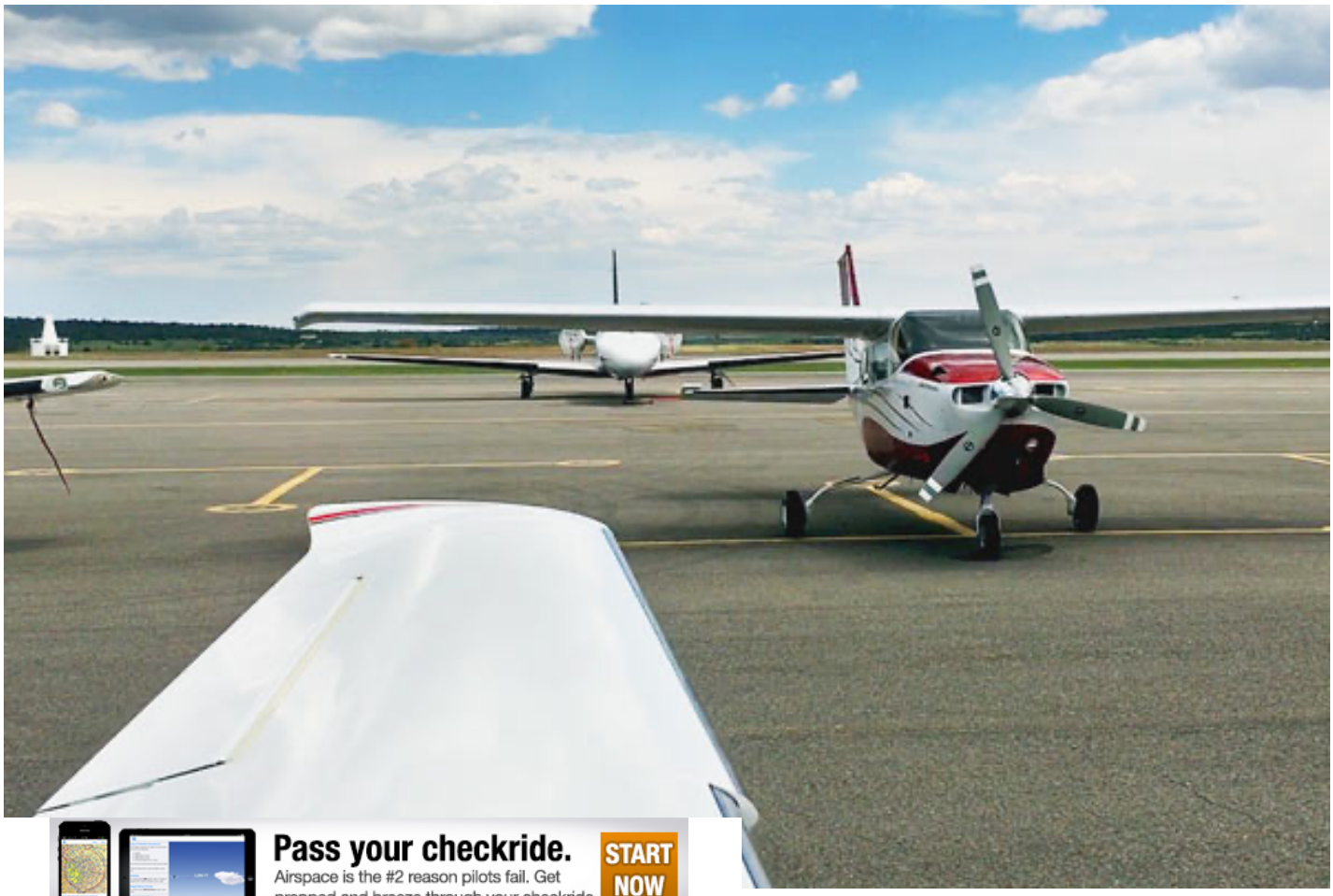
The Pros And Cons Of Carbureted vs. Fuel Injected Engines

