Internal valve Operation

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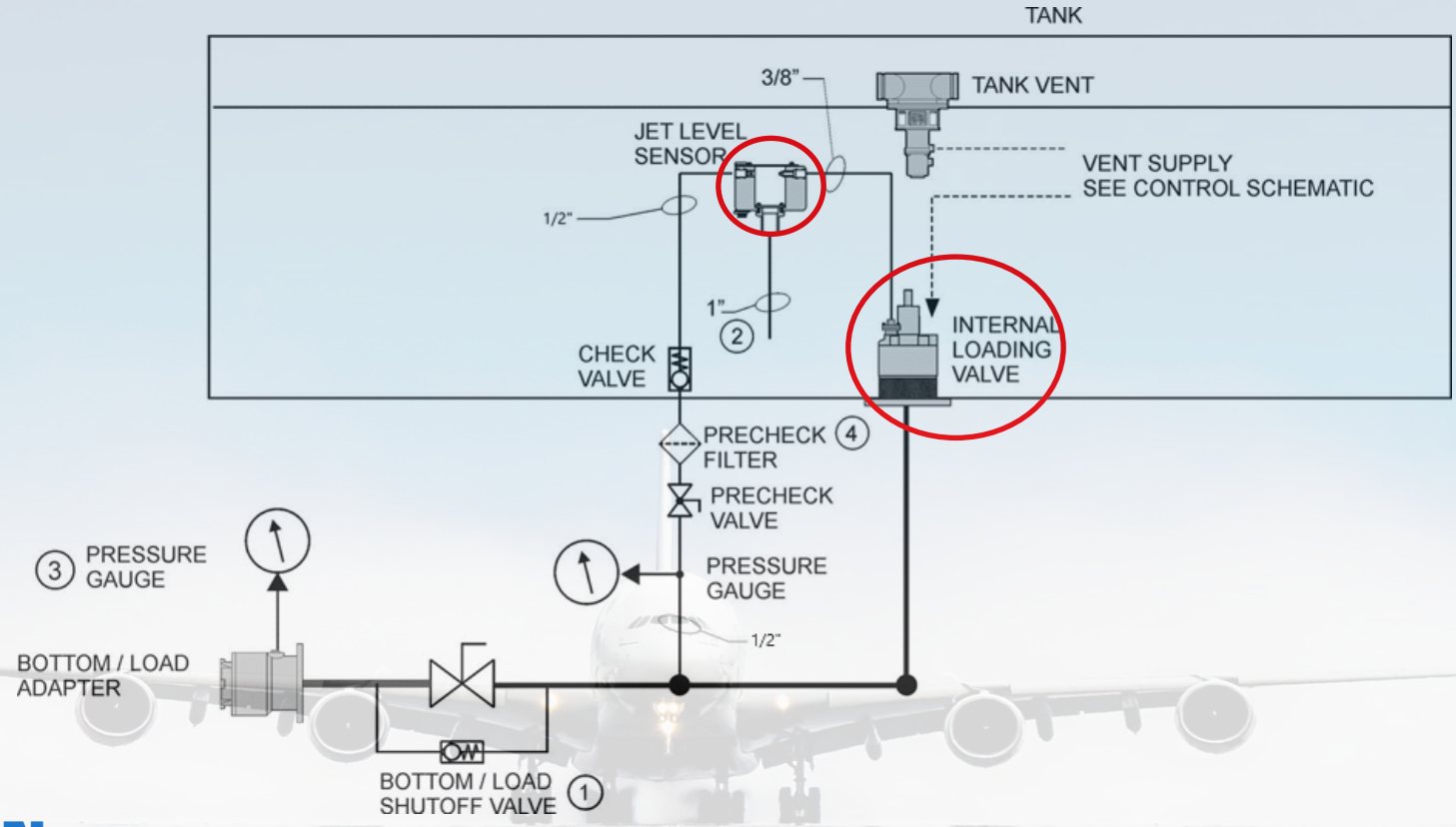
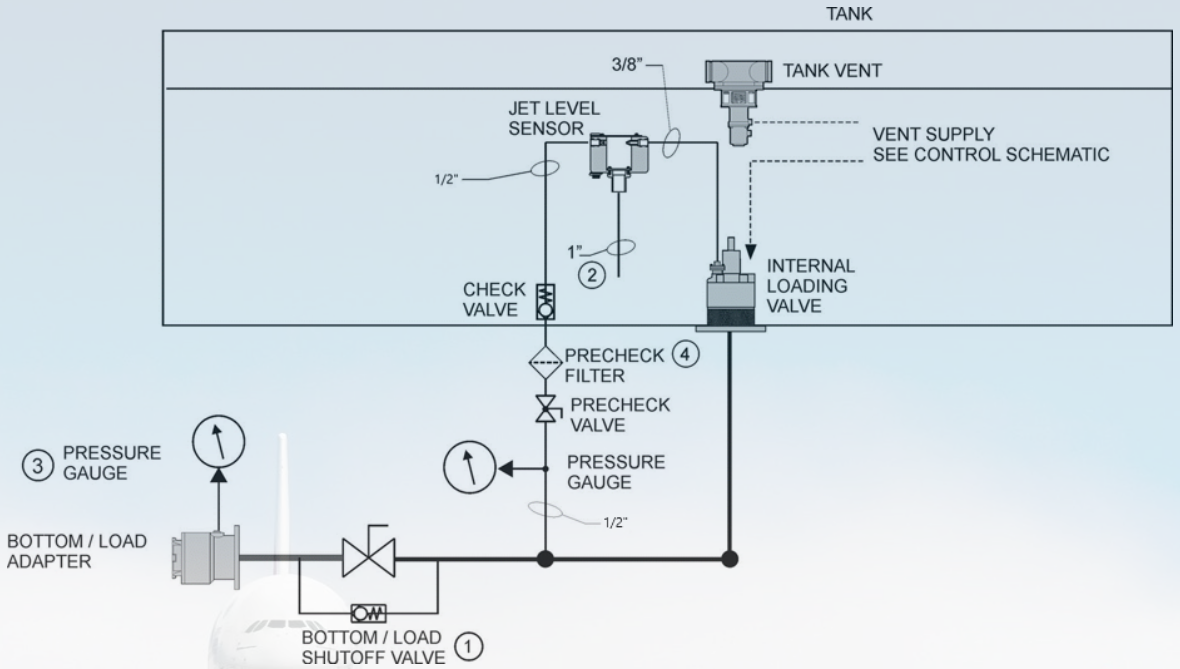
Internal Valves

