

BLACKSTONE

LABORATORIES

P.O. NUMBER CC: Visa
 CODE: 35/7018/66

UNIT NUMBER N3946Q
 REPORT DATE: 1/7/04
 LAB NUMBER: C09494

OIL REPORT

CLIENT	CONTACT:	PHONE: (408) 737-8192
	NAME: PAUL MENNEN	FAX:
	ADDRESS: 1452 OWEN SOUND DR. SUNNYVALE, CA 94087	E-MAIL: paul@mennen.org

UNIT	EQUIPMENT MAKE: Continental	OIL USE INTERVAL: 97 Hours
	EQUIPMENT MODEL: IO-550-D	OIL TYPE & GRADE: Aeroshell W100 (AD)
	FUEL TYPE: Gasoline (Leaded)	MAKE-UP OIL ADDED: 2 qts
	ADDITIONAL INFO: Cessna A185F, S/N 680053	

COMMENTS
 PAUL: Wow, 97 hours on the oil! That is a lot -- too long, even, considering that you were getting some abnormal wear before this. Note chrome, copper, and nickel, all showing abnormal and abrasive wear metals in the oil. Lead, from 100LL blow-by, is probably this high because of the long oil change interval. We were concerned about the metals before and do not like them any more now. We suggest a short-run (10 hour) oil change, then run the next one 20-25 hours and resample to see if metals return to normal. Caution! Excessive abrasive metals in the system!

ELEMENTS IN PARTS PER MILLION	MI/HR ON OIL	97	UNIT / LOCATION AVERAGES	26	19			
	MI/HR ON UNIT	268		172	72	19		UNIVERSAL AVERAGES
	SAMPLE DATE	12/19/03		05/15/03	06/24/02	03/06/02		
ALUMINUM	15	13	13	10	8			8
CHROMIUM	21	17	14	17	8			9
IRON	63	54	38	61	37			36
COPPER	14	15	10	22	28			3
LEAD	10910	6984	6330	3711	1106			3005
TIN	2	2	3	2	3			1
MOLYBDENUM	4	3	3	2				4
NICKEL	38	34	26	37	9			6
MANGANESE	3	2	2	2				0
SILVER	0	0	0	0	0			0
TITANIUM	0	0	0	0				0
POTASSIUM	0	1	1	2				0
BORON	0	0	0	0				0
SILICON	10	11	10	14	10			11
SODIUM	1	1	1	1				1
CALCIUM	1	1	1	0				2
MAGNESIUM	0	1	1	1	0			0
PHOSPHORUS	14	17	25	12				581
ZINC	29	16	6	13				2
BARIUM	0	0	0	0				0

PROPERTIES	TEST	cST VISCOSITY @ 40 °C	SUS VISCOSITY @ 100 °F	VISCOSITY INDEX	cST VISCOSITY @ 100 °C	SUS VISCOSITY @ 210 °F	FLASHPOINT IN °F	FUEL %	ANTIFREEZE %	WATER %	INSOLUBLES %
	VALUES SHOULD BE					86-105	>460	<1.0		0.0	<0.6
	TESTED VALUES WERE					99.4	520	<0.5	-	0.0	0.6

BLACKSTONE

LABORATORIES

P.O. NUMBER CC: Visa
 CODE: 35/7018/66

UNIT NUMBER N3946Q
 REPORT DATE: 3/24/04
 LAB NUMBER: C14510

OIL REPORT

CLIENT	CONTACT:	PHONE: (408) 737-8192
	NAME: PAUL MENNEN	FAX:
	ADDRESS: 1452 OWEN SOUND DR. SUNNYVALE, CA 94087	E-MAIL: paul@mennen.org

UNIT	EQUIPMENT MAKE: Continental	OIL USE INTERVAL: 20 Hours
	EQUIPMENT MODEL: IO-550-D	OIL TYPE & GRADE: Aeroshell W80 (AD)
	FUEL TYPE: Gasoline (Leaded)	MAKE-UP OIL ADDED: 5 qts
	ADDITIONAL INFO: Cessna A185F, S/N 680053	

COMMENTS PAUL: We are pleased to see you only ran this oil 20 hours. That has certainly helped bring wear down to more normal levels, though we'd like to see them fall lower before we consider this IO-550 to be wearing normally. You always get some residual metals from oil change to oil change, and we think if you keep the next sample short, wear will probably improve again. Note the viscosity, reading more like W100 or 15W/50. If some of the excess oil was a different grade, that might explain it. As long as the filter is clean & the engine is running well, check back to monitor.

ELEMENTS IN PARTS PER MILLION	MI/HR ON OIL	20	UNIT / LOCATION AVERAGES	97	26	19	UNI VERSAL AVERAGES
	MI/HR ON UNIT	289		268	172	72	
	SAMPLE DATE	03/20/04		12/19/03	05/15/03	06/24/02	03/06/02
	ALUMINUM	6	11	15	13	10	8
CHROMIUM	9	15	21	14	17	8	9
IRON	25	47	63	38	61	37	34
COPPER	5	13	14	10	22	28	3
LEAD	4237	6297	10910	6330	3711	1106	3119
TIN	0	2	2	3	2	3	1
MOLYBDENUM	2	3	4	3	2		4
NICKEL	20	30	38	26	37	9	7
MANGANESE	1	2	3	2	2		0
SILVER	0	0	0	0	0	0	0
TITANIUM	0	0	0	0	0		0
POTASSIUM	0	1	0	1	2		0
BORON	0	0	0	0	0		0
SILICON	6	10	10	10	14	10	11
SODIUM	0	1	1	1	1		1
CALCIUM	0	1	1	1	0		2
MAGNESIUM	0	1	0	1	1	0	0
PHOSPHORUS	20	18	14	25	12		567
ZINC	9	14	29	6	13		3
BARIUM	0	0	0	0	0		0

