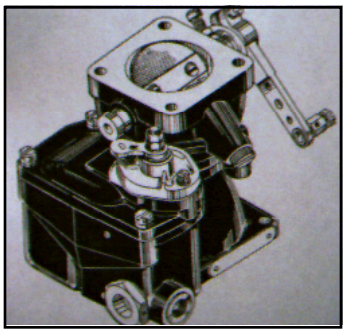
Stromberg Carb Fuel Level and Tools

CARBURETOR FUEL HEIGHT-SETTING TOOL & HOWTO for the STROMBERG NA-S3A1

History



The Stromberg carburetor used on our c-85 and c-90 Continental engines is becoming more of a relic every year, and maintenance and overhaul of them are not as big a portion of the training of the new A&E's these days. Consequently, it might be handy to be aware of the noted points in this article and have it available when you assist the A&X to do an overhaul or simply a have a looksee once in a while. During the period when the Strombergs were the carburetor nearly every engine had, practical experience abounded and so did information from the old hands, but that day is gone. These tips were found out the hard way.

These carburetors were designed to use a stainless steel needle and sharp-edged bronze seat. Not surprisingly, they would often leak and the only cure then was to lap them (see the article on "Needles" for how to do that for either the stainless or the Delrin set). Many owners did not bother and simply turned off the fuel and let the engine run until it shut down. In 1943, a magic cure was waiting for the carburetors made after the war....Neoprene. It and a rounded seat meant that a leak was rare indeed. With the advent of the "new" fuels and their additives, and some fly-by-night makers of the tips, some Neoprene needle tips would swell and choke the engines so many have gone back to the stainless or changed to the Delrin needle.

It is mentioned here and later because to set the level is easy, but to prevent seeps is hard unless one takes the time to lap the stainless or Delrin needles to prevent them from leaking. The second leak path is explained in these articles as improper torquing of the seat. Even with the level set properly, there are still some Stromberg carburetors which were shifted from one plane type to ours without realizing that some were made with a bleed hole too low such that the carburetor would weep via that hole. During this setup and observation, you can find out if that will be your fate and if you have the carburetor meant to be on the plane.

Characteristics:

Time after time in the net, there are complaints and exclamations to the effect: "the Stromberg always leaks", and that rumor or old hangar tale is right up there with the statement that: "the Stromberg mixture control does not work!". Nonsense and double nonsense. Many are not aware that someone in the past changed carburetors so there are a bunch out there which had one of the bleed holes drilled in the wrong place with the outlet below the fuel level when used in our planes...guess what?....the carb leaks on the ground. Many of the complaints are due to the mis-adjustment of the level of the fuel. Many are due to the fact that, when the needle was changed from one style to the other because of the new fuels or to comply with the suggestion to go to the Delrin needle, the level was not re-adjusted, or they neglected to use a new seat with shape to match the replacement needle and that combination can never seat properly or the weight needed with the Delrin is not added. The last one, a biggee that is caused by the person doing the level setting, is to improperly torque the seat so that the fuel leaks via the threads of the seat; that one is common because the observation period after the acceptance of the level is too short to see what happens long term. There is a lot of difference between a ten minute observation on the bench and three days sitting on the line. The person who adds one combination and then another of the gaskets gets tired of removing and replacing and so they cheat a bit by loosening the seat to get the level, not realizing they are causing the long term leak via the threads of the seat.

To Stromberg's shame, they neglect to tell the installer what the adequate torque to prevent leaks is. The service letter reaffirming the need to "properly" torque the seat was written....in 1941.

To set the level for the short term is relatively easy. To set it for the long term, you have to observe it for a significant period and make the effort to prevent a seep via the threads of the seat or a mis-matched or non-lapped needle/seat set.

What setting the level means:

The level in the Stromberg is determined by the combined thickness of the gaskets under the needle seat. Honest. Weird it is and any right-minded designer would have made the float position be the determinant but not in this carburetor. The gaskets which go under the seat come in a kit, and vary in thickness as listed in the article "Stromberg Gaskets Howto" which is now part three of this article. You put in a guessed combination, see what the level is, find it wrong and so take the seat out and use a different combination of gaskets and do it again until you get the right balance for the sanctioned level.