Introduction



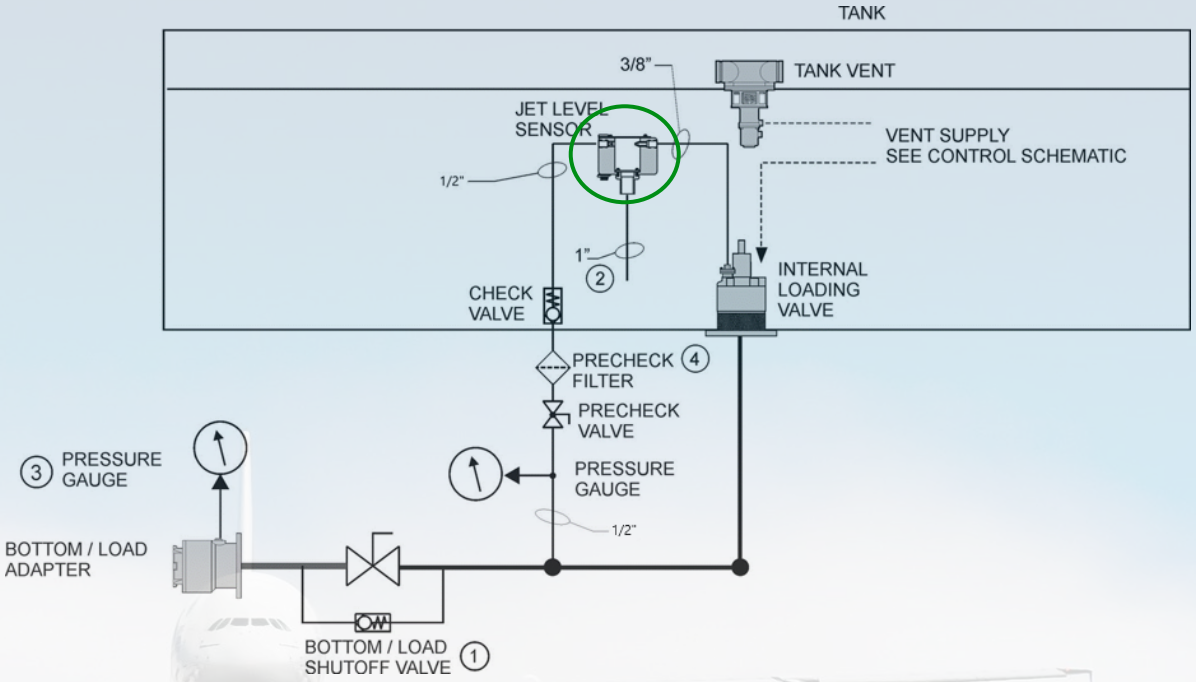
Bottom Loading Basics

- Fuel enters through the bottom load adapter, through the piping to the internal valve where it enters the tank
- The Jet Level sensor provides high level protection, and the vent prevents over pressurizing the tank



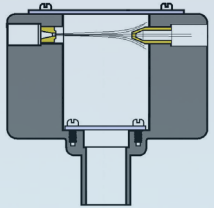
Jet Level Sensor

- A very simple device with no moving parts.
- Fail safe, if it does fail the signal will not be sent to the internal valve pilot and the internal valve will not open.
- Two ways to operate the sensor –
  - Shut off the signal (as pictured) or
  - Fill up the bowl to disrupt the signal.

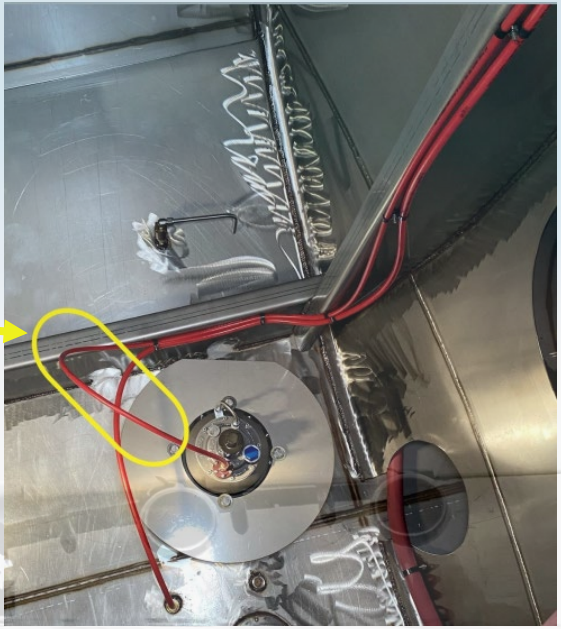


Jet Level Sensor

- Fuel is sprayed through a nozzle across an open area to a receiver.
- It is intended to transfer a pressure signal not flow.
- *Min. 9psi needed at inlet of sensor. ~3.5 psi needed to keep pilot open.*