PROPERTIES	TEST	cST VISCOSITY @ 40 °C	SUS VISCOSITY @ 100 °F	VISCOSITY INDEX	cST VISCOSITY @ 100 °C	SUS VISCOSITY @ 210 °F	FLASHPOINT IN °F	FUEL %	ANTIFREEZE %	WATER %	INSOLUBLES %
	VALUES SHOULD BE					74-85	>450	<1.0		0.0	<0.6
	TESTED VALUES WERE					96.9	505	<0.5	-	0.0	0.5

BLACKSTONE LABORATORIES

P.O. NUMBER CC: Visa
CODE: 35/7018/66

UNIT NUMBER N3946Q
REPORT DATE: 9/24/04
LAB NUMBER: C27891

OIL REPORT

CLIENT	CONTACT:	PHONE: (408) 737-8192
	NAME: PAUL MENNEN	FAX:
	ADDRESS: 1452 OWEN SOUND DR.	E-MAIL: paul@mennen.org
	SUNNYVALE, CA 94087	

UNIT	EQUIPMENT MAKE: Continental	OIL USE INTERVAL: 66 Hours
	EQUIPMENT MODEL: IO-550-D	OIL TYPE & GRADE: Aeroshell W100 (AD)
	FUEL TYPE: Gasoline (Leaded)	MAKE-UP OIL ADDED: 2 qts
	ADDITIONAL INFO: Cessna A185F, S/N 680053	

COMMENTS
PAUL: Just about everything was high in this sample. This oil was run for quite a long time and it was in use while the two new cylinders your added were breaking in, so we think both of these factors are the reason for the high readings. Of these findings, insolubles were probably the most significant. A full 1.8% of this sample was solid material. This shows an extremely high amount of oil oxidation and blow-by and shows the oil filter was probably bypassing. Suggest resampling in 20-25 hours to keep an eye on these finds. You might also want to check compressions.

ELEMENTS IN PARTS PER MILLION	MI/HR ON OIL	66	UNIT / LOCATION AVERAGES	20	97	26		19	UNI VERSAL AVERAGES
	MI/HR ON UNIT	371		289	268	172	72	19	
	SAMPLE DATE	09/09/04		03/20/04	12/19/03	05/15/03	06/24/02	03/06/02	
ALUMINIUM	15	12	6	15	13	10	8	8	
CHROMIUM	28	18	9	21	14	17	8	8	
IRON	106	59	25	63	38	61	37	33	
COPPER	15	13	5	14	10	22	28	4	
LEAD	7033	6444	4237	10910	6330	3711	1106	3044	
TIN	0	1	0	2	3	2	3	1	
MOLYBDENUM	3	3	2	4	3	2		4	
NICKEL	41	32	20	38	26	37	9	7	
MANGANESE	3	2	1	3	2	2		0	
SILVER	0	0	0	0	0	0	0	0	
TITANIUM	0	0	0	0	0	0		0	
POTASSIUM	2	1	0	0	1	2		0	
BORON	0	0	0	0	0	0		0	
SILICON	28	14	6	10	10	14	10	10	
SODIUM	3	1	0	1	1	1		1	
CALCIUM	3	1	0	1	1	0		1	
MAGNESIUM	1	1	0	0	1	1	0	0	
PHOSPHORUS	7	16	20	14	25	12		528	
ZINC	16	15	9	29	6	13		4	
BARIUM	0	0	0	0	0	0		0	

PROPERTIES	TEST	cST VISCOSITY @ 40 °C	SUS VISCOSITY @ 100 °F	VISCOSITY INDEX	cST VISCOSITY @ 100 °C	SUS VISCOSITY @ 210 °F	FLASHPOINT IN °F	FUEL %	ANTIFREEZE %	WATER %	INSOLUBLES %
	VALUES SHOULD BE					86-105	>460	<1.0		0.0	<0.6
	TESTED VALUES WERE					106.2	510	<0.5	-	TR	1.8

BLACKSTONE

LABORATORIES

P.O. NUMBER CC: Visa
 CODE: 35/7018/37

UNIT NUMBER N3946Q
 REPORT DATE: 2/15/05
 LAB NUMBER: C37828

OIL REPORT

CLIENT	CONTACT:	PHONE: (408) 737-8192
	NAME: PAUL MENNEN	FAX:
	ADDRESS: 1452 OWEN SOUND DR.	E-MAIL: paul@mennen.org
	SUNNYVALE, CA 94087	

UNIT	EQUIPMENT MAKE: Continental	OIL USE INTERVAL: 27 Hours
	EQUIPMENT MODEL: IO-550-D	OIL TYPE & GRADE: Aeroshell W100 (AD)
	FUEL TYPE: Gasoline (Leaded)	MAKE-UP OIL ADDED: 0 qts
	ADDITIONAL INFO: Cessna A185F, S/N 680053	

COMMENTS
 PAUL: Nearly everything improved in this second sample since your cylinder work. Note the drop in silicon and insolubles. Both read at normal levels after being quite high last sample. Aluminum increased for some reason but we are thinking the piston and case metals are gong to start improving in the next sample, unless the next sample is the first AD oil following a couple fills of mineral oil. In that case, you may get wear and lead increases next sample, but they will drop in the next sample thereafter. No new problems detected in this oil. Some nice improvements.