By Swayne Martin | 09/14/2017 | Previous | Next

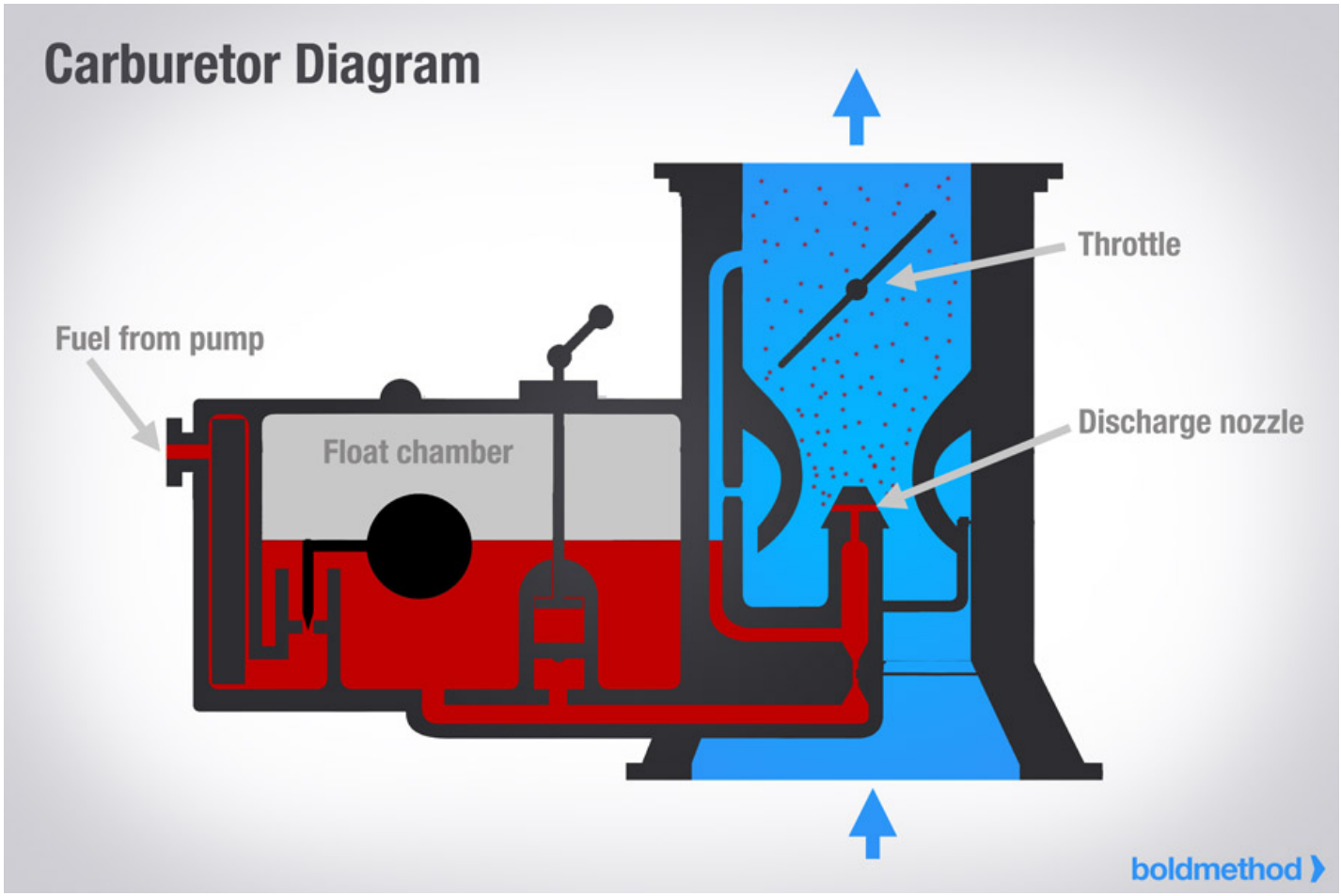


There are two main types of fuel induction systems in airplanes: carburetors, fuel injectors. Each system has benefits and drawbacks - here's why.

Let's start with a basic systems overview.

Carbureted Engines

Carburetors house a float-type chamber, where fuel is collected and distributed to the induction system.



