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Cam Spalling, Exhaust Valve Guide Wear, and Lenckite AvBlend®

Paul R. Neuda

Being one of those persons who very much wants to believe that someone is trying to improve the product we fly so that we have a safer, more efficient less costly way of aviating, I am also one of those people who don't want to lead the charge into new territory but would rather take a wait and see attitude before I buy into a new venture. Maybe that's why I'm not rich and flying a Challenger 601-3A. Conversely, I'm also not broke and able to do my aviation thing comfortably. So perhaps you can see the dilemma I face when I try to write about a company that claims to have had a great measure of success with a product that helps prevent exhaust valve sticking and cam/lifter wear in Lycoming engines and makes Continentals run smoother. I immediately liked the idea.

The product is called Lenckite AvBlend® (a registered trademark of Tecni Flyte Corporation, Chicago Ridge, Illinois). An FAA approved pure lubricant, AvBlend® is advertised as a way to prevent rust and corrosion, prevent dry engine starts through positive lubrication, keep new and rebuilt engines dimensionally correct, prevent unnecessary maintenance expense caused by premature valve guide wear, and to restore performance to engines with accumulated hours. Don't you like the idea as well? Here I'm faced with a dichotomy. The problem comes from some of my contacts in the field who make various remarks ranging from "snake oil" to "who knows, try it, it can't hurt anything." However, that isn't going to stop me from sharing with you what I have discovered on my trip to Chicago to visit the Rachanski family's operations. If you think you might want to use AvBlend® and/or get your engine overhauled at Blueprint Engines, then check it out for yourself, get references, and make your decision based on your own best instincts. I, for one, am going to try the Lenckite AvBlend®. My instincts tell me that it can't hurt anything and could certainly help.

The Rachanskis - Ed Sr. and Ed Jr.

Ed Rachanski Sr. is the man in charge. A former race car driver who had a factory contract on the drag racing "funny car" circuit, Ed gave up a lucrative career to get off the never-ending road and come home to Chicago to spend more time with his family. If his business is any indication, he has a close-knit family with his children in the business with him.

The Rachanskis have two businesses which make up this article. One is the business of manufacturing and distributing Lenckite AvBlend® lubricant and the other is the Blueprint Engine Company which overhauls/rebuilds engines to factory new specifications.

Let's start with the background on Lenckite. This product is the brainchild of Joe Lencki, race car driver and engine designer for the Indy race car circuit. The lubricant he originally developed in 1936 was exclusively used in engines powering Indy racers. During those times, Lencki shared his thoughts and experimentation with notables such as the Chevrolet Brothers, Firestone, Kettering, Burbank, Dusenberg, and many others. The development of the lubricant came about when Joe Lencki, upset over the fact that the camshaft grinding for his engine cost $300.00 a pop, started looking for a less expensive way of addressing this particular cost. The engines, when they were shut down from the current week's race, were not started again until the following week, at which time the oil, which had drained into the case, had to go through a number of gears to lubricate the cams – the classic "dry start." So Lencki developed his product and in 1946,

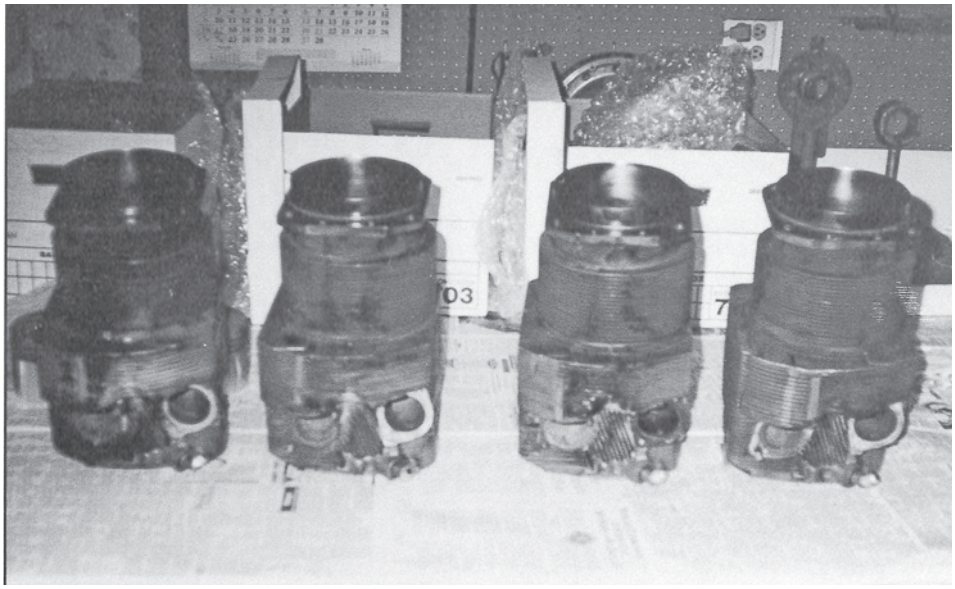
it became known as "Speedway Cocktail" with major acceptance on the Indy race car circuit.