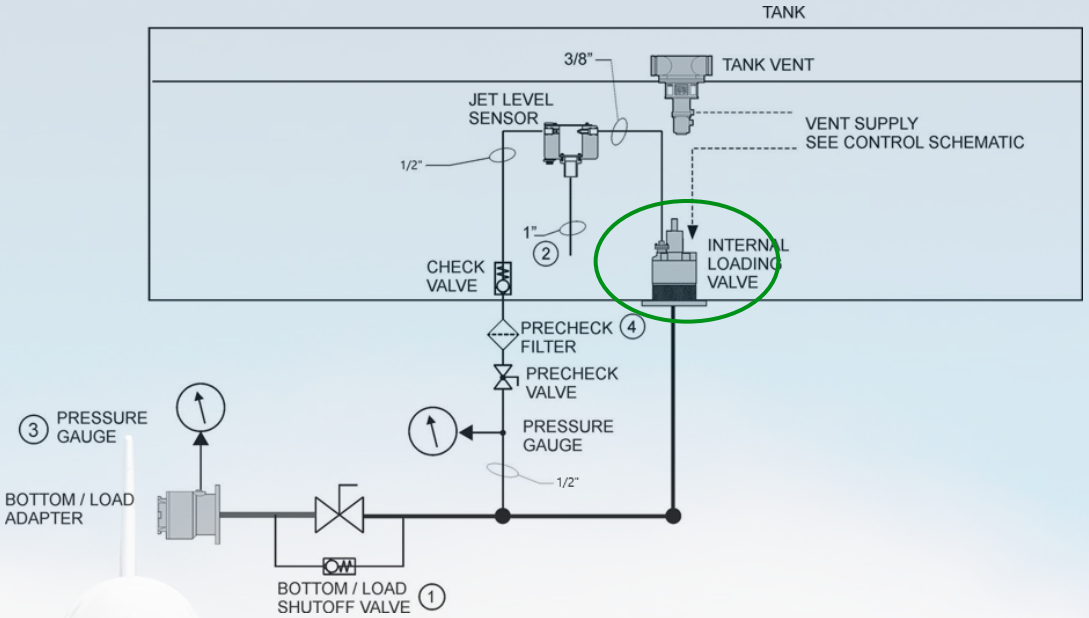


- NOTE: Take care not to kink fuel line going up to the sensor or down to the valve
- Limit the length of lines and elbows in the precheck line
- Recommend line and components upstream of jet level to be ½". From Jet level to pilot can be 3/8"



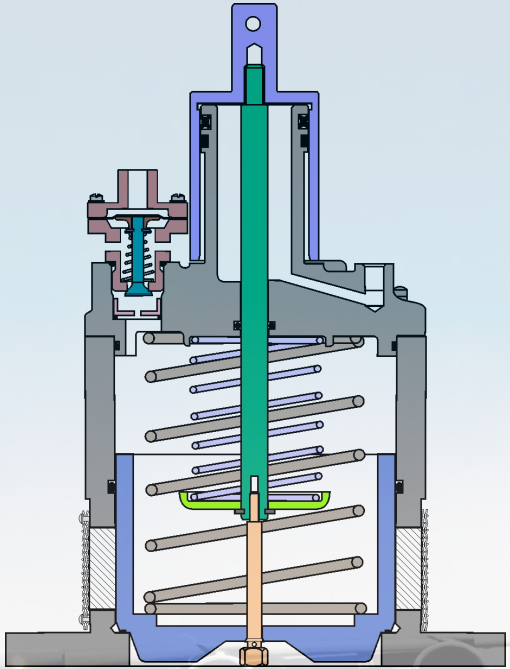
Internal Valve

- This image highlights an air operated valve
- At least 50psi air pressure needed to open for offloading. Usually regulated to 80psi by truck builders.
- At least 5psi fuel pressure needed to “crack” open the piston for loading. 55-60psi for full open.
- All of our valves, regardless of size, can handle 800gpm at a minimum.
  - Note. At higher loading rates you will need to consider dual pilot valves to prevent surging due to abrupt shutdown at high flowrates.



