

A Cure for the Ancient Engine





Blues:

I could have had a V-8 instead

BY BUDD DAVISSON

Let's say you have a wonderfully useful airplane, but every time you open the cowl, all you see in there is a boat anchor—a rusty, expensive, unreliable boat anchor. However, sitting right outside of your hangar door is a nice, new Chevy. Every time you open the Chevy's hood you see a shiny, state-of-the-art, totally reliable V-8. It's about the same size and weight as your present engine. So, you do the obvious: you substitute

the Chevy for the boat anchor, and trundle off over the horizon.

Where that kind of mechanical magic used to be a near impossibility, the FAA has recently made it much easier to do, by putting the aircraft into the Experimental Exhibition category. Where that used to limit the utility of the aircraft somewhat, that is no longer the case. Ask Brian Robinson of Lindsay, Ontario, and Buzz Hale of Incline Village,



PHIL HIGH

Moving the hinges to the top of the door and adding pneumatic springs creates a pair of flip-up doors that give the Bee's pilot and passengers unparalleled access to the beach or lake. On land, a short ladder can be very helpful.



Don't let the polished exterior fool you. C-FIL is no hangar queen, as the scuffed side panel can attest. In addition to the swing-up doors on each side, the nose features a hatch that opens up on one side, allowing the crew to step onto the beach without getting their feet wet.



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Brian Robinson, of Robinson V-8 Power, has created a solid, economical solution to the problem of engine replacement in the Seabee.

Nevada. They'd love to tell you how well this has been working for them.

Seabees have been part of the Robinson family for a long time. In fact, Brian's father had one. He says, "He sold the Seabee when I was two years old, but it imprinted itself on my memories and, as I got older, I developed a burning desire to own one. After all, I live where an amphibian of any kind makes a huge amount of sense, and the Seabee makes more sense than most. It's affordable, strong, has lots of room, and is easy to take off and land. It is, however, an airplane in search of a bigger motor."

Brian scratched his Seabee itch when he talked his dad into buying a derelict airframe (there are apparently lots of them, for reasons we'll discuss in a minute) in 1969 and got

it flying a year later.

He says, "As soon as we bought the Seabee, my dad immediately started telling me horror stories about the Franklin engine. In fact, he said that at one point he had over 30 unserviceable cylinders laying around because the Franklin ate them like popcorn."

The 6-cylinder, 500-cubic inch, Franklin Aircooled Motors 6A8-215-B9F is apparently no one's favorite engine. No one's! This is especially true of Seabee owners, because it's a classic case of too much airplane and not enough motor. To compound the lack of power (215 hp), the engine is famed for its lack of reliability and being difficult to support.

Buzz says, "It should be noted, however, that there are always those who want to keep everything origi-



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Buzz Hale's Canadian-registered Bee (now certified in the US as Experimental-Exhibition, and registered as N300TB) is more like a high-end aerial RV, capable of taking Buzz and his wife, Jannette, anywhere they want to go, and in sumptuous comfort. Their version of the conversion is dubbed the "ThunderBee."

nal, and, as a result, put up with the limitations. Any of the Franklins still flying that I am aware of have been extensively modified with unapproved parts. There have been no new Franklin engine parts built since 1950, so anyone who claims his engine is 100 percent original is kidding themselves. AC 23-27 allows substitution of parts that are no longer available, but does not allow you to substitute the engine. You can fly a Franklin with over 50 percent untested substituted parts, modified cylinders, etc."

Brian further explains, "There were approximately 1,000 Seabees built by Republic in 1946/47. However, by the early 1950s, Franklin decided to stop supporting the engine. Then they went bankrupt (the type certificate and production of the engine moved overseas, to Poland). Since that day, Seabee owners have been flying with essentially orphaned engines. And not a very good engine, at that. They have terrible cylinder problems because they have too much metal in the wrong places and, when they cool and



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The Bee's water rudder is neatly tucked under the swept-up section of the aft hull. When the landing gear is retracted for water operations, the tail-wheel pivots 90 degrees to keep it out of the way.