ELEMENTS IN PARTS PER MILLION	MI/HR ON OIL	27	UNIT / LOCATION AVERAGES	66	20	97	26		UNIVERSAL AVERAGES
	MI/HR ON UNIT	398		371	289	268	172	72	
	SAMPLE DATE	02/04/05		09/09/04	03/20/04	12/19/03	05/15/03	06/24/02	
ALUMINIUM	18	13	15	6	15	13	10	8	
CHROMIUM	20	18	28	9	21	14	17	8	
IRON	63	59	106	25	63	38	61	33	
COPPER	11	13	15	5	14	10	22	4	
LEAD	6009	6372	7033	4237	10910	6330	3711	3044	
TIN	2	2	0	0	2	3	2	1	
MOLYBDENUM	5	3	3	2	4	3	2	4	
NICKEL	34	33	41	20	38	26	37	7	
MANGANESE	2	2	3	1	3	2	2	0	
SILVER	0	0	0	0	0	0	0	0	
TITANIUM	0	0	0	0	0	0	0	0	
POTASSIUM	0	1	2	0	0	1	2	0	
BORON	0	0	0	0	0	0	0	0	
SILICON	13	14	28	6	10	10	14	10	
SODIUM	1	1	3	0	1	1	1	1	
CALCIUM	4	2	3	0	1	1	0	1	
MAGNESIUM	5	1	1	0	0	1	1	0	
PHOSPHORUS	34	19	7	20	14	25	12	528	
ZINC	11	14	16	9	29	6	13	4	
BARIIUM	0	0	0	0	0	0	0	0	

PROPERTIES	TEST	cST VISCOSITY @ 40 °C	SUS VISCOSITY @ 100 °F	VISCOSITY INDEX	cST VISCOSITY @ 100 °C	SUS VISCOSITY @ 210 °F	FLASHPOINT IN °F	FUEL %	ANTIFREEZE %	WATER %	INSOLUBLES %
	VALUES SHOULD BE					86-105	>460	<1.0		0.0	<0.6
	TESTED VALUES WERE					91.7	505	<0.5	-	0.0	0.5

BLACKSTONE

LABORATORIES

P.O. NUMBER CC: Visa (Prepaid)
 CODE: 35/7018/37

UNIT NUMBER N3946Q
 REPORT DATE: 10/11/05
 LAB NUMBER: C57154

OIL REPORT

CLIENT	CONTACT:	PHONE: (408) 737-8192
	NAME: PAUL MENNEN	FAX:
	ADDRESS: 1452 OWEN SOUND DR.	E-MAIL: paul@mennen.org
	SUNNYVALE, CA 94087	

UNIT	EQUIPMENT MAKE: Continental	OIL USE INTERVAL: 53 Hours
	EQUIPMENT MODEL: IO-550-D	OIL TYPE & GRADE: Exxon Elite 20W/50 (AD)
	FUEL TYPE: Gasoline (Leaded)	MAKE-UP OIL ADDED: 1.5 qts
	ADDITIONAL INFO: Cessna A185F, S/N 680053, Two cylinders replaced at 436.4 hours.	

COMMENTS
 PAUL: If this sample is the first AD oil following a couple fills of mineral oil, then you would get increases in wear metals and lead. Combine that with 53 hours of oil use (28 hrs is average) and you can see the results in the top of the left-hand column. Those numbers should drop in the next sample especially if you utilize the average number of hours on the new oil. No fuel or moisture was found. Air filtration was okay. Oil filtration was good as indicated by the 0.4% level of insolubles. We suggest a 28-30 hour oil change interval and resample to monitor engine wear.

ELEMENTS IN PARTS PER MILLION	MI/HR ON OIL	53	UNIT /	27	66	20	97	26	UNIVERSAL AVERAGES
	MI/HR ON UNIT	489	LOCATION	398	371	289	268	172	
	SAMPLE DATE	09/22/05	AVERAGES	02/04/05	09/09/04	03/20/04	12/19/03	05/15/03	
ALUMINUM	11	13	18	15	6	15	13	9	
CHROMIUM	30	20	20	28	9	21	14	10	
IRON	108	66	63	106	25	63	38	37	
COPPER	17	13	11	15	5	14	10	6	
LEAD	7682	6559	6009	7033	4237	10910	6330	3538	
TIN	1	1	2	0	0	2	3	1	
MOLYBDENUM	4	3	5	3	2	4	3	4	
NICKEL	41	34	34	41	20	38	26	7	
MANGANESE	3	2	2	3	1	3	2	0	
SILVER	0	0	0	0	0	0	0	0	
TITANIUM	0	0	0	0	0	0	0	0	
POTASSIUM	1	1	0	2	0	0	1	0	
BORON	0	0	0	0	0	0	0	0	
SILICON	15	14	13	28	6	10	10	10	
SODIUM	1	1	1	3	0	1	1	1	
CALCIUM	8	2	4	3	0	1	1	2	
MAGNESIUM	3	2	5	1	0	0	1	0	
PHOSPHORUS	740	122	34	7	20	14	25	605	
ZINC	25	16	11	16	9	29	6	4	
BARIIUM	0	0	0	0	0	0	0	0	

PROPERTIES	TEST	cST VISCOSITY @ 40 °C	SUS VISCOSITY @ 100 °F	VISCOSITY INDEX	cST VISCOSITY @ 100 °C	SUS VISCOSITY @ 210 °F	FLASHPOINT IN °F	FUEL %	ANTIFREEZE %	WATER %	INSOLUBLES %
	VALUES SHOULD BE					89-105	>445	<1.0		0.0	<0.6
	TESTED VALUES WERE					99.9	475	<0.5	-	0.0	0.4

BLACKSTONE

LABORATORIES

P.O. NUMBER CC: Visa (Prepaid)
 CODE: 35/7018/37

UNIT NUMBER N3946Q
 REPORT DATE: 7/28/06
 LAB NUMBER: C80108

OIL REPORT

CLIENT	CONTACT:	PHONE: (408) 737-8192
	NAME: PAUL MENNEN	FAX:
	ADDRESS: 1452 OWEN SOUND DR. SUNNYVALE, CA 94087	E-MAIL: paul@mennen.org

UNIT	EQUIPMENT MAKE: Continental	OIL USE INTERVAL: 25 Hours
	EQUIPMENT MODEL: IO-550-D	OIL TYPE & GRADE: Exxon Elite 20W/50 (AD)
	FUEL TYPE: Gasoline (Leaded)	MAKE-UP OIL ADDED: 1 qt
	ADDITIONAL INFO: Cessna A185F, S/N 680053, Two cylinders replaced at 436.4 hours.	