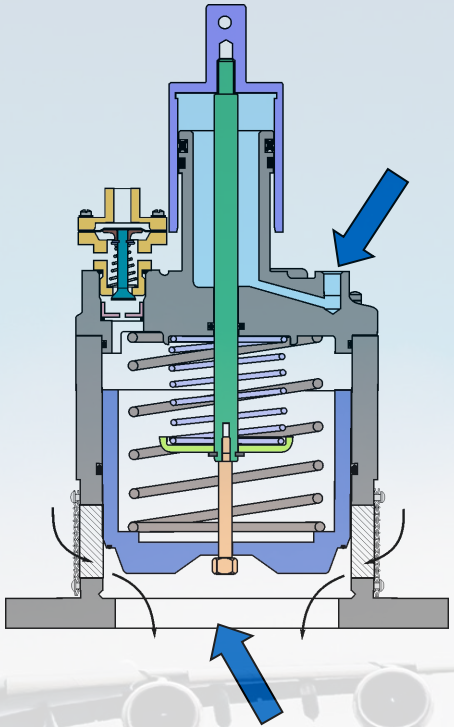
Air Operated Internal Valve Operation

- This image display's the valve in the normally closed position
- The piston is down, and the pilot valve is closed



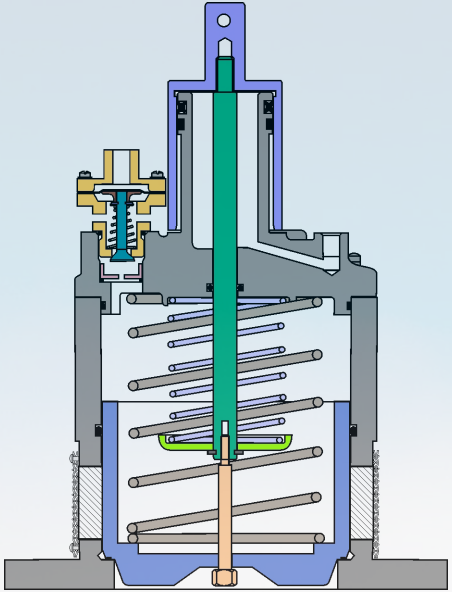
Air Operated Internal Valve Operation

- For fueling operations or when fuel is leaving the tank the valve will be opened via air pressure applied to the port on the top
- The cylinder lifts the shaft and lifts the piston via the metering screw
- Please note that when the valve is opened using air pressure there is no high level protection



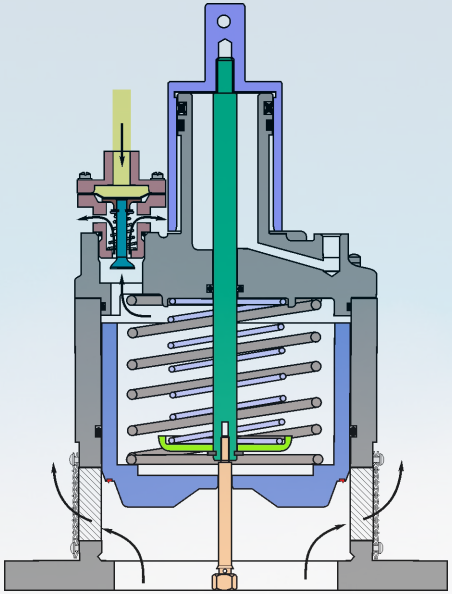
Air Operated Internal Valve Operation

- For bottom loading operations the valve will initially remain in the closed position
- As pressure is applied to the face of the piston fuel is allowed to pass to the back side of the piston via a gap around the metering screw
- Fuel pressure on both sides of the piston will be equal
- The force on the back side of the piston is greater due to the spring and a slight hydraulic advantage due to the surface area on the back side of the piston being greater than the face