It can get frustrating, especially if you think you finally have the proper level and then measure the needle movement to find that it does not meet the 0.048" minimum necessary to let in enough fuel when a lot is needed.

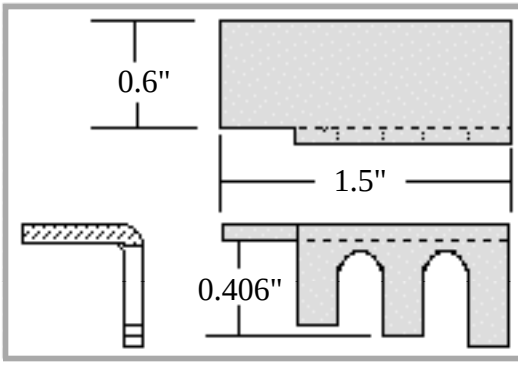
The All-Important Gaskets:

Setting the fuel level in the Stromberg carburetor for the C-85 and C-90 engines is a bit "odd" because: 1) the thickness of the gasket stack under the needle seat determines the fuel height, 2) the effective thickness of the gaskets is only realized when they are compressed by correctly torquing the seat, 3) there are no guidelines as to how many of what thickness to start with, and 4) there is no easy guide to determine the fuel height. All that said, the job is easy if you make yourself a simple tool and follow these guidelines. Gasket information which follows later includes a picture of the gasket set.

Your A&X will want to confirm the logic and correctness of the overhaul and level setting steps, so make sure they are aware what is to be done and that they will take part before you start. Assisting them to do it is best. Finding information such as in this note is getting more difficult each year. Some artistic liberties are taken in order to make the sketches understandable rather than precise as to relative sizes of the parts.

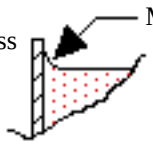
The Height Tool:

The tool for confirming the fuel level illustrated here is made from a piece of aluminum angle and the dimensions shown are what came of using a piece that size so it would fit in the carb as well as establish the fuel level range. The only critical dimensions are those of the lengths of the "fingers". The ideal distance from the top edge of the bottom half of the carburetor to the fuel level is 13/32cds (0.406) when the thickness of the gaskets under the inlet seat is correct. Without a tool like this, it is very difficult to properly assess the fuel level because there isn't much space, not much "seeing" space, and the fuel "JUMPS". (NOTE: These dimensions and the 13/32cds fuel level are correct for the C-85). See the optional method in the Addendum.



1. Material is 0.06 aluminum angle
2. Break all edges
3 The cutouts between the legs are necessary to prevent the gasoline from "jumping" from one leg to the other.
4. The center leg is the 13/32cds dimension (0.406), the ideal fuel height. The left leg is shorter by 3/64s and the right is longer by 1/64th of an inch to cover the allowable range.

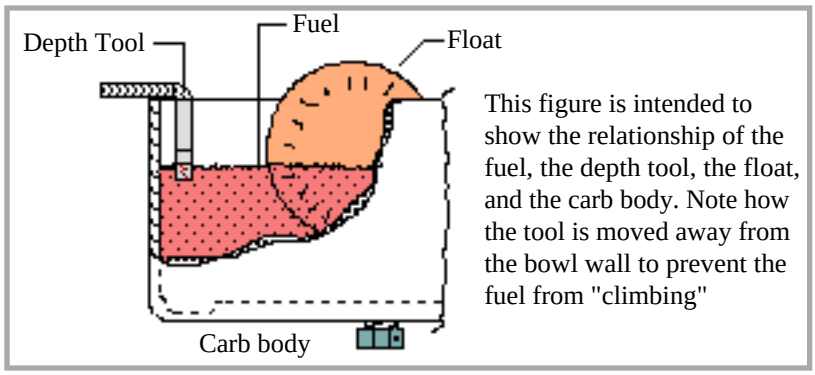
The angle, height and direction are dependent on the viscosity, the cleanliness of the container surface. For a greasy surface, the meniscus goes in a negative direction. On the far