According to Ed Sr., there have been and will continue to be products available for reciprocating engines such as Bardahl, Slick 50, Wynn's Friction Proofing, and Microlon. Most of these products have solids in them and these are added to the solids already in motor oils. Unfortunately, solids burn in the combustion chamber and leave residues behind in the form of carbon deposits and buildup. He believes that engine metallurgy today is so advanced that most forms of additives in the lubrication system other than the oil itself serve no particular purpose to prevent wear since wear and friction are not the usual issue. Dry starts are the weakness, especially with aircraft engines which could sit for weeks at a time between flights.

Ed went on to state that Lenckite AvBlend® is a very fine pure lubricant that goes into the engine oil. The molecular structure of the AvBlend® is finer that the engine oil itself, and is carried by the oil throughout the engine. As the engine heats up, the pores open in the metal and the AvBlend® soaks into the metal, pistons, valves, and bearings so that the next time you start the engine, you help eliminate dry start. Used at each oil change, it needs replenishing in order to keep the parts soaked since AvBlend® leaks back out.

Although Joe Lencki never made the product available for any kind of mass distribution, through Ed Rachanski, the product is being marketed not only to the automotive market but to the aviation community as well. Rachanski, through a test arranged with the FAA, was able to get approval for aircraft engines in 1980.

Now we come to a problem. This is all very nice history and charm-



The 7700+ Hour Cylinders

Ed Rachanski Sr on compression checks…

"Let's take a look at the development of an airplane/engine combination. The airplane manufacturer says 'we have a four seater aircraft that will fly this fast, it weighs this much, it has four cylinder engine putting out 200 HP and according to our performance instructions in our operations manual, you can put in this many people weighing this much, take off at this density altitude with this length of runway over a 50 foot obstacle and you can do it safely.' Here's the catch. The airframe manufacturer says 200 HP. So the engine manufacturer says here's 200 HP engine, give or take 3 or 4%.

Ok, you now have 500, 800, or 1,000 hours on the engine and the mechanic says, you've got 80/62, 80/72, 80/76, 80/68. Well, as sure as I'm sitting here, you don't have 200 HP. That 80/62 is short about 12 to 15 HP on average. You probably have 180 HP, give or take. Now if the performance charts say that you can put four big guys in it, put fifty pounds of fish in the back and take off on a 2200 foot grass runway with a 50 foot obstacle – the manufacturer says given all that – you've got to have 200 HP.

The mechanic, in order to do a compression check properly and test for those 200 HP, has to run the engine to get it hot, then he has to shut it down, pull the plugs out, and do the compression check. If the engine is not heated properly, the oil remains heavy and thick around the rings and will usually read around 3 to 4 PSI higher than if the engine has been heated properly. (In other words, an error on the high side.)

We recommend that you pull a cylinder if it reads 80/74 or less. Why? If you are supposed to have 350 HP on the left and right engines, and you're in Atlanta on a hot humid 100 degree day, loaded to gross and you take off, and for whatever the reason, you lose one of those engines, you better hope you have 80/75 on all the cylinders on a good engine so you can make it back down safely. If you have a few cylinders at 80/60 or 80/65 due to a leaky valve or whatever, you're not going to burn all the fuel and therefore won't have all the rated horsepower that the engine is capable of providing.