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C-FILM and C-FOME cruise along the marshlands on the west end of lake Butte des Morts, showing that the outstanding design of Percival Spenser, as interpreted by Republic Aviation in the immediate postwar years, is a more than viable aircraft.

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shrink, they crack. For that reason, good, original cylinders are getting very, very hard to find. A lot of Seabees have essentially been grounded simply because the engines are so hard to keep running or the owners are unwilling to fly them because of their lack of reliability.

"No one knows what the official TBO of the engine is because the Canadian DOT could find no documentation of it, so apparently Franklin never published it. However, a 1,200-hour Franklin is considered to be very high-time. Further, few of these engines make it to 1,200 hours with all of the original cylinders. Because the Seabee is so dependent on having all 215 horses available, the airplanes are approaching being unsafe to fly, because the engines are so likely to get sick without warning. You have to inspect and maintain them carefully. The reason we had so many unserviceable jugs sitting around is because we were continually changing cylinders . . . they rarely lasted 300 hours.

As if the engines weren't a big enough problem, the special pusher propellers are equally problematic.

"The original props have been AD'd to death," Brian says, "and blades have become very difficult to locate in airworthy condition because of water erosion—nearly impossible in fact. This forces people to buy new blades from Hartzell—a waste of money on an old-generation propeller."

"It's a shame that the engine is grounding so many of the airplanes because the Seabee really is an amazing airframe. When Republic started building them, they had just finished building Thunderbolts and such for World War II, so they were really set up to build metal airplanes. If they had been a smaller company, the Seabee probably wouldn't have been designed the way it was. Many of its skins are heavy-sheet that is hydroformed into shape with the corrugations, giving them strength and making them part of the structure. Those kinds of processes required large machinery that the average

light aircraft plant didn't have. For that reason, it's a very strong airplane. Also, because the heavy skins carry so much of the load, the Seabee doesn't have nearly as many parts as a normal airplane. The wings, for instance, have almost no ribs because the corrugated skins hold their shape. The corrugations also act as drains so water doesn't pool inside and the alloy used is practically impervious to fresh water."

The Seabee is designed with several roles in mind and it would perform them all much better with more power.

Brian says, "A normal Franklin Seabee weighs around 2,300 pounds empty—the actual weight depends on how it has been fitted out—and grosses 3,150, but, with its large cabin, it's really easy to overload it because the power is so marginal. Even though it's underpowered, however, it's still a terrific airplane, just as it is. It's a little hard to decide whether it's a boat that flies or an airplane that floats, because it is so good on the water. In terms of handling, it's one of the more forgiving amphibians to land. And with the size of the cabin and the way the doors are designed, it's the perfect airplane to load up with your fishing gear and drop into your favorite lake."

The solutions for a lot of life's problems are put in motion by a single event that galvanizes someone into action. In the case of the Chevy Seabee, it was a flight that Brian took with his daughter.

He remembers, "We were flying along when the engine began to lose power. It needed all six cylinders to fly and at least one, maybe more, were dropping off-line, and we were coming down whether we wanted to or not. Fortunately, there was a farm field within reach and the landing was fairly eventful. However, the airplane hadn't stopped rolling before I looked over at my daughter and made up my mind that something had to be done about the Seabee engine situation. I loved the airplane, but I loved my family too. So I started looking for a solution."

How Can This Be Done?

According to the current FAA Order 8130.2G, the Experimental-Exhibition category is available for this type of project under Paragraph 4110 C as a Group 2 Aircraft, which includes virtually all civil aircraft under 12,500 pounds.

The process is fairly straightforward: The project parts must first be de-registered from the FAA registry. *Written* permission needs to be obtained from your local FSDO office to remove any data plates from the project aircraft. Then the project can be re-certified as an experimental-exhibition project. This frees you up from the restrictions that normally apply to modifying a certified airplane. Even better, the area operating restrictions that formerly applied to all Experimental-Exhibition aircraft were updated in 2010 (effective April 2011). The current 8130.2G Guidance for Experimental-Exhibition has removed the limited proficiency area for Group 2 aircraft. The proficiency is now considered to be the entire Continental US. However an annual program letter must be kept updated with your local FSDO listing any public events that you will be exhibiting the aircraft at. All other flights are considered proficiency flights, which includes all aspects of the normal operation of the aircraft. Suddenly solving the boat anchor engine problem is much easier.

