Airspeed Indicator Anomaly – Sharing another Experience

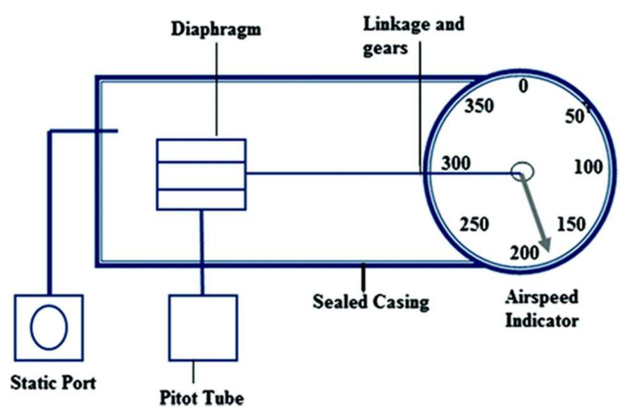
By Hugo Ritzenthaler

Going through the maintenance records of my first Pitts, an open cockpit S1S, which I had flown from 1981 through 1996, I came across an anomaly that occurred right after the completion of an annual inspection in 1992. Upon completion of the annual, I flew the airplane back to my home base in Romeo, MI. Arriving over the airport, I entered the traffic pattern at my typical pattern airspeed of 100 mph indicated. However, the airplane seemed to fly noticeably slower than the 100 mph the ASI showed. By this time I had flown this Pitts for over 10 years, I certainly knew its flying characteristics at low airspeeds. I assessed that something was not right with the airspeed. To be safe, I increased the approach speed and landed without any problems. On roll-out and taxiing back to the hangar, I noticed that my ASI was still showing a speed above 40 mph, whereas the pointer has always returned to about 5 degrees below the 40 mph mark. At this point I knew that my senses were correct and that I did have some kind of problem with the airspeed indicating system.

Few days later I made a test flight to see if this condition with the airspeed would repeat. I went up and started flying the Pitts at various airspeeds and attitudes. I knew soon for sure that something was wrong with the airspeed indication when the ASI showed an increase in airspeed while I was pulling up to vertical from level. I repeated this maneuver and ended up with the same result. Upon landing, when taxiing to the hangar, my IAS was again above 40 mph.

Now it was time to do a deep dive root cause analysis. An inspection of the externally accessible components, pitot tube and static port, did not reveal any blockage or damage. Next, I reviewed the function of the mechanical airspeed indication system.

Pitts S-1-S



Airspeed System Component	Phase of Flight	Static Pressure		Static Air inside ASI Casing	IAS (mph)	TAS (mph)	
		p(S) Ambient	p(S) inside ASI Casing				
	Ground - TO Roll	p(S) = GRD level	p(S) = GRD level	Static Air inside ASI Casing is equal to ambient air pressure	**60**	**60**	IAS =TAS Uneffected
	Climb [p(S) trapped air slowly leaking out of ASI casing]	p(S) =p(GRD) - delta p	p(S) = GRD level	Static Air inside ASI Casing slowly ajusting to ambient air pressure	< 100	100	IAS lagging TAS IAS reads slower speed
Static Port Blocked (but not totally closed)	**Level Flight** [after p(S) inside ASI casing has equalized	p(S) = Altitude	p(S) = Altitude	Static Air inside ASI Casing has ajusted to ambient air pressure	**150**	**150**	IAS = TAS Uneffected
Pitot Tube Open	**Descent** (ambient air slowly leaking into ASI Casing)	p(S) = Altitude + delta p	p(S) = Altitude	Static Air inside ASI Casing slowly ajusting to ambient air pressure	> 100	100	IAS higher than TAS IAS reads faster speed
	Ground -Taxiing [p(S) still at about Traffic Pattern Altitude]	p(S) = GRD level	p(S) = TP Altitude	Static Air inside ASI Casing slowly ajusting to ambient air pressure	>> 10 (above 40 IAS)	**10**	IAS higher than TAS IAS reads faster speed

Having been involved in the development of mechanical pressure gauges during my working life, I was aware of the ASI having some gearing that could have become disengaged to end up with a dislocated "zero" position. That, however, would have produced airspeeds well above the typical 150 mph during level flight.

Since the phase of flight, that is most critical to maintaining control of the aircraft, is during the approach to landing, I evaluated the set of conditions that exist within the airspeed indicator system at that point of time. Having the ASI show a higher than actual airspeed during the landing phase can easily lead to stalling the aircraft, especially when turning base to final. The analysis in above table shows that the physical conditions in the airspeed indicator system, when considering the possibility of a blocked or partially blocked static port, will produce a higher than actual indicated airspeed.

Having already checked the externally accessible components, I started pulling off the panel on the side of the fuselage where the plastic tubing from the pitot tube/static air vent was hidden from sight. That panel was also one of the panels that had been removed during the annual inspection. Following the static air tubing to the point where it entered the wing root, one could see that the static line tubing had a kink in the shape of a "V", hence, restricting the airflow. The fix was simple, all it took was replacing the tubing.

Post repair test flights, particularly descending from altitude to landing and taxiing, confirmed that the root cause of the anomaly was the kinked static line.

Getting the kink out of the static air tube also resolved the issue of getting an increase in airspeed reading when pulling up to vertical. That is certainly a more difficult task to explain in form of physics. However, in order for the increase in speed to happen, the static air pressure inside the ASI Casing had to decrease much more rapidly than the pitot tube air pressure decreased due to the slowing of the aircraft while transitioning from level to vertical flight. It could well be that during the abrupt pull up, the kinked tubing relaxed somewhat and opened the air passage to the ASI casing, which would release pressure inside the ASI casing and, thus, expand the diaphragm to show the higher speed.