to maintain level flight. Although the ailerons were still responsive, a precautionary landing was accomplished.

Upon inspection it was discovered that the torque tube in the fuselage was cracked 3/4 around its circumference between the control stick housing and the aileron push rod bracket. The crack was welded and the torque tube installed with no further complications.

N333N has a total of 585 hard aerobic hours logged with an undetermined high number of rolls to the left. (Direction of the crack on the torque tube.)

The crack was not discernible on previous inspections through the belly inspection plates. However, it would have been obvious from the cockpit except that the rear floor boards around the wobble pump and fuel filter obstructed the torque tube view.

In the event of complete failure of the torque tube and subsequent loss of aileron control, it is doubtful if a wings level condition could be accomplished with use of rudder alone. In addition, the torque tube would probably slide through the rear bearing, rendering the elevators useless.

It is recommended that all Pitts pilots thoroughly inspect their torque tube for cracks and either remove the rear floor boards permanently or have them easily accessible for inspection of the control column.

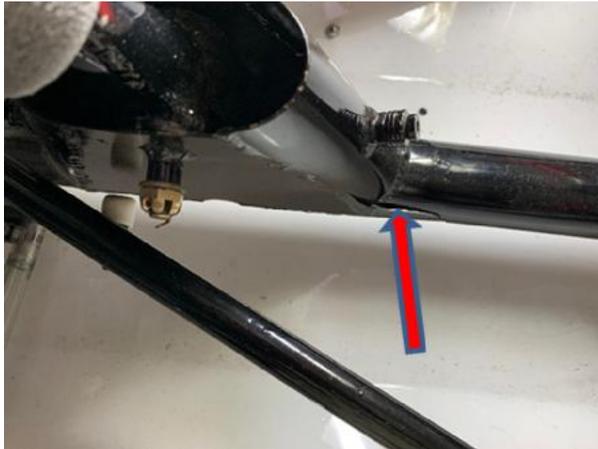
Pilots with Pitts under construction should consider using only heel runners, ala Bucker Jungmeister, Stearman, etc. or floorboards, making the entire section of torque tube, fuel lines, brake lines readily available for inspection, not to mention, the window for competition framing that may be installed.

It is further recommended that the section of the torque tube between the control stick housing and the aileron bracket be befed up with welded straps or collars before installation. It may eliminate a similar nasty situation.

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One of the articles in the first edition of the IAC Tech Brief books

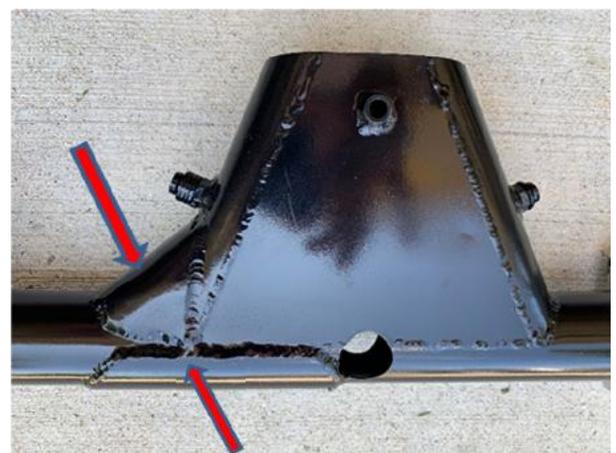
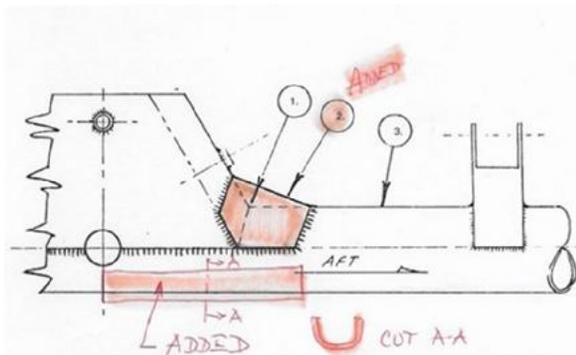
When I inspected the Pitts, clamped down the ailerons and moved stick sideways for aileron input I heard a squeak. Looking at the side of the torque tube, one could see a crack opening while moving the stick.



Gap opened near weld line when forcing stick to side with ailerons locked (clamped down)

Removing the torque tube was a big job. The way the airplane was built, there was never a thought that the torque tube would ever have to be removed. The torque tube was constructed in accordance with the original Pitts specifications, which calls for a 0.35" material thickness. It did hold up for a total of 998 hrs of operation, 480 hrs of them were flown in the Unlimited category. Considering that some of the reported torque tube failures (with 0.28" material thickness) occurred between 400 and 550 hrs Total Time, the assembly in my Pitts held up quite well.

Upon removal of the torque tube, two reinforcements were added. A gusset was welded on top of the tube connecting the tube with the stick tower and a channel was welded at the bottom of the tube where typically a crack can incur.



A periodic inspection of the torque tube during the year has been added to the check A/C list. The torque tube inspection will also include adding the "stick side pressure test" with the ailerons clamped down.

Lesson learned, knowing your airplane and listening to what it tells you, may save your life.