Cessna.

IF YOUR CESSNA HOME
A SERVICE AT THE SIGN
OF THE CESSNA SHIELD

CUSTOMER CARE
OWNER ADVISORY

MARKETING DIVISION · CESSNA AIRCRAFT COMPANY / WICHITA, KANSAS 67201 / CABLE ADDRESS - CESSCO WICHITA

September 11, 1981

SE81-33A

FUEL VAPOR

Dear Cessna Owner:

The purpose of this letter is to provide Owners and Operators with the facts about fuel vapor as related to the fuel systems in their aircraft.

Fuel vapor can and does occur in all airplances using aviation gasoline. Vapor forms because of the low vaporization point of the volatile elements in Avgas. The rate of formation of fuel vapor is affected by the temperature of the fuel and the ambient air pressure surrounding it. The higher the fuel temperature and the lower the air pressure, the faster the volatile elements will convert to a vapor.

For example, if your aircraft has heat soaked on the ground during warm weather or in a hot sun, the temperature of the fuel in your main tanks will be high. In addition, warm ambient air flowing through the engine compartment during groundoperation combined with heat from the engine itself will tend to increase the temperature of fuel flowing to the engine. Quite naturally, the rate of vapor formation will increase as the fuel temperature increases.

(continued).....

If warm ambient air temperatures are combined with decreased air pressure, as happens when you rapidly climb the airplane to altitude, the rate of vapor formation will be further increased.

Vapor formation will ultimately begin to decrease as the outside air temperature decreases with altitude and the fuel has had an opportunity to cool. However, since fuel cools slowly and your altitude may increase rapidly, vapor formation is most likely to occur early in the flight (i.e. - first hour). The rate of vapor formation will begin to decrease later on in the flight, as the more volatile elements have disappeared and the fuel has cooled.

To fully understand how fuel vapor affects the operation of your aircraft, a brief review of the fuel supply system in Cessna 210 series aircraft is appropriate. A simplified fuel system schematic is attached for your review, and if you'll pull it out and follow along, it's easy to understand.

The main fuel tank in each wing is vented to outside air, and is fitted with two feed lines leading to a fuel reservoir in the forward portion of the fuselage below the cabin floor.

One feed line leaves the aft part of the main wing tank, follows down the rear doorpost and connects to the aft end of the reservoir. The other feed line from the main wing tank goes down the front doorppst and connects to a cone-type fitting in the upper corner of the fuel reservoir.

Fuel flows from the reservoir through the fuel selector valve, then through supply lines to the auxiliary fuel boost pump. From there, the supply lines pass through the firewall to the fuel strainer in the engine compartment. Fuel is then forced by the engine driven main fuel pump to the fuel injection system.

The main fuel pump is fitted with a return line which delivers excess fuel not used by the engine, and any fuel vapor generated by the action of the pump, back through a portion of the fuel selector valve into the appropriate reservoir. Vapor returned to the reservoir passes up the front fuel supply line into the main tank, where it is vented to the atmosphere.

One of the first indications of excessive vapor formation is fluctuation of the fuel flow indicator. For example, if the fuel flow has stabilized at 90 lbs. per hour after leveling off in cruise and then the fuel flow indicator begins to fluctuate between 80 and 90 lbs. per hour, followed by engine roughness, fuel vapor may be the cause.

Under certain circumstances, fuel flow fluctuations can occur when the main engine-driven fuel pump is not receiving sufficient liquid fuel, either from a build-up of vapor, air entrainment in the fuel supply system, restrictions to the normal flow of fuel through the system, or other mechanical problems explained below.

It is important to note that engine roughness, power hesitations, fluctuations in RPM, fuel flow and manifold pressure in any airplane can be caused by conditions totally unrelated to fuel vapor, such as:

* Dirty spark plugs
* Incorrect magneto timing
* Low compression in one or more cylinders, and
* Other engine mechanical problems

Any of these conditions may cause indications which can be mistaken for excessive fuel vapor formation. Checking these items at regular intervals is standard maintenance practice for all airplanes and is not unique to Cessna or our 200 series aircraft.

Also, any abnormal restrictions to fuel flow or vapor return flow through the system may result in the same symptoms encountered with excessive fuel vapor. Some examples of these are:

* Twisted fuel supply hoses
* Clogged fuel supply lines or strainers
* Sticking auxiliary fuel pump by-pass valve
* Restricted vapor ejector or vapor return lines
* Vapor return check valves improperly installed
* Damaged fuel tank selector valves
* Improperly set or damaged fuel pumps

Air leaking into the fuel supply system may also produce conditions that can be mistaken for fuel vapor. Air in the fuel system typically results in fuel flow fluctuations early in the flight and can be caused by the following:

* Minor leaks in fuel lines
* Loose connections in the fuel system
* Cracked or leaking flares at fuel line connections
* Loose fuel pump through bolts
* Damaged fuel selector valves
* Damaged or leaking fuel injection system components

Any of these discrepancies can be found and corrected by your Cessna Dealer. The system should be checked at regular maintenance intervals and repaired as necessary.