One of the nice words taught in chemistry is "meniscus", and it means the arched interface of any fluid to any surface above the fluid level. How extreme the meniscus is is a function of the fluid's viscosity and the cleanliness of the wall where the

top of the fluid touches it-----for gasoline, with a low viscosity, there is a significant meniscus formed at the interface of the fuel and whatever tool is used to probe its level. Because the fuel seems to jump as the tool touches the surface of the fuel, it is difficult to determine the actual level of the fuel as closely as you would wish when considering the range of tolerance Stromberg specifies, but this tool makes it easier because it has a finger which is just right, another a little long, and one a little short of the ideal 13/32cds. The meniscus formed by the fuel at the surface of the inner walls of the carburetor is why the measurements have to be made away from the wall.

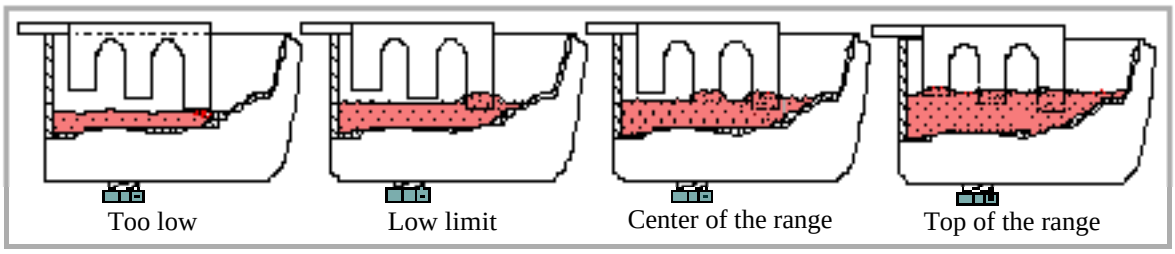
Note that there is a separation between the fingers; if you assume that a stairstep arrangement for the fingers would be easier to make and would be just as good, be forewarned that the meniscus which forms on the long finger as it dips into the fuel will lead to a capillary movement of fuel which makes it appear that the shorter finger is the actual depth, but when you make the tool as shown with the separation, there is no capillary action between fingers and so you get the best assessment of the level. The usual caveat of: "break all edges" is included on the sketch, and it is important to make sure there are no burrs on the bottom ends of the fingers because any little projection would start the climb of the fuel on the finger.



This figure is intended to show the relationship of the fuel, the depth tool, the float, and the carb body. Note how the tool is moved away from the bowl wall to prevent the fuel from "climbing"

It is important, whatever tool is used to measure the depth of the fuel, to make sure the measurement is made away from the wall of the carburetor. Unless there is a gap between the tool and the wall of the carburetor as shown, two things can modify the apparent depth, and these are: 1) the slight radius of the tool corner can sit up on the edge of the carburetor, making it easy to misjudge the height of the fuel, and 2) that bugaboo of the action of capillary action by fuel between the wall and the tool will force the fuel to climb a surprising amount between the wall and tool. There isn't much play room between the wall of the carburetor and the float, so we are talking here about a 1/16th or so separation of tool to wall.

The four scenes of the figure following illustrate the four possibilities of the fuel level-------much too low, then deep enough to touch the finger which is 2/64ths (2/64ths is used here because the tolerances of the level and the thickness of the gaskets under the seat are discussed in 64ths by Stromberg, so I have stayed with their convention), and then what appears to be about the right depth since both the too-long and the just-right fingers are immersed in the fluid, but the too-short finger is not. Finally, the other extreme of having all three fingers in the fuel, indicating that the fuel level is too high by at least 2/64ths.



