WASP JR. (985) B4, B5, AND WASP (R-1340) S1H2, S3H1, S3H2 AND S3H1-G ENGINES

MAINTENANCE MANUAL

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On the B5, S1H2, S3H1, S3H2 and S3H1-G engines, the surplus oil in the engine proper drains into the sump, from where it is pumped back through the scavenge pump. Oil from the rockerboxes drains through the pushrod covers to the front case, or through a system of intercylinder drains to an additional compartment in the sump where it is returned to the oil tank. The rear case oil drains through a tube into the supercharger case, then into the sump.

On the B4 engine, the rear case acts as a sump. Drain oil from the rockerboxes is carried by inter-rockerbox and inter-cylinder drain tubes to the rockerbox oil scavenge tube. This tube carries the oil to the rear case. Oil from the crankcase drains into the rear case through three sleeves extending through the supercharger case. A tube attached to the lower side of the front case section carries drain oil to the rear case, where it enters the small scavenge section of the oil pump. The large scavenge section of the oil pump scavenges the rear case through an external tube extending from the bottom to the right side of the rear case. The scavenge sections of the pump force the oil through the oil outlet port located in the center of the carburetor mounting flange.

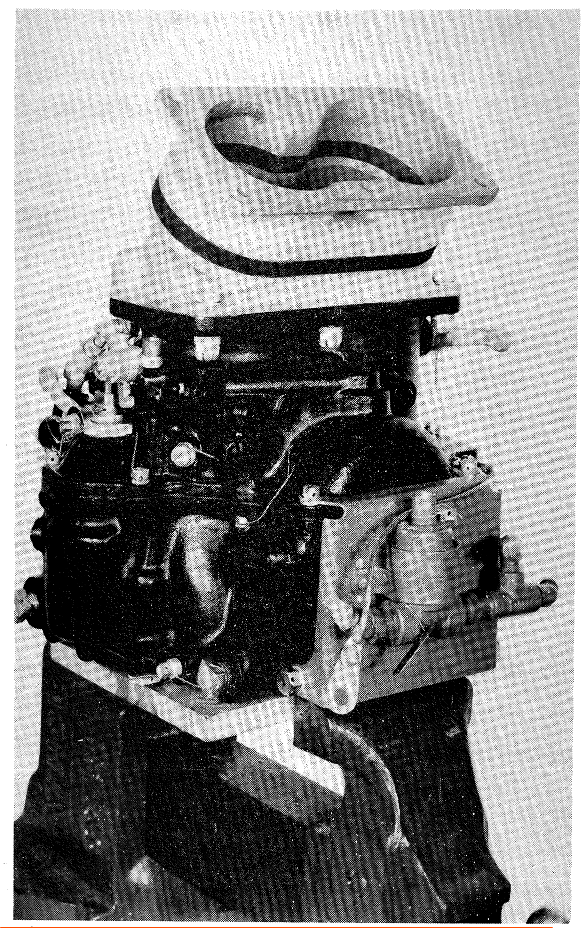
CARBURETOR

These engines are equipped with float-type carburetors. The carburetor meters fuel in proportion to the mass air flow to the engine. The mass air flow to the engine is determined by the throttle opening. After being metered by the carburetor, the fuel is discharged into the air stream to the impeller where it is thoroughly mixed with the air, vaporized, and then delivered to the cylinders through the intake pipes and inlet valves. On the B4, S3H2, S1H2 and S3H2 engines a right angle adapter elbow is provided for the carburetor mounting to bring the carburetor into its normal cperating position.

1. **Manufacturer's prefix:** All Stromberg Aircraft float-type carburetors have the manufacturer's prefix "NA."

2. **Type:** The next letter indicates the type as follows: "R" single barrel; "Y" double barrel; double float chambers fore and aft of the barrels; "C" two barrels down draft.

3. **Size:** The first numeral indicates the nominal rated size of the carburetor throat. The size starts with a one-inch diameter, which is number 1, and increases in one-quarter inch steps. For example: a two-inch carburetor is number 5. The actual diameter of the carburetor barrel opening is three-sixteenths of an inch greater than the nominal rated size, in accordance with the standards of the Society of Automotive Engineers.