Operators experiencing fuel flow fluctuations should follow instructions and procedures provided as follows:

T210 and P210 aircraft (1976 through 1978 models)

* Reference instrument panel placard (major fuel flow fluctuations and power surges).

* Reference special procedure card (D1189-13)--concerning fuel flow stabilization and in-flight engine restart procedures. (This card is to be retained in the above aircraft at all times)

1979 T210 and P210 aircraft

* Reference instrument panel placard (major fuel flow fluctuations and power surges). This placard is also shown in Section 2 of the Pilot's Operating Handbook.

* Reference Section 3 of the Pilot's Operating Handbook for procedures concerning excessive fuel vapor and fuel flow stabilization.

* Reference Section 3 of the Pilot's Operating Handbook for engine restart procedures during flight.

Cessna has manufactured over 13,000 aircraft of the 200 series that have successfully and safely flown millions of hours. Very few reports have been received of fuel flow fluctuations suspected to be caused by fuel vapor, and to our knowledge, no forced landings have resulted which were caused by excessive vapor formation in the fuel system.

The fuel system in your Cessna as designed, properly maintained, free of the air leaks and restrictions mentioned earlier, and correctly operated according to published information in the Pilot's Operating Handbook and aircraft placards, is a safe and satisfactory system in all respects.

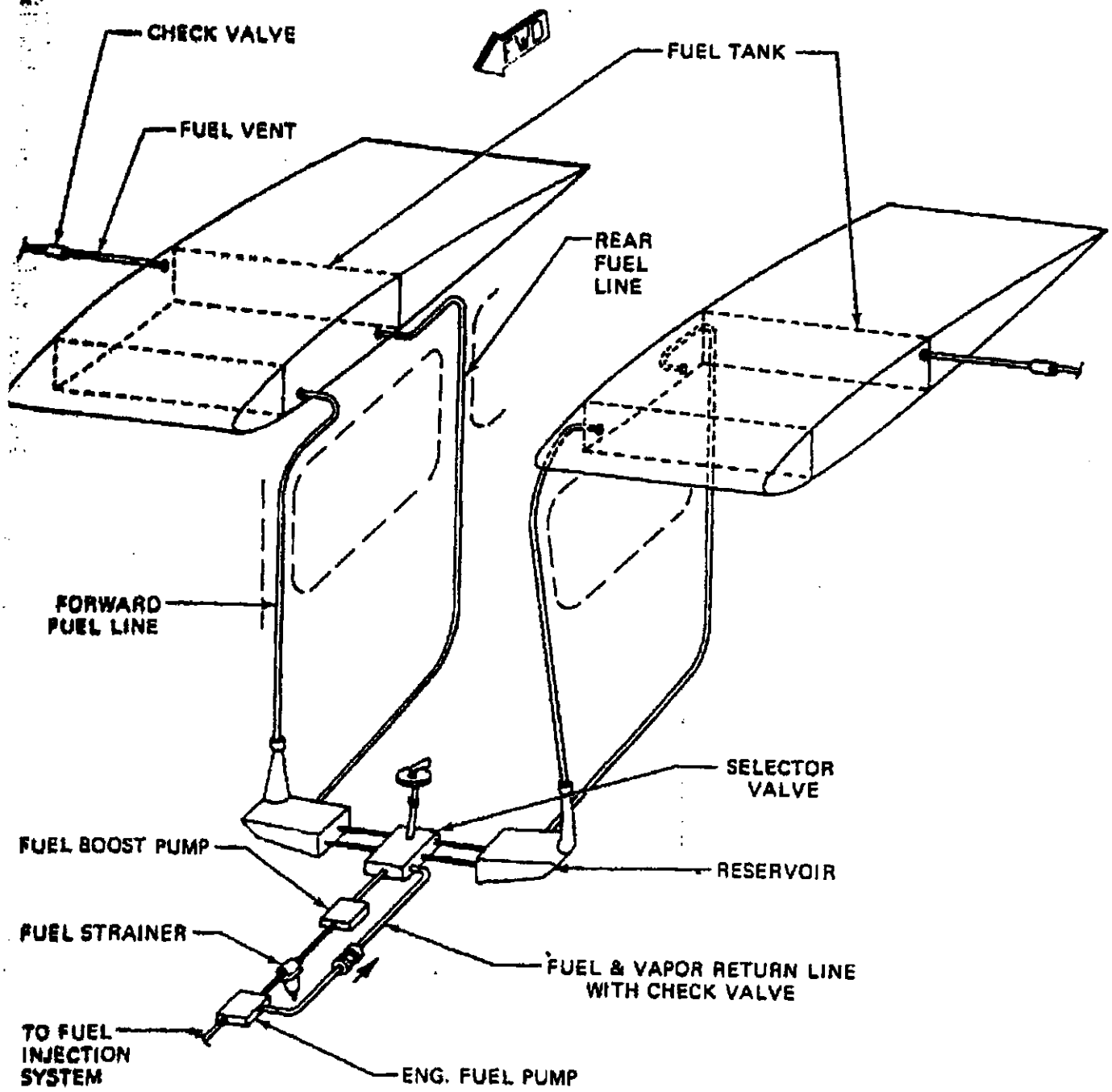
Because a few customers have experienced what they considered excessive fuel vapor elimination problems after all the mechanical and fuel system checks were completed, we have developed a special Service Kit for 1976 through 1979 T210 and P210 aircraft.