COMMENTS
 PAUL: Nice improvement in wear and silicon. It looks like the two cylinders that were replaced at 436.4 hours have finally past the wear-in stage and we found nothing in this sample that would suggest any serious problems are developing. Fuel was present at 1.0%, which is right at the problem level, however, since the viscosity was okay, we aren't ready to call this a problem. No water or excess blow-by was found. At 524.3 total hours, we think this engine is back on track and you could extend your oil use a little if you wanted to. Try 35 hours on the next fill.

	MI/HR ON OIL	25	UNIT / LOCATION AVERAGES	53	27	66	20	97	UNIVERSAL AVERAGES
	MI/HR ON UNIT	524		489	398	371	289	268	
	SAMPLE DATE	07/05/06		09/22/05	02/04/05	09/09/04	03/20/04	12/19/03	
ELEMENTS IN PARTS PER MILLION	ALUMINUM	4	12	11	18	15	6	15	9
	CHROMIUM	7	18	30	20	28	9	21	10
	IRON	26	61	108	63	106	25	63	36
	COPPER	4	12	17	11	15	5	14	6
	LEAD	3072	6123	7682	6009	7033	4237	10910	3604
	TIN	0	1	1	2	0	0	2	1
	MOLYBDENUM	1	3	4	5	3	2	4	4
	NICKEL	13	31	41	34	41	20	38	7
	MANGANESE	1	2	3	2	3	1	3	1
	SILVER	0	0	0	0	0	0	0	0
	TITANIUM	0	0	0	0	0	0	0	0
	POTASSIUM	0	1	1	0	2	0	0	0
	BORON	0	0	0	0	0	0	0	0
	SILICON	5	13	15	13	28	6	10	9
	SODIUM	0	1	1	1	3	0	1	1
	CALCIUM	3	3	8	4	3	0	1	2
	MAGNESIUM	0	1	3	5	1	0	0	0
	PHOSPHORUS	854	213	740	34	7	20	14	657
	ZINC	4	14	25	11	16	9	29	4
	BARIUM	0	0	0	0	0	0	0	0

PROPERTIES	TEST	cST VISCOSITY @ 40 °C	SUS VISCOSITY @ 100 °F	VISCOSITY INDEX	cST VISCOSITY @ 100 °C	SUS VISCOSITY @ 210 °F	FLASHPOINT IN °F	FUEL %	ANTIFREEZE %	WATER %	INSOLUBLES %
	VALUES SHOULD BE					89-105	>445	<1.0		0.0	<0.6
	TESTED VALUES WERE					92.9	425	1.0	-	0.0	0.5

BLACKSTONE LABORATORIES

P.O. NUMBER CC: Visa (Prepaid)
CODE: 35/7018/37

UNIT NUMBER N3946Q
REPORT DATE: 1/4/07
LAB NUMBER: C93611

OIL REPORT

CLIENT	CONTACT:	PHONE: (408) 737-8192
	NAME: PAUL MENNEN	FAX:
	ADDRESS: 1452 OWEN SOUND DR.	E-MAIL: paul@mennen.org
	SUNNYVALE, CA 94087	

UNIT	EQUIPMENT MAKE: Continental	OIL USE INTERVAL: 61 Hours
	EQUIPMENT MODEL: IO-550-D	OIL TYPE & GRADE: Exxon Elite 20W/50 (AD)
	FUEL TYPE: Gasoline (Leaded)	MAKE-UP OIL ADDED: 1 qt
	ADDITIONAL INFO: Cessna A185F, S/N 680053, Two cylinders replaced at 436.4 hours.	

COMMENTS
PAUL: Virtually all wear increased in this sample, though the oil was run significantly longer, so we don't think the increase is a big concern at this point. Normally, we only expect to see iron track directly with time on the oil, however, if the two replacement cylinders are anything other than factory steel, then that could explain the chrome and nickel as well. Lead is high from the long oil run and shows excess blow-by past the rings or valve guides. Suggest running a compression test. If this is okay and the engine is running well, check back in ~50 hours for another look.

ELEMENTS IN PARTS PER MILLION	MI/HR ON OIL	61	UNIT / LOCATION AVERAGES	25	53	27	66	20	UNIVERSAL AVERAGES
	MI/HR ON UNIT	586		524	489	398	371	289	
	SAMPLE DATE	12/18/06		07/05/06	09/22/05	02/04/05	09/09/04	03/20/04	
ALUMINUM	11	11	4	11	18	15	6	8	
CHROMIUM	15	18	7	30	20	28	9	6	
IRON	65	62	26	108	63	106	25	26	
COPPER	8	12	4	17	11	15	5	5	
LEAD	9262	6472	3072	7682	6009	7033	4237	3574	
TIN	0	1	0	1	2	0	0	1	
MOLYBDENUM	3	3	1	4	5	3	2	2	
NICKEL	26	31	13	41	34	41	20	6	
MANGANESE	1	2	1	3	2	3	1	0	
SILVER	0	0	0	0	0	0	0	0	
TITANIUM	0	0	0	0	0	0	0	0	
POTASSIUM	0	1	0	1	0	2	0	0	
BORON	0	0	0	0	0	0	0	0	
SILICON	7	12	5	15	13	28	6	8	
SODIUM	1	1	0	1	1	3	0	0	
CALCIUM	7	3	3	8	4	3	0	2	
MAGNESIUM	1	1	0	3	5	1	0	0	
PHOSPHORUS	838	283	854	740	34	7	20	689	
ZINC	4	13	4	25	11	16	9	5	
BARIUM	1	0	0	0	0	0	0	0	

PROPERTIES	TEST	cST VISCOSITY @ 40 °C	SUS VISCOSITY @ 100 °F	VISCOSITY INDEX	cST VISCOSITY @ 100 °C	SUS VISCOSITY @ 210 °F	FLASHPOINT IN °F	FUEL %	ANTIFREEZE %	WATER %	INSOLUBLES %
	VALUES SHOULD BE					89-105	>445	<1.0		0.0	<0.6
	TESTED VALUES WERE					101.7	470	<0.5	-	0.0	0.5

BLACKSTONE LABORATORIES

P.O. NUMBER CC: Visa (Prepaid)
CODE: 35/7018/284

UNIT NUMBER N3946Q
REPORT DATE: 7/12/07
LAB NUMBER: D10748

OIL REPORT

CLIENT	CONTACT:	PHONE: (408) 737-8192
	NAME: PAUL MENNEN	FAX:
	ADDRESS: 1452 OWEN SOUND DR.	E-MAIL: paul@mennen.org
	SUNNYVALE, CA 94087	

UNIT	EQUIPMENT MAKE: Continental	OIL USE INTERVAL: 14 Hours
	EQUIPMENT MODEL: IO-550-D7B	OIL TYPE & GRADE: Aeroshell W100 (AD)
	FUEL TYPE: Gasoline (Leaded)	MAKE-UP OIL ADDED: 1 qt
	ADDITIONAL INFO: Cessna A185F, S/N 680053	

COMMENTS
PAUL: It looks like it took about six months to get these 14 hours on this fill of oil, so we're glad to see you've changed the oil sooner than you normally do. Wear metals matched up well with averages, and that's a good sign that no problems are developing. One thing we are concerned with is fuel. 2.5% is more than we like to see, and it could show a fuel system problem. But fuel problems are few and far between in aircraft -- more likely it's the result of excessive priming or flying without getting the oil temps into the green. Check back to monitor.

ELEMENTS IN PARTS PER MILLION	MI/HR ON OIL	14	UNIT / LOCATION AVERAGES	61	25	53	27	66	UNIVERSAL AVERAGES
	MI/HR ON UNIT	600		586	524	489	398	371	
	SAMPLE DATE	06/18/07		12/18/06	07/05/06	09/22/05	02/04/05	09/09/04	
ALUMINUM	7	11	11	4	11	18	15	8	
CHROMIUM	8	17	15	7	30	20	28	8	
IRON	31	59	65	26	108	63	106	29	
COPPER	3	11	8	4	17	11	15	5	
LEAD	3935	6218	9262	3072	7682	6009	7033	3831	
TIN	0	1	0	0	1	2	0	1	
MOLYBDENUM	2	3	3	1	4	5	3	2	
NICKEL	14	29	26	13	41	34	41	10	
MANGANESE	1	2	1	1	3	2	3	1	
SILVER	0	0	0	0	0	0	0	0	
TITANIUM	0	0	0	0	0	0	0	0	
POTASSIUM	1	1	0	0	1	0	2	1	
BORON	0	0	0	0	0	0	0	0	
SILICON	4	11	7	5	15	13	28	7	
SODIUM	0	1	1	0	1	1	3	0	
CALCIUM	5	3	7	3	8	4	3	4	
MAGNESIUM	0	1	1	0	3	5	1	1	
PHOSPHORUS	751	330	838	854	740	34	7	721	
ZINC	2	12	4	4	25	11	16	4	
BARIUM	1	0	1	0	0	0	0	1	

PROPERTIES	TEST	cST VISCOSITY @ 40 °C	SUS VISCOSITY @ 100 °F	VISCOSITY INDEX	cST VISCOSITY @ 100 °C	SUS VISCOSITY @ 210 °F	FLASHPOINT IN °F	FUEL %	ANTIFREEZE %	WATER %	INSOLUBLES %
	VALUES SHOULD BE					86-105	>460	<1.0		0.0	<0.6
	TESTED VALUES WERE					96.8	410	2.5	-	0.0	0.5



OIL REPORT

LAB NUMBER: D36651 UNIT ID: N3946Q
 REPORT DATE: 4/15/2008 CLIENT ID: 7018
 CODE: 35/284 PAYMENT: CC: Visa

UNIT	MAKE/MODEL: Continental IO-550-D7B	OIL TYPE & GRADE: Exxon Elite 20W/50 (AD)
	FUEL TYPE: Gasoline (Leaded)	OIL USE INTERVAL: 9 Hours
	ADDITIONAL INFO: Cessna A185F, S/N 680053	

CLIENT	PAUL MENNEN	PHONE: (408) 737-8192
	1452 OWEN SOUND DR.	FAX:
	SUNNYVALE, CA 94087	ALT PHONE:
		EMAIL: paul@mennen.org

COMMENTS PAUL: Thanks for the note about not flying much recently. We are cheering your decision to take this oil out of service after just 8.8 hours. That is the best way we know of to limit the effects of corrosion. People will spend all kinds of money on additives, but a simple oil change is the best way to keep metals down when you're not flying a lot. Though the metals didn't change much, they are perhaps high for an oil with so few hours on it, but once you're flying more, everything should improve. No moisture or fuel found. We'll watch nickel for you.