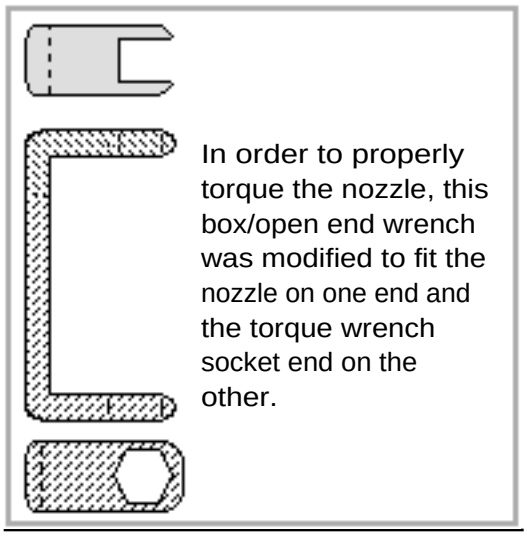
It is necessary, if you want a leak-free installation, that the needle and seat are lapped to be leak free. See the article on Stromberg needles and tips for that guidance. Although the Neoprene-tipped needle did not

need lapping, their use has been superseded by the stainless steel or the Delrin needles because of the sensitivity of some of the Neoprene needles to the new fuels or additives.

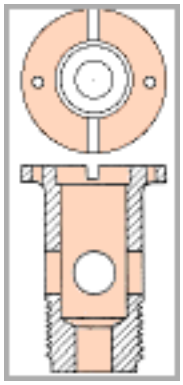
When observing the level over a half hour or hour, there can be a seep if the seat is inadequately torqued or because the needle/seat have not been lapped.

Carburetor Nozzle Torquing Tool:

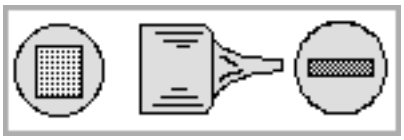
The tool here allows torquing the nozzle; without a tool such as this, a secure attachment to the nozzle during tightening is impossible unless one has a deep, deep socket wrench which will fit the nozzle. The tool shown here is easy to make if one has access to a torch since the wrenches can be easily bent in the vise once made red hot. If you are good at buying wrenches, you could get a combination wrench, with the box end for the nozzle and the open end the correct size to fit your torque wrench, normally 3/8ths or 1/2 inch------if the open end is not exactly the size needed to fit the torque wrench, the open end can easily be opened to the correct size with a mill or simply a good file and some patience. It is important to torque the nozzle, just as it is critically necessary to torque the needle valve seat.



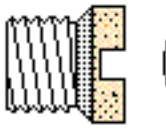
In order to properly torque the nozzle, this box/open end wrench was modified to fit the nozzle on one end and the torque wrench socket end on the other.



The fuel inlet needle seat, made of brass, looks something like this and it has two portions of a wide slot which are to be used to install and torque or remove the seat. Screwdrivers the size necessary to properly fit in both slot portions at the same time are few and far between, but it is important to use something with a wide enough and thick enough blade that there will be no tearout or burring, so we recommend the following tool.



This tool, a bit made to be used with a socket wrench, is just the ticket for installing or removing the needle seat since the size of the blade ensures a snug fit in the split slots of the seat. Tools like this are readily available from all socket manufacturers or adapt one to get the width necessary. It is necessary because of the importance of properly torquing the seat; if you don't do that "little" step, there will be an insidious leak via the threads of the seat which will defy a search.



The main jet needs an oversize driver to fit the slot as well. Stromberg cautions that care should be taken not to damage the slot so as not to affect the flow. The 45 is the size for all C-85s but one of three for the C-90.

Removing the float shaft is much easier if you have a good magnet, like those on the end of magnets made for mechanics to retrieve dropped tools, for it works to start the float shaft out of its nest each time so it can be grasped.

Safety

Safety should be paramount; since this setup suggests that you use fuel for the hydraulic head, never allow the mech to do the job where there is an open flame or sparks. Remember the water heater's flame and pilot light so common in a garage; it is better to be a bit uncomfortable than unsafe. The new fuels used

today are different and can cause rashes or itching if allowed to come in contact with the skin, so, if you spill some on yourself, halt and get it off quickly. Be safe.