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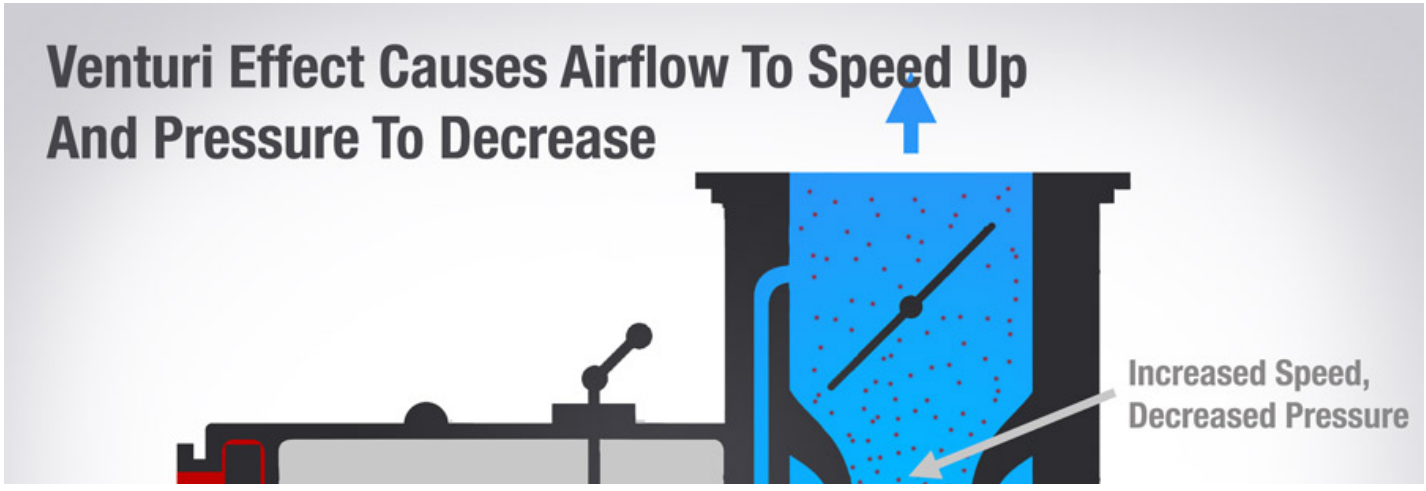
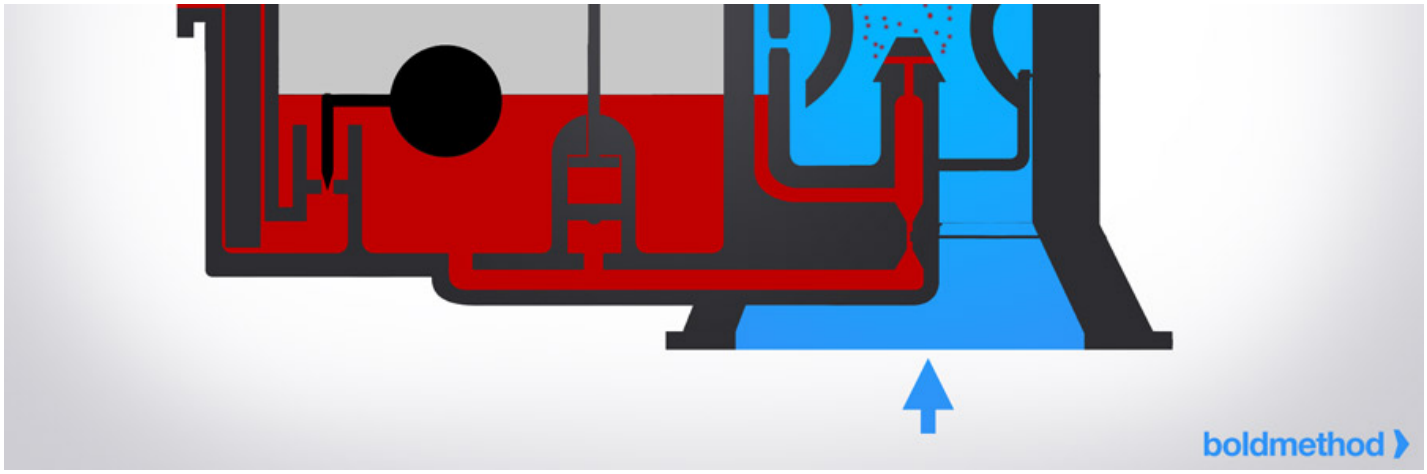
By using the venturi effect, where air speeds up in the manifold due to a narrowing of the chamber, fuel is vaporized and mixed with air prior to entering the engine. The volume of air flowing through the induction system is the primary means of fuel metering. The throttle controls how much air goes into the engine, while the mixture controls how much fuel is mixed with the air.





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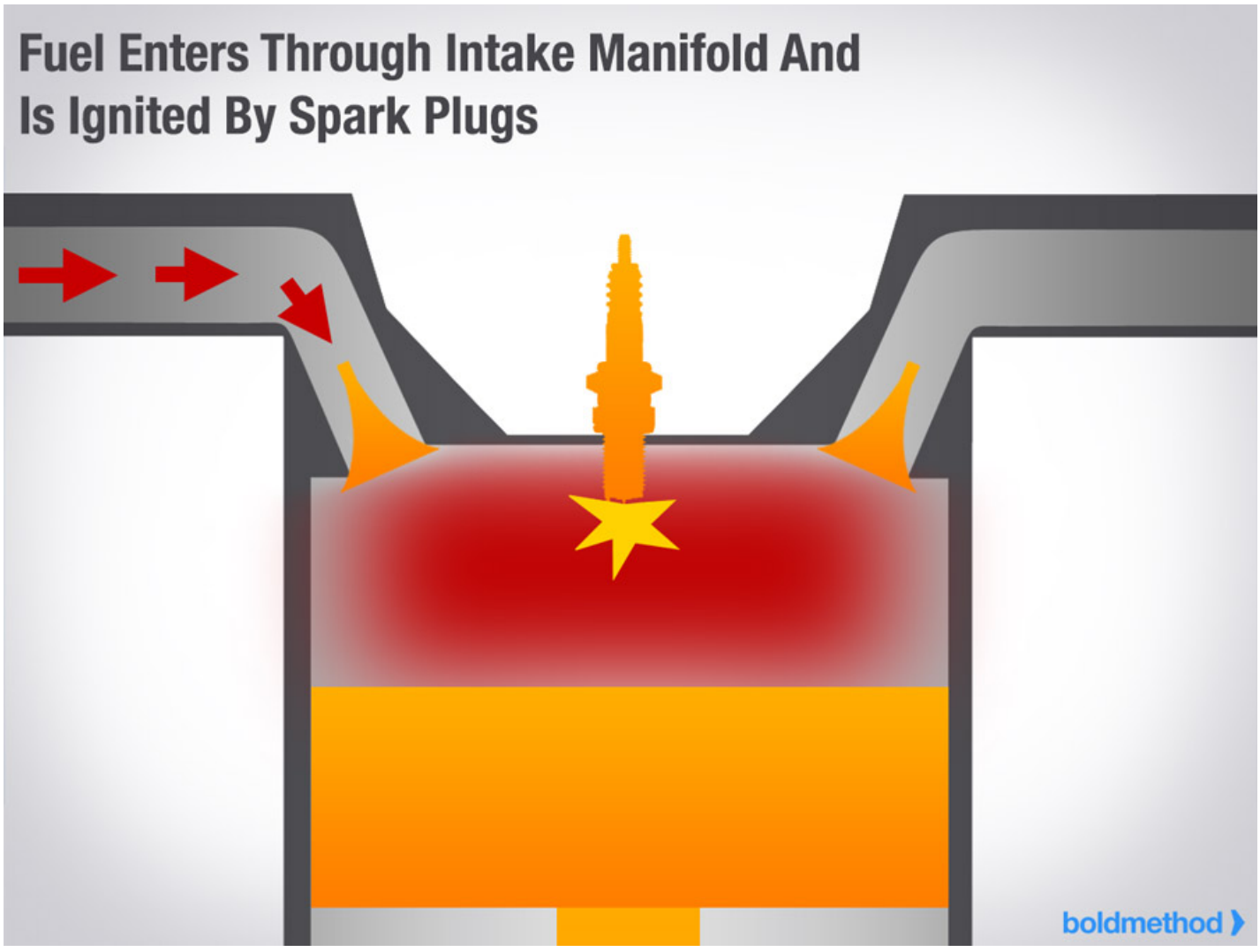
This fuel/air mixture then flows together through the induction system to the engine's cylinders, where it's ignited by spark plugs to produce power. With a few extra steps (4 cycles, to be exact), you've got engine power, and you're ready to fly.