ELEMENTS IN PARTS PER MILLION			UNIT / LOCATION AVERAGES	14	61	25	53	27	UNIVERSAL AVERAGES
	MI/HR on Oil			06/18/07	12/18/06	07/05/06	09/22/05	02/04/05	
	9								
	671			600	586	524	489	398	
	03/25/08								
	0 qts			1 qt	1 qt	1 qt	1.5 qts	0 qts	
ALUMINUM	8	11	7	11	4	11	18	8	
CHROMIUM	10	16	8	15	7	30	20	8	
IRON	39	57	31	65	26	108	63	32	
COPPER	4	10	3	8	4	17	11	5	
LEAD	5235	6129	3935	9262	3072	7682	6009	4299	
TIN	4	1	0	0	0	1	2	2	
MOLYBDENUM	3	3	2	3	1	4	5	2	
NICKEL	20	28	14	26	13	41	34	13	
MANGANESE	1	2	1	1	1	3	2	1	
SILVER	0	0	0	0	0	0	0	0	
TITANIUM	1	0	0	0	0	0	0	0	
POTASSIUM	2	1	1	0	0	1	0	1	
BORON	0	0	0	0	0	0	0	0	
SILICON	5	11	4	7	5	15	13	6	
SODIUM	1	1	0	1	0	1	1	0	
CALCIUM	3	3	5	7	3	8	4	3	
MAGNESIUM	0	1	0	1	0	3	5	0	
PHOSPHORUS	1101	400	751	838	854	740	34	848	
ZINC	3	11	2	4	4	25	11	3	
BARIUM	0	0	1	1	0	0	0	0	

Values Should Be*

PROPERTIES			96.8	101.7	92.9	99.9	91.7
	SUS Viscosity @ 210°F		19.60	20.75	18.67	20.33	18.38
	94.8	89-105					
	19.12	17.7-21.8					
	465	>445	410	470	425	475	505
	<0.5	<1.0	2.5	<0.5	1.0	<0.5	<0.5
Antifreeze %	-		-	-	-	-	-
Water %	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Insolubles %	0.5	<0.6	0.5	0.5	0.5	0.4	0.5
TBN							
TAN							
ISO Code							

* THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE

416 E. PETTIT AVE. FORT WAYNE, IN 46806 (260) 744-2380 www.blackstone-labs.com



OIL REPORT

LAB NUMBER: D80279
 REPORT DATE: 7/2/2009
 CODE: 35/284

UNIT ID: N3946Q
 CLIENT ID: 7018
 PAYMENT: CC: Visa

UNIT	MAKE/MODEL: Continental IO-550-D7B	OIL TYPE & GRADE: Exxon Elite 20W/50 (AD)
	FUEL TYPE: Gasoline (Leaded)	OIL USE INTERVAL: 19 Hours
	ADDITIONAL INFO: Cessna A185F, S/N 680053	

CLIENT	PAUL MENNEN	PHONE: (408) 737-8192
	1452 OWEN SOUND DR.	FAX:
	SUNNYVALE, CA 94087	ALT PHONE:
		EMAIL: paul@mennen.org

COMMENTS
 PAUL: Now that's the kind of improvement we like to see. Nickel dropped sharply here, even though you ran this oil about 10 hours longer than last. It's still something to keep an eye on, because when any metal makes an erratic wear pattern -- high, low, high, low, without any sort of rhyme or reason, it could signal a part is having trouble. In this case, assuming steel cylinders, we'd guess exhaust valve guides. But for now it's low, as the other metals, so if the engine is running well, the filter is clean, and compressions are good, check back to monitor.

ELEMENTS IN PARTS PER MILLION	MI/HR on Oil	19	UNIT / LOCATION AVERAGES					UNIVERSAL AVERAGES
	MI/HR on Unit	745	9	14	61	25	53	
	Sample Date	06/09/09	03/25/08	06/18/07	12/18/06	07/05/06	09/22/05	
	Make Up Oil Added	0 qts	0 qts	1 qt	1 qt	1 qt	1.5 qts	
ALUMINUM	7	10	8	7	11	4	11	8
CHROMIUM	7	16	10	8	15	7	30	8
IRON	25	54	39	31	65	26	108	31
COPPER	4	10	4	3	8	4	17	5
LEAD	4075	5958	5235	3935	9262	3072	7682	4243
TIN	3	1	4	0	0	0	1	2
MOLYBDENUM	2	3	3	2	3	1	4	2
NICKEL	9	27	20	14	26	13	41	12
MANGANESE	1	2	1	1	1	1	3	1
SILVER	0	0	0	0	0	0	0	0
TITANIUM	0	0	1	0	0	0	0	0
POTASSIUM	0	1	2	1	0	0	1	1
BORON	0	0	0	0	0	0	0	0
SILICON	6	10	5	4	7	5	15	6
SODIUM	0	1	1	0	1	0	1	0
CALCIUM	4	3	3	5	7	3	8	4
MAGNESIUM	0	1	0	0	1	0	3	0
PHOSPHORUS	897	441	1101	751	838	854	740	860
ZINC	5	11	3	2	4	4	25	4
BARIIUM	0	0	0	1	1	0	0	0