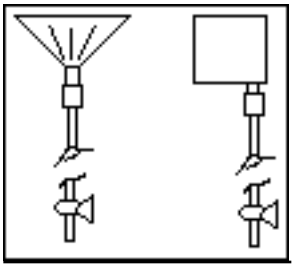
For reasons that will never be revealed to we earthlings, the gasoline that we treat so cavalierly is amazingly forgiving of our sloppiness-----but-----gasoline is astoundingly dangerous and don't ever forget it. This is why the A&X is so valuable because he knows the proper methods to stay safe. Set up the operation with that in mind----doors open, no smoking, no gas-fired water heaters around...and have the fire extinguisher at your elbow at all times. Gasoline can bite and it won't ask permission first!!! The greatest fear many of us have is to be hurt with fire; the "tank" we are talking about for these experiments is above us to give the hydraulic head necessary to simulate the pressure of fuel from tanks. Take no chances that the fuel can spill on you. Just having fuel on your skin will cause the skin to itch and, perhaps, hurt. Spilling fuel that is then ignited would ruin all our days. Think it through first, do the safety things or don't even attempt to do the job!!! Wear the right clothes which are known not to create static electricity.

Make sure the fuel holder is secure from accidental tugs or swipes----don't take a chance of getting it on you, especially in your eyes!!! Having spilled some of the new fuel on the bench stool I was sitting on during a session with a spare carburetor to write this story, I can attest that the new fuel will rigorously attack any sensitive skin, especially that of the crotch!!! Be somewhere you can take a quick shower or be "irrigated" with a water hose.

Bench setup

You want the carburetor level. The carburetor is unstable on the bench due to the position of the studs and the bottom plug; don't chance it staying balanced, since a tug on the hose will tend to knock the whole expensive assembly over. Make a nest to hold the carburetor, but do not use plastic as the nest, since the new fuels eat some plastics.

Our planes sit at about a 15 degree angle. Keep that in mind when making the nest and figure out a way to simulate that angle while observing the level after you are satisfied with it on the level. Doing it this way means that if you happen to have a carb with the "too-low" air bleed passage, you will be able to see it leak or if the level is too high such that it overflows the rear lip of the carb, then you have more work ahead. When the level is properly set, another check is to view the nozzle; you can see the fuel bulging from the openings of the nozzle, but they will not flow until a lower pressure is created by the action of the venturi with the engine running.



Hydraulic head to simulate the fuel pressure in the plane

Use a DOE sanctioned gas "can" for the "tank", placing the can above the carburetor by about 24 inches. Surgical hose between the tank and the carburetor works well since it is easier to force over the fittings, but be aware that the next time you look at it, it will be all cracked and hard; for a onetime use, it is the best.

One PSI per 40 inches of head for fuel is the guideline. Stromberg requires 0.5 PSI for the hydraulic head for setting the level (it works with much less, but they want this minimum used to be sure that the needle seats against some pressure).

Use the same fuel as you intend to use in the plane. Use fresh fuel. Stromberg lists a table to show the allowance for fuel density but we normally don't have the ability or tools to measure it, so try to do the tests on "normal" temperature days. Expect the adjustment session to take at least two hours, based on needing to twice change the gasket and check the level over time Understand that the new fuels react differently than we are accustomed to---they eat paints that used to be non-affected, and will cause an intense itch very rapidly if spilled on the skin. Start with any gasket thickness under the seat, and snug the seat. Let in the fuel and see which way you have to go, either needing to add or decrease the gasket stack thickness.

Steps During Adjustments:

With a dry bowl, release the fuel shutoff clamp/valve slowly, because the first fuel into the bowl will vigorously bubble and jet----right toward you or something that you did not want splashed with the fuel. Do not turn on the fuel and walk away, because the first gasket thickness might be such as to permit overflow. Don't bother to install the float shaft retainer set screw or the shaft hole plug during the setting session. When you are close to having the correct thickness of gasket, let the fuel in, and let it creep to the final level over a span of, say, five minutes. Remember that the rate of fuel entering is not constant---once the fuel level is near the maximum with the particular gasket set, the rate of fuel entry is very!! Slow. Don't hurry the "seep/creep". A little vibration of the bowl will assist getting to the final level a little sooner, and simulates the vibration of the engine.-

The 13/32cd gage needs to have the dip portion away from the wall of the casting; the fuel, especially in a clean carburetor, establishes a quite significant meniscus at the wall. You need to be sampling for level out in the "flat" portion of the fuel.