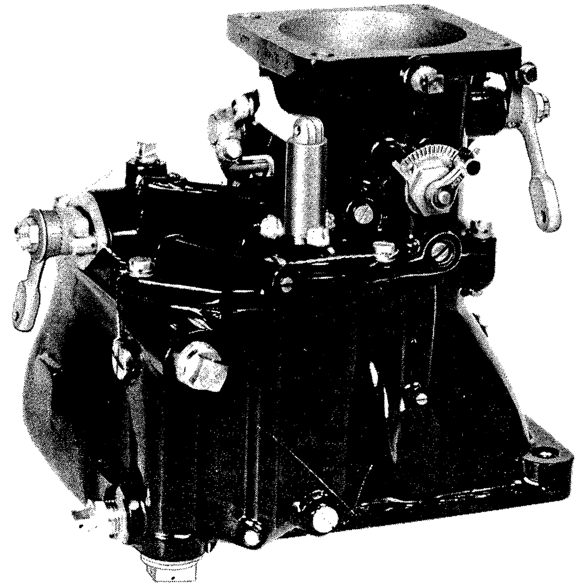


NA-Y9E1 Carburetor and Elbow

4. **Model:** A letter which follows the numeral indicating the nominal rated size of a carburetor is used to designate the various models of a given type.

5. **Model modification:** On some carburetor models, a number will follow the model letter, which indicates that the original has been modified.

6. **Setting number:** A manufacturer's carburetor setting number is an arbitrary number assigned to a particular combination of venturi, jets, bleeds and adjustments which give the desired operational characteristics in the particular model carburetor to which it is assigned.



NA-R9B Carburetor

General Description

The NA-R9B carburetor, which is standard on the Wasp Jr., R-985 engine, is a single barrel, up draft carburetor. This relatively simple, venturi type carburetor has a single float, and is equipped with an economizer, manually operated needle valve type mixture control, accelerating pump, and self-primer. The NA-Y9H carburetor used on the Wasp R-1340 engine is basically the same as the NA-R9B carburetor except that it has two barrels, two floats, uses the back suction type mixture control and has idle cut-off. The NA-Y9E1 carburetor is essentially the same as the NA-Y9H with the exception of the fact that it does not have a self-primer.

