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310-FM 483 Instructions on DELIVERY OF THIS INFO -
Stromberg NA-R5, NA-R5A, and NA-R6 Carburetors MATT

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Introduction

The Stromberg NA-R5, NA-R5A, and NA-R6 carburetors are designed to meet the exacting requirements of air cooled engines. The principles of operation, described in these instructions are quite similar to those used in all Stromberg aircraft and motor car carburetors. The specification or setting in these carburetors is the result of a great deal of test work conducted by the engine and carburetor manufacturers in the laboratory and in flight and should not be changed unless it is absolutely certain that a change is necessary to meet unusual operating conditions. The NA-R5 and NA-R5A models have a nominal barrel diameter of 2 inches and an actual barrel diameter of 2-3/16 inches and differ from each other in arrangement of the throttle with respect to the float chamber. The throttle shaft in the NA-R5 is perpendicular to the fore and aft centerline of the float chamber, whereas, on the NA-R5A the shaft is parallel to the float chamber center line.

The nominal barrel diameter of the NA-R6 is 2-1/4 inches, the actual diameter 2-7/16 inches. The throttle shaft on the NA-R6 is perpendicular to the fore and aft center line of the float chamber. The float level is 3/4 inches below the parting surface of the body on the NA-R5, NA-R5A, and NA-R6 carburetors.

Installation

The carburetor should be so mounted on the engine that the float chamber is at the side of the throttle barrel, preferable with fuel inlet to the rear. With this arrangement the fuel level at the main discharge nozzle, as maintained by the float mechanism, remains constant in either a climb or dive and is only change by a side slip or skid. With the carburetor mounted in this manner the throttle control lever will be at the left side of the NA-R5 and NA-R6, and at the rear on the NA-R5A, with the mixture control at the right side as viewed from the rear of the engine. The fuel inlet is a 1/4" pipe tap connection located in the main body at the rear of the float chamber. If a fuel pump is used a pressure of 3 lbs. per square inch at the carburetor is recommended and provision should be made for a fuel pressure gauge connection in the fuel line near the carburetor. If a gravity feed system is used the tanks should be so located that the minimum head of fuel on the carburetor inlet is 24 inches under all normal conditions of flight.

The manual mixture control of the NA-R6, when used in the tank installation, should be wired in the full rich position.

Starting

The procedure to be following in starting depends somewhat upon the engine, and the primer equipment furnished by the engine manufacturer. The engine should be primed

either by the operation of the primer system, or if none is provided, by squirting gasoline into the exhaust stacks with an oil can and then turning the engine backwards to draw this fuel into the cylinders. The throttle should be closed and the engine turned over by hand or by the starter. This will produce sufficient suction at the carburetor to draw fuel out of the idle system up into the manifold. The ignition switch should then be turned on and the engine started. An accelerating pump connected to the throttle furnishes additional fuel for acceleration and may be used to keep the engine running after a start in extremely cold weather by quickly opening and closing the carburetor.

Adjustment

The main and economizer metering jets used in the carburetor are of the fixed orifice type, and their size as well as the remainder of the carburetor specification have been determined by test work, as previously mentioned, so that no adjustment for cruising and full throttle speeds is required. An idle adjustment is provided to take care of slight production variations in the carburetors and engines. This consists of an idle discharge nozzle which may be rotated by means of an idle adjustment lever. A quadrant is fastened to the carburetor body behind this lever and indicates by the letters "R" and "L" the direction to move the lever to obtain a richer or leaner idle mixture. This quadrant also acts as a locking device for the idle adjustment. A throttle stop is provided on the throttle shaft next to the throttle control lever, which should be adjusted to obtain the desired engine speed. Both the throttle stop and the idle adjustment should be set with the engine hot to obtain proper idling speed and smooth operation.

Servicing

Once the carburetor is properly installed and the idle adjustments made, very little attention is required in service. A fuel strainer is provided below the fuel inlet of the carburetor, and may be removed by the removal of a square head nut. The strainer should be removed frequently, to get rid of any dirt or water which may have accumulated in the strainer chamber. The entire carburetor should also be inspected to see that all parts are tight and properly safetied, and a small quantity of oil put on the pump operating mechanism.

Description and Functioning of Carburetor

Float Mechanism: A conventional type of float mechanism located in the float chamber having ample fuel capacity to operate in all ordinary maneuvers is used. This float mechanism is adjusted at the factory to obtain the proper fuel level, and requires no adjustment in service unless it is necessary after a long period of service to install new parts. For information concerning the proper level see the section of these instructions pertaining to overhaul.

