Tail Wheel Microswitch

This story begins at Breckinridge County Airport in Kentucky (I93). My good friend Miller Monarch was in need of some time with a Seabee pilot to rid himself of the “rust” that had built up over the last four years (I’ve been there). It was a beautiful day and conditions were just right for some water work and airport landings. The water work went well and after an hour or so we headed back to the airport. Upon entering downwind, Miller lowered the landing gear and commenced with the electric hydraulic pump. No gear down light! As you may remember the tail wheel only turns on the gear down light when it’s down and locked. Looking at the float mirrors it appeared that the mains were definitely down and the tail wheel appeared down to both of us. The light was a “press to test” light and it turned on when pressed. At the time I thought it might be a wire at the tail wheel switch that let loose so we continued. Miller continued the pattern and as a precaution I kept pumping the hydraulic pump handle to keep pressure on the landing gear system.

The touchdown was beautiful and as the tail came down we were looking up at the sky at about a 30-degee angle and heard a screeching noise from the back end. Uh, oh! We deplaned to go see the problem. The tail wheel had collapsed.

The fellows at I93 were right on the ball! They showed up in their vehicles before we even got out of the Seabee asking what we needed (There’s a bunch of great guys there). The tail wheel had collapsed and retracted to the right just the way it was designed to do but it put a real strain on the left steering control arm and the left steering cable had broken. The water rudder was just barely touching the concrete and was undamaged. All this damage was the result of the collapse and had nothing to do with the lack of gear extension.

When the “Breckinridge Army” returned with a jack, the tail was raised and the tail wheel mechanism was checked and the tail wheel lowered into the down-and-locked position. Taxi to the ramp was normal.

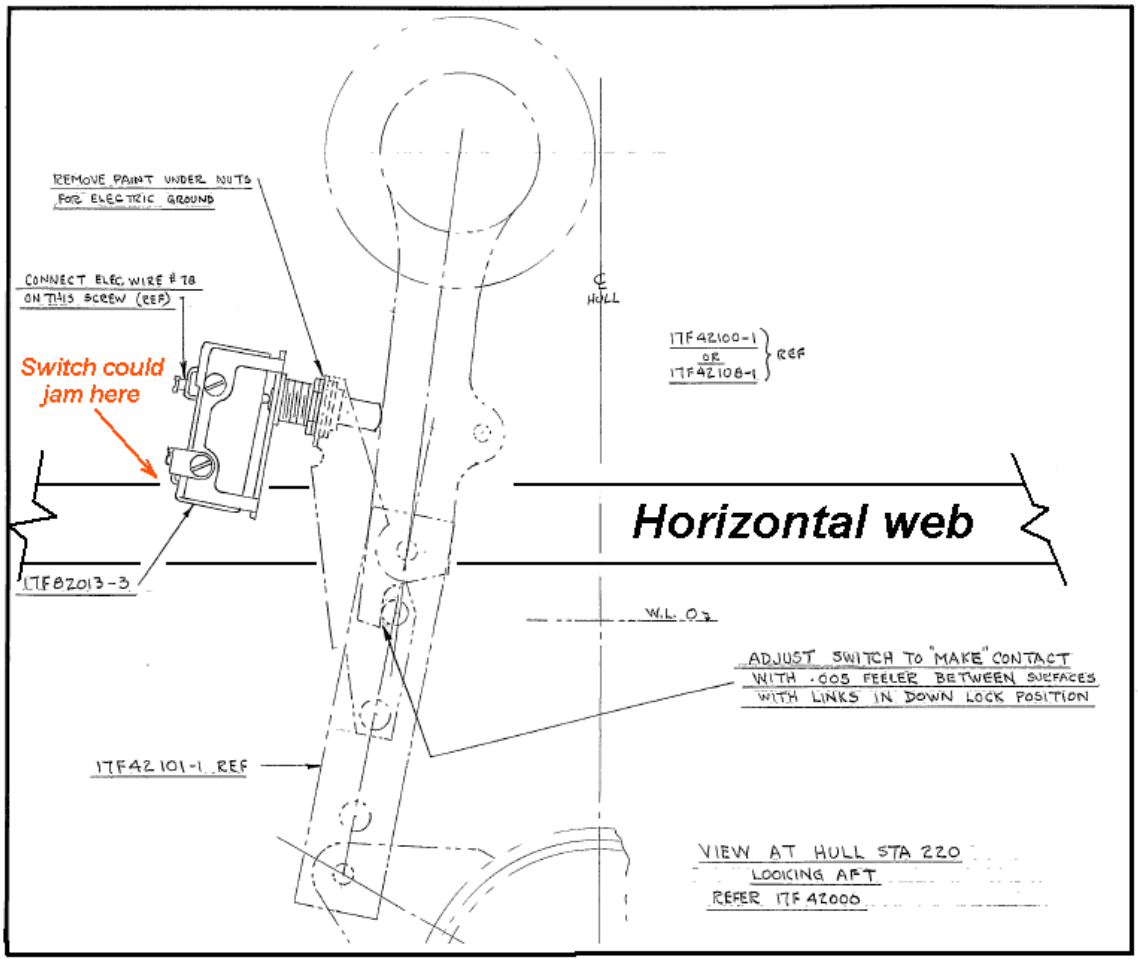
Upon reaching the work area all kinds of opinions started flowing: one said it was air in the hydraulic line, another said it was the mechanism itself. I felt it was an electro-mechanical problem because when the tail wheel was lowered into the down position the down light miraculously came on! This told me the tail wheel mechanism never got to the over center position that enables the light to illuminate.

After changing the o-rings in the tail wheel actuator and bleeding the tail wheel system the gear was cycled four or five times with no adverse effect. Everything was normal.

Looking back on it we could have gone around and recycled the gear but we were both convinced the tail wheel was down and locked. Then again, cycling the gear could have caused more damage.

The possible cause

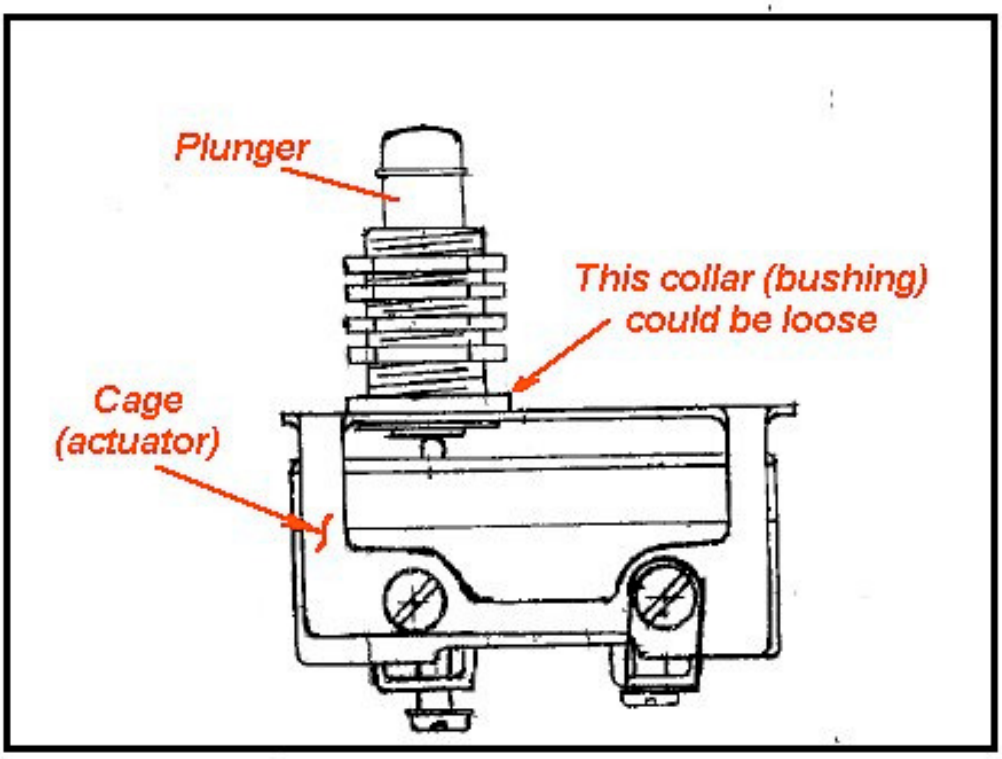
When the tail wheel microswitch was inspected closely we noticed it was able to rotate about the plunger axis. The switch mounting nuts were tight but the plunger collar on the switch "cage" was rotating (see drawing page 3). Any amount of nut tightening wouldn't have prevented the whole switch from twisting thence jamming the switch against the horizontal web just behind it. Miller is in the process of changing the "cage" (with the loose collar) as we speak. This will determine if it is, in fact, the culprit.



Tail wheel linkage with switch

The "collar" on the microswitch "cage" may be able to be silver soldered or epoxied in place but a new cage is preferable. It appears that the collar is bronze and the cage is steel.

If you find that no matter how tight the lock nuts are on your switch and your switch still rotates, you may need to change the “cage” around the switch. This is a separate part (with the loose collar) and is still available from Honeywell (Part No. MC2711 or AN3168-2). The microswitch is also available (Part No. BZ-2R-A2).

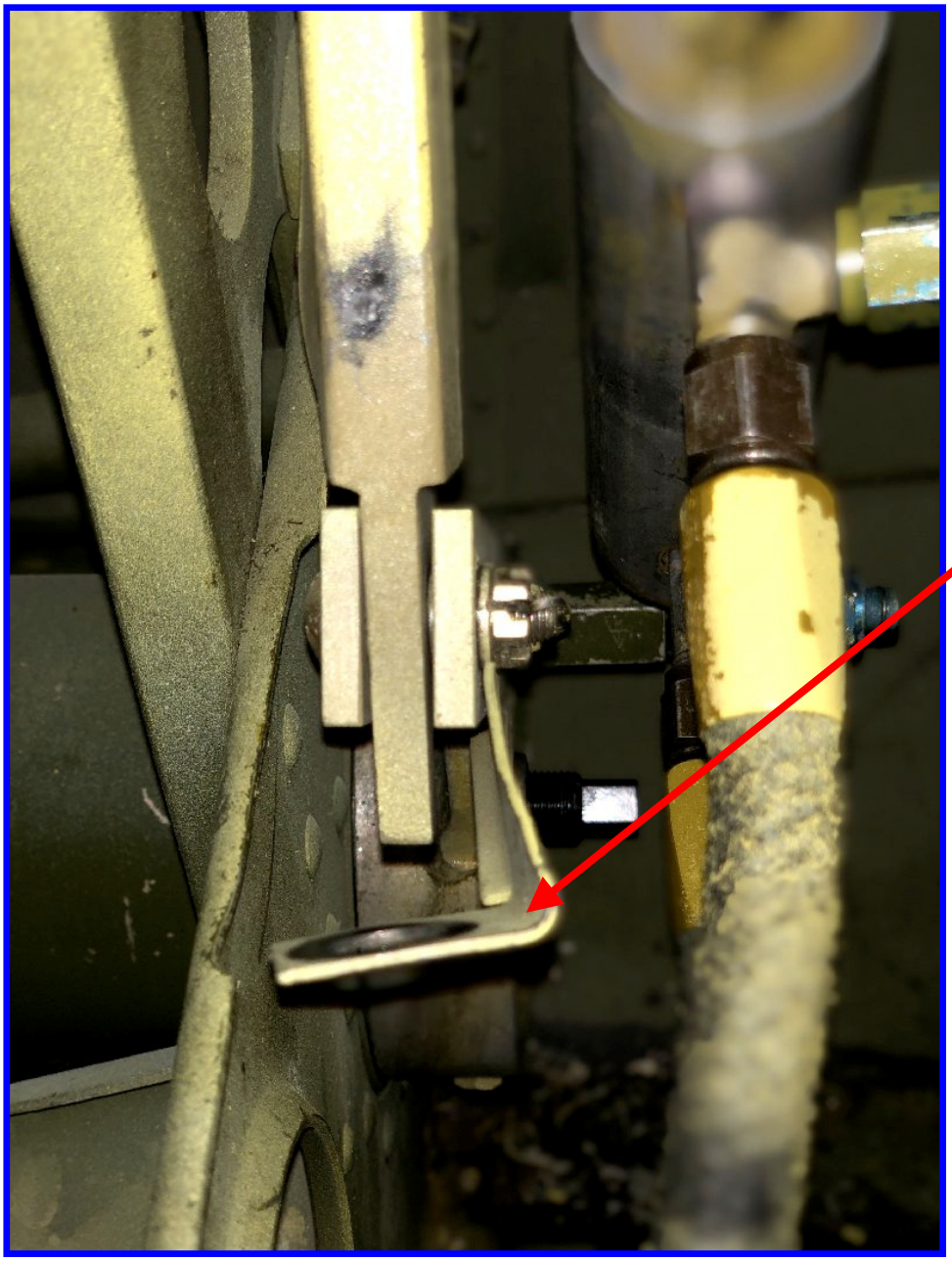


Microswitch with suspect collar shown

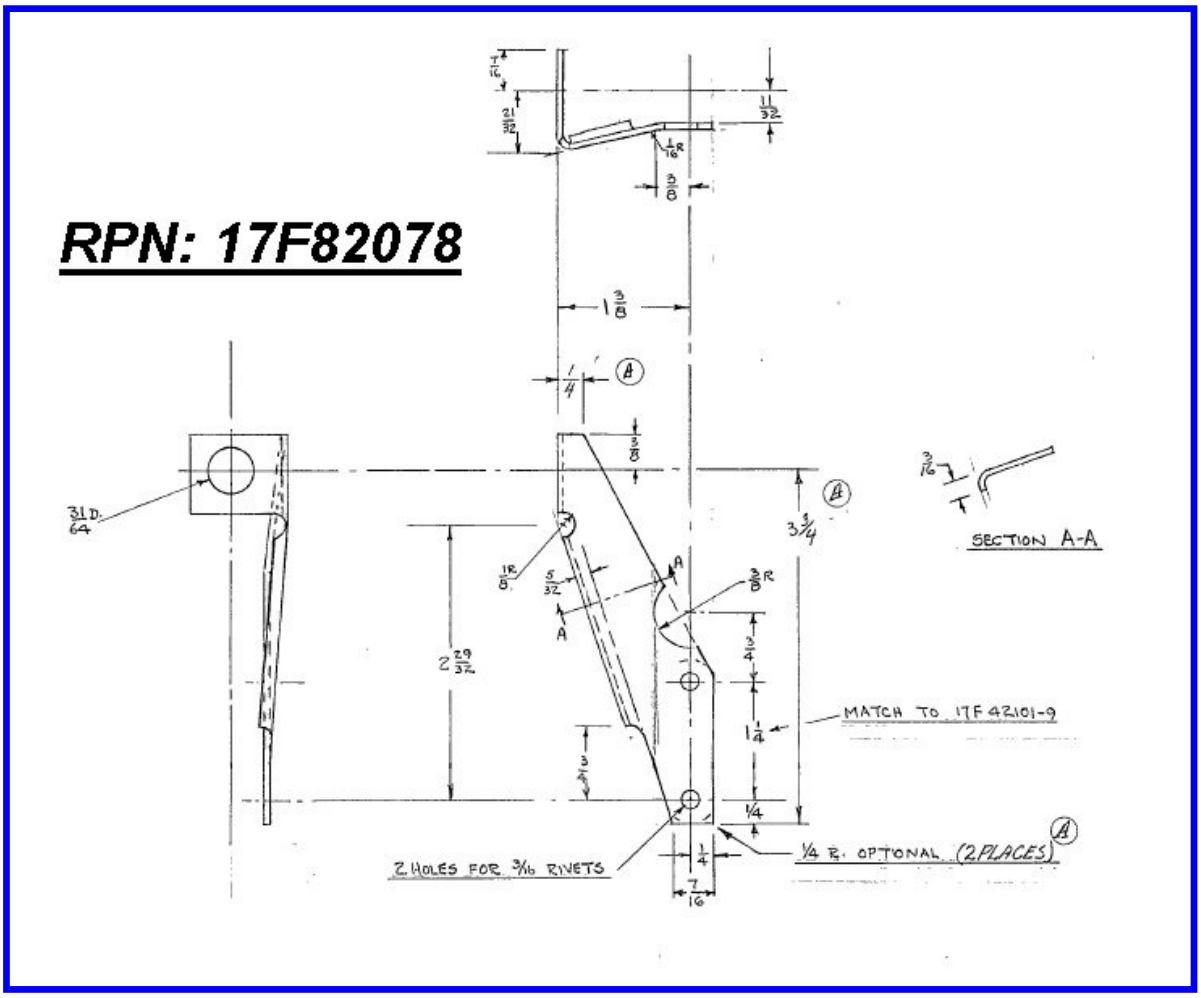
As a side note: I had a similar thing happen to me on the water except the lock nuts had loosened and the switch was able to rotate and jam up against the horizontal web that is behind the switch (see drawing above). There was no damage to the switch and tightening the lock nuts solved the problem. Republic Service Bulletin #8 addresses this issue. The switch is strong enough that, if you are using an electric hydraulic pump, the pump will stop normally (if you have a pressure switch in the hydraulic system) indicating the tail wheel is down…but it’s not! Check your microswitch today!

Extra! Extra Read all about it!

It turns out that there was another issue with the microswitch; the bracket holding the switch was bent (see photo below). This, along with the above symptom, must have caused the tail wheel mechanism to "jam up". Please check your microswitch and bracket. Unfortunately the bracket may be riveted to the control arm of the tail wheel mechanism. You may have to remove the lower linkage of the mechanism to straighten it out or replace it (see drawing page 5).



Microswitch bracket bent



Original Republic Drawing-Microswitch Bracket