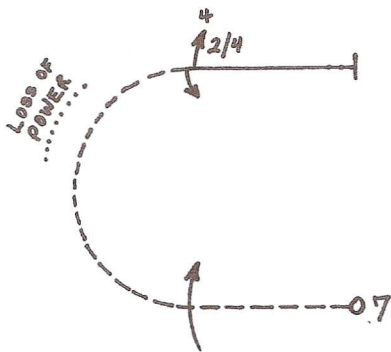


# Engine Oil Pressure and Prop Pitch - Sharing an Experience

by Hugo Ritzenhaler

Going through the maintenance records of my Pitts S1E (200 hp/constant speed prop) a couple weeks ago, I came across an anomaly that occurred on my Pitts in August of 2001 during one of our CAN-AM contests in Hanover, Ontario. It is such a special case that I thought I share it with you aerobatic aircraft (and not just Pitts) pilots and owners.

As I mentioned, I was attending the contest in Hanover. Since there were no other Unlimited pilots present, I competed in the Advanced category. Part of the known sequence was an outside half loop up from inverted (fig. 7). All went well during the known sequence until I was getting to the outside loop. Pushing up, getting past the vertical, I noticed a drastic drop in engine power and change in sound of the engine.



I managed completing the outside loop to level flight at which point the engine regained full power with oil pressure in the green. I interrupted the sequence and radioed the chief judge of my intention to land. Once on the ground, I ran up the engine, cycled the prop but could not reproduce the anomaly encountered during the outside loop. The safety committee reviewed my situation and decided to let me finish the sequence. I restarted the sequence with the figure prior to the outside loop. When I got to the push-up into the half outside loop, to my surprise, at about the same point into the figure, I noticed the exact drop off in engine power, which I had experienced during my previous flight. Since the power came back once I was on level flight, I finished the sequence without any further problems (there were no other outside maneuvers in this known sequence).

Since the weather turned sour later on Saturday and continued to stay that way on Sunday, there were no further flights. I had an uneventful flight back to my home base in Romeo midday on Monday. Once home it was time to dig deep and analyze the root cause for this anomaly, which I had encountered in Canada. To find out whether the condition still existed, I took my Pitts up the following weekend and pushed an outside loop. Guess what, the power loss reoccurred.

I called around, talking to many people, and lastly thought of Doug Dodge in Bay City. Doug, after listening to my problem, suggested that it may be related to oil pressure, affecting the prop pitch, which in turn could be the root cause for the loss of engine power. One needs to understand that on aerobatic

engines, oil pressure forces the blades to a fine pitch. So losing oil pressure moves the blades to a coarse pitch (reduction in engine RPM).

Finally, Doug pointed to the O-Ring, which is assembled to the sump plug at the far end of the finger screen (Fig 1).

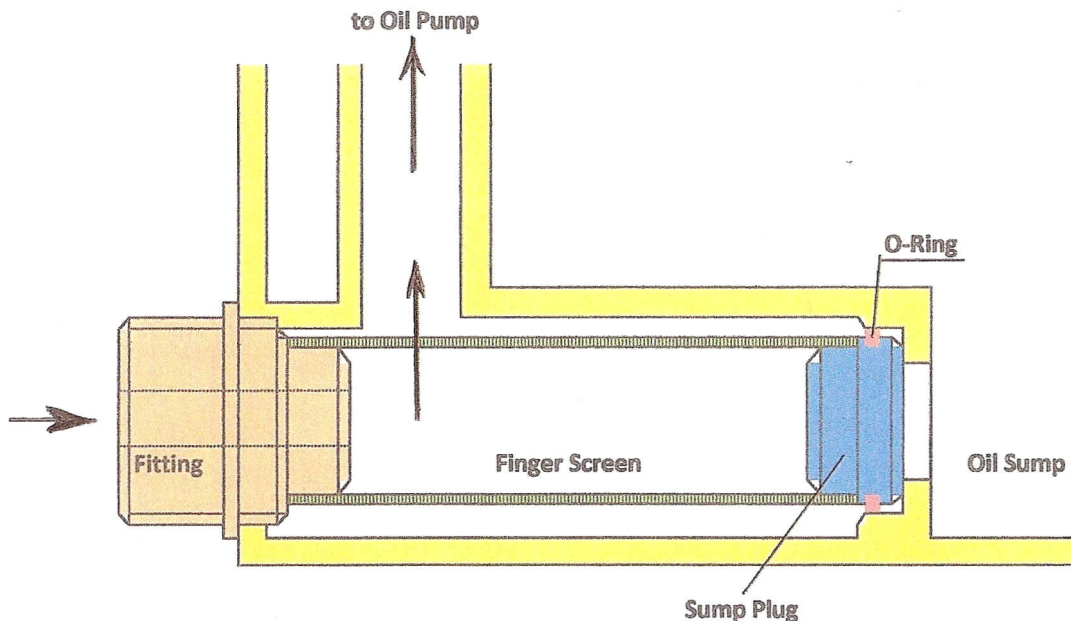


Fig 1 - Sump Plug held in place by oil screen - correct screen length

So off I went, draining the engine oil and removing the fitting to the cavity in which the finger screen was to be located. After carefully removing the screen, I pointed the flash light into the cavity and found the sump plug, with the O-Ring in place, loosely positioned in the finger screen cavity. Well, I thought, this is easy, just put the plug back into its place and the problem should be taken care of. At that time I had no idea how all these parts were suppose to fit and interact with one another. So I carefully repositioned the plug, reassembled the screen and readied the Pitts for a test flight. Once up in the air, I repeated the outside loop push-up and got around without any problem. Too good to be true, so let's try another one. Got half way around and guess what, the anomaly reoccurred.