Main Metering System: The metering system used in the carburetor is of the plain tube type with an air bleed to the main discharge nozzle which is secured in a boss in the air intake with the discharge holes near the center of the venturi. The main air bleed

consists of a tube screwed into the main discharge nozzle boss. This tube has a hole drilled through the center, and a side hole, which acts as a restriction near the upper end. This arrangement permits air to flow from the space behind the venturi through the side hole and into the annular space between the main discharge nozzle and the main discharge nozzle boss. From this space it passed through side holes and mixes with the fuel in the main discharge nozzle. The actual metering of the fuel is accomplished by the main metering jet located in the passage between the discharge nozzle and the float chamber. This metering system provides a practically constant mixture ratio over the cruising range of speeds.

Mixture Controls: The altitude or mixture control on the NA-R5, NA-R5A, and NA-R6 carburetors consists of a needle valve and seat located directly above the main metering jet in the passage between this jet and the float chamber. This needle is operated by an eccentrically located pin on the shaft to which the mixture control lever is attached. A movement of the control lever towards the lean position lowers the needle into its seat and restricts the flow of fuel to the main metering system. A small hole drilled through the needle valve seat permits some fuel to flow even when the needle valve is on its seat. The size of this by-pass hole determines the range of the mixture control. Fuel flows from the float chamber to the space around the mixture control needle valve through side holes drilled above the seat.

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Economizer Metering System: The economizer system, as applied to this carburetor, is in reality an enriching device, which provides a rich mixture at full throttle for maximum power and permits a leaner mixture at cruising speeds for maximum economy. This enrichment is obtained by the use of a valve and valve seat located in the float chamber beside the accelerating pump. When this valve is open, fuel is drawn from the float chamber through a drilled passage to the main discharge nozzle. This economizer valve is held in closed position by a spring at idling and cruising speeds, but is opened at an engine speed of approximately 200 r.p.m. below the full throttle speed, by a stamped arm fastened to the accelerating pump stem.

Idling System: As the main metering system will not function at very low air flows (low engine speed) an idling system is provided. This consists of an idle tube with an idle metering orifice near the bottom and air bleed holes in the side, an idle air bleed and an adjustable idle discharge nozzle. Fuel for the idle system is taken from the annular space around the main discharge nozzle, passes through the idle metering jet, and mixes with the air from the idle air bleed in the idle tube and then passes into the carburetor barrel above the throttle through the idle discharge nozzle. The idle system operates up to an engine speed of approximately 900 to 1000 R.P.M.

Accelerating Pump: For smooth and quick acceleration of an aircraft engine a quantity of fuel in addition to that supplied by the regular metering system is required. A fuel pump operated by the throttle has therefore been incorporated in the design of the carburetor. This consists of an inverted cylinder or sleeve connected to the throttle in such a way that it is depressed as the throttle is opened. Within this cylinder is a piston free to slide on a vertical stud. The upper end of the stud and the piston form a valve which is open when

the piston is depressed, thus opening the fuel passage from within the cylinder to the center hole of the stud and the passage leading to the main discharge nozzle. During any fixed throttle position the piston is held against the valve seat by a spring, and no fuel can flow to the discharge nozzle. If the throttle is opened quickly, the piston is forced down by the gasoline within the cylinder and fuel is forced out the discharge nozzle. When the throttle movement has been completed, the spring returns the piston to its seat, forcing additional fuel out of the nozzle. As the throttle is closed the valve remains closed, and fuel is drawn into the cylinder through the clearance space between the cylinder and the piston.

Overhaul

Disassembly: The carburetor should be disassembled for cleaning and inspection each time the engine is given an overhaul. After the carburetor has been removed from the engine and the hot spot and air intake or heater taken off, the halves of the carburetor may be separated by the removal of the fillister head screws at the parting surface. The mixture control needle and the pump sleeve are held in the upper half or throttle valve body, and will be drawn out of the lower half as the upper half is lifted off. The venturi is held in the lower half by a hexagon head screw. Remove the float fulcrum screw and the float and needle valve. Also remove the plugs in the air intake flange under the main and economizer jets.

If there is any indication of dirt or foreign matter in the float chamber it is advisable to remove the main discharge nozzle so that it may be thoroughly cleaned. Remove the pump valve and piston and also the fuel strainer. The removal of the above parts will permit a thorough inspection and cleaning of the carburetor and unless replacements are necessary, further disassembly is not recommended.

Inspection and Cleaning: The bodies and all parts should be thoroughly cleaned in gasoline, and all passages blown out with an air hose.

The needle valve and seat should be inspected for wear, and if the needle valve is badly grooved both parts should be replaced. The needle valve is made of stainless steel and the seat made of monel so that under ordinary service conditions these parts should last for many hundreds of hours. Check the main and economizer metering jets, the mixture control, and the float needle seat, to make sure they are tight. See that the throttle fits in the barrel tightly when in the closed position, that the throttle stem and bushings do not have excessive clearance, and that the pump operating lever and stem are in good condition and operate smoothly.

Table of Clearances

	Min.	Desired	Max.	Correction
Float Fulcrum Pin in Float Bearing	.001"L	.0025"L	.009"L	Replace Float and/or Fulcrum Pin
Float Bearing End	.006"L	.015"L	.032"L	Change thickness of Gasket

Play				under Fulcrum Pin
Float Pin in Needle Slot	.007"L	.014"L	.020"L	Replace Float if Pin is Worn or if Needle is worn
Throttle Shaft and Bushings	.001"L	.0015"L	.007"L	Replace Bushings and/or Shaft if worn
Accelerating Pump Piston and Sleeve	.0035"L	.0045"L	.009"L	Replace worn parts
Accelerating Pump Stem and Bushing	.001"L	.002"L	.010"L	Replace worn parts
Accelerating Pump Fork and Block	.0005"L	.0035"L	.010"L	Replace worn parts
Mixture Control Needle Stem in Guide	.003"L	.005"L	.015"L	Replace Guide
Mixture Control Needle in Seat	.010"L	.010"L	.025"L	Replace Seat and/or Needle
Econ. Valve in Seat	.005"L	.007"L	.015"L	Replace worn parts
Float Level	Minus 3/64"	As specified	Plus 1/64"	Change thickness of Float Needle Seat Gasket

Replacement: If due to accident or wear after long service it is necessary to make replacements, the parts should be obtained from the Stromberg Carburetor Division of Bendix Aviation Corporation, South Bend, Indiana, or an authorized Stromberg aircraft carburetor service organization. Ordering by the part numbers as shown on the attached assembly drawing, will greatly facilitate service.

It is recommended that in replacing a float needle valve or needle valve seat, that these two assemblies be installed at the same time, as it is very difficult to fit a new needle valve to an old seat or a new seat with an old needle.

The float level on these carburetors should be $\frac{3}{4}$ " below the parting surface on the NA-R5, NA-R5A, and NA-R6, and is dependent upon the thickness of the gasket under the needle valve seat. The level should be checked under the conditions encountered in service as regards the fuel used and the fuel pressure or head at the carburetor. If a fuel pump is used, a pressure at the carburetor of 3 lbs. per sq. in. (117" gasoline at .710 sp. gr.) is recommended and should be used in checking the level. If after fitting new parts the level is not correct, remove the needle valve seat and put in thicker gaskets to lower the level, and thinner gaskets to raise it. One sixty-fourth inch change in gasket thickness will change the level approximately $\frac{5}{64}$ ".

The needle valve type mixture control used in the NA-R5, NA-R5A, and NA-R6 carburetors is operated by an eccentric pin which is part of the mixture control assembly. The mixture control lever and stop are one piece and it is important that it should be pinned to the stem so that the proper angle with the eccentric pin is made. This may be obtained by placing the mixture control stem, without the stem nut, spring and packing, in the throttle valve body with the eccentric pin towards the pump mechanism and turning it until the distance from the parting flange surface to the outside of the small diameter of

the pin is 25/32". (See Figure 1). With the stem held in this position, place the mixture control stop against the shoulder on the stem with the stop surface against the casting (full rich position) and drill through the stop and stem. Then assemble the spring, packing and nut, on the stem, press the stop against the nut and pin in place.