Trying to determine how close the dip portion of the gage is to the clear, invisible fuel (red fuel is great because the coloring helps to see it) is very difficult, since the slightest contact of the gage to the fuel will have a meniscus form instantly at the interface. It takes a little playing to move the gage tip toward the fuel slowly, and note how close it is to being all the way down when the fuel "jumps" up on it.

Remember. After you are "done" and have torqued the needle valve, let the system stand for at least an hour with the head of fuel attached to see if there is any seep. This is why it is best to leave the top of the carb off until after you are very sure there is no seep.

When the level is set correctly, a cross check is to note that the fuel can be seen in the openings of the nozzle but will not weep from them....it slightly bulges from them. A bit of suction is necessary to pull the fuel from the nozzle.

If it does overflow via the main nozzle, you will have to readjust the float level to be a tad lower----but first, determine if the drips are coming from the main nozzle or a hole in the side of the body near where the throttle meets the wall-----as Stromberg notes in their manual and in one of the service letters, some carburetors had their idle air openings positioned too low, and these can "leak" if the fuel level is higher than they are. The cure, in the service letter, was to plug the offending hole and re-drill another that was higher, opening above the fuel level. The important thing is to look before “correcting” the wrong thing. Don’t assume your plane has the original or assigned carburetor, either; we have had so many interchanged carburetors noted to us that one cannot be too careful. Stromberg tells how to compare the part numbers with the engines, so check it!!

This is being revised in March of 2004, and two months ago, there was another carburetor which had never had the leaky hole shifted as per the service letter....and it caused much grief until it was shifted.

Note: the C-90 float level is supposed to be 7/32", per a Cessna bulletin and Cessna notes, but not per the Stromberg manual. No one I know has ever used this lesser dimension, and it seems suspect!!! Until more research has turned up the "why"----just realize that there is another mystery. Now that Precision Engines Division of Precision Airmotive has the licenses for the Strombergs, ask them if there are any questions that cannot be answered by referring to the manuals.

The manuals state that the minimum float travel after the level has been set and all torqued is 0.048. That dimension is on every spec sheet. A too-small movement would limit the rate at which the fuel into the bowl could be replaced so check this dimension before tidying up.

That comment of not assuming applies to the main jet, too, since it was common “in the old days” to change the main jet if one were to be flying from high airports or simply because the engine ran better—but no one bothered to make a note in the log books, so check and check again. There are three sizes of main jets for the C-90’s depending on the carb part number and one size, 45, for the C-85’s. The size is impressed in the rim of the main jet. The diameter of the 45 hole is the same as the number drill bit 45, so check.

The fuel level tolerance:

The level will not be exactly the specified 13/32cds. There are discrete steps of fuel level brought about by the thicknesses of the gaskets. According to the book, the difference in level caused by a 1/64th change in total gasket thickness causes a 5/64ths change in fuel level. Assume the fuel level is 2/64ths high or low; when you increase or decrease the gasket thickness stack by only one 1/64th to accommodate, then you are changing the height by 5/64ths, which means that you are now 3/64ths low or high. The manual notes that the maximum number of gaskets to be used together is two. The manual notes the allowable tolerances, and the conclusion from them is that the level, if it can't be the desired 13/32cds, is better higher than lower.

Safetying the components

The 0.023 diameter safety wire is called out in the manual; the next larger can be substituted, though 0.023 (or 0.020) is a lot easier to manipulate within the body, and it gets out of the way better than does the heavier wire, an especially important item when considering the lack of clearances and possibilities of interferences of the bowl, needle, and float assembly. Use the smaller diameter wire, brass or steel, if you have it.