Back on the ground, removing fitting and screen, I re-inspect the position of the sump plug. To my surprise, the plug was again loosely positioned in the finger screen cavity. Something must allow the sump plug to move out of its place, the only way the oil could by-pass the channel to the oil pump (Fig 2). Oil by -passing the oil pump or leaking directly into the oil sump would certainly lead to a loss of oil pressure and subsequent drop in Engine RPM.

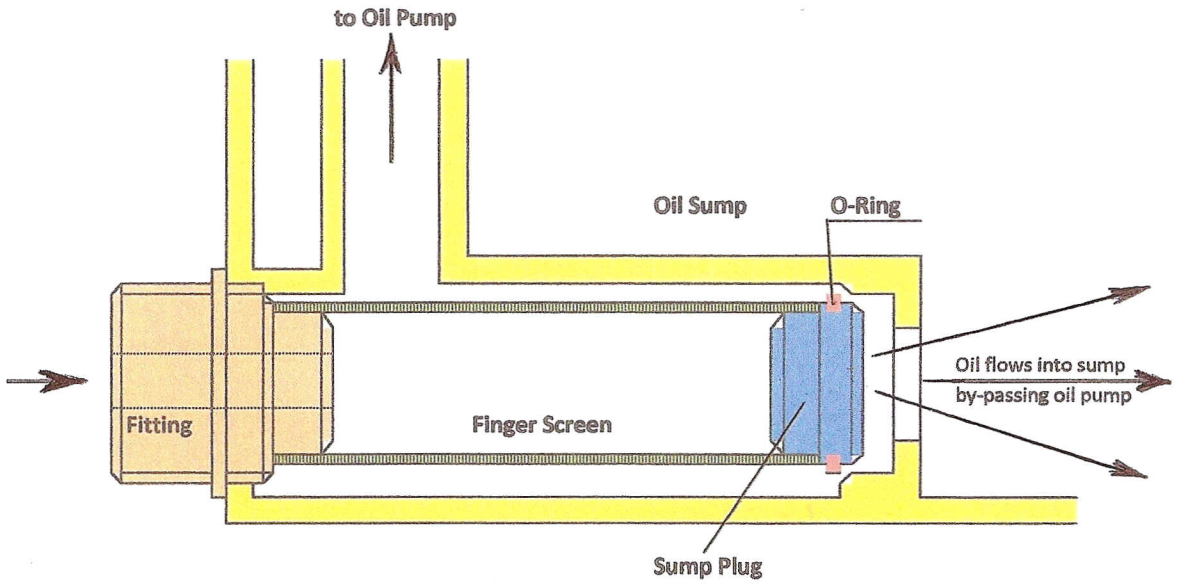
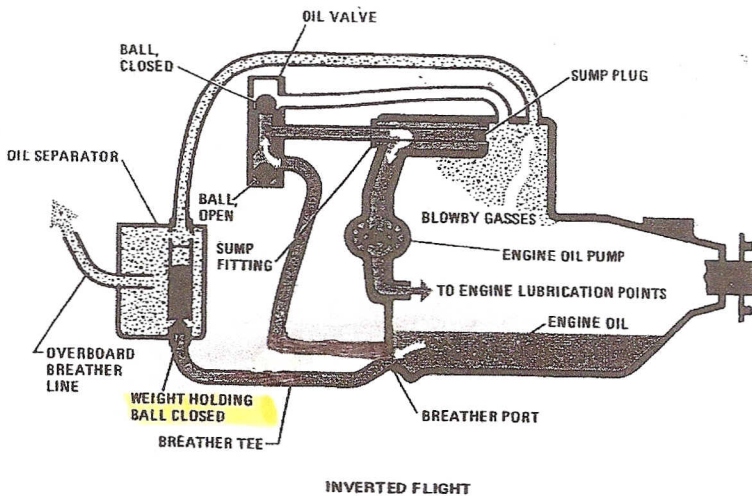
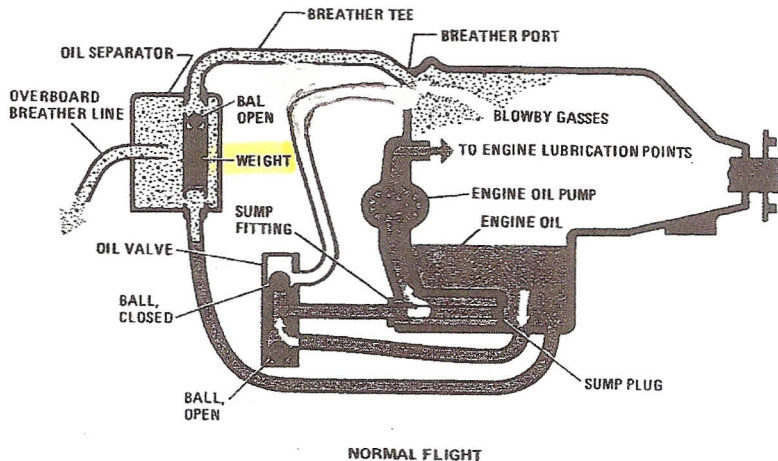


