



**Averages:** Both the universal and unit averages are running averages and change with the number of samples analyzed.

**Elements:** Elements are quantified in the oil at part per million levels (PPM). This list shows the most common sources of the elements from an aircraft engine. They are grouped by category. Following each element is a description of where it comes from.

### Engine Wear Metals

**Aluminum:** Pistons, piston pin plugs, bearings, and the case.

**Chromium:** Rings, (replacement) cylinders, an alloy in steel.

**Iron:** Cylinders, rotating shafts, the valve train, and any steel part sharing the oil.

**Copper:** Brass or bronze parts, bushings, bearings, and oil coolers.

**Lead:** Primarily leaded gas blow-by, (traces from) bearings.

**Tin:** Bearings, bronze parts (with copper), anti-wear coatings.

**Nickel:** Valve guides, trace element in steel.

### Trace Elements

**Manganese:** Grease additive.

**Silver:** Trace element in some types of bearings.

**Titanium, Potassium, Boron:** Trace elements.

**Molybdenum:** Traces of anti-wear coatings, some cylinder types.

### Contaminants

**Silicon:** Abrasive dirt (via intake air), silicone sealers, and gaskets.

**Sodium:** Contaminants common to anti-freeze and brine-filled valves.

### Oil Additives

**Calcium/Magnesium:** Oil additives, rare in aircraft engine oils.

**Phosphorus:** Common anti-wear additive in aircraft oils.

**Zinc:** Component of brass (with copper), oil additive common to auto engine oils.

**Barium:** Additive used in some synthetic oils, not common to aircraft oils.

### Physical properties:

**Viscