BLACKSTONE LABORATORIES

The Oil Report
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Oil the News that's Fit to Print!

Looking Ahead

Changes we'd like to see in the aircraft industry

by Ryan Stark

April 2017 will mark my 20th year here at Blackstone and in that time a lot of changes have taken place. I'm a big fan of change myself. Long ago I got some advice from my Uncle Dan who said, "The only thing that's constant in life is change." I have since decided that his words were the truth in everything except aircraft engines -- and that's not without good cause.

Changes in aircraft engines have had a history of backfiring and causing major headaches for everyone involved. One wrong change to the way a crankshaft is manufactured and you might have to ground a major portion of the aircraft flying today. One change to the hone pattern on a cylinder might suddenly cause your piston pin plugs to wear down to nothing and flood your oil sump and filter with metal flakes. You can see my point here, but with that said, there are still some changes I'd like to see happen.

Thinner oil

Our company line is, "All oils work fine, the brand doesn't matter," and I still adhere to that, though I'll let you in on a little secret: Aeroshell W65 was one of my favorite oils and I was sad to see it removed from the market. "Why would that oil by your favorite?" you might ask. The answer is because I'm a big fan of thinner oils, and I think their use would go a long way to solving a lot of the problems that thick oils cause in an engine.

For years now, there has been a major shift in automotive oils from 10W/40s, which were common in the 1970s, to 10W/30 in the '80s. Those were followed by 5W/30s in the '90s, and now 5W/20 oil is the oil of choice for most non-German cars and light trucks. Even diesel engine manufacturers, which resisted this change for many years, and now recommending 10W/30s, and I suspect they will quickly go even lower. So what's the difference in thinner oils? Well, they pump more easily and that's important when you are trying to start an engine on a cold winter morning. What's more, the thin viscosity doesn't cause any wear problems.

I was convinced of this after seeing a lot of samples of Aeroshell W65 in use. Those engines usually had great wear numbers, so the parts obviously didn't mind 30W oil versus a 50W, and I never saw the reason to switch back to a 50W just because the weather got warmer. If you ask Lycoming about causes of camshaft problems, they will say that two major factors are high-RPM starts and cold starts without preheating. Now, I'm no tribologist, but it seems to me that both of these problems are due to a lack of lubrication between the camshaft and followers. Why is there a lack of oil at start up? It's because your engine is trying to pump that thick blob of 50W molasses that's chilled to the bone down in your oil sump. In fact, after knowing how thick 50W oil is, it always surprises me that engines develop oil pressure as fast as they do. Of course, if you like preheating your engine for 30 minutes before you can actually take off, then this change might not be for you. Or you could try a fill of W80 and see if it makes a difference on start up.

Electronic controls

This change would be a little harder to implement, since there are a lot of pilots out there who don't have anything better to do than adjust the mixture knob while they are waiting for flight following to hand them off to their next controller. I'm guilty of it, and I'm also guilty of not knowing what's good and what's bad on that regard. My training on engine leaning was sorely lacking and I suspect my instructor didn't know what the hell she was doing either. But I do know that Lycoming and Continental know what they are doing, and they are the ones who should decide what the mixture parameters for an engine should be. Electronic controls give you that, and also do a wonderful job of protecting the engine when it sees situations where detonation can occur.

Diesel engines

This one is coming in the near future, and while I don't think these will ever completely replace gasoline engines, they do have a lot of advantages that can't be ignored, like better fuel consumption and more longevity (in general). Plus, the fueling structure is already in place since these run on Jet A. Now, if you can just train the line-boy to not put gas in there…

Unleaded fuel

This one is coming too, but it's a tricky-wicket so to speak. For anti-detonation purposes, it's hard to beat lead. Still, that problem isn't insurmountable. Automotive engines did away with lead in the late '70s and they have done nothing but get better. Of course, that's also about the time that electronic controls became prevalent, and that by itself no doubt helped eliminate some of the detonation problems. I believe it's possible to get rid of lead in the fuel without the use of electronic engine controls, but it makes the problem harder to solve. One plus to getting rid of 100LL is, we would actually be able to see lead babbitt bearing wear in your oil analysis.

Emission controls

I know, I know, "What are you smoking?" But hear me out. Lycoming also states that the number one cause of cam failure is corrosion, so it's a major problem. Have you ever wondered why an aircraft engine will start to rust if you don't fly at least five hours per month, but you can park your car behind your house for a year without turning it over, yet it will still look great in analysis? The answer in my mind is lack of an open breather on the automotive engine. If you keep an engine sealed up from the atmosphere, that will keep water from getting into the oil and condensation from forming on your parts. Maybe we don't need a full-blown emission control with exhaust gas recirculation and catalytic converters, but if the designers could find a way to keep the engines from rusting, it sure would be a step in the right direction.

So that's my wish list, for what it's worth. Change is a tricky thing to institute in the aviation world, but it doesn't mean we should stop trying. Will any/all of these be commonly available in the next 20 years? It's like the monkey said after he took a dump in the closet -- "That remains to be seen."*

*Special thanks to my grandpa, Cliff Clevenger, for that line.

