

## FIELD SERVICE NEWS

Fuji Heavy Industries, Ltd.  
Main Office - No.1-7,  
2-chome, Tsunohazu,  
Shinjuku-ku, Tokyo, Japan  
Phone: 03-343-5311

FAN-000  
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Aircraft Division

Utsunomiya Work No. 680  
Nishihara-cho, Utsunomiya City,  
Tochigi Prefecture, Japan  
Phone: 0286-58-1111

### FA-200: Problem of unbalanced consumption of fuel

#### 1. Foreword

As you may have already noticed, the FA-200 sometimes exhibits a slight unbalanced fuel consumption in either left or right fuel tank. We have previously suggested a solution of this problem by adjusting the air-vent angle. Since we should give no fear to the users in this regard, we would like to explain our policy on improving the problem of unbalanced fuel consumption.

Before presenting the description, we would like to emphasize that no engine trouble will occur due to air suction from empty fuel tank even if one of the fuel tanks has become empty.

#### 2. Reasons for one-sided fuel consumption

The fuel system of the FA-200 is as illustrated in Fig. 1. With an ON - OFF valve used instead of a selector valve, fuel consumption in both fuel tanks becomes unbalanced to some extent. Despite this technical

problem, the ON - OFF valve is employed in FA-200 for the following reasons.

The FA-200 features the use of the sump tank in the fuel system. The sump tank is used to prevent fuel supply interruption during inverted flight. Although inverted flight by the FA-200 is not authorized, a loop, roll and other similar flight will give the aircraft the same conditions as in the case of inverted flight for a moment. When an experienced pilot correctly controls the aircraft during such flight, a positive gravity is applied to the aircraft, and thus no fuel supply interruption will occur even if the aircraft is not equipped with the sump tank. However, if a pilot fails to control the aircraft during rolling, etc., negative gravity is applied, allowing no fuel to flow out from the fuel tank; thus fuel supply interruption will occur. In order to prevent this trouble, the sump tank is installed so that fuel is supplied continuously during an inverted flight for a relatively short period of time. The present ON - OFF valve, therefore, is used instead of a transfer valve.

If the fuel systems for both sides operate in exactly same way, fuel should flow evenly from both fuel tanks. If, however, flow resistance in the system of either side differs slightly from the other, it will cause fuel consumption in both fuel tanks to become unbalanced.

### 3. Remedies for unbalanced consumption of fuel

Unbalanced fuel consumption can be corrected by adjusting the direction of the air-vent of either fuel tank beneath the body in case of Serial Numbers 1 through 55, or air-vent beneath the fuel tank in case of Serial Numbers 56 through 101. Bend air-vent of fuel tank, from which fuel does not decrease, toward the head of the aircraft. With dynamic pressure

to be obtained through the air-vent thus adjusted, the difference in flow resistance between both side systems is balanced.

There is, however, a limit in bending the air-vent. Note that an excessively bent air-vent contrarily affects. The following maximum bending angles apply:

Serial Numbers 1 through 55           Max. 60°

Serial Numbers 56 through 101       Max. 30°

If unbalanced fuel consumption is still significant with the above adjustment, you should judge that some kind of faulty condition is present in the fuel system.

Never bend the sump tank air-vent.

4. FA-200 can fly safely regardless of phenomenon of unbalanced fuel consumption

First of all, the provision of the sump tank secures the safety in flight. Even if air is sucked, the air is separated by the sump tank, and only fuel is allowed to flow to the engine system.

We conducted a series of experiments both on the ground and in air, by running the engine with one of the fuel tanks empty, and checked whether an air-lock phenomenon occurs or not. The tests have proved that the engine operates very satisfactorily under the tested conditions.

In addition to the above test, a series of severer performance test was carried out. In this test, the maximum dynamic pressure was applied to the air-vent of the empty fuel tank, and the engine was operated with a slight amount of fuel filled in the other fuel tank to see the engine under a malfunctioning status. For testing purpose, fuel was filled in the fuel tank having larger fuel line resistance.

Prior to the test dynamic pressure applied to the air-vent was measured through an actual flying test, and the maximum differential dynamic pressure thus obtained was used in the test. In other words, the maximum difference between the pressure at the air-vent of the left and right tanks was applied to the air-vent of the empty fuel tank. By this test, it has also been proved that there was no malfunction of the engine due to fuel supply.

These satisfactory test results have been obtained because of an approximately 100 mm head difference between the outlet of the fuel tank and inlet of the sump tank and because of the separation of air by the sump tank.

#### 5. Future action

At any rate, the phenomenon of unbalanced fuel consumption is not necessarily desirable. Almost all necessary measurements have been taken on the problem of one-sided fuel consumption. We, therefore, have decided to replace the present ON - OFF valve with a selector valve in answer to the requests by a number of users, although slight cost increase may be unavoidable.

Fig. 2 shows the system diagram under the present plan.

In this case, the sump tank is provided in the left side only due to the problem of weight and space available.

It should be completely understood that, with this modification made, the pilot is required to control the selector valve to change over the fuel tank and, especially, use the left-side fuel tank when making acrobatic flight.

This system is scheduled to be completed by the end of 1969, and it is planned to adopt the system to Aero Subaru Serial Number 102 scheduled

to be manufactured in April 1970. It will also be possible to adopt this modification to those FA-200's which have already been handed over to the customers.

6. Other information

A problem of squawking in the fuel quantity transmitter has been sometimes reported of late. We are making every effort in solving the problem and are certain that a complete fuel quantity transmitter will be made available in the very near future.