Lycoming Service Instruction 1191 says that the 80/75 is satisfactory. It goes on further to say that anything less than 80/70 requires further inspection."

ing information, but how is anyone going to prove anything? So Ed Sr., Ed Jr., and Mike Rachanski all pitched in to bring out a set of four HIO-360 cylinders from an engine which powered a WGN news helicopter. These cylinders were part of the engine that had gone an incredible 7786 hours without replacement and were part of a ten year test leading to FAA approval for the Lenckite AvBlend®. During each teardown and overhaul, with the FAA inspector present, the engines were disassembled and inspected for wear. With only normal honing during the overhaul to bring them back to dimensionally correct specifications and without chroming and/or oversizing, the cylinders were put back into service.

This engine and its cylinders always used the Lenckite AvBlend® and the Rachanskis attribute this incredible performance to that product keeping the rings, valves, cylinders, and guides lubricated even after shutdown. As a matter of interest, after the last overhaul, they were surprised to find out that the engine had been run 500 or 600 hours without Lenckite AvBlend® and upon teardown, discovered pitted valve stems and valve guides worn beyond limits. With all the other overhauls when the AvBlend® was being used, the exhaust valve-to-guide clearances had less than one thousandths wear. I am not an engineer, nor am I an A&P. However, from all I saw from that test, I could only express amazement. Maybe someone else can find other reasons for cylinders going 7700+ hours, but I haven't been able to get to TBO on any airplane I've owned without pulling at least one.

So now I asked about further references and Ed Sr. pointed out that American Flyers, with eleven locations and about 78 aircraft flying 6,600 hours per month, uses Lenckite AvBlend®. They were having valve sticking problems and changing the oil every 30 to 50 hours. So about 2 1/2 years ago, they started putting in one can of AvBlend® with each oil change. Valve sticking has become a non-event for them since that time and they have reported a 75 to 80% reduction in exhaust valve sticking incidents.

The secret of good performance in any engine – aircraft or otherwise – according to Rachanski Sr., is to get and keep peak pressure in the combustion chamber. In order to do that you have to keep the exhaust valve tight and within the manufacturer's tolerances by keeping all the parts dimensionally correct. Furthermore, in an engine that has time on it, as long as it has no metal worn off, you can use AvBlend® and it will help keep the engine carbon free by soaking into the valves, guides, and other parts of the engine. Carbon tends not to stick on a wet surface. If there's carbon already in the engine, the Lenckite AvBlend® will help slowly dissolve it. With the AvBlend®, when one of their overhaul engines comes back in for overhaul, the Rachanskis claim that they find only one or two thousandths average exhaust valve-to-guide wear against 9 or 10 thousandths without the AvBlend®.

The Rachanskis' two companies

And on the recommended engine operating procedures…

"If the manufacturer says full throttle on takeoff, he means just that. If you get a higher reading, don't pull the throttles back; tell your mechanic to adjust the controllers so that full throttle on takeoff meets the book values in the POH. On critical takeoff, if you have a fuel flow that's high or low, don't try to reset it in the cockpit, have your mechanic adjust the fuel pump or mixture control valve(s) so that you get the proper fuel flows. Otherwise, you're looking for serious problems. If your RPM on takeoff isn't right, have your governors adjusted to meet book values. The manufacturer gives very specific numbers that must be met for operating your engines properly. Good maintenance means meeting those numbers and when you do that, you won't burn valves and pistons.

Over the years as an independent accident investigator and engine expert, I've found that there are three considerations that affect engine operation and power output – engineering, manufacturing and the end user. When anything slips between the cracks in any of these areas, the possibility of failure of the engine increases dramatically. When the manufacturer's engineering department designs an engine, they make blueprints and a test model to test their theories. When all are satisfied that it's going to work, the project goes into production and blueprints for the engine are given to manufacturing. They must follow engineering as to their choice of metals and materials, heat treating, and machining. They must make the engine according to engineering's blueprints. Then at the end of that phase, the engine is certified under Part 33 and the engine goes into the airframe manufacturer's airplane. Then the end users come into the loop. This includes the owners, operators, the pilots, and the maintenance technicians who are subject to a number of rules not only from the FAA but through the manufacturer's operating manuals, maintenance manuals, etc. Sometimes, we think we know better than they do and go off on our own and to things the way we want to do it. When we deviate from these "how to do it's", things can break. When we don't follow service bulletins, service instructions, and ADs, we're basically going off on our own.