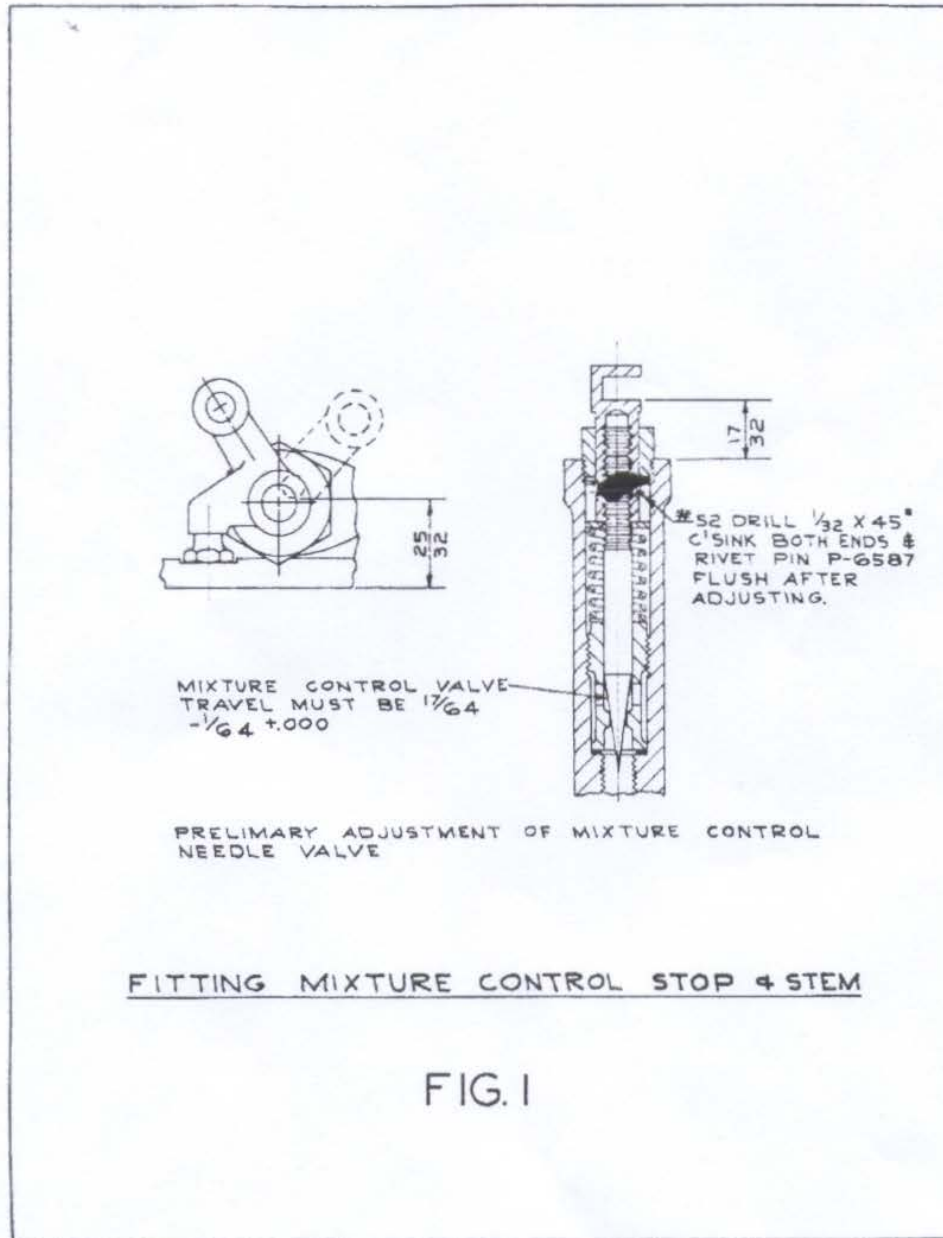
The mixture control needle is screwed into the needle holder and these parts should be so adjusted that a needle valve travel of 1/4 inch and a lever travel of approximately 75-deg is obtained. An approximate adjustment may be obtained before assembling the needle valve in the upper half by setting the bottom of the needle holder slot 17/32" from the main body parting surface with the needle valve held down against the needle valve seat. When this preliminary adjustment has been made, assemble the two halves together and determine if the needle travel is as given above. This may be measured by the removal of the plug and metering jet from the bottom of the carburetor. When in the full lean position, the needle stops against the needle valve seat; when in the full rich position, the stop strikes the casting. Solder and pin the mixture control needle in the holder to prevent his adjustment changing in service. In assembling the mixture control needle assembly, the slot in the needle holder should be placed with the opening towards the pump mechanism.