Generally speaking, some of the fuel quantity gauges are not always 100 % reliable. It is, therefore, strongly suggested that you pay attention to the amount of fuel remaining in the tanks. Especially, before resuming your flight after a long distance flight, open the fuel cap and see if a sufficient amount of fuel is remaining for the subsequent flight. Sometimes, you may find that more fuel has been consumed during a given flight than you think.

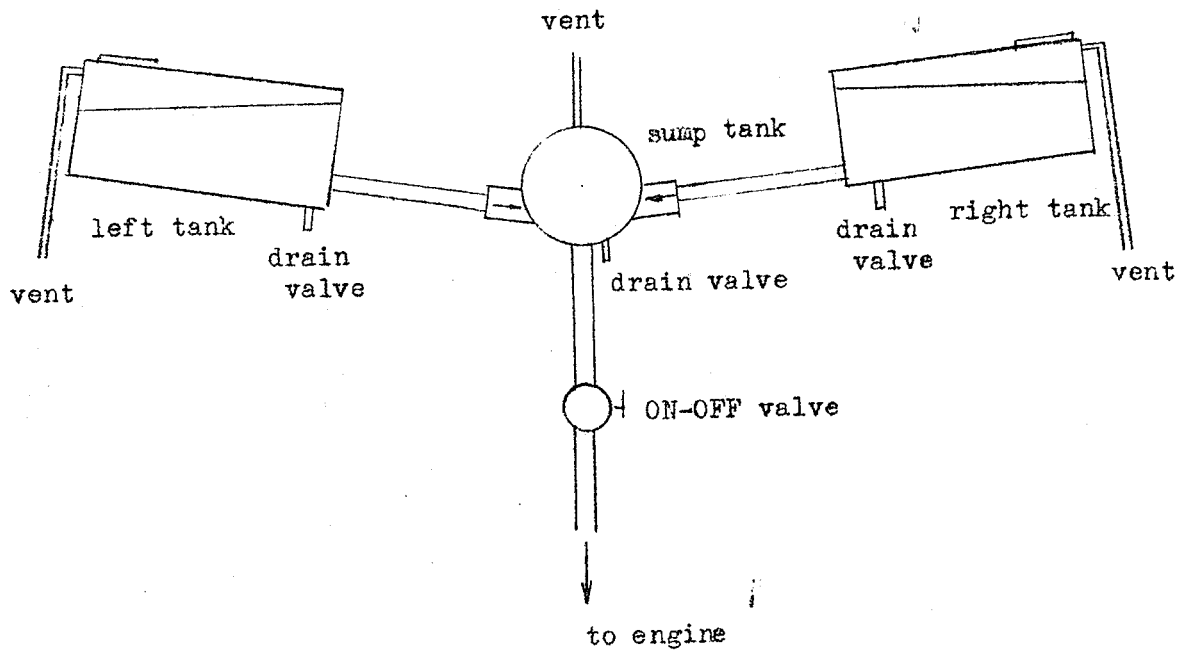


Fig 1. FA-200 Fuel System

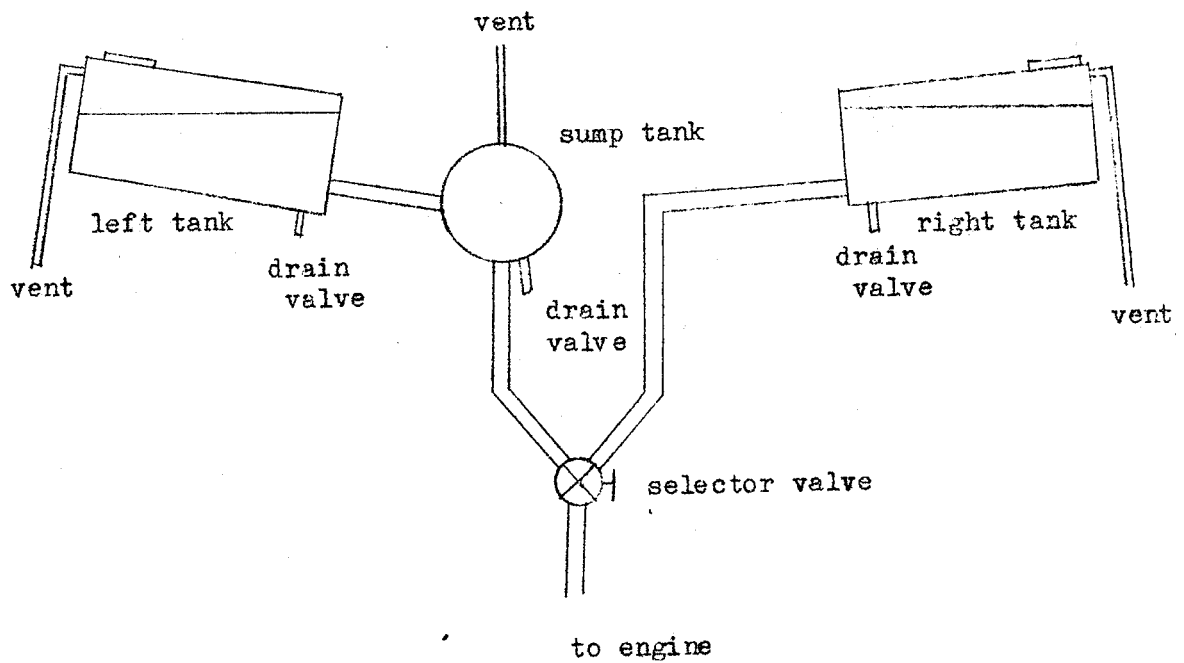


Fig 2. Idea of FA-200 Fuel System Modification