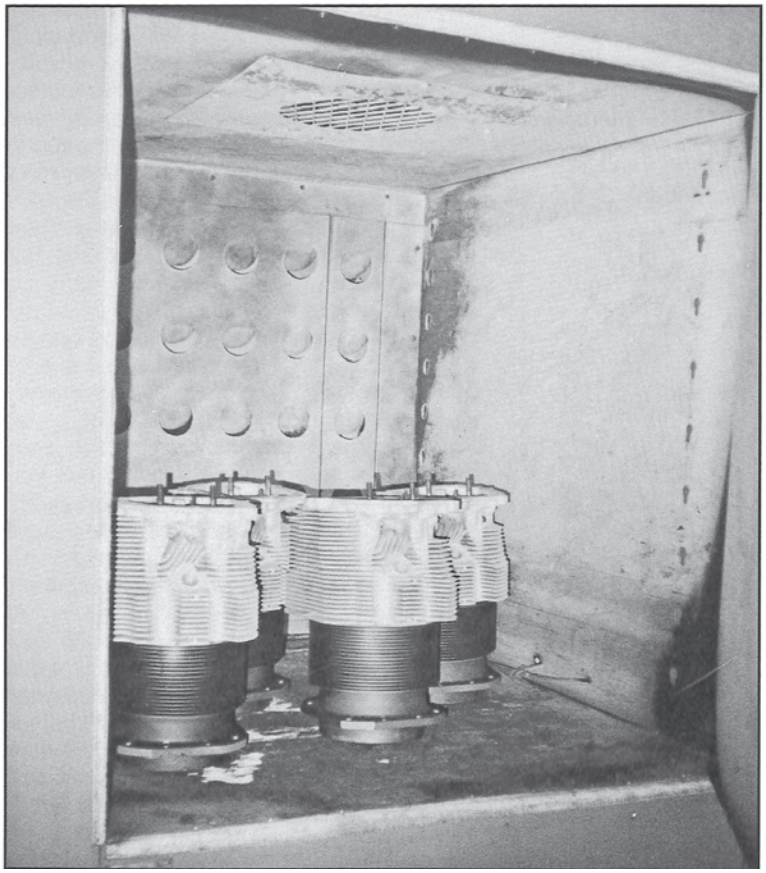
For example, I have seen crashed aircraft spark plugs that haven't been changed in over 600 to 800 hours and the electrodes have eroded to the point where the plugs should have been scraped a long time ago. In cases like this, you certainly can't blame engineering or the manufacturing department."

are very much inter-related as you may well imagine and after a few minutes drive to the Blueprint Engine plant, we started discussing overhauls. The Rachanskis insist on doing things their way. Read that to mean when they do any overhaul, they go by factory new specifications (not service limits) and use only new cylinders when applicable. Camshafts and lifters are also replaced with new ones.

The first think that I noticed when I walked in was the floor. It was spotless. So were all the engine work areas. Everything seemed to have its place and all was neat and clean. Consider me impressed a second time. Ok, all engine rebuild shops have to be clean so you don't get trash into things that go round and round. Maybe that's true and maybe that's the norm. A small operation, Mike is responsible for all the cylinder work, prep work, and inventory. Ed Jr. does all of the assembly work and sister Kim does the bookkeeping. Ed Sr. could be called the Chairman of the Board but in his family business, I suspect he is called "Dad" or maybe "Sir" when things don't quite go right.

In the late 1970's and early 80's, Blueprint Engines rebuilt all the TIO and LTIO-540s for American Central Airlines who were running 26 Navajos. As is normal in a large hub airport such as Chicago, Atlanta or Denver, ATC mixes the Navajos in with the jets and insisted on 160/170 knots to the marker.

Those of us who have done this on a number of occasions know the problem this creates. When you get to the marker, it's go down, slow down, gear down – in that order. In his engine operations training program, Ra-



Cylinder Oven-Heating

Ed Rachanski Jr. on engine changes…

"We 'power balance' the cylinders to the firing impulses and the firing order. We check the cubic centimeters (the volume of air) in the combustion chambers, take the appropriate readings for all six cylinders, and then stagger them according to the firing order. The stagger-pressure procedure we use is proprietary. What you don't want is to have two cylinders with the highest and lowest volume measurements right next to each other. Power balancing them cuts down on engine shaking and results in a smoother running powerplant. As far as the cost to overhaul any engine is concerned, you have to measure apples to apples. If you try to compare an engine which has been overhauled to service limits to one that has been overhauled to new limits, then of course, the cost of the new limits engine will be more since more parts have been replaced. That's the case with the Blueprint engine, especially in view of the fact that we replace the camshaft with a new one. Prior to shipping, our engines are also run on our shop dynamometer."