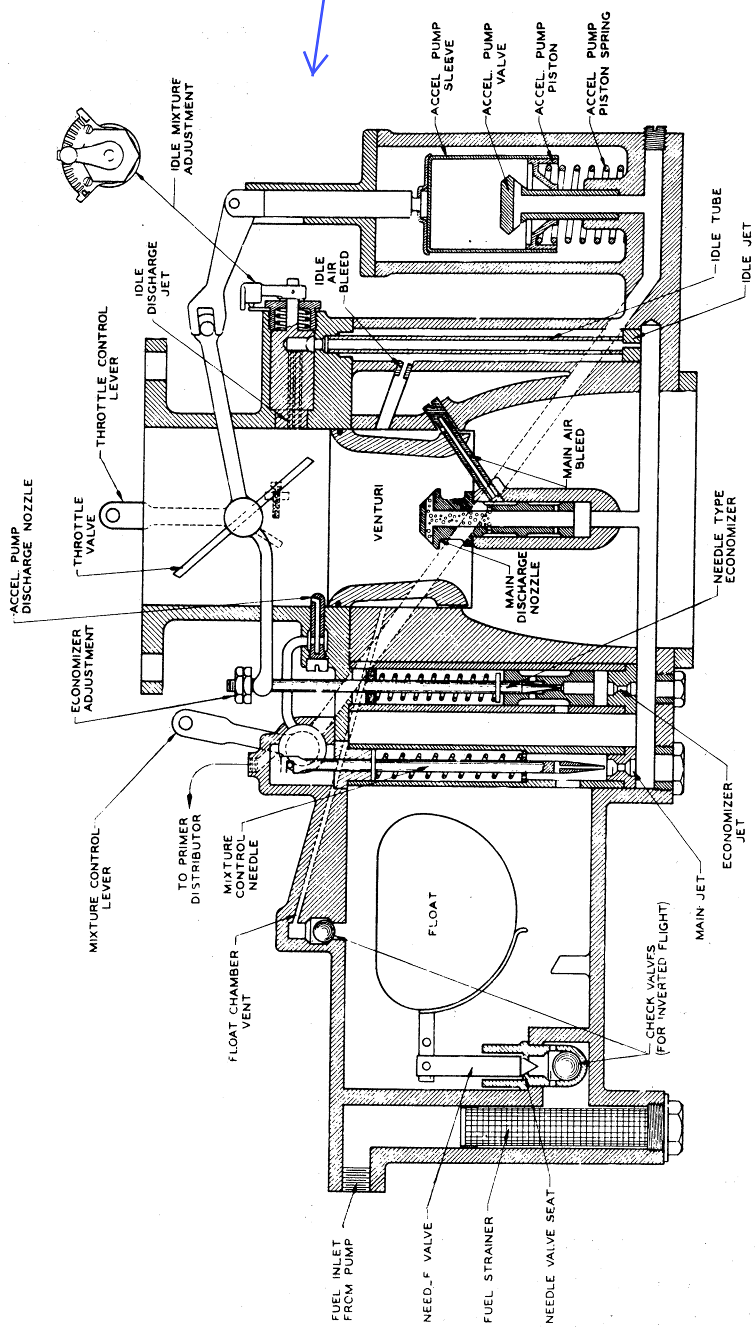
Main Metering System

The main metering system consists of a venturi, main jet, main air bleed, and a discharge nozzle. It is fortunate that the pressure differential in a venturi varies as the square of the air velocity through it, while the fluid flow through a fixed orifice varies as the square root of the pressure drops across it. Thus, theoretically, the fuel flow through a simple carburetor will vary directly as the velocity of the air through the venturi, and if the density of the air is maintained constant in the venturi, the fuel flow will theoretically vary directly as the mass air flow. Actually, this theoretical condition does not strictly hold true, but the fuel flow increases at a more rapid rate than the increase in mass air flow. To correct this condition and assist in the vaporization of the fuel as it leaves the carburetor, Stromberg uses the principle of bleeding air into the fuel as it enters the discharge nozzle. This air bleed is known as the main air bleed and is a jet, bleeding air into the main discharge nozzle passage. Such a jet provides a constant F/A ratio throughout the useful range of airflows required by the engine. The fuel-air ratio can be modified as desired by the proper selection of the dimensions of the air bleed, main jet, and discharge nozzle.

Idle System

It is necessary to have an idling system to take care of the engine at lower speeds. During idling, the air velocity through the main venturi is very low and there is not sufficient venturi suction to draw fuel from the discharge nozzle. At the same time, however, there is

Not the kind used on the Wasp



Schematic Diagram of NA-R9B Carburetor a very high suction on the intake manifold side of the throttle and, therefore, the fuel feed is arranged to deliver into this region of high suction. To utilize this suction, a complete discharge jet system in miniature is used with the fuel metering jet, air bleed, and discharge jet, opening into the small air passage around the throttle, formed by the slot in the idling discharge jet. Idling adjustment is accomplished by adjusting the idle discharge nozzle in connection with the throttle valve opening.

Economizer

It is desirable to have a lean mixture for maximum economy at part throttle or cruising speeds, and a much richer mixture for climb and take-off, for the cooling effect at high power. In order to obtain this change in mixture ratio, as the throttle is opened, various forms of economizer systems are used. These, in their present form, are in reality enrichening devices. The NA-R9B, NA-Y9E1, and NA-Y9H carburetor economizers consist of a needle valve, which is opened by the throttle at a predetermined throttle position, and permits a quantity of fuel flow through the economizer jet in addition to that furnished by the main metering jet, to mix with the air in the carburetor.

Mixture Control

As the airplane ascends to altitude, the atmosphere decreases in pressure and temperature resulting in a decrease in density. The weight of the air charge taken into the engine decreases with the decrease in air density, cutting down the power in about the same percentage. In addition, the mixture proportion delivered by the carburetor is affected, the mixture becoming richer at a rate inversely proportional to the square root of change in air density. In order to compensate for this change in mixture, a mixture control is provided on all Stromberg Aircraft Carburetors. The NA-R9B carburetor uses the needle valve type of mixture control. The needle restricts the flow of fuel to the jets. The NA-Y9E1 and NA-Y9H carburetors, used on the Wasp engine, employ the back suction type mixture control with idle cut-off which reduces the fuel flow by lowering the pressure in the float chamber in order to reduce the flow of fuel through the jets. A small nozzle in the venturi which has a restricted passage leading to the float chamber produces the suction in the float chamber. When the mixture control is in full rich position, the float chamber is vented to the air scoop. As the mixture control is gradually leaned off, the valve closes off the float vent which in turn lowers the float chamber pressure.

Inverted Flight

Float type carburetors are designed to operate satisfactorily during all airplane maneuvers. During upside down flying, the float action reverses. Fuel is pumped to the jets at fuel pump pressure which would cause the carburetors to run very rich. Check valves are used to restrict the flow of fuel to the needle valve and to shut off the float chamber vent. Special fuel and oil systems are required if the airplane is to be operated upside down for a long period of time.

Accelerator

For quick acceleration of the engine, a quantity of fuel in addition to that supplied by the main metering system is required. A fuel pump, operated by the throttle has, therefore, been incorporated in the design. This pump gives a positive accelerating charge, regardless of the suction existing in the carburetor. It delivers this charge as a momentary spurt of fuel followed by a sustained discharge for a few seconds.