The debate rages on about pod air cleaners.

Some report good results while others can't get them to work well or, in some cases, at all.

There's a reason for the variability in success rates, but in order to understand what's going on we need to go all the way back to the beginning.

When the manufacturer set out to design an engine with a particular displacement, obviously they began with the cylinders.

From there they were under strict guidelines as to what was acceptable insofar as emissions and, to an extent that many folks don't realize, noise level. Air AND sound pollution.

With these restrictions in mind they designed the air cleaner, the cams, and the exhaust system as a working whole.

The primary determinants are the camshafts and the carburetors. The cams determine timing, lift, and duration of the valves opening, and the carbs regulate not only the amount of fuel that is allowed into the airstream but the degree to which the fuel is pre-mixed with air.

During the refining process the exhaust systems were tuned to provide a certain amount of back pressure AND to keep noise at a set threshold.

Now to the airbox.

It too was designed to create a predictable amount of resistance to air flow, as this phenomenon assists the carburetors by holding vacuum relatively steady given always-changing throttle openings. This in turn facilitates the carbs' ability to lift gas, which is very heavy compared to air, up through the jets both at the proper volume and with the proper amount of pre-mixing—aka “emulsification.” Given the same vacuum, too much air yields lean with a lot of excess heat while too little yields rich with incomplete combustion.

Your average person doesn't realize how fine the distinctions are, but *we* know that the side holes in the main jet holders (aka “emulsion tubes”) and nozzles vary in size, location, and number between carb models.

A CB750 has one pattern, CB900 has another, CB1100 another still. The emulsion tubes in CBX carbs are different from one model year to the next.

Imagine: teensy little holes you never knew about are largely responsible for how well your engine runs. There are even bike models that employ different emulsion tubes among the carbs in a single set, and if they get mixed up—you guessed it, they don't work right.

Overall efficiency of the system is predicated on what the designers established through long trial and error to be a “best case” solution to a whole bunch of variables: air density, temperature, humidity, elevation, proximity to large bodies of water, etc.—they all matter to one degree or another.

Airboxes are tricky in another way too:

When a piston goes down it creates vacuum in the throat of it's corresponding carburetor, and thus the airbox interior as well. The result is that all of the carbs are also put under vacuum—to a closely calculable degree. This “resonance effect” is factored in, and in fact the system both anticipates and reciprocally depends on it as well.

What I'm working my way around to saying should be obvious by now: With this much refinement built into them it becomes 100% predictable that disrupting air flow will bring about a corresponding effect.

And in the case of pods, it's all bad.

When we take away resonance and resistance we don't just reduce vacuum but we're altering the very characteristic of the air stream itself. Air isn't just compressible—it's also...*stretchable*. Consequently, we see not just a decrease in fuel exiting the jets but what little fuel *is* drawn up through them isn't properly emulsified.

It's between challenging and impossible to compensate for the resulting extremely lean condition by merely increasing jet sizes. This is owing to the law of diminishing returns: increasing jet sizes actually *diminishes* emulsification!

You can get away with some increase to be certain because street bike carbs are set lean at the factory—thank you, EPA—but beyond a certain point you'll have an engine that runs reasonably well at an increasingly narrow throttle range and above or below that it'll go either rich or lean.

Race bike carb builders use this knowledge to optimize power at wide-open-throttle with *comparatively* less regard for small throttle openings.

But, for street/recreational bikes the exact opposite is true for the simple reason that for “around town” riding—and this is another thing that most folks don't know—you get most of your fuel from the slow circuit. We can tolerate jetting a tad lean at very small throttle openings (easier starting and nice response off the line—especially on carbs with an accelerator pump) but we want to tend ever so slightly toward rich at the most-used range because it gives us cooler running temps and therefore longer engine life.

So, what does all this high-minded theorizing actually mean in the universe of practical reality?

Very simple. Although I strongly favor the stock airbox I'm not dead set against pods. It's just that there are some caveats, which I can state in a “universally applicable” 2-part rule:

First, your compression and valve clearances must be “race-ready.” The degree to which they're not optimal is the degree to which you *will* have trouble. Let's say that you have a 1979-1983 Honda DOHC inline-four or any year CBX. (They all have the same compression ratio.) If your compression is below 150 PSI you'll have increasingly frustrating times with pods. Below 120, while your bike will run just fine on the stock airbox you'll never get pods to run right no matter what you do. If you combine poor compression with below-spec valve lash, you're lost.

Second, combine your pods with a performance main jet/slide needle combination such as DynoJet. The ability to adjust that which on stock carbs are fixed parameters—needle length, needle height, and fuel flow rate through the jets—allows us to establish a far broader range of “healthy” fuel-air mixture than up-jetting alone.

Keep the rubber side down.