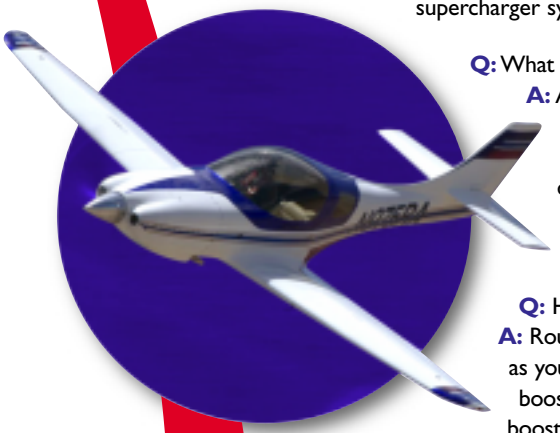
AeroSuperchargers FAQs

Q: Why would I want to supercharge my experimental airplane?

A: Supercharging increases air density and significantly increases power on an otherwise stock engine. In short, supercharging makes a 360 perform like a 520 and makes 540 perform like a big block 720. Automotive OEM manufacturers like Ford, GM, Mazda, Mercedes, and Jaguar offer factory installed superchargers on several models due to the tremendous benefits. Our supercharger systems offer more torque and horsepower per dollar than any other single engine modification. Most other modifications available require specific matched parts, in-depth tuning and won't produce the performance gains you'll receive from just the simple addition of a supercharger system.



Q: What exactly does a supercharger do?

A: A supercharger forces additional air and fuel into the engine. This occurs when the engine is under full throttle or under load, not at normal cruise or most normal flying. A large displacement engine makes more power than a small displacement engine because it can convert larger amounts of fuel and air into energy. A supercharger allows a smaller engine to do the same thing but only when extra power is actually needed.

Q: How much power could I expect to gain with a supercharger?

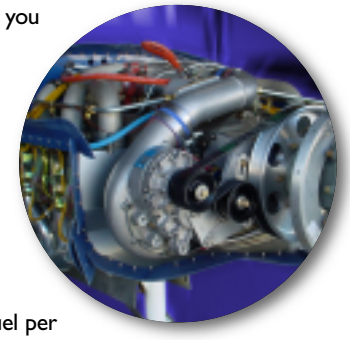
A: Roughly, you can expect to gain about the same power difference percentage as you gain induction pressure percentage. The equation is HPafter = ((14.7 + boost)/14.7)*HPbefore. For instance, if you have a 200HP engine and you add 7.5psi boost, you can expect to have about 300HP. This is an estimate, not an exact calculation so take it for what it is worth. In reality, it will likely be just a bit less than that due to inefficiencies and air density losses due to heating.

Q: Will a supercharger affect my engine life?

A: Engine longevity is a function of your personal flying habits and how well your aircraft is tuned. If a airplane is tuned properly and not abused, engine life should remain unaffected for the most part, although in general, any power adding modification will increase engine wear. Even a normally aspirated airplane will show signs of premature aging if used under rigorous conditions such as air racing. Likewise, premature engine failure is a possibility with any plane that is not properly tuned and a supercharged one is no exception. As explained, a supercharger is an air movement device that forces increased air into an engine. While under boost, the additional air requires additional fuel to enrich the air to fuel ratio entering the engine. Detonation is a sign that your plane is not running properly and can indicate a variety of problems including a lean condition(heat), a timing curve that is too aggressive, or bad fuel. Demanding performance from a detonating engine will likely result in reduced engine life with or without a supercharger. We recommend that the installer of any supercharger be qualified to identify detonation and have the ability to identify and correct the cause of it.

Q: Will a supercharger affect my fuel economy?

A: Fuel economy depends entirely on your flying habits and in some cases you may experience an increase in fuel mileage. Under normal flying, for example, the supercharger is not under boost but is increasing the efficiency of the engine by forcing air through restrictions like the air filter. But let's face it, you are not interested in a supercharger to enjoy "normal flying conditions." When you are demanding additional performance from your plane it will require additional fuel. If you are a "lead foot" your fuel economy will decline because your aircraft is working harder. If you are simply using the supercharger for occasional climb and flight performance, then your fuel economy should remain about the same. Remember that the only way to make more horsepower is to burn more fuel per unit of time, and that's exactly what a supercharger is designed to do.



Q: Will installing a supercharger on my plane void the factory warranty?

A: It is illegal for a engine supplier to void your warranty simply because you have modifications to your plane. It is the manufacturers responsibility to prove that any modification was the reason for a failure. Most supercharged applications do not harm the plane's engine. With that said, some

Engine manufacturers are more performance orientated and willing to work with customers. It would be our suggestion to consult with your engine mfg. regarding their warranty specifics.

Q: Can I install a supercharger system myself?
A: Installing a supercharger is not brain surgery or rocket science. If you are relatively mechanically inclined, can follow directions, and have the necessary tooling then installation can usually be completed within a 6-8 hour timeframe. We goes to great lengths to ensure that each kit is complete with everything you will need, even down to the wire ties, and that the directions are clear, visual, and concise. We also provide excellent tech support should you run into any problems during the installation process.