Cholesterol follow-up

Back in August 2015 I wrote about cholesterol testing and its parallels to oil analysis (read it here). I'm sure you're all wondering how my health has been, so this is a follow up to that. In the article I stated that there appears to be a connection between Vitamin D and cholesterol and I am here to tell you that I might have been wrong.

My final blood test was on August 7, 2015 and at the time I was taking a Vitamin D supplement to see if it would lower my cholesterol. Well, the supplement worked: my Vitamin D increased to 33, which was an all-time high; however my cholesterol also increased. So barring any sort of lab error that might have occurred, I'm not sure if there is a conclusion or not.

That article received a lot of feedback and I enjoyed all of the comments from our customers, but was especially intrigued by one e-mail I received. He pointed me towards the book "The Great Cholesterol Con," by Malcolm Kendrick, and while it wasn't the easiest read I've ever come across, it did change my life.

The books states that cholesterol levels aren't related to heart disease at all and that I should eat anything I like. Well, I'm 43 now and can make up my mind on what I do, and I have to say, I really liked the sound of that. It was the first time I had ever heard anyone say that your diet isn't related to heart disease and he had that data in his book to back it up.

I'll admit I never read any of the studies he talked about, though apparently they are all available on the Internet. As for what causes heart disease, well, I won't spoil the book for you -- ha ha just kidding, I'll spoil it: stress! Reduce that in your life and you'll be better off. Who can argue with that? Plus now that I don't have to feel bad about putting butter on my toast, my life just got less stressful.

--Ryan Stark

Date: August 7, 2015
Total cholesterol: 208
Bad cholesterol: 136
Good cholesterol: 46
Tri-Glicerides: 128
Vitamin D: 33

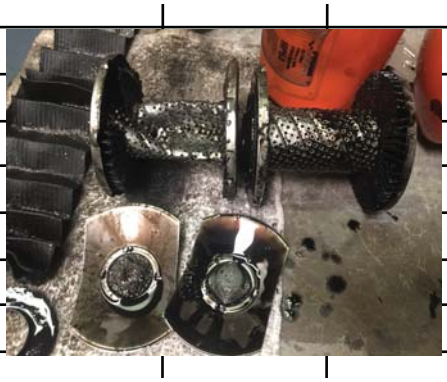
Report of the Month

This 1945 Pratt & Whitney R-2800 engine failed in flight. Can you tell what went wrong?

To learn more about where the elements are coming from, click here.

ELEMENTS IN PARTS PER MILLION			UNIT/ LOCATION AVERAGES		UNIVERSAL AVERAGES
	MI/HR on Oil	25		51	
	MI/HR on Unit				
	Sample Date	7/13/2016		5/26/2013	
	ALUMINUM	169	15	9	7
	CHROME	4	2	2	2
	IRON	265	65	51	35
	COPPER	22	28	12	10
	LEAD	818	985	926	1100
	TIN	29	2	0	2
	MO LYBDENUM	0	0	0	0
	NICKEL	6	1	1	1
	PO TASSIUM	0	4	4	3
	BORON	0	1	1	1
	SILICON	38	11	11	9
	SODIUM	4	16	16	9
	CALCIUM	2	7	7	3
	MAGNESIUM	9	5	5	5
	PHOSPHORUS	17	0	0	7
	ZINC	7	5	5	3
	BARIUM	0	0	0	0

The Lockheed R2800 in question.



The paper filter element jammed up with metal from the failed bearing, and then the metal jammed up the bypass element too. Pictured is a comparison between the crushed filter element and a normal one.

PROPERTIES		Values Should Be*	
SUS Viscosity @210°F	107.3	100-125	112.7
cSt Viscosity @ 100°C	22.06	20.4-26.3	23.29
Flashpoint in °F	510	>480	520
Fuel %	<0.5	<1.0	<0.5
Antifreeze %	-	-	-
Water %	0.0	0.1	0.0
Insolubles %	0.6	<0.7	0.8
TBN			
TAN			
ISO Code			

The screen dome around the bypass valve was mashed flat by the hydraulic action of the scavenge oil.

*THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE

This engine suffered a bearing failure -- a problem that's difficult for us to see in analysis, because any lead coming from bearing babbitt is masked by lead from 100LL. What we do see, though, is elevated bronze wear (copper and tin). The pilot says: "I was flying over the Sierras in a really bad spot that necessitated using the engine to get as much altitude and distance from the mountains as possible. As soon as power was reduced I knew it was going to seize and sure enough it did. As to why it failed, there could be many causes. This new engine was built by Ford in 1945 and was never used. It was put on this aircraft in 1994, flew 20 hours, and then sat for 16 years. It ran well. We could see a history of left-engine failues in the sludge on the bottom of the oil tank that we cleaned. Maybe some of this found its way through the oil system and scored the main bearing. Or maybe sitting for 16/70 years caused long-term issues with the main bearing. Or maybe a Japanese spy was working in the P&W plant in 1945...just kidding! Anyway we are all okay. It was a good day."