BLACKSTONE LABORATORIES

OIL REPORT

LAB NUMBER: K20144 **UNIT ID:** N421SM-LH
REPORT DATE: 5/15/2018 **CLIENT ID:** 125279
CODE: 20/32 **PAYMENT:** Verbal, Tlb

UNIT

MAKE/MODEL: Continental GTSIO-520-L
FUEL TYPE: Gasoline (Leaded)
ADDITIONAL INFO: Cessna 421C, S/N: 421C1213

OIL TYPE & GRADE: Aeroshell W100 Plus (AD)
OIL USE INTERVAL: 51 Hours

CLIENT

TLB LEGACY AVIATION
9101 ALTA DR
#106
LAS VEGAS, NV 89145

PHONE:
FAX:
ALT PHONE:
EMAIL:

COMMENTS

TLB: Universal averages show typical wear levels for this type of engine after about 35 hours on the oil. Metals are high, but only copper and nickel are high enough to take note of. Copper shows wear at brass/bronze parts. Nickel is typically from exhaust valve guides. If ay nickel cylinders are in use, some extra nickel may be normal. Any excess metal in the oil filter? How were compressions at the last annual? Fuel at 1.0% can show a fuel system problem, but it's right at the cautionary mark. Some of it could just be from normal use. Check back in 40 hours to monitor.

ELEMENTS IN PARTS PER MILLION

		UNIT / LOCATION AVERAGES						UNIVERSAL AVERAGES
MI/HR on Oil	51							
MI/HR on Unit	691							
Sample Date	5/2/2018							
Make Up Oil Added	7 qts							
ALUMINUM	10	10						6
CHROMIUM	9	9						7
IRON	50	50						39
COPPER	**14**	14						4
LEAD	6645	6645						4691
TIN	4	4						1
MOLYBDENUM	6	6						3
NICKEL	**32**	32						15
MANGANESE	1	1						0
SILVER	0	0						0
TITANIUM	1	1						0
POTASSIUM	0	0						1
BORON	1	1						1
SILICON	8	8						6
SODIUM	1	1						1
CALCIUM	2	2						5
MAGNESIUM	0	0						1
PHOSPHORUS	1189	1189						288
ZINC	3	3						4
BARIUM	0	0						0

PROPERTIES

		Values Should Be*					
SUS Viscosity @ 210°F	95.7	86-105					
cSt Viscosity @ 100°C	19.35	17.0-21.8					
Flashpoint in °F	**440**	>460					
Fuel %	**1.0**	<1.0					
Antifreeze %	-						
Water %	0.0	0.0					
Insolubles %	0.5	<0.6					
TBN							
TAN							
ISO Code							

*** THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE**

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LIABILITY LIMITED TO COST OF ANALYSIS

BLACKSTONE LABORATORIES

OIL REPORT

LAB NUMBER: K20485 **UNIT ID:** N421SM-RH
REPORT DATE: 5/16/2018 **CLIENT ID:** 125279
CODE: 20/32 **PAYMENT:** Verbal, Tlb

UNIT

MAKE/MODEL: Continental GTSIO-520
FUEL TYPE: Gasoline (Leaded)
ADDITIONAL INFO: Cessna 421C, S/N: 421C1213

OIL TYPE & GRADE: Aeroshell W100 Plus (AD)
OIL USE INTERVAL: 52 Hours

CLIENT

TLB LEGACY AVIATION
9101 ALTA DR
#106
LAS VEGAS, NV 89145

PHONE:
FAX:
ALT PHONE:
EMAIL:

COMMENTS

TLB: Note that N421SM's left engine type was listed with the "-L" suffix, while the right was not - that does make a difference as far as the universal averages are concerned. If we need to update any records, just let us know. This RAM-built Continental looks fine with wear metals all reading in average ranges. Chrome's on the high side of average, but if the cylinders used in the rebuild were chrome or Millenium steel it may be normal for this engine. Insolubles were high and show the oil filter's capacity was about used up. Good report, so just check back in ~45 hours.