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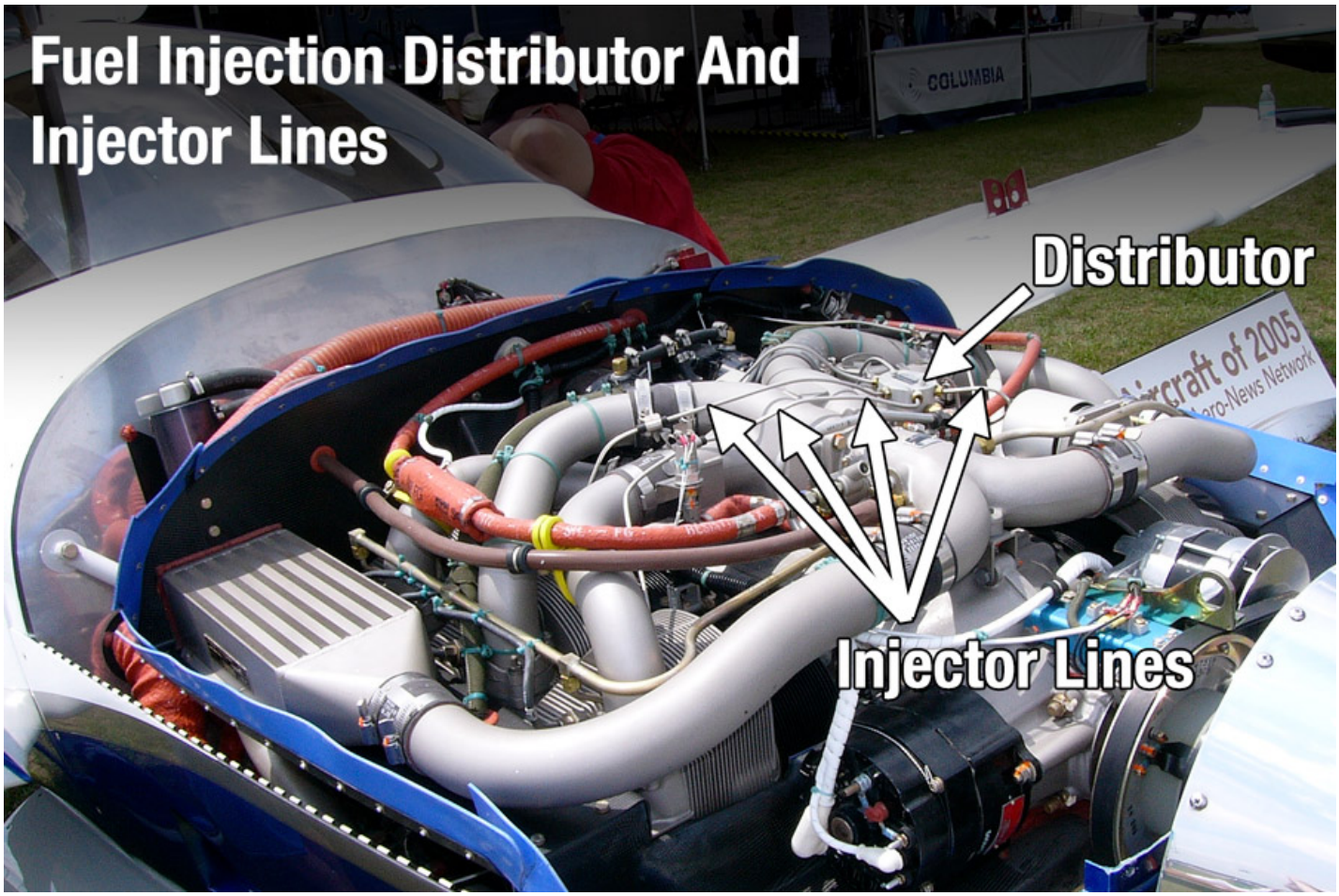
Fuel Injected Engines