There are two main types of carb body; one has the safety hole near the head of the seat and the other has the hole near the base. There is a service note on how and where to make the holes if they are not there, and how to do the safetying.

Install the float shaft retainer and the shaft hole plug, reconfirm that there is no safety wire interference, and then do the final "proof" test to confirm the correct level.

Safety the main fuel nozzle? Yes, though the manual is not explicit, but does say that all "internal" safetying should be done, except for the seat, before the level adjustments are made. There is a hole in the nozzle hex for a safety wire, so----safety it as well, even though not stated in the manual.

Gasket Sets For Stromberg NA-S3A1 Carburetors For The C-85/90 Engines

Setting the level of the fuel in the carburetor depends on the gasket combinations

History:

In the "used-to-be" days, a low fuel level was confirmed when the engine would quit at full power in a high angle climb, and a too high level was confirmed by clouds of black smoke and drooling fuel if the owner did not turn the fuel off after flying.

More and more of the FBO's lack hands-on knowledge of what makes our older planes tick and finding definitive information is getting tougher and tougher as a result. During carb overhaul or float level adjustment or a change of the needle/seat combination, new gaskets are needed to adjust the fuel level and to keep the carburetor leak-free.

When this was first written, more for me and close associates who wanted to find out what really made the Strombergs "tick", I could make the statement about the level and the gaskets and be understood. Today, an addition to the explanation is called for. The float sits on a fulcrum with its body on one side of the fulcrum and the structure supporting the needle on the other; unlike many carburetors, one does not bend anything on the Stromberg to make things fit or seal and that includes no bending of the float arm to adjust the fuel level. Consequently, the fuel level is determined by the relative height of the seat. which is That position alteration is accomplished by a combination of different thicknesses of gaskets under the seat.

The Kits:

There are kits that contain just the gaskets and the answer you want to know is: "does the carb kit include the under-the-seat-gaskets of different thicknesses which permit you to set the float height"? the Stromberg overhaul manual and parts list calls out four thicknesses of the seat gaskets, 1/64, 2/64, 3/64, and 4/64ths. Whether those sizes are in the kits available from the various catalog sources is known only when you open them...the sellers do not know. This table indicates what I found in the kits from the sources noted. All were usable. The answer to the question is...yes.

Correct value Thickness	Fresno Air Parts	Leibee	Leibee	Leibee	Aircraft Spruce	Univair
1/64 Inch	1	1	1	1	1	1
2/64	1	1	1	1	1	1
3/64						
4/64	2	3	2	2	2	1

To confuse the issue a bit, there is a gasket, part number P12XXX, which is supposed to be the first tried under the seat; if it gives the correct level, quit. If it does not give the correct range, you can either remove it and install one of the gaskets above, or leave it in and add one of the gaskets. The manual states that a maximum of two gaskets can be used to get the correct height, so not getting the 3/64 thickness gasket is no loss. There is no hint as to the thickness of the P12XXX nor whether it is compressible, as are the gaskets above, very slightly. The combinations of 1, 2, and 4 thicknesses, two at a time, would yield 1,2,3,4,5,6, and 8/64's. With Univair's kit, the combos would be more limited, but only the 8/64s would not be possible. The message is that the kit should contain what you need, not what the kit vendor happened to throw together, so, open and measure right away to confirm that you have what you need.

According to the Stromberg overhaul manual, only two gaskets are "allowed" under the seat. Hmmmm.

The gasket sets from the different sources looked quite similar. A one-to-one comparison on the parts in them showed that the only differences were that some of the metal parts are of aluminum, instead of brass. In two of Leibee kits, some of the brass parts show evidence of discoloration/corrosion, apparently due to being exposed to some chemicals of the other gaskets. Nothing serious and a lot of these kits may be old but still usable. There are two different materials used to make the mixture control gaskets, those that go under the bottom plate and the one that seals the cap to the casting; one looks like it was made of the ends of horse hair---like the original---and the other looks like the material we would see in auto carb gaskets. Both will work, its just that the original material adheres too well, and is so difficult to get off.