ELEMENTS IN PARTS PER MILLION

		UNIT / LOCATION AVERAGES	UNIVERSAL AVERAGES
MI/HR on Oil	52		
MI/HR on Unit	204		
Sample Date	5/2/2018		
Make Up Oil Added	8 qts		
ALUMINUM	9	9	10
CHROMIUM	20	20	11
IRON	58	58	56
COPPER	13	13	10
LEAD	5006	5006	5109
TIN	3	3	2
MOLYBDENUM	11	11	4
NICKEL	29	29	15
MANGANESE	1	1	1
SILVER	0	0	0
TITANIUM	1	1	0
POTASSIUM	0	0	0
BORON	2	2	0
SILICON	13	13	7
SODIUM	2	2	1
CALCIUM	6	6	4
MAGNESIUM	1	1	1
PHOSPHORUS	998	998	354
ZINC	6	6	7
BARIUM	0	0	0

PROPERTIES

		Values Should Be*
SUS Viscosity @ 210°F	95.4	86-105
cSt Viscosity @ 100°C	19.27	17.0-21.8
Flashpoint in °F	490	>460
Fuel %	<0.5	<1.0
Antifreeze %	-	
Water %	0.0	0.0
Insolubles %	0.6	<0.6
TBN		
TAN		
ISO Code		

* THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE

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LIABILITY LIMITED TO COST OF ANALYSIS

BLACKSTONE LABORATORIES

OIL REPORT

LAB NUMBER: K48087 **UNIT ID:** N421SM-LH
REPORT DATE: 8/24/2018 **CLIENT ID:** 77676
CODE: 20/32 **PAYMENT:** CC: Visa

UNIT

MAKE/MODEL: Continental GTSIO-520-L
FUEL TYPE: Gasoline (Leaded)
ADDITIONAL INFO: Cessna 421C, S/N: 421C1213, 294470-P,
OIL TYPE & GRADE: Aeroshell W100 Plus (AD)
OIL USE INTERVAL: 66 Hours

CLIENT

SCOTT BULLOCK
APEX AVIATION - HENDERSON
1410 JET STREAM DRIVE
STE 100
HENDERSON, NV 89052
PHONE: (702) 281-9173
FAX:
ALT PHONE:
EMAIL: scott@apexaviation.aero, info@apexaviationlv.com, tim@apexaviationlv.com

COMMENTS

SCOTT: Usually we like to compare twin engines, but the other side is much newer so we'll evaluate each on its own. This side looks really good, considering the oil has almost 70 hours on it. The only place the engine had a hard time keeping up with the long oil change is insolubles. Those are the solids that collect from heat, use, and blow-by. They should improve next time, especially if the next oil change is a little shorter than this one. Blow-by looks good and no fuel is present. A good report overall.

ELEMENTS IN PARTS PER MILLION

MI/HR on Oil	66	UNIT / LOCATION AVERAGES	51						UNIVERSAL AVERAGES
MI/HR on Unit	757		691						
Sample Date	8/3/2018		5/2/2018						
Make Up Oil Added	8 qts		7 qts						
ALUMINUM	7	6	10						6
CHROMIUM	8	5	9						7
IRON	49	26	50						39
COPPER	12	6	14						4
LEAD	5778	3498	6645						4702
TIN	4	2	4						1
MOLYBDENUM	5	4	6						3
NICKEL	27	17	32						15
MANGANESE	1	0	1						0
SILVER	0	0	0						0
TITANIUM	1	0	1						0
POTASSIUM	1	1	0						1
BORON	1	1	1						1
SILICON	6	6	8						6
SODIUM	0	2	1						1
CALCIUM	1	7	2						5
MAGNESIUM	0	0	0						1
PHOSPHORUS	1046	622	1189						289
ZINC	4	2	3						4
BARIUM	0	0	0						0

PROPERTIES

		Values Should Be*					
SUS Viscosity @ 210°F	95.8	86-105	95.7				
cSt Viscosity @ 100°C	19.36	17.0-21.8	19.35				
Flashpoint in °F	485	>460	440				
Fuel %	<0.5	<1.0	1.0				
Antifreeze %	-		-				
Water %	0.0	0.0	0.0				
Insolubles %	0.7	<0.6	0.5				
TBN							
TAN							
ISO Code							

* THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE

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BLACKSTONE LABORATORIES

OIL REPORT

LAB NUMBER: K48088 **UNIT ID:** N421SM-RH
REPORT DATE: 8/24/2018 **CLIENT ID:** 77676
CODE: 20/32 **PAYMENT:** CC: Visa

UNIT

MAKE/MODEL: Continental GTSIO-520-N
FUEL TYPE: Gasoline (Leaded)
ADDITIONAL INFO: Cessna 421C, S/N: 421C1213, 610222
OIL TYPE & GRADE: Aeroshell W100 Plus (AD)
OIL USE INTERVAL: 66 Hours