Fuel injected systems use a fuel pump to push fuel through a metering system. Then, the fuel flows through injector lines to each cylinder.



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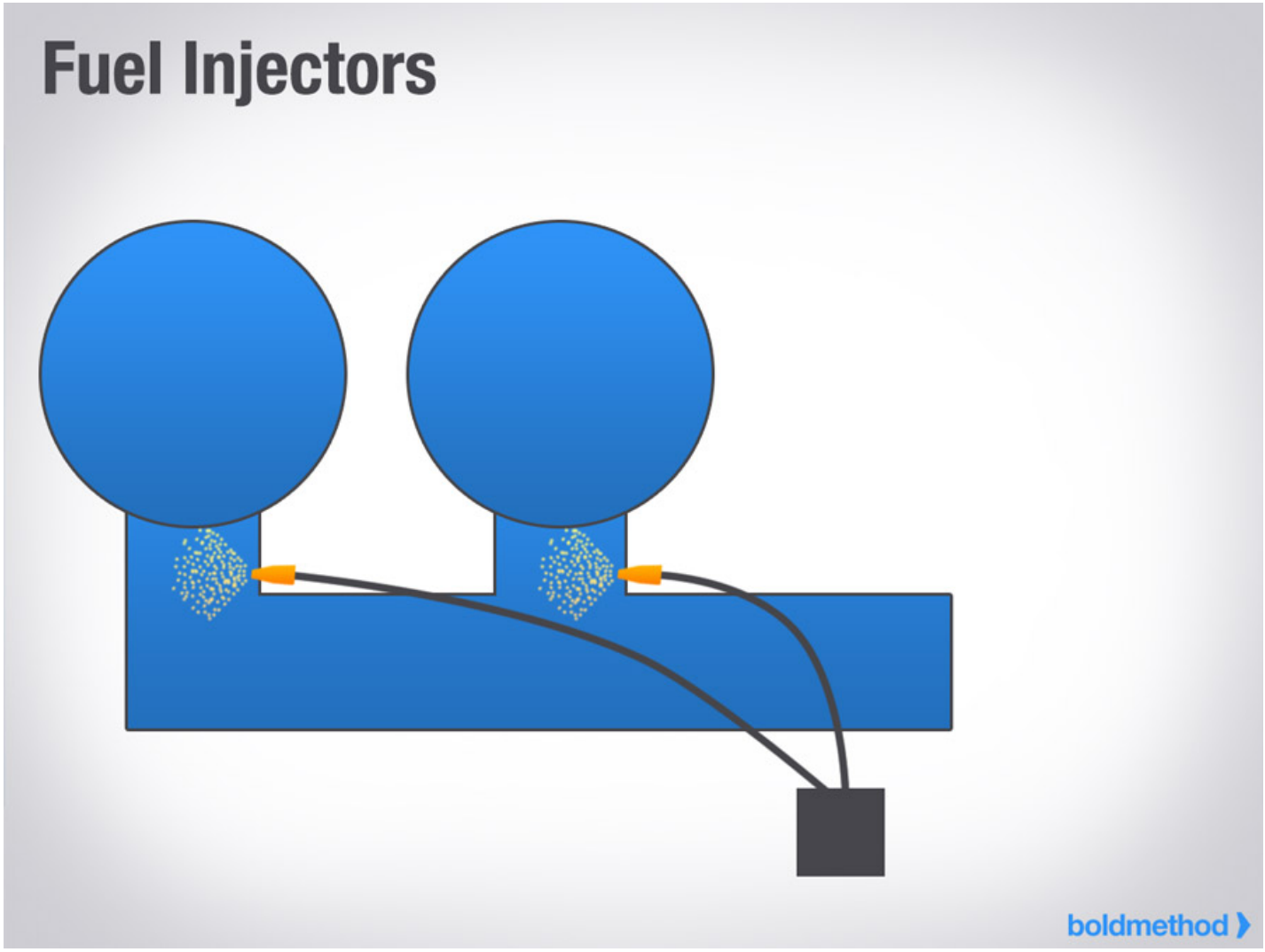
Fuel injected systems work a little differently that carbureted engines, because there is no air mixed with the fuel in the metering system. A servo regulator measures airflow entering the engine, and meters fuel accordingly for the proper mixture.