North of the Canadian border, there never has been a problem with those kinds of mods because the Canadian DOT has an easy solution: license the airplane as an Owner Maintained aircraft. The only problem is that the U.S. won't allow owner-maintained aircraft to cross into the U.S. We don't have an explanation for the differences, but the ongoing successes folks are having with Chevy-powered Seabees clearly demonstrate that there are viable ways to save aircraft that are powered by boat anchor motors.



PHIL HIGH

The V-8 engine fits beautifully within the stock Seabee cowling, maintaining the classic looks of the airplane. The engine extension and the Morse chain drive enclosed in the housing are nearly identical in dimensions as the original Franklin installation. Even the radiator for the GM V-8 fits within the cowling!

When Brian looked around for solutions, he found the Lycoming GO-480 was a certified replacement, but that was as ancient as the Franklin and burned even more gas. There was at least one O-540 converted Seabee, but that must have been done on a field approval and because he never found the paperwork for the STC. Then the obvious solution popped up.

"We were sitting around having a beer," he says, "and my dad said, 'You know what you really need in the airplane is a 350 Chevy,' and that one comment got me thinking. I talked to Fred Geschwender, who had made a name for himself in converting V-8s for airplane use and had sold quite a few of his reduction units."

Through the 70s and into the 80s, Fred Geschwender and his work with aviation V-8s was well-respected. In fact, a number of crop duster aircraft were converted to his 351 Ford V-8s and had good success with them while operating in a harsh environment.

Brian says, "Fred suggested I get an LS-1 Chevy Corvette engine. It was all aluminum and Fred convinced me to fight the urge to modify the

engine. He said I should capitalize on all the testing and design work that Chevrolet had put into the engine and run it dead stock including the factory installed electronic ignition. He also convinced me that with me being a mechanical engineer, I could, and should, design my own reduction unit. I was skeptical but started down that path anyway.

"I looked at every combination available. Gears and belts and eventually settled on Morse Hi-Vo chains, with an oil spray bar for lubrication, which is exactly what Fred had used. Hi-Vo chains are similar to a timing chain on a car, only much bigger. They are one of the lowest-friction, easiest to build and maintain, ways to transmit power.

"To get the CG right and get the prop back where it's supposed to be, I needed to design a fairly long-nosed reduction housing. Fortunately, I have a lot of friends that are great mechanics or engineers and, with their help, I came up with a unit that is loosely patterned after what was on the Franklin originally, which gave no problems. I connected it to the engine through a splined adapter and the balanced, manual transmis-

sion automotive flywheel.

"Initially, I worked with a 1.68 reduction ratio, but now run a 1.98:1 because by using four blades, as with the MT prop, the diameter can be quite a bit smaller, which reduces water erosion and lets me turn the V-8 to a higher rpm on takeoff for more power and not worry about tip speeds. I looked at Hartzells but they were heavier and none were reversible like the MT was.

When Brian initially started measuring and weighing everything, he realized that the engine, complete with the reduction unit and radiator, would fit nicely inside the original cowling and was almost the same weight as the Franklin. The radiator would tuck behind the original cowling grillwork so the classic lines of the airplane wouldn't change at all. In fact, he could mount the engine on a new 4130 steel structure that not only mounted the engine via six points, rather than four, but eliminated the wing-to-wing flexing of the original mounting system, which significantly reduced the airframe maintenance.

When he finished the conversion on his own airplane and flew it for the first time, he realized that the basic

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—Buzz Hale

airplane had been even better than he thought it was: The infirmities of the Franklin had been camouflaging some of the airplane's true capabilities.

"With the 84-inch three-blade to keep the prop in an efficient rpm range, on takeoff we were turning 4,400 rpm with the LS-1 for 2,600 rpm on the prop. However, with the smaller, 78-inch four-blade, we could get 5,200 rpm on the engine so we were making much more horsepower. Regardless, the LS-1 makes 320 hp for takeoff, which gives spectacular improvements. Where a stock 'Bee takes forever to get off the water, 30-40 seconds at most weights, we're off in less than half that and the rate of climb is doubled. It's hard to believe it's the same airplane.

