

Folkerts Michael

To: Folkerts Michael
Subject: FW: Fuel Gauge Calibration Process

From: Horsham Aviation Services <
Sent: Tuesday, February 25, 2020 9:51 PM
To: Tom Turner
Subject: RE: Fuel gauge calibration

Dear Tom

Please find attached clause 6 of CASA CAO100.5 appendix 1 that mandates fuel gauge calibration requirements for our Australian registered aircraft.

In relation to approved data, only some manufacturers of aircraft, such as Cessna and Aerostar (Piper), provide details on how to carry out a fuel gauge system calibration check.

I can't recall reading anything too much about this subject in the Beech maintenance manuals. What we have been instructed to do as maintenance engineers is that in the case of General Practices, one aircraft manufacturer's approved data can be used as approved data for another manufacturer's aircraft to carry out such a generic task/procedure of this type.

The procedure we use aligns with the Cessna and Piper method of carrying out fuel calibrations, and has actually been passed down through our industry over the decades and goes like this:

- 1 The aircraft's fuel tanks are completely drained of all fuel. Initially excess fuel may be carefully sucked out from fuel filling points or the electric fuel pump used with an additional hose to defuel all possible fuel through those methods. The remaining fuel is then drained through the aircraft's fuel tank/cell drain points
- 2 The aircraft is then put in its level flying attitude, laterally and longitudinally. External power is then connected to the aircraft to provide a voltage that's within the aircraft's alternator charging system normal regulated value range
- 3 The aircraft's flight manual is then consulted and the aircraft's total and usable fuel quantities are ascertained. The unusable quantity is calculated for each tank. This unusable quantity of fuel is then added to each tank and our fuel calibration rig is then zeroed and our usable fuel added starts from this point
- 4 After the fuel gauges are warmed, and in the case of the Bonanzas, their fuel vents are confirmed clear and their fuel bladders are confirmed lying flat, the gauges are confirmed to be reading zero (empty), or if not reading empty (within the permissible tolerances), the problem is sought and rectified. NOTE: during the fuel calibration tapping/slapping is carried out on the wing skins/covers above the fuel transmitters to remove any frictional sticktion in the fuel transmitters (such as their wiper finger moving across the variable resistor)
- 5 Prior to starting the calibration a rough working fuel calibration table is set out:

Aircraft Registration		
L/H Actual	Gauge	R/H Actual
0	0	0
	$\frac{1}{4}$	
	$\frac{1}{2}$	
	$\frac{3}{4}$	

	F	
Usable Ltrs		
Date		

- 6 We start pouring the fuel in and the person inside is instructed to halt the fuel flow when he sees the needle approx. 2 widths short of the first graduation mark. We then stay paused for approx. 30 seconds to let the gauge system catch up (hysteresis effect). During this 30 seconds we continue to sensibly slap above the fuel transmitters to simulate aircraft vibration. Generally the gauge then moves up that little bit more and stabilises on the tank gauge graduation mark. If not we add a little bit more fuel and then recheck. This procedure is then repeated to obtain the actual fuel quantity for each tank gauge major graduation.
- 7 NOTES:
- We always err on the safer side with the displayed value of the actual quantity
 - Even though the tank may hold more usable fuel, the reading that we are after is the minimum quantity of actual fuel that produces the indication at that particular graduation point. In other words the gauge may read full with only 120Ltr in the tank but the tank can actually hold 140Ltr, so we would write 120Ltr on our cal card because 120Ltr is the minimum it reads full even though it will still be reading full with 140Ltr in it
 - The max useable quantity can always be found in the aircraft's FM/POH or hopefully placarded at the fuel selector and fuel tank filling points.
 - If a fuel gauge system is found to be accurate within 5% we will install a placard near the fuel gauges stating that, and no actual calibration card is required. This would be expected in the case of a capacitance fuel gauge system where the system can normally be adjusted to remove any errors.
 - Some aircraft manufacturers provide a fuel calibration test box for capacitance systems and instructions contained in a maintenance manual (approved data) on how to calibrate their gauge systems which may actually not involve an actual calibration as described above. This is also acceptable for our 4 year calibration requirement
 - Once the aircraft has been refuelled, all fuel tank selections should be purged to remove possible air induced by the defueling procedure. This can either be done in the hangar before the reconnection of the fuel supply line/hose used to run the fuel out of the aircraft, or can be done by selecting all tank positions for a sensible period of time during an engine ground run. Failure to do this may result in engine power disruption when selecting a tank that hasn't been purged.
- 8 Ground power is removed. Any disconnected fuel supply hoses are reconnected and checked and the aircraft that's generally jacked for this procedure (with quite a high tail stand) is de-jacked and a new calibration card is made and installed, as close to the aircraft's fuel gauges as sensibly possible

You're welcome to pass on or print for your members if you think it warranted, or useful

Regards,
Tony Brand
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