This kit increases the vapor-handling capability of the existing system by providing a separate vapor return line with integral check valves linking the fuel reservoirs to the wing tanks.

This kit will not eliminate the formation of fuel vapor nor will it eliminate the normal maintenance checks necessary to the safe and efficient operation of any airplane.

This Service Kit is available to all Owners and Operators of affected aircraft if they feel that their peculiar operating conditions or method of flying make their airplane susceptible to unusual fuel vapor problems.

Joe Quackenbush
Manager, Customer Services
Single Engine Division



T210/P210 FUEL SYSTEM SCHEMATIC
(1976 through 1979)

NOTE: This schematic is applicable in general to all model years from 1962 thru 1981

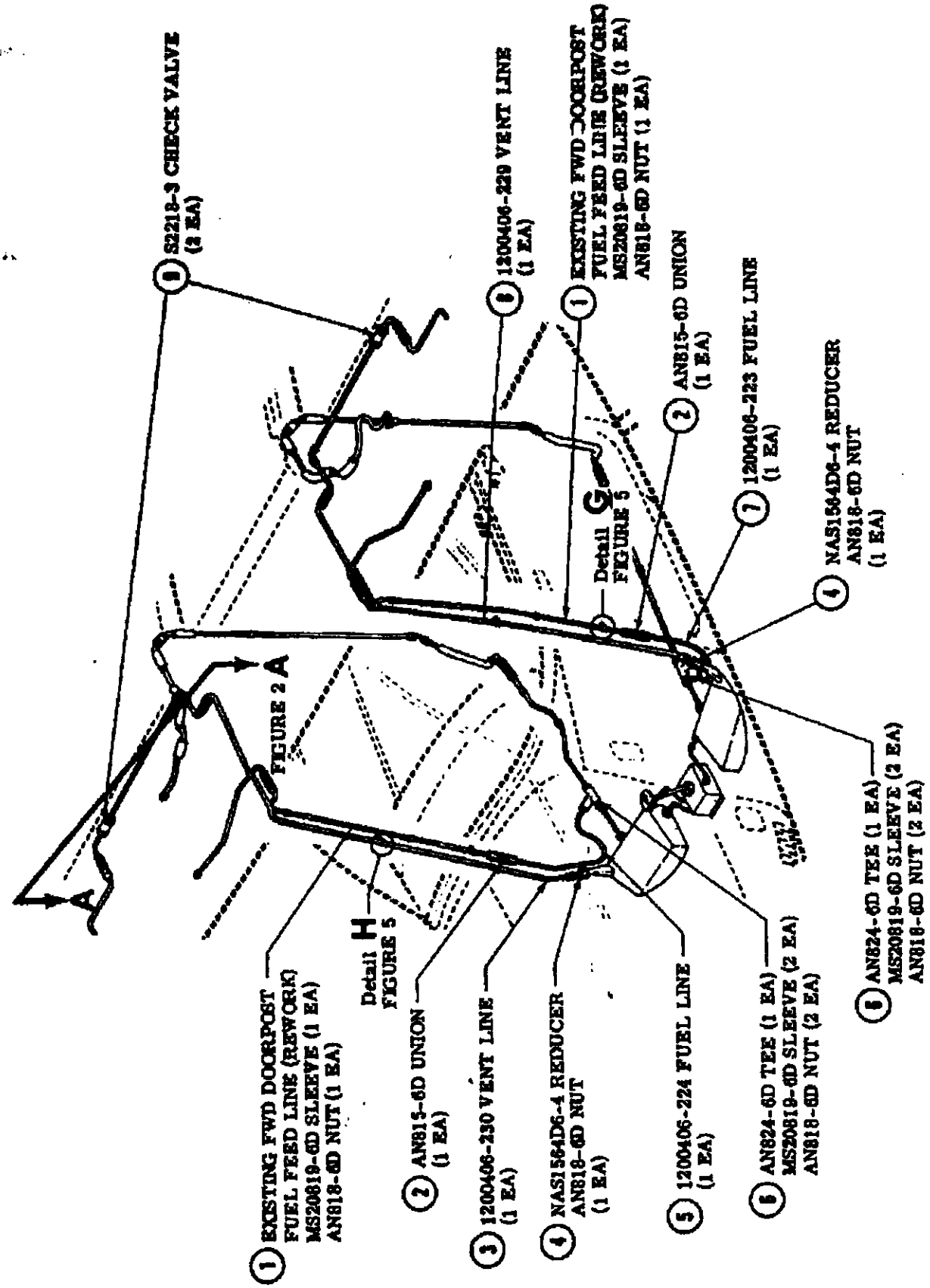


Figure 1. Fuel System Vent Line Modification Installation

NOTE: This is the fuel system schematic after modification with one of the Cessna kits.