CLIENT

SCOTT BULLOCK
APEX AVIATION - HENDERSON
1410 JET STREAM DRIVE
STE 100
HENDERSON, NV 89052
PHONE: (702) 281-9173
FAX:
ALT PHONE:
EMAIL: scott@apexaviation.aero, info@apexaviationlv.com, tim@apexaviationlv.com

COMMENTS

SCOTT: We didn't even talk about how wear improved on the other side, despite this being a 66-hour oil change. Wear has improved on this side too, which is great. Any time you can run the oil longer and get less wear, that's an indication that the engine is in good shape. Iron is 2 ppm higher than last time, but on a per-hour basis it's better than last time and better than average. Insolubles are low on this side, reading down at 0.3%. No water or fuel found. Blow-by is truly excellent. Looks like a great pair of engines on this Cessna!

ELEMENTS IN PARTS PER MILLION

MI/HR on Oil	66	UNIT / LOCATION AVERAGES	52					UNIVERSAL AVERAGES
MI/HR on Unit	270		204					
Sample Date	8/3/2018		5/2/2018					
Make Up Oil Added	8 qts		8 qts					
ALUMINUM	5	7	9					5
CHROMIUM	16	18	20					7
IRON	60	59	58					37
COPPER	10	12	13					4
LEAD	4970	4988	5006					4397
TIN	4	4	3					1
MOLYBDENUM	7	9	11					3
NICKEL	24	27	29					15
MANGANESE	1	1	1					0
SILVER	0	0	0					0
TITANIUM	1	1	1					0
POTASSIUM	1	1	0					1
BORON	1	2	2					1
SILICON	7	10	13					6
SODIUM	1	2	2					1
CALCIUM	1	4	6					13
MAGNESIUM	0	1	1					1
PHOSPHORUS	1071	1035	998					246
ZINC	3	5	6					4
BARIUM	0	0	0					0

PROPERTIES

		Values Should Be*					
SUS Viscosity @ 210°F	96.8	86-105	95.4				
cSt Viscosity @ 100°C	19.61	17.0-21.8	19.27				
Flashpoint in °F	475	>460	490				
Fuel %	<0.5	<1.0	<0.5				
Antifreeze %	-		-				
Water %	0.0	0.0	0.0				
Insolubles %	0.3	<0.6	0.6				
TBN							
TAN							
ISO Code							

* THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE

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BLACKSTONE LABORATORIES

OIL REPORT

LAB NUMBER: K76845 **UNIT ID:** N421SM-LH
REPORT DATE: 12/10/2018 **CLIENT ID:** 130021
CODE: 63/32 **PAYMENT:** CC: Visa

UNIT

MAKE/MODEL: Continental GTSIO-520-L
FUEL TYPE: Gasoline (Leaded)
ADDITIONAL INFO: Cessna 421C, S/N: 421C1213, 294470-P,
OIL TYPE & GRADE: Aeroshell W100 Plus (AD)
OIL USE INTERVAL: 48 Hours

CLIENT

APEX AVIATION
2634 AIRPORT DR
STE 106
NORTH LAS VEGAS, NV 89032
PHONE: (702) 636-6555
FAX:
ALT PHONE:
EMAIL: val@apexaviationlv.com

COMMENTS

SCOTT: Thanks for letting us know about the new push rod tube seals. Those aren't really wearing parts in the same sense as pistons or rings, but the work required in getting to them could result in some changes on our end. The repairs could account for the additional metal and silicon in this sample. We found similar changes from the right engine too, which goes along with that idea. If only one engine had shown more metal and silicon than before, another explanation would have been more likely. Look for less copper, nickel, and silicon at the next oil change.