Values Should Be*

PROPERTIES	SUS Viscosity @ 210°F	98.9	89-105	94.8	96.8	101.7	92.9	99.9
	cSt Viscosity @ 100°C	20.09	17.7-21.8	19.12	19.60	20.75	18.67	20.33
	Flashpoint in °F	SHORT	>445	465	410	470	425	475
	Fuel %	-	<1.0	<0.5	2.5	<0.5	1.0	<0.5
	Antifreeze %	-		-	-	-	-	-
	Water %	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Insolubles %	0.4	<0.6	0.5	0.5	0.5	0.5	0.4
	TBN							
	TAN							
	ISO Code							

* THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE

416 E. PETTIT AVE. FORT WAYNE, IN 46806 (260) 744-2380 www.blackstone-labs.com



OIL REPORT

LAB NUMBER: D96205
 REPORT DATE: 11/30/2009
 CODE: 35/284

UNIT ID: N3946Q
 CLIENT ID: 7018
 PAYMENT: CC: Visa

UNIT	MAKE/MODEL: Continental IO-550-D7B	OIL TYPE & GRADE: Exxon Elite 20W/50 (AD)
	FUEL TYPE: Gasoline (Leaded)	OIL USE INTERVAL: 35 Hours
	ADDITIONAL INFO: Cessna A185F, S/N 680053	

CLIENT	PAUL MENNEN	PHONE: (408) 737-8192
	1452 OWEN SOUND DR.	FAX:
	SUNNYVALE, CA 94087	ALT PHONE:
		EMAIL: paul@mennen.org

COMMENTS PAUL: This is the longest oil run we have seen in a while from your Continental and we are happy to report everything still looks good. All wear is reading well with the normal range for this particular engine (see Unit/Location averages) and the oil was free of any harmful contamination. This engine tends to leave a little more nickel in the oil than a standard IO-550-D7B, so Unit/Location averages offer a little better comparison as to what's normal. Those averages are based on 13 samples and have an average oil run of 38 hours. In any case, nice report here.

ELEMENTS IN PARTS PER MILLION	MI/HR on Oil	35	UNIT / LOCATION AVERAGES					UNIVERSAL AVERAGES
	MI/HR on Unit	780	19	9	14	61	25	
	Sample Date	11/05/09	06/09/09	03/25/08	06/18/07	12/18/06	07/05/06	
	Make Up Oil Added	1 qt	0 qts	0 qts	1 qt	1 qt	1 qt	
ALUMINUM	9	10	7	8	7	11	4	7
CHROMIUM	10	15	7	10	8	15	7	7
IRON	45	53	25	39	31	65	26	30
COPPER	4	9	4	4	3	8	4	5
LEAD	8228	6132	4075	5235	3935	9262	3072	4971
TIN	2	1	3	4	0	0	0	1
MOLYBDENUM	2	3	2	3	2	3	1	2
NICKEL	14	26	9	20	14	26	13	7
MANGANESE	1	2	1	1	1	1	1	0
SILVER	0	0	0	0	0	0	0	0
TITANIUM	0	0	0	1	0	0	0	0
POTASSIUM	0	1	0	2	1	0	0	0
BORON	1	0	0	0	0	0	0	0
SILICON	6	10	6	5	4	7	5	8
SODIUM	1	1	0	1	0	1	0	1
CALCIUM	5	3	4	3	5	7	3	11
MAGNESIUM	1	1	0	0	0	1	0	1
PHOSPHORUS	1055	488	897	1101	751	838	854	628
ZINC	4	10	5	3	2	4	4	5
BARIIUM	0	0	0	0	1	1	0	0

Values Should Be*

PROPERTIES	SUS Viscosity @ 210°F	97.1	89-105	98.9	94.8	96.8	101.7	92.9
	cSt Viscosity @ 100°C	19.67	17.7-21.8	20.09	19.12	19.60	20.75	18.67
	Flashpoint in °F	470	>445	SHORT	465	410	470	425
	Fuel %	<0.5	<1.0	-	<0.5	2.5	<0.5	1.0
	Antifreeze %	-	-	-	-	-	-	-
	Water %	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Insolubles %	0.4	<0.6	0.4	0.5	0.5	0.5	0.5
	TBN							
	TAN							
	ISO Code							

* THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE

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OIL REPORT

LAB NUMBER: E13494
 REPORT DATE: 5/20/2010
 CODE: 35/284

UNIT ID: N3946Q
 CLIENT ID: 7018
 PAYMENT: CC: Visa

UNIT	MAKE/MODEL: Continental IO-550-D7B	OIL TYPE & GRADE: Exxon Elite 20W/50 (AD)
	FUEL TYPE: Gasoline (Leaded)	OIL USE INTERVAL: 10 Hours
	ADDITIONAL INFO: Cessna A185F, S/N 680053	

CLIENT	PAUL MENNEN	PHONE: (408) 737-8192
	1452 OWEN SOUND DR.	FAX:
	SUNNYVALE, CA 94087	ALT PHONE:
		EMAIL: paul@mennen.org

COMMENTS PAUL: You mentioned on the oil slip that this oil was run longer than usual and that the last oil change was back in June of 2009, though it looks like you forgot the change back in November. Going by that, this oil only has ~10 hours on it, and while wear may be considered fairly high for such a short oil run, we are not seeing anything that would point to a serious problem developing. Aluminum and iron often read high in engines that see some inactivity, but not here and that's a good thing. The trace of fuel isn't a concern and should disappear next time.

