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TOTAL PERFORMANCE

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SERVICE LETTER 19-09-23

Date Released: December 2, 2019

Date Effective: December 2, 2019

Subject: RV-12 Rotax 912ULS High Fuel Flow Indication

Affected Models: RV-12 Rotax 912ULS powered aircraft with fuel flow

Affected Serial Numbers: All

Required Action: None

Time of Compliance: None

Supersedes Notice: None

Labor Required / SLSA Warranty Allowance: Not Applicable

Level of Certification: Not Applicable

Synopsis:

Some RV-12 aircraft equipped with a Rotax 912 ULS engine and a fuel flow meter may erroneously indicate abnormally high fuel flow at altitude. Erroneous high fuel flow indications most likely will occur between altitudes of 6,000 and 10,000 feet. Van's Aircraft has tested and observed elevated fuel flow rates in excess of as much as 10 gph between these altitudes. Most aircraft will indicate normal fuel flow through this range or will indicate only a slight increase in fuel flow.

The likely reason this occurs is not because the fuel flow rate itself has actually increased (although high fuel flow at any altitude could indicate a leak in the fuel system). Both the electric and engine-driven fuel pumps generate pulses which move through the fuel line connecting them. Inside the fuel flow meter is a small paddle wheel. As the paddle wheel turns, a sensor detects the paddle wheel blades as they pass by, and this blade count is used to calculate fuel flow. Pulses from the two fuel pumps interact with these blades and can in some cases cause the blade of the paddle wheel to move irregularly and double count.

For the purpose of testing and evaluation, Van's Aircraft equipped an RV-12 with fuel flow sensors on both the supply and return lines. Several altitudes were flown at a planned set RPM. The results are shown in the table and graph below. The graph shows

the fuel flow values form a bell-shaped curve, which is indicative of a harmonic effect occurring in the fuel system. Note that after the aircraft climbs above the affected altitude range the fuel flow returns to normal. This affect at various levels of magnitude has been observed on a number of RV-12 aircraft, all within the same altitude band.

Observed and recorded engine operating parameters indicated in these cases that the engine was not actually exceeding normal rates of fuel consumption. The return line flow rate remained constant during all tests (the return line is not affected by the pulses from the fuel pumps). Also note that fuel pressure remained constant, indicating that vapor in the fuel line was not a factor. This is important: the reason the electric pump is placed at the beginning of the fuel system and operates continuously is to prevent vapor-related issues; this is an important safety aspect of the system design, and the electric fuel pump should always be used in a continuously-operating mode).

Van's Aircraft made and explored numerous modifications to the fuel system to determine if there was a workable way to adjust or remediate this band of erroneously indicated high fuel flow rates. Some of the modifications that were tried sometimes reduced the magnitude of the erroneous fuel flow indications, but they did not completely eliminate the problem on affected aircraft.

As a result of this erroneous and somewhat unpredictable behavior, Van's Aircraft stopped supplying fuel flow transducers with RV-12iS airframe kits when the airplane will be equipped with a Rotax 912ULS. Even in aircraft that do not exhibit erroneous readings, accuracy of the system is limited because no fuel flow meter is installed on the return line, which results in further calculation errors. Therefore, where fuel flow is indicated, it should always be used as a rough estimated value and for secondary reference only!