All of the vendors noted advertise in Trade-A-Plane and any information noted should be checked and updated from those sources. Some vendors have the kits but do not list them, so you will have to ask.

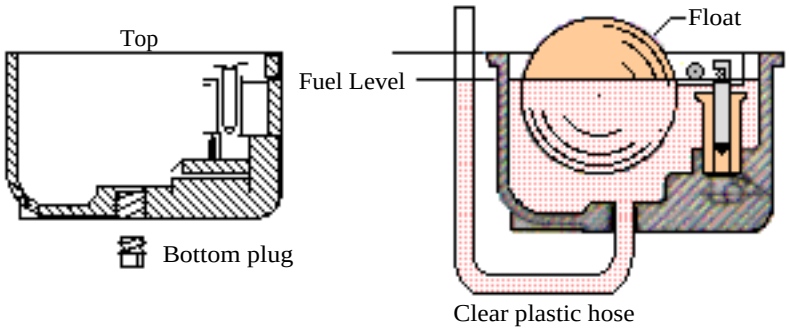
For the story on how to use the gaskets to set the fuel level and how to make the tools which make it straightforward, see the other Stromberg articles. One of the points made in the howto story when discussing the methods of fuel level concerns getting the combination of gaskets which set the level as desired while at the same time having the seat torqued such that there is not a sneak path via the threads of the seat and carb body. It is so very tempting to loosen the seat just a bit to make the level right. That is one reason the long term test on the bench is necessary, to ensure there is no leak path via the threads from under-tightening.

A typical gasket set contains the items shown here; the round purple item with the two holes is the gasket which goes below the bottom plate of the mixture assembly, and the three red and one purple are the gaskets of differing thicknesses which are combined under the seat to achieve the correct fuel level.

Note there are no gaskets for between the carb and the air box or between the carb and the induction spider. They are individually available from catalog sources such as Aircraft Spruce so it is better to order them at the same time as the kit.

An aside: To avoid adding another mostly empty page, I have shortened a report from one who just used the information to work on two carbs. He got the plugs in the bottom out easily and improved on the tube process shown on the last page. Using his test plug which has the nipple and some plastic tubing, one could check on the fuel level if it comes into question without taking the carb off or apart. Neat.

So many of the bottom plug have been "welded in" to the casting because they have been in place so long, I have been apprehensive to suggest an alternate method of viewing the fuel level, but enough of the owners who have been able to get the plug out indicates that the method might be possible for you. Breaking the casting by too much force won't be worth it, but if you can't get the plug out but are willing to drill through the plug and tap it to accept a smaller plug and a tube like the one shown, then this works as a measurement method, too. Tubes and gasoline also have a significant meniscus, so compensate for it. I have not shown how to secure the hose to the side of the casting, but keep it simple such as with a couple rubber bands.



IF !! you can get the bottom plug out, a visual level indicator can be made as shown. If you cannot get the plug out but are willing to drill and tap a hole in the casting to achieve this effect, the concept is indicated.

Input from one using the tube measure. I could not find a straight bladed screwdriver socket large enough for the seat so I went to Sears and bought a 3/4" drive to 1/2" adapter. I then took it to a machine shop with the seat and a drawing of what I wanted. Two days later I had a perfectly made screwdriver socket that matches the seat exactly. For the measuring tube I went to the hardware store and bought a plug similar to what was already in the carb bowl. They had several versions, hollow, solid and one with a nipple. I took the hollow one and drilled a hole in it to fit a piece of 5/32" O.D. brass tubing, as that is what I had laying around. I bent it into a u-shape and soldered it into the brass plug. I cut it down so I could screw it into the bowl and then slipped a short piece of clear plastic line on it, rubber bands around the top edge and now I have my gauge. I quickly tried it with water and it worked like a charm. A quicker way would be to take the plug with the small nipple and just slip the hose over it and curve it up. Thought I would pass this on to you so you could disseminate it as you see fit. Thanks again for the advice!!!

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