

## KOEHLER KORNER

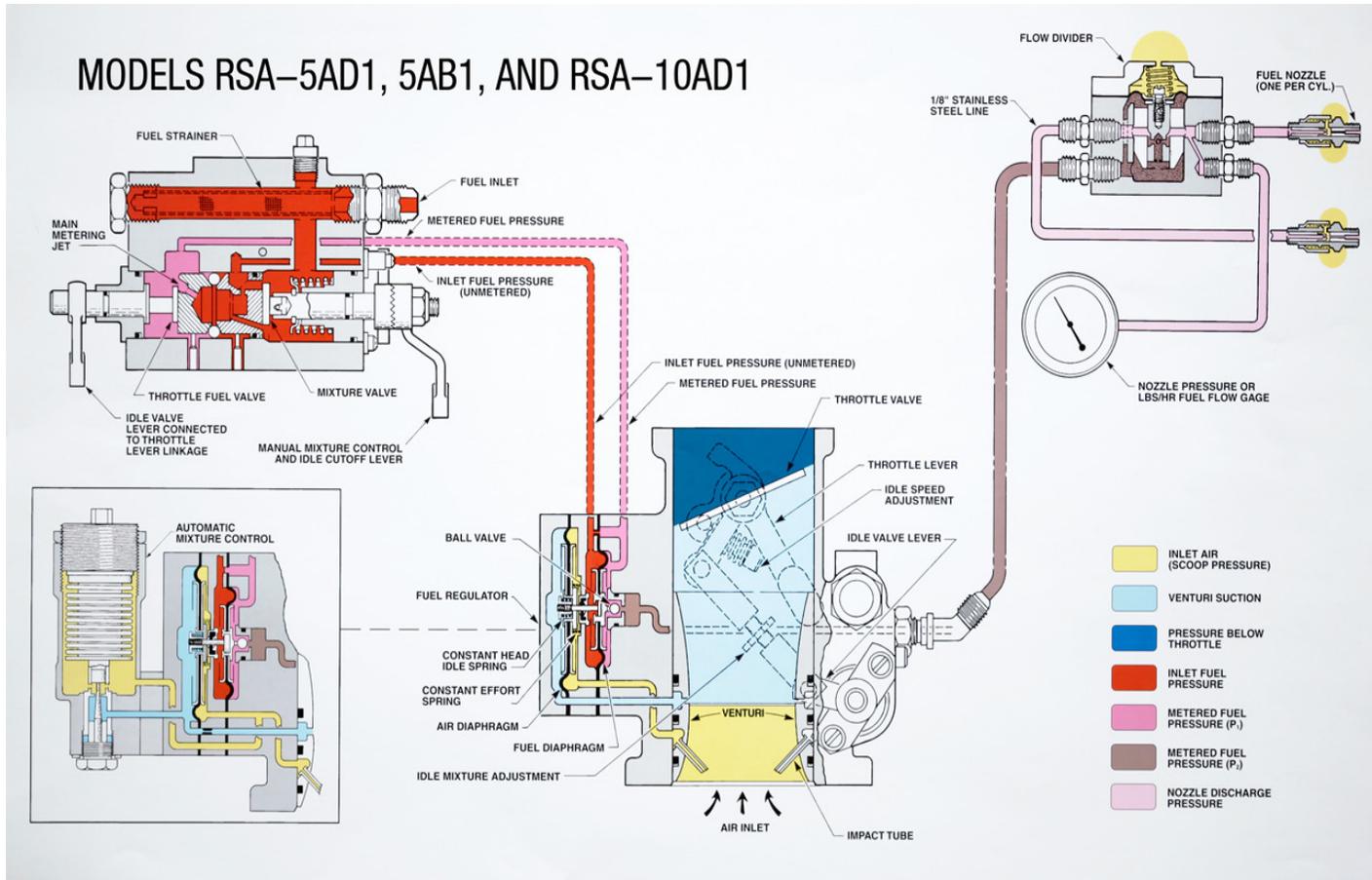
The FAA has issued an Airworthiness Concern Sheet due to a reported rash of uncommanded engine shutdowns during power reduction to idle. This issue primarily involves the Lycoming IO-360 engine with the AvStar (Bendix) fuel injection system. If you have had such an incident, it is requested you provide the details to the FAA. The Concert Sheet was issued on December 16, 2025 and can be found with a keyword search on-line.