(Interestingly, the Rachanskis don't believe in "breaking in" and don't suggest using mineral oil at all. They final hone their cylinders using silicone ball hones to knock the peaks off the cylinder walls in the machine shop and they state that there is subsequently no break-in when using this process.)

"During operation, you have a film of oil between the rings and cylinder walls and there's nothing to break in. If the cylinders are not honed in this fashion, when you knock the high spots in the cylinders off with the rings, those thin slivers of metal fall off and can damage your bearings. We call this 'bust-in', not break-in.

We also feel very strongly that a shop which is in tune with our rebuild philosophy has to do the removal and reinstallation of an engine. If the reinstallation isn't done correctly with the baffling put in properly and if necessary repairs and maintenance haven't been done to the engine compartment of the airframe, then all the work done is at risk and inviting future problems."

chanski told those pilots never to come to idle to slow down; always keep some power and "keep the fire going". With this operating procedure, the engines went to their 1800 hour TBO and cylinder cracking was not an issue.

I have to interject my own personal experience here in that I believe that this can be accomplished only by using new cylinders on your overhauled engine to have any chance of duplicating this airline's experience. Furthermore, my gut feeling is that when you run these engines every day, use new cylinders when you overhaul, and adhere to a strict SOP to operate your engines, it doesn't matter what your airline or freight operator's name is, the engines will last.

Ameriflight, the largest Navajo freight operator in the U.S., is now on an extended TBO schedule going to 2,000 hours before an engine overhaul. Since Ameriflight started using new cylinders, cracking has become a non event for them as well. I therefore wonder if we, as private operators, flying 120 to 150 hours per year can do that? I'm not sure. We're probably a lot harder on engines than we think we are. With our extended intervals between flights, generally short hops, lack of proficiency that comes with 10 hours per month of flying vs. the 60 or so hours that the professional pilot gets, we're behind the 8-ball from the start. So maybe we really do need to look for ways to keep our engines lubricated while the airplane sits and waits for us to start it up again.

Blueprint Engine Company is now offering a full power section warranty to selected operators whose engines they overhaul provided they use the Lenckite AvBlend® as recommended and change their oil every fifty hours. Rachanski feels that they have a track record with their overhauled engines and they can afford to give such a warranty on the cylinders and crankcase section (the accessories are covered for one year). They also feel that corporate operators try to take good care of their airframes and engines and they are willing to work with them on this program. So maybe I'm all wet on my theory of lack of use and maybe this stuff really works.

In 1983, Blueprint was chosen one of the top eight shops in the country by an Aviation Consumer readers' survey and recently U.S. Aviator found them to be one of the top five shops in the country. If clean, neat and orderly is any indication of good shop, Blueprint Engines certainly qualifies on that point alone. All accessories are sent out to the best shops in the country for overhaul and yellow-tagging.

In addition, they also have oven heating equipment which allows the entire cylinder to be heated prior to installing new valve guide and seat inserts. Blueprint says that this is the factory recommended method. Heating just the valve head area with a Bunsen torch accomplishes the process as well, but at the cost of weakening or warping the surrounding steel cylinder barrel structure. Not being a metallurgist, I don't know how true this is, but it seems that oven heating is the way to go – especially in view of the fact that is the factory method.

Blueprint suggests using a proven, premium grade oil in your engine. Furthermore, the Rachanskis have found that if you follow the manufacturer's recommendations to the letter, maintenance is proper, pilot operation is by the book, the engine starts out dimensionally correct, and you use Lenckite AvBlend® to help keep those parts dimensionally correct, you'll get to TBO.

If you'd like to take a further look at Blueprint and AvBlend®, call Ed Rachanski, Jr. at 888-645-1101 or 708-790-0108 or write to them at Power by Blueprint Inc., 6800 W 73rd St., Bedford Park, IL 60638-6024.