"Since our original conversion to our own airplane, we've made a bunch of other changes that include using an LS-7, that is a dry sump racing engine available straight from Chevrolet's Racing Division. It is rated at 500 hp, but we can't use that at takeoff. However, it is still delivering 350 hp at 10,000 feet and that's where the drag of this old slug comes down. If you're willing to burn the fuel, it'll cruise at 147 mph TAS up there. Down low, it's still a 115-mph airplane, but you can do that with only 170 hp, so the fuel burn is only about 10 gph. If you're looking for a fast airplane, you only have to glance at a Seabee to know you need to look elsewhere."

Although he didn't start out wanting to be in the manufacturing busi-

ness, Brian quickly realized that the V-8 concept could be the core of an on-going business and formed Robinson V8 Power (www.V8Seabee.com) in Lindsay, Ontario. (His website has an excellent section on the current FAA rules about certifying such a conversion, and it's not that difficult.)

Brian says, "As we got our feet wet, so to speak, and realized there were markets for this outside of the Seabees, we began building reduction units in different ratios and lengths for different applications, but we started with Seabees and that's still our main focus. Even so, airplanes like Murphy Super Rebels and Cessna Skymasters are being converted.

Buzz Hale had one of the first Seabee conversions in the US and he says, "This is the greatest aircraft ever. It's a camper, RV and a boat that flies and, with the new engine is so reliable it gives tremendous peace of mind. The airplane is addictive and makes you want to immediately go places with it."

He continues, "As soon as we saw the V-8 conversion, we tracked down a derelict Seabee to convert and rebuild, but, since it was going to be a long-term project, we bought another V-8 'Bee to fly and are glad we did because it gives us a lot of ideas for the one we're rebuilding. Among other things, we went to electric gear, in which a linear actuator replaces the hydraulic pump that took 27 strokes to get the gear up. Most folks in Canada convert 'Bees to electric gear and I can see why.

"On our airplane, we're going to a yacht-style, wood accented interior and have made it into a true flying boat. We've spent five years on it, making 57 modifications, and our passion has turned into a five-year obsession with every single nut and bolt.

"We've put 250 hours on our flying airplane, which is the equivalent of flying around the world and it has been nothing but an oil and gas airplane. Nothing has gone wrong. Because the GM engine computer is programmed with the export code for leaded fuel and uses no O2 sensors, we can run 100-octane, low-

lead as well as premium unleaded mogas. Plus, we have heat and excellent air conditioning, which is great in the summer or year-round in Florida. The mufflers make it so quiet and it runs so smooth, you'd think you were flying a turbine. Or an electric motor. It's amazing! What's more amazing is that I know Brian has 2,100 hours on his own airplane with no problems. Think about that, 2,100 hours! I don't know how much more proof someone needs that the V-8 conversion concept can work.

"The Experimental-Exhibition category the airplane has to be operated in the US scares a lot of folks, but it shouldn't. It opens up a lot of opportunities."

The aging of the general aviation fleet is an ongoing concern for pilots and the FAA alike: As engines get older and the supply of parts gets smaller, the safety/reliability of those engines becomes problematic and the question has to be asked, "Do we ground a portion of the fleet or do we leave traditional regulatory limitations behind and seek viable alternatives?" Given the massive number of well-proven automotive engines being produced, it only seems logical that, at some point, the FAA should begin to look at those as an alternate source of power. If they don't, the general aviation fleet will continue to decrease simply because we're stretching the limits of certified, but ancient, engines. It would seem that seeking alternative engine sources would be in the best interest of the FAA as well as that of the general aviation flying public. Plus, the ability to burn unleaded fuel is a great environmental bonus, as well as a significant reduction in operating cost.

As Brian Robinson, along with so many others, says, "As airplanes like the Seabee begin to age out, and engines get more difficult and expensive to rebuild and maintain, the automotive conversions begin to look better and better. Just about everything about them is attractive."

It's hard to disagree with that argument and it's going to become increasingly difficult to ignore. 