Fig 2 - Oil screen too short, Sump plug able to unseat

The hydraulic schematic of the engine in inverted flight provides a good picture of why there is little or no oil going to the oil pump if the sump plug were leaking.



Any leakage at the sump plug would not affect oil pressure in normal upright flight as the oil pick-up is immersed in oil.



So why would the plug not stay in its position? After studying the design of the cavity, finger screen and sump plug, I started measuring all those components. It did not take long to realize that the finger screen was too short by about 5 mm (Fig 3). This discrepancy in length of the finger screen allowed the sump plug to move out of its cavity, rendering the O-Ring ineffective. This bleeding of oil directly into the sump reduced or completely stopped oil going to the oil pump to produce the necessary pressure to properly pitch the prop (move the prop to a fine pitch).

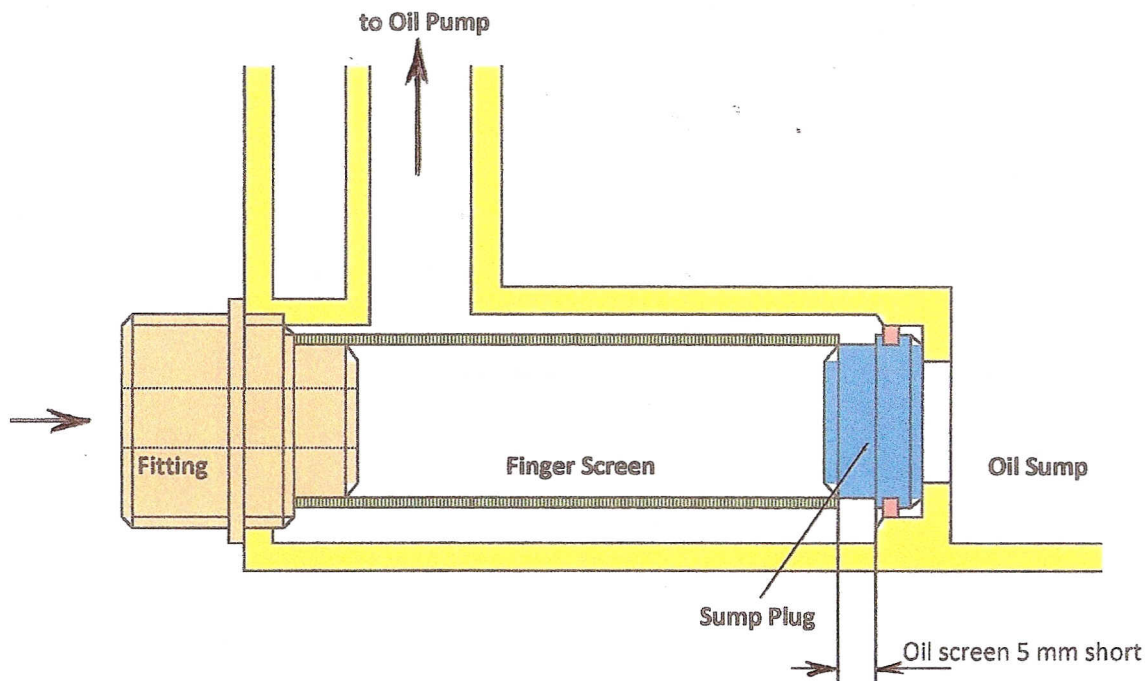


Fig 3 - Oil screen short by 5 mm

Once I understood the root cause, the problem was easily fixed. I got myself a longer finger screen, cut to length and reassembled plug, screen and fittings. The following test flight, during which many outside

push-ups were flown, did verify that the corrective measure was effective in correcting the hydraulic flow of the oil in the inverted engine position. I have flown my Pitts since for 9 years without ever experiencing another oil pressure drop in the inverted flight push-up attitude.

There was of course one question that remained still unanswered at the time the corrective measure was put in place; if the screen was too short when it was installed at the time the engine was put together many years before 2001, why did it take all those years for the sump plug to work itself out of position? The answer may lie with the O-Ring. When the engine was assembled, I assume the O-Ring was new. Over years the O-Ring must have taken a set in its O.D. reducing the hold in its own cavity, and with the g-forces acting on the plug itself, it simply slipped out. At time of this slipping of the sump plug, I had flown advanced and unlimited figures since taking possession of this Pitts in 1996. I suppose the O-ring on the sump plug just got loose enough that weekend to take up the slack the shorter screen provided.

Now, why it had to happen during a contest, is anyone's guess. I suppose it just was time for the sump plug finally slip out of its cavity.