At the cylinders, each fuel injector sprays fuel just outside of the cylinder head at the intake manifold. This means your fuel is vaporized and mixed with air just before entering the cylinder.

Fuel injected engines often have an electric fuel pump as a backup, to ensure fuel can be

pushed through the metering system even if the engine driven pump fails. However in some aircraft, the electric backup pump doesn't provide enough pressure on its own to keep the engine running.



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Starting Your Engine

Cold starts are relatively easy for both carbureted engines and fuel injected engines. While priming a carbureted engine, it's possible that only one cylinder is priming, but it can be any number of cylinders, based on your engine's design.

It's more common in fuel injected engines for each cylinder to be primed at once, usually by an auxiliary fuel pump.

Starting a hot, fuel injected engine can be tough. When you park a fuel injected airplane after flying, fuel can vaporize in the injector lines. Once you try to restart the hot engine, the cylinders initially may not receive the right amount of fuel in the mixture for combustion, because it's in a gas state.

You'll need a hot start procedure to get it going, and that's not always easy to do.

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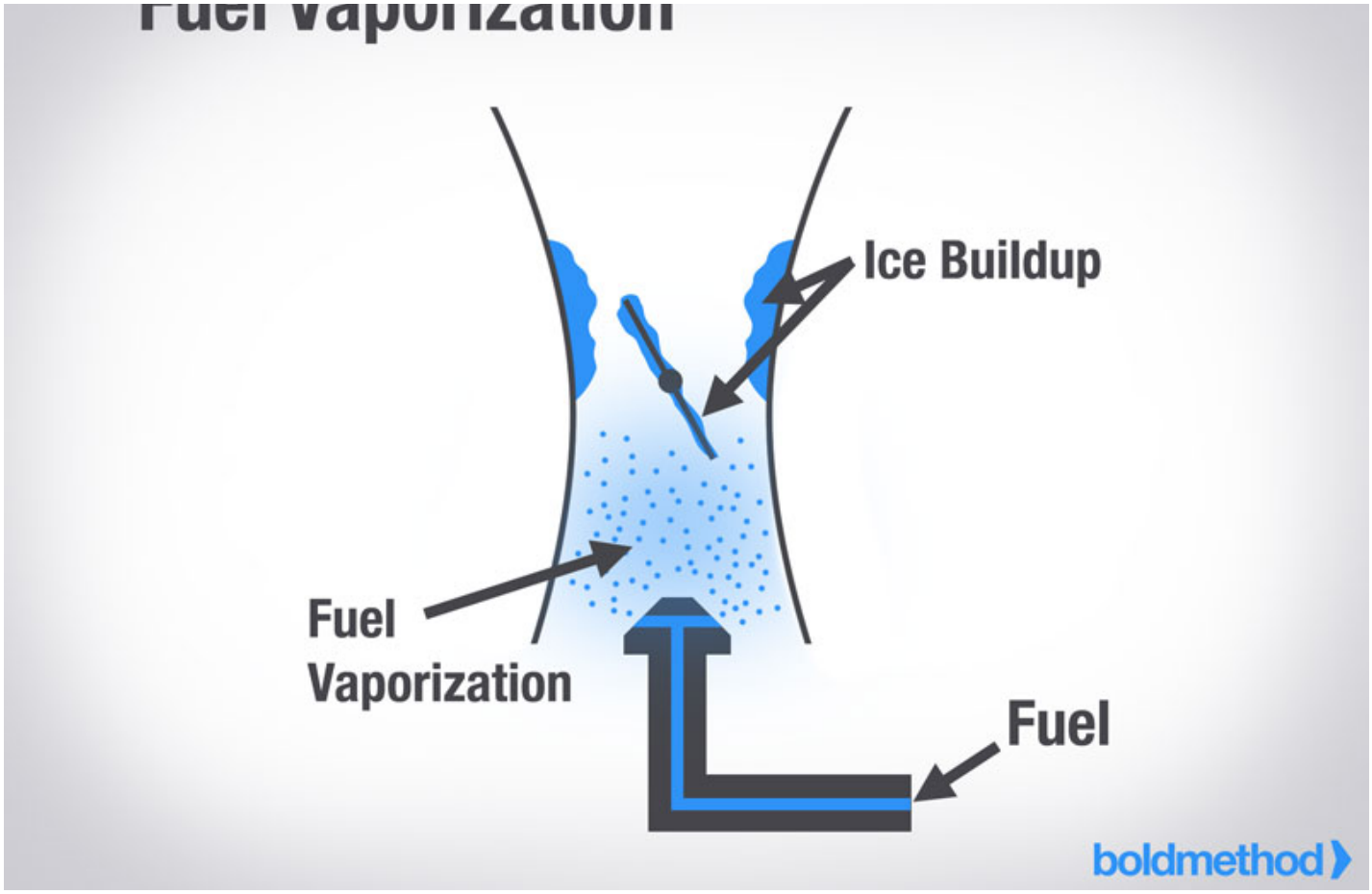
Icing Concerns

In carbureted engines, there's a risk of carburetor ice forming, something that's led to hundreds of engine failures and crashes. Carburetor ice is caused by air expansion and fuel evaporation in the venturi of the carburetor, both of which can cool the surrounding area to a sub-freezing levels.