Q: Do I have to tap the oil pan for the oil supply?
A: No

Q: Where should the source for a boost reading be taken?
A: Boost readings should be taken at a clean manifold source. Perhaps run a T Line off of the vacuum regulator.

Q: Is the supercharger always working?
A: While the supercharger is always spinning and moving air, it is not always producing boost in the engine. Boost is a function of engine load and RPM. The majority of the time your supercharger will not be producing boost. The supercharger produces boost under high load conditions which may include heavy acceleration, climb out or racing conditions. Superchargers offer the power you need on demand, the reminder of the time the engine is working just like a normally aspirated engine.

Q: What would cause my engine to detonate at high RPM or MAP?
A: Detonation is generally caused by lack of fuel or improper ignition timing. Other causes of detonation can be high engine temperature, improper spark plug gap, excessive boost, bad fuel, excessive discharge temperature, or bad spark plugs.

Q: What happens if my supercharger drive belt breaks? Will my engine still work?
A: It the supercharger drive belt breaks the plane will fly exactly like it did without the supercharger. It will require a different mixture setting for the new MAP and power settings. It will run perfectly normal, and you still should be able to fly around. However blower drive belt breakage is very rare. These belts typically last for 1,000 hours or more.

Q: What is the function of a spark plug?
A: The spark plug is what causes ignition. It takes a voltage surge from the coil through the distributor, and produces a high voltage spark that ignites the compressed/boosted air fuel mixture within each cylinder. If everything is working properly and your fuel curve is set appropriately, an even and safe burning of the compressed mixture will result. The piston is pushed down, the crankshaft turns, and the engine runs efficiently. This provides maximum fuel economy, lowest exhaust emissions and is the ideal, safe ignition scenario for a boosted application.

Q: Why do we need to change spark plugs?
A: If your goal is to maintain an efficient engine and maintain your engine's fuel economy, you should change your spark plugs at regular intervals. As spark plug electrodes wear, the voltage required to jump the gap increases. Under hard acceleration, high speeds or heavy loads, misfires can occur and that will waste fuel. Also, aside from inhibiting the performance of a supercharged application, a rich fuel mixture or poor oil control can foul or coat the ceramic insulator on the spark plug tip. This will eventually cause the spark plug to stop working.

Q: Why is intercooling such a good thing?
A: Anytime you compress air, it heats up. Even at 100% adiabatic efficiency (which is impossible), the air will heat up quite a bit. The inefficiency of the compressor (turbocharger or supercharger) will heat the air up even more. As the air is heated, the density of the air drops. Engine power is a function of the amount of air, and fuel, you can get into the cylinder during the intake stroke. It is not really the volume of air but rather the mass of air that is the key. As the air is heated and the density drops, the same volume will supply less air mass to the cylinder. The key is to not only compress the air, but to cool it back down as well to achieve the maximum mass of air, and therefore maximum power.

In addition to this, the hotter the inlet air, the more tendency the engine will have towards detonation and pre-ignition. These are very damaging to the engine and they rob power.

Q: What effect will supercharging have on the life of my engine?
A: The primary cause for premature engine wear and failure is detonation and increased RPM. Our systems integrate fuel system controls such as calibrated injectors and upper deck pressurization. These fuel management programs virtually eliminate any potential for detonation as long as proper monitoring of the EGT's and CHT's on the engine. In addition, the supercharger will deliver maximum power at a lower RPM than the engine did before supercharging. This low speed torque and horsepower enables the user to operate their engine at a lower speed. This lower operating speed can actually enhance engine life and increase fuel economy. But a supercharger substantially increases power and torque at much lower rpm's. At these RPM's stock engine components are usually more than adequate. Additionally an engine sees maximum load on the components at the moment the piston changes speed from going up in the cylinder to going down. There is a commonly

held theory, too complicated to go into here, that increasing the combustion pressure, which a supercharger does, actually reduces this maximum load when piston travel changes from up to down. Under this theory, at comparable rpm's a blown engine is easier on parts than an unblown engine. In actuality, as long as detonation is controlled, you rarely have any engine failures with a blower.

Q: What is the difference between a supercharger and a turbocharger?
A: Both turbochargers and superchargers are called forced induction systems. They both compress the air flowing into the engine . The advantage of compressing the air is that it lets the engine stuff more air in a cylinder. More air means that more fuel can be stuffed in too. Therefore you get more power from each explosion in each cylinder.
A turbo/supercharged engine produces more power overall than the same engine without the charging. The typical boost provided by either a turbocharger or a supercharger is 12" to 18" MAP. Since Turbochargers are powered by exhaust pressure while superchargers are driven from the engine crank pulley. Superchargers allow you to attain boost and horsepower on demand. A turbocharger requires the exhaust pressure to build resulting in a "lag" in horsepower increase. A turbocharger will typically have a higher discharge temperature than a centrifugal supercharger. This higher temperature is a result of the turbo impeller spinning faster and the heat generated from the exhaust gas.