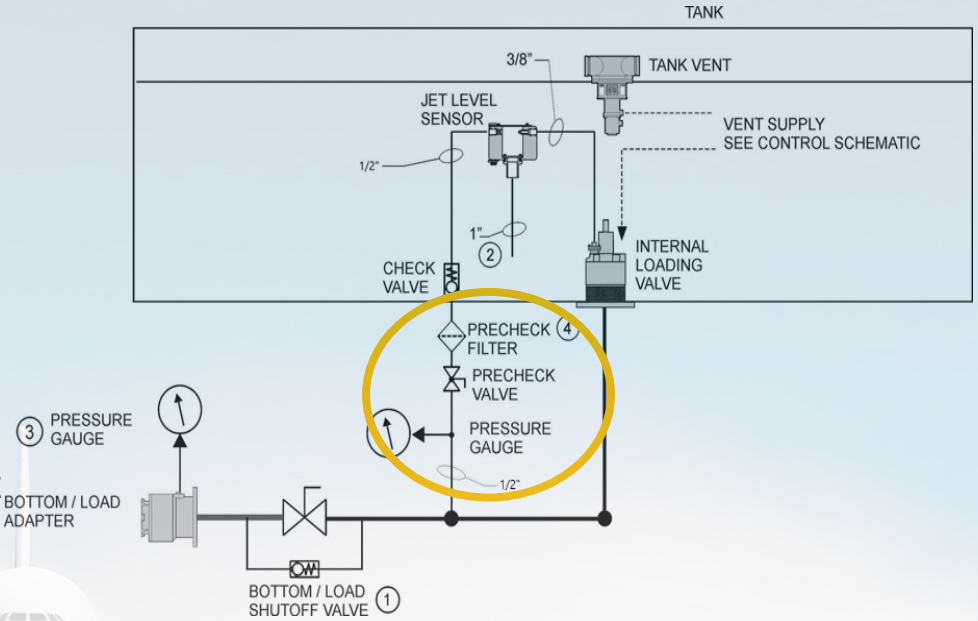
Air Operated Internal Valve Operation

- When the pressure signal from the Jet Level Sensor is high enough the pilot will open
- As the pilot is opened the pressure on the back side of the piston is relieved allowing the valve to open.
- If the pilot closes the valve will return to the closed position



Precheck

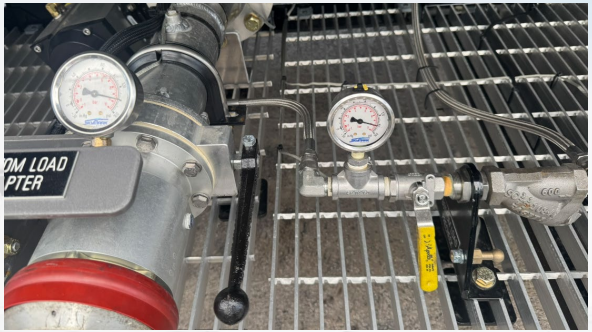
- It is recommended that during each bottom loading operation the operator precheck the operation of the high level protection system. This should be done regardless if loading rack automatic shutdown systems for high level control are fitted !
  - ATA 103 requires this to be performed at least daily for operational checks that valve closes, then quarterly functional check to ensure it stays closed against pressure.



Precheck Testing Steps

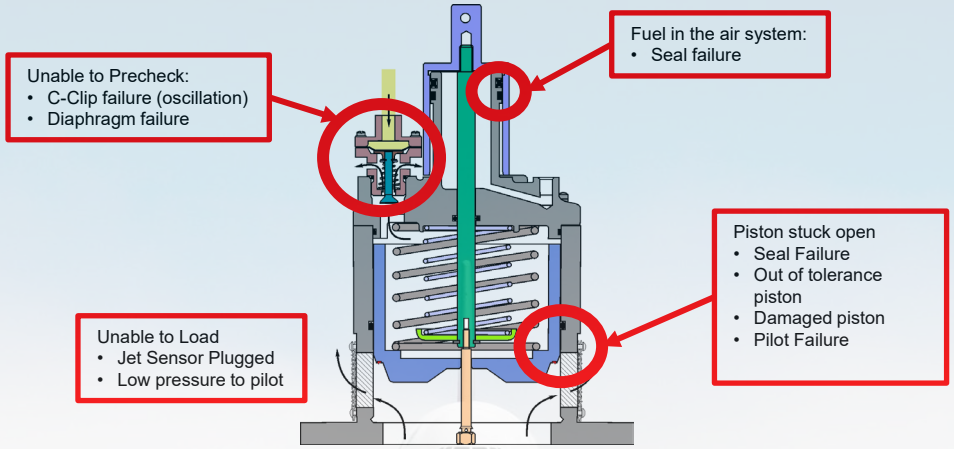
1. Close the precheck valve, this will stop the pressure signal from passing through the jet level sensor to the pilot, causing the pilot and the internal valve to close.
2. Observe the meter on the loading rack to assure that the flow of fuel stops.
3. If the flow of fuel stops the precheck has been completed successfully and the precheck valve can be reopened and bottom loading continued.
4. If the flow of fuel does not stop, it is not recommended that you continue to bottom load the unit until some other means is used for high level protection or the internal valve is serviced.