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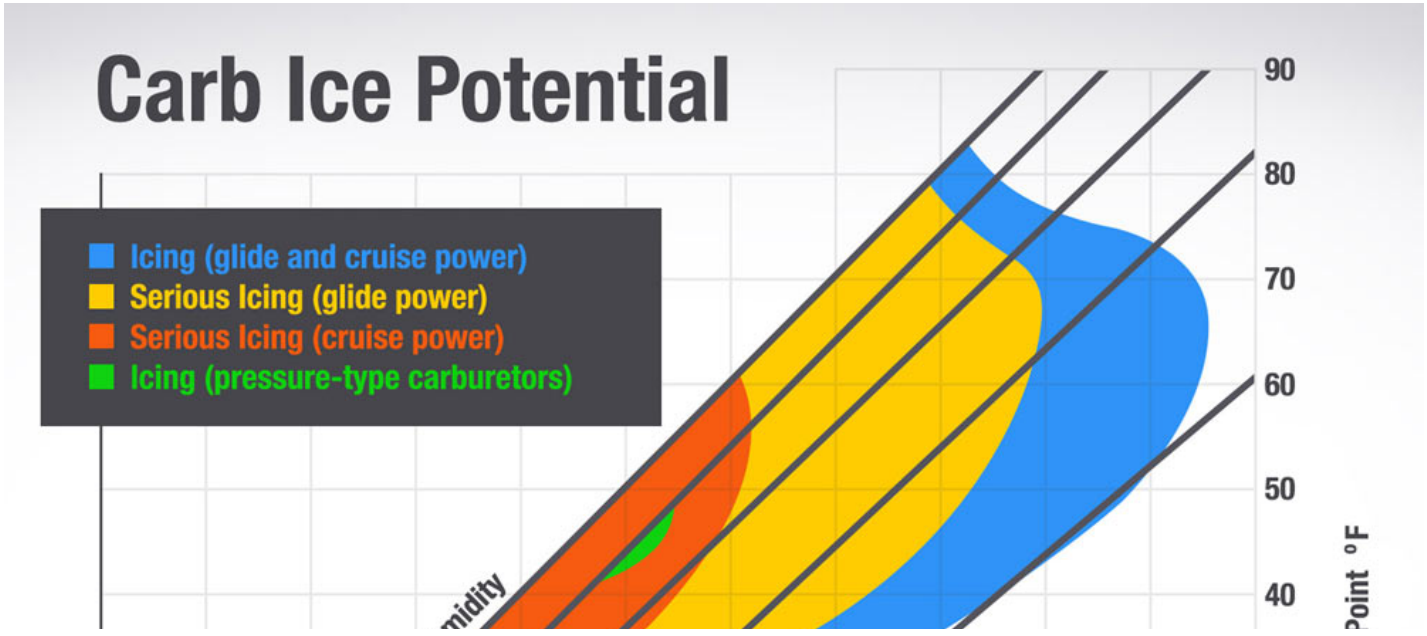
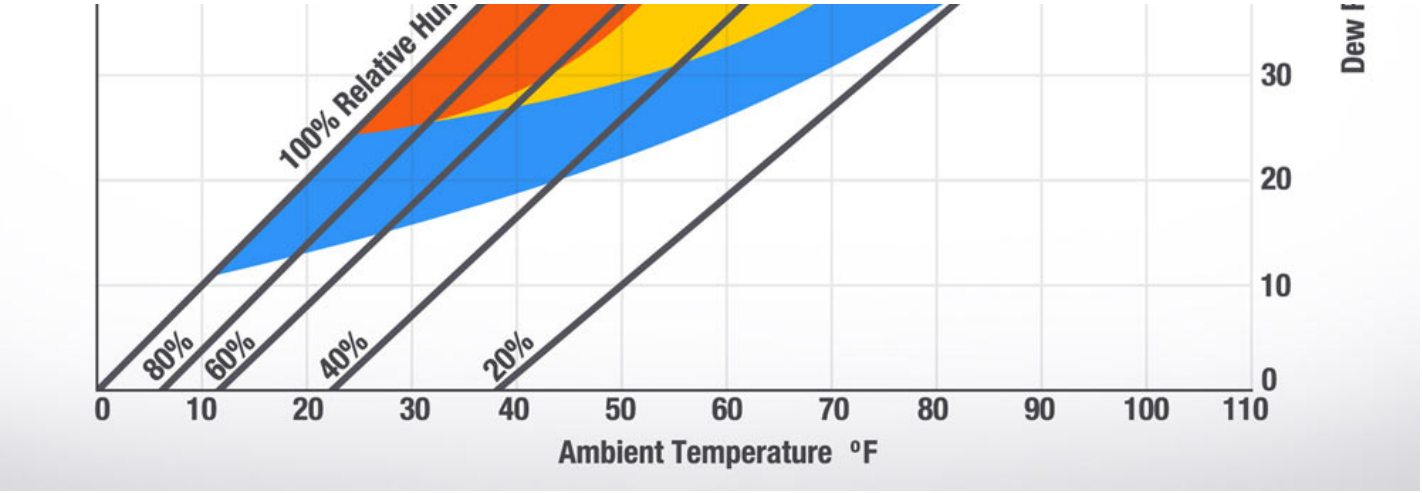
Surprisingly, you don't need to fly through icing conditions to get carburetor ice. High humidity or visible moisture, and temperatures between 20 degrees and 70 degrees Fahrenheit are the most common causes of carburetor icing.