Q: Can I install a supercharger system myself?
A: Each supercharger system we sell comes complete with detailed instruction manual. A word of caution: bolting on a 50% increase in horsepower is not magic and some kits can be more challenging than others. You must be confident in your mechanical training, experience and abilities to properly complete the installation. Any error in the installation could affect the performance of your plane.

Q: There is no supercharger system available for my plane—can I design a custom application using supercharger head unit?
A: Most head units (supercharger compressors) are universal and can be mounted to any experimental plane (space permitting). To design a custom application requires a bracket to mount the supercharger to the engine, custom air tubes to bring air to the supercharger and a custom discharge tube to route the air from the supercharger to the engine. Significant consideration needs to be given to pulley location, size and alignment. Once the supercharger is installed there are several tuning factors including proper timing and fuel delivery. A custom application is certainly not impossible but definitely presents a challenge. A custom supercharger application should only be performed by individuals with fabrication and tuning capabilities.

Q: What is boost?
A: Boost is the amount of pressure (in MAP) that the supercharger provides. The air that goes into an unblown (unsupercharged) engine is drawn in by the vacuum created when the piston goes down in the cylinder bore. This air goes into the unsupercharged engine at atmospheric pressure, which at 16,000Ft. is about 13" (MAP). On a blown engine the boost is the amount of additional pressure the inlet charge has over atmospheric that goes into the engine. So if your blower makes 16" of boost that means your inlet charge is atmospheric pressure (13") plus the 16" of boost for a total of 29" MAP. or 100% sea level performance.

Q: How much boost can you normally run?
A: 12 to 18" MAP is normally a safe level for most stock engines. Running more than this will usually require a reduction in compression ratio.. Every engine is different and some engines are more tolerant of boost than others.

Q: Which is more important, horsepower or torque?
A: Horsepower is a rate based measure of an engines ability to do work. In order to accelerate a given mass from 0 to 60 mph for instance, a certain amount of horsepower is needed. Torque, on the other hand, is merely a force. Torque can exist with no motion. Therefore a torque rating really does not tell you much without an RPM that the torque was measured at. If you have torque and RPM, you can calculate horsepower HP=(torque ft*lbs x RPM)/5252. So you may wonder why people get so hung up on torque. Well, given a peak torque and RPM, and the peak HP rating, you can tell some characteristics of the engine performance you won't get with just HP. If you have an engine with a peak torque above the peak HP, you have an engine that does not care to rev but instead has good power at low engine RPM. If you have an engine with torque (ft*lbs) and HP ratings about the same, it is a typically automotive engine. If you have an engine with high HP ratings and low torque ratings you have an engine that has poor power down low but can rev very high. Bottom line, any performance estimates will require the HP, not the torque.

Q: What exhaust system should I use with my supercharger?
A: Stock is OK. However, the increased mass of the intake air makes the exhaust system flow more than it was originally designed for. Therefore, exhaust modifications such as high performance cat-back exhaust systems can add substantial increases.

Q: What else can I do to get even more out of my engine now that I have a supercharger?
A: Several modifications can be made to your engine to substantially increase horsepower, in fact there are too many to list. In basic terms, you will need to strengthen the engine internal components, increase air flow and increase fuel. It is recommended that you consult with others who have implemented successful engine combinations.

Q: Are superchargers noisy?
A: Some blowers can have a whine when the engine is running, particularly when they are in boost. This is usually due to the gears inside the blower-housing turning.

Q: What kind of fuel is required with a supercharger system?
A: All of our supercharger systems require the use normal 100LL. Octane boosters are not required but may improve performance in severely hot climates or under circumstances where a heavy load is placed on the engine for an extended period of time such as racing.

Q: When should a air bypass valve be used?
A: An air bypass valve is used on all of our supercharged applications where the supercharger is making more than 6 psi.

Q: How much horsepower will a supercharger add to my engine?
A: Although some manufacturers claim a specific horsepower increase, superchargers actually add horsepower as a percentage gain (percentage of an atmosphere). Assuming an engine with a compression ratio of around 8:1 running 100LL, if a supercharger gives your engine 29.9" of boost, (which is atmospheric pressure) then the output of your engine will double, everything else being equal. After adjusting for thermal and mechanical energy transfer, if an efficient centrifugal supercharger is generating 14" MAP (approx. 1/2 of atmosphere), you will see around a 35-40% gain in horsepower and torque at your non-supercharged maximum horsepower rpm. At higher boost levels, the heat generated by compressing air will produce diminishing returns as the boost is increased, although the use of intercooling or racing fuel can avoid this scenario of diminishing returns. Assuming the use of intercooling to run higher boost levels while maintaining reliability, a 100% increase can generally be achieved at around 34' MAP on an engine with 8:1 compression running pump gas.

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