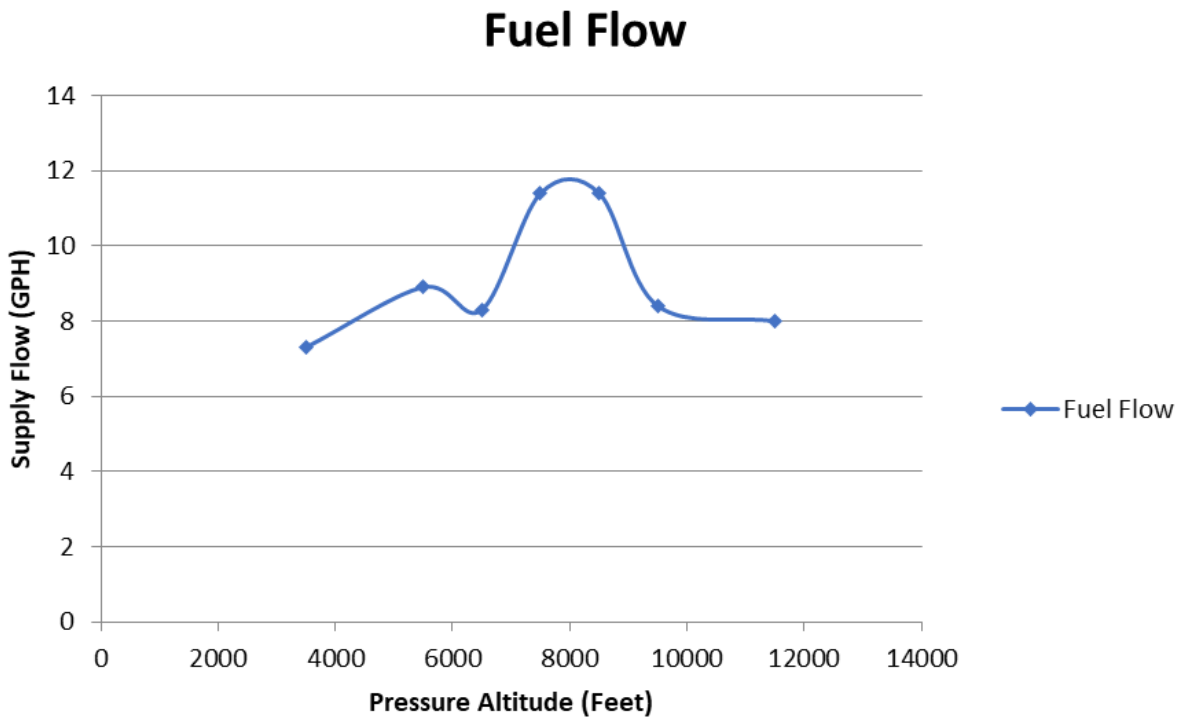
WARNING: Fuel flow should <u>never</u> be used as a primary means of determining the remaining fuel level.

There are two acceptable means of determining the RV-12 fuel level. Primary fuel level is indicated by a float arm located inside the tank. This value is indicated on the EFIS display and by a physical Mohler fuel level gauge located on the top of the tank, which is visible in flight by the pilot (Note some early RV-12 aircraft may have a sight gauge on the side of the tank. Van's recommends the addition of a Mohler gauge to these aircraft not only for an indicator to be referenced in flight, but also a means of observing the fuel level while filling the tank). Both of these systems should be used to determine the remaining fuel level, <u>not fuel flow</u>.

High fuel-flow alarms (especially repeated erroneous, false alarms) can be distracting to a pilot. Since fuel flow is neither a mandatory or critical indication, we recommend that aircraft that exhibit erroneously high fuel flow indications should at minimum turn off the high-pressure warning via the setup menu of the SkyView EFIS system (reference the SkyView installation guide available on the Dynon website). Note that Garmin systems do not indicate fuel flow even if the sensor is installed (when the Van's RV-12 configurations are applied). Alternately, owners of aircraft with the erroneous fuel flow indications may wish to disable the fuel flow indication completely.

CAUTION: Before turning off the high-fuel-flow EFIS warning the entire fuel system should be checked for proper function and leaks.

Alt, MSL	3500	5500	6500	7500	8500	9500	11500
OAT, F	57	53	51	48	47	46	36
MP, in	24.2	22.8	21.8	21.3	20.8	20	19
RPM	5400	5400	5400	5400	5400	5400	5400
FloScan (Return)	**2**	**2**	**2**	**2**	**2**	**1.7**	**1.8**
FT-60 (Supply)	**7.3**	**8.9**	**8.3**	**11.4**	**11.4**	**8.4**	**8**
Fuel Press, psi	4.4	4.4	4.4	4.4	4.4	4.4	4.3
Indicated Airspeed KIAS	111	106	105	101	97	97	94
True Airspeed KTAS	117	118	116	114	112	113	113



Materials Required:
None

Method of Compliance:
None