ELEMENTS IN PARTS PER MILLION

MI/HR on Oil	48	UNIT / LOCATION AVERAGES	66	51				UNIVERSAL AVERAGES
MI/HR on Unit	805		757	691				
Sample Date	11/21/2018		8/3/2018	5/2/2018				
Make Up Oil Added	8 qts		8 qts	7 qts				
ALUMINUM	8	6	7	10				6
CHROMIUM	10	4	8	9				7
IRON	56	27	49	50				39
COPPER	14	6	12	14				4
LEAD	6507	3534	5778	6645				4685
TIN	3	2	4	4				1
MOLYBDENUM	6	4	5	6				3
NICKEL	31	16	27	32				15
MANGANESE	1	0	1	1				0
SILVER	0	0	0	0				0
TITANIUM	1	0	1	1				0
POTASSIUM	0	1	1	0				1
BORON	1	0	1	1				1
SILICON	34	9	6	8				6
SODIUM	1	2	0	1				1
CALCIUM	2	7	1	2				5
MAGNESIUM	1	0	0	0				1
PHOSPHORUS	1149	681	1046	1189				293
ZINC	4	2	4	3				4
BARIUM	0	0	0	0				0

PROPERTIES

		Values Should Be*					
SUS Viscosity @ 210°F	94.0	86-105	95.8	95.7			
cSt Viscosity @ 100°C	18.94	17.0-21.8	19.36	19.35			
Flashpoint in °F	475	>460	485	440			
Fuel %	<0.5	<1.0	<0.5	1.0			
Antifreeze %	-		-	-			
Water %	0.0	0.0	0.0	0.0			
Insolubles %	0.4	<0.6	0.7	0.5			
TBN							
TAN							
ISO Code							

* THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE

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LIABILITY LIMITED TO COST OF ANALYSIS

BLACKSTONE LABORATORIES

OIL REPORT

LAB NUMBER: K76846 **UNIT ID:** N421SM-RH
REPORT DATE: 12/10/2018 **CLIENT ID:** 130021
CODE: 63/32 **PAYMENT:** CC: Visa

UNIT

MAKE/MODEL: Continental GTSIO-520-N
FUEL TYPE: Gasoline (Leaded)
ADDITIONAL INFO: Cessna 421C, S/N: 421C1213, 610222
OIL TYPE & GRADE: Aeroshell W100 Plus (AD)
OIL USE INTERVAL: 48 Hours

CLIENT

APEX AVIATION
2634 AIRPORT DR
STE 106
NORTH LAS VEGAS, NV 89032
PHONE: (702) 636-6555
FAX:
ALT PHONE:
EMAIL: val@apexaviationlv.com

COMMENTS

SCOTT: There's some extra copper and silicon in this sample, just like we noted for the left engine. Nickel is higher too, though 29 ppm is still just inside the average range for this type of Continental. Chrome is a little out of line at 18 ppm, but that's only an actual increase of a couple ppm. We'll give this engine the benefit of the doubt for now, and assume the changes in wear and silicon are just from the push rod tube seal work. Suggest a follow-up in about 40 hours, just to make sure things are headed in the right direction for both sides of N421SM.

ELEMENTS IN PARTS PER MILLION

								UNIVERSAL AVERAGES
MI/HR on Oil	48	UNIT / LOCATION AVERAGES	66	52				
MI/HR on Unit	318		270	204				
Sample Date	11/21/2018		8/3/2018	5/2/2018				
Make Up Oil Added	8 qts		8 qts	8 qts				
ALUMINUM	8	7	5	9				5
CHROMIUM	18	18	16	20				7
IRON	74	64	60	58				37
COPPER	12	12	10	13				4
LEAD	5900	5292	4970	5006				4404
TIN	5	4	4	3				1
MOLYBDENUM	8	9	7	11				3
NICKEL	29	27	24	29				15
MANGANESE	1	1	1	1				0
SILVER	0	0	0	0				0
TITANIUM	1	1	1	1				0
POTASSIUM	0	0	1	0				1
BORON	0	1	1	2				1
SILICON	34	18	7	13				6
SODIUM	1	1	1	2				1
CALCIUM	1	3	1	6				13
MAGNESIUM	1	1	0	1				1
PHOSPHORUS	1122	1064	1071	998				259
ZINC	4	4	3	6				4
BARIUM	0	0	0	0				0

PROPERTIES

		Values Should Be*					
SUS Viscosity @ 210°F	92.7	86-105	96.8	95.4			
cSt Viscosity @ 100°C	18.64	17.0-21.8	19.61	19.27			
Flashpoint in °F	470	>460	475	490			
Fuel %	<0.5	<1.0	<0.5	<0.5			
Antifreeze %	-	-	-	-			
Water %	0.0	0.0	0.0	0.0			
Insolubles %	0.5	<0.6	0.3	**0.6**			
TBN							
TAN							
ISO Code							

*** THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE**

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