ELEMENTS IN PARTS PER MILLION	MI/HR on Oil	10	UNIT / LOCATION AVERAGES	35	19	9	14	61	UNIVERSAL AVERAGES
	MI/HR on Unit	790		780	745	671	600	586	
	Sample Date	05/03/10		11/05/09	06/09/09	03/25/08	06/18/07	12/18/06	
	Make Up Oil Added			1 qt	0 qts	0 qts	1 qt	1 qt	
	ALUMINUM	6	10	9	7	8	7	11	7
	CHROMIUM	5	14	10	7	10	8	15	6
	IRON	23	51	45	25	39	31	65	29
	COPPER	2	9	4	4	4	3	8	4
	LEAD	3424	5939	8228	4075	5235	3935	9262	4750
	TIN	1	1	2	3	4	0	0	1
	MOLYBDENUM	1	3	2	2	3	2	3	2
	NICKEL	7	24	14	9	20	14	26	7
	MANGANESE	1	2	1	1	1	1	1	0
	SILVER	0	0	0	0	0	0	0	0
	TITANIUM	0	0	0	0	1	0	0	0
	POTASSIUM	1	1	0	0	2	1	0	0
	BORON	0	0	1	0	0	0	0	0
	SILICON	4	10	6	6	5	4	7	7
	SODIUM	0	1	1	0	1	0	1	1
	CALCIUM	4	3	5	4	3	5	7	10
	MAGNESIUM	0	1	1	0	0	0	1	1
	PHOSPHORUS	1010	526	1055	897	1101	751	838	683
	ZINC	2	9	4	5	3	2	4	4
	BARIIUM	0	0	0	0	0	1	1	0

Values Should Be*

PROPERTIES	SUS Viscosity @ 210°F	96.3	89-105	97.1	98.9	94.8	96.8	101.7
	cSt Viscosity @ 100°C	19.48	17.7-21.8	19.67	20.09	19.12	19.60	20.75
	Flashpoint in °F	440	>445	470	SHORT	465	410	470
	Fuel %	TR	<1.0	<0.5	-	<0.5	2.5	<0.5
	Antifreeze %	-	-	-	-	-	-	-
	Water %	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Insolubles %	0.3	<0.6	0.4	0.4	0.5	0.5	0.5
	TBN							
	TAN							
	ISO Code							

* THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE

416 E. PETTIT AVE. FORT WAYNE, IN 46806 (260) 744-2380 www.blackstone-labs.com



OIL REPORT

LAB NUMBER: E62831
 REPORT DATE: 7/13/2011
 CODE: 35/75

UNIT ID: N3946Q
 CLIENT ID: 7018
 PAYMENT: CC: Visa

UNIT	MAKE/MODEL: Continental IO-550-D7B	OIL TYPE & GRADE: Exxon Elite 20W/50 (AD)
	FUEL TYPE: Gasoline (Leaded)	OIL USE INTERVAL: 50 Hours
	ADDITIONAL INFO: Cessna A185F, S/N 680053	

CLIENT	PAUL MENNEN	PHONE: (408) 737-8192
	1452 OWEN SOUND DR.	FAX:
	SUNNYVALE, CA 94087	ALT PHONE:
		EMAIL: paul@mennen.org

COMMENTS PAUL: At 50 hours this oil has been in use for quite a while--the longest run in recent history. We were looking for higher numbers to go along with the extra hours, and we weren't disappointed. All metals increased but still read within the universal average range (based on ~30 hours). This tells that your IO-550 can handle a long oil run with out any trouble. The oil was in good shape, and tested free of fuel and moisture. The low silicon and insoluble readings show adequate air and oil filtration. At 847 hours, we have no issues to report.

ELEMENTS IN PARTS PER MILLION	MI/HR on Oil	50	10	35	19	9	14	UNIVERSAL AVERAGES
	MI/HR on Unit	847	790	780	745	671	600	
	Sample Date	06/28/11	05/03/10	11/05/09	06/09/09	03/25/08	06/18/07	
	Make Up Oil Added	3 qts		1 qt	0 qts	0 qts	1 qt	
ALUMINUM	13	10	6	9	7	8	7	8
CHROMIUM	10	14	5	10	7	10	8	8
IRON	56	52	23	45	25	39	31	34
COPPER	4	8	2	4	4	4	3	5
LEAD	8618	6117	3424	8228	4075	5235	3935	5323
TIN	0	1	1	2	3	4	0	1
MOLYBDENUM	2	3	1	2	2	3	2	3
NICKEL	15	24	7	14	9	20	14	10
MANGANESE	1	2	1	1	1	1	1	0
SILVER	0	0	0	0	0	0	0	0
TITANIUM	0	0	0	0	0	1	0	0
POTASSIUM	3	1	1	0	0	2	1	1
BORON	1	0	0	1	0	0	0	0
SILICON	6	9	4	6	6	5	4	7
SODIUM	1	1	0	1	0	1	0	1
CALCIUM	5	4	4	5	4	3	5	8
MAGNESIUM	1	1	0	1	0	0	0	1
PHOSPHORUS	1004	557	1010	1055	897	1101	751	752
ZINC	3	9	2	4	5	3	2	4
BARIIUM	0	0	0	0	0	0	1	0

Values
Should Be*

PROPERTIES	SUS Viscosity @ 210°F	98.0	89-105	96.3	97.1	98.9	94.8	96.8
	cSt Viscosity @ 100°C	19.89	17.7-21.8	19.48	19.67	20.09	19.12	19.60
	Flashpoint in °F	460	>445	440	470	SHORT	465	410
	Fuel %	<0.5	<1.0	TR	<0.5	-	<0.5	2.5
	Antifreeze %	-		-	-	-	-	-
	Water %	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Insolubles %	0.5	<0.6	0.3	0.4	0.4	0.5	0.5
	TBN							
	TAN							
	ISO Code							

* THIS COLUMN APPLIES ONLY TO THE CURRENT SAMPLE

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