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You'll recognize carb ice forming by a drop in RPM with a fixed pitch propellor, or a drop in manifold pressure with a constant speed propellor.

If it happens, what should you do?

In carbureted airplanes, the corrective action is to use carb heat. When you turn carb heat on, hot air is taken from around the exhaust shroud, and routed into the carburetor. As the hot air enters, it melts any ice that's formed.

But it's not all good news. As carb heat melts the ice and sends it through your engine, your motor with cough, wheeze and shake until the ice is gone. It's not fun to hear, but stick with it, because it will eventually get better. There are countless NTSB report where pilots turned *off* carb heat, because they thought they were making the situation worse, only to totally lose the engine shortly after. You don't want to be one of those statistics.So when do you turn carb heat off? After the ice has melted, RPM and manifold pressure will rise again, the engine will run smoother, and you can turn off carb heat.

Fuel Injected Engines: Different Types Of Ice Hazards

If you fly a fuel-injected airplane, you obviously have no risk of carburetor icing. However, you can get induction icing, or a clogged filter. Just like the icing that can build up on your wings, you can have ice form (from visible moisture) on your induction intake or air filter.

On nearly all aircraft, there's an alternate air intake just for this reason.

Carbureted and fuel injected engines have their pros and cons. But now that you know a little more about the difference between the two systems, flying both types, and troubleshooting their problems, should be a little more simple.

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Trey LeBlanc

Swayne,

What are your thoughts for backcountry flying? Seems like carbs could be a little more comforting if you're in a pinch in the bush... but the IO model engines also seem more reliable. Interested to hear your thoughts.

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Frederick Reed

I was waiting for advantages in carburetor system. I can't think of any big enough to compensate for it's down sides. He seemed to sidestep that poiny.

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Jason McCutcheon

Seems to me, that may be why carbs have gone the way of the Dodo bird. I don't personally know of a recently manufactured aircraft or car with a carburetor.

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Huddy Buddy

Rotax, et al

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Brian Ketchem

Significantly less expensive to overhaul would be one I would think.

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Ed Jones

Had a Beech B24 Sierra years ago and loved it. Flew it in and out of St Louis and Arkansas regularly without any problems. Fuel injection was well done in that aircraft

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Shawn Lee

has anyone know where the alternate air comes from for Piper Seminole?why does the RPM slightly dropp when we use alternate air if we get it from different source.

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Swayne Martin

Swayne is an editor at Boldmethod, certified flight instructor, and a First Officer on the Boeing 757/767 for a Major US Carrier. He graduated as an aviation major from the University of North Dakota in 2018, holds a PIC Type Rating for Cessna Citation Jets (CE-525), is a former pilot for Mokulele Airlines, and flew Embraer 145s at the beginning

of his airline career. Swayne is an author of articles, quizzes and lists on Boldmethod every week. You can reach Swayne at swayne@boldmethod.com, and follow his flying adventures on his YouTube Channel.

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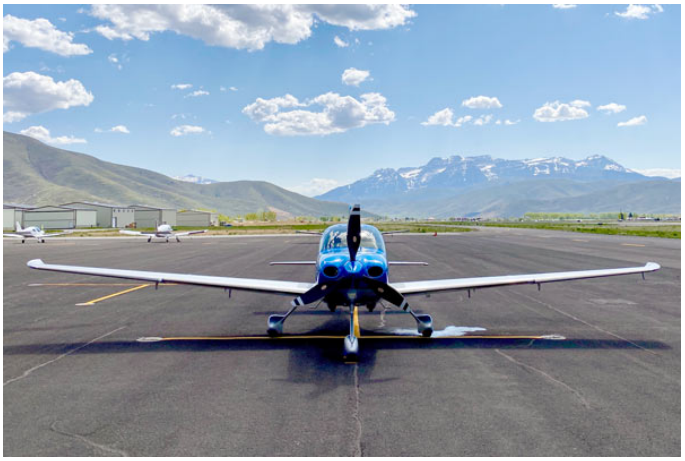

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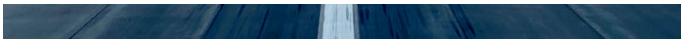

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