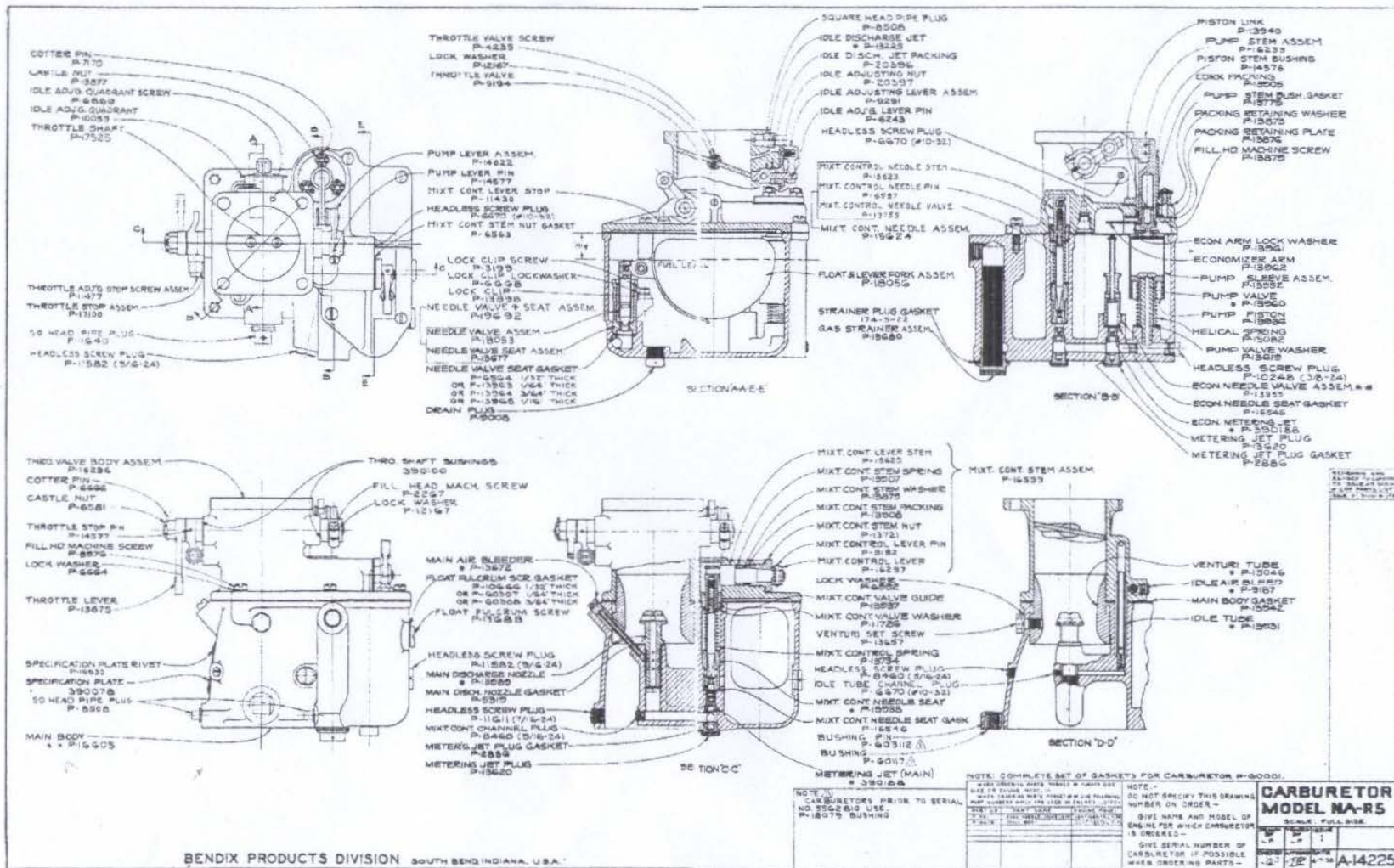
As previously explained the economizer is operated by means of a stamped part called the economizer arm, which is a part of the pump stem assembly. As the purpose of the economizer is to give a rich mixture at full throttle and a leaner mixture at cruising speed, the economizer arm has to be set so that it will open the economizer valve at a specified degree throttle opening. This setting is made before the pump lever is pinned to the throttle shaft. The economizer setting is given on the specification sheet in degrees. By adding 20-deg. (the angle of the throttle valve) to the setting given, the angle that the valve makes with the horizontal flange surface is found. The pump lever should be set on the throttle shaft so that when the throttle valve is opened to the desired angle the economizer arm can be felt striking the top of the economizer valve. When the lever has been correctly set, drill and pin it in place.

Overhaul Tools

Name	Size	Tool Number	Net Price
Handle, Sliding Offset	3/8" x 8"	T-19279	\$1.05
Handle, Metering Jet Screwdriver		T-24950	.80
Reamer, Throttle Bushing	.4395" x 15-5/8"	T-16910	12.25
Remover, Throttle Bushing	3/8" to 9/16"	T-19492	1.50
Screw Driver	.037" x 3/8"	T-18170	1.85
Screw Driver	.047" x 1/4"	T-18172	1.85
Screw Driver, Type A&B Jet	8"	T-24923	.85
Screw Driver, Socket	.062" x .687"	T-19272	1.60
Screw Driver, Econ. Assy.	.062" x .547"	T-19278	1.25
Socket, Double Hex.	9/16"	T-24944	.85
Socket, Square	11/16"	T-24963	.95
"T" Wrench Extension	5" x 3/8"	T-20183	1.20

Socket, Screw Driver	.068" x 3/4" with .484" pilot	T-19276	1.95
Reamer, Taper Pin	No. 0000	T-24957	3.25





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