So, let's talk about the RSA fuel injection system on most Lycoming IO-360 engines. For years the subject system was called the Bendix system, because it was built and supported by Bendix. Several years ago, AvStar acquired the rights to the system, hence the name change, but physically nothing really changed. I am an old guy so I will refer to it as the Bendix system. It was developed back after WWII as a simplified pressure carburetor with a distribution manifold to inject fuel just upstream of the intake valve. On the pressure carburetor there is an automatic leaning capability with altitude, but that was eliminated. Also, the pressure carburetor just injected fuel into the main induction manifold, or on some aircraft in the turbo charger (where it got thoroughly mixed with air for an even fuel/air ratio) (example, R-2800). The added flow divider is not just a distribution manifold, but a piston that has fuel pressure on one side and springs on the other. As the pressure increases, the piston rises, exposing specially shaped slots for fuel to go to each cylinder. By gradually opening, these slots ensure even flow to each cylinder. The fuel flows continuously, not intermittently, like on our cars. It accumulates behind the intake valve, hopefully warming and vaporizing, until the valve opens and sucks the charge into the cylinder. The injection nozzle helps to atomize the fuel by adding a little bit of air into the fuel flow.



Oh, I forgot to mention that the fuel pressure at the flow divider is controlled by the main servo which is really a pitot tube and venturi that measures dynamic air pressure. It measures the pressure difference between pitot and static pressure and meters fuel pressure proportional to that air velocity difference. It mechanically converts the air velocity going into the engine to fuel pressure. Lastly there is a manual gate valve allowing the pilot to manually lean the amount of fuel going into the fuel servo. It is very crude. Think of controlling the area your lawn sprinkler hits by adjusting the knob on the spigot on the side of your house.

## MODELS RSA-5AD1, 5AB1, AND RSA-10AD1



Obviously, you have to play some tricks on this fuel injection unit to get it to work at start. The usual practice is to prime the engine, and when it starts to fire, opening the mixture allowing fuel to come through the injection system which is now being metered by the airflow through the main servo.

It is critically important that the idle rpm and mixture be set up correctly on this fuel injection system. There is a setscrew stop on the butterfly that roughly controls rpm at idle, and an adjustable linkage between the throttle arm and a variable fuel orifice in the main servo unit. Think of a “V” shaped slot that is partially covered by a plate. As the throttle is opened, the plate is progressively pulled up the “V”, gradually increasing the fuel orifice size. The adjustable linkage allows you to change how much of the “V” orifice is opened at idle. It serves to adjust the fuel/air mixture at idle.

So, with the idle stop for rpm and the linkage for mixture, you can adjust the idle rpm and mixture. The only problem is that they interact. Let’s say you set the rpm to 700, but the mixture was way too rich. As you lean the mixture, the engine will actually make more power, and the rpm will increase! For this reason, adjusting the idle rpm and mixture can be very tedious and must be done in very small increments.

The proper procedure to set idle rpm and mixture is to first warm up the engine. Ideally oil temp is around 180 and CHTs are around 300. Now, pull the engine to idle and note the rpm.

Usually around a 700 rpm idle works for our four cylinder Lycomings. Adjust as necessary. Then, check the mixture by very slowly leaning using the mixture control and watching the rpm. You want the idle mixture to be slightly rich, so ideally you want a 35-50 rpm rise before the engine cuts out. If you get less of a rise, richen the mixture, and if you get more of a rise, lean the mixture. Work in very small increments, like 1/8<sup>th</sup> of a turn. Usually, you will have to shut down the engine to make adjustments, so you may have to do some run-ups to both clear the induction system, and keep everything hot. Be patient and do not give up early. It is hot and dirty work.

Back to the Airworthiness Concern Sheet, it is my observation that many of the engines do not have the idle mixture and rpm set right, so that when the engine is pulled back to idle, it may cough, stumble, and/or quit!

I hope this discussion of basic fuel metering using the Bendix fuel injection system will help you more successfully maintain and fly your plane.

Keep building, flying, and maintaining.

Dick

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