Note: if using the '3-line' type jet level (filling the bucket style) at least 5gpm could still be flowing when the internal valve is shut.



Common Failure points

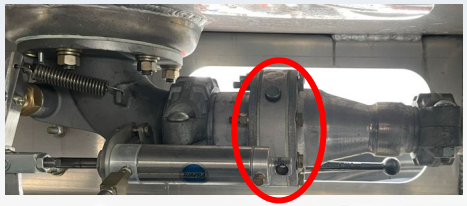
Common potential Failure points in the past with Internal valves. Failures caused by either design or field external factors.

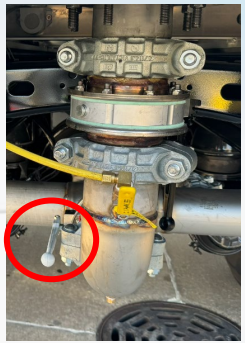


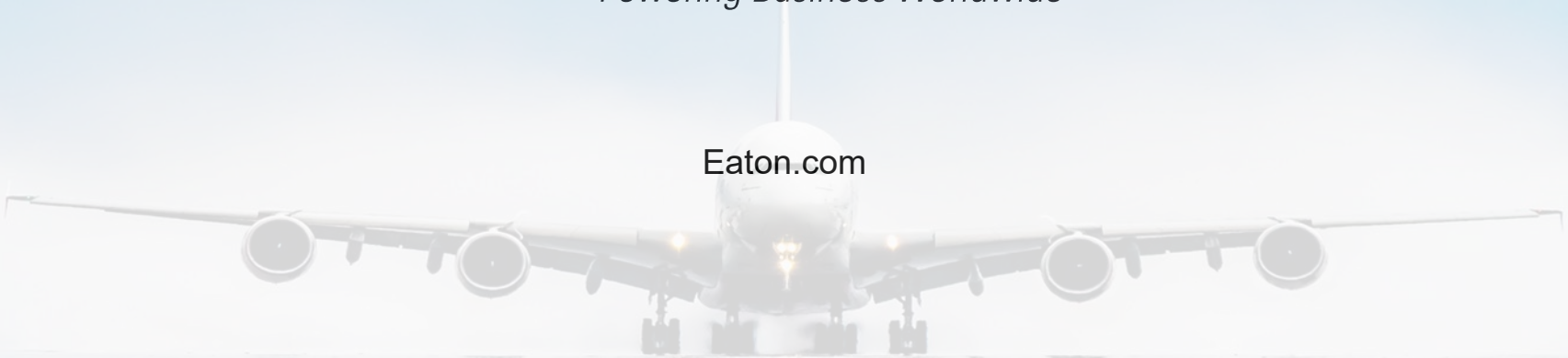
Field Failure Examples

Low Loading pressure review

- **Internal valve is surging / Oscillating while loading.**
  - Check length and routing of precheck hose.
  - Check filter.
  - High points in precheck lines
  - Observe loading pressure.
  - Check for loose fittings
  - Recommend ½" lines and strainers upstream of Jet Level sensor
- On smaller FBO's they may have low loading pressure from 1"-1 ½" pumps. Loading static pressure around 40-50psi. Fueling operating pressure while loading is about 2-4 psi. This can cause surging as the jet level and pilot may not be getting sufficient pressure to keep pilot open.
- To check for a low-pressure condition,
  1. close valve upstream of internal valve,
  2. activate flow from the loading rack and allow pressure to build,
  3. Slowly open the maintenance valve upstream of internal valve
  4. If internal valve opens and no longer surges, you have a low-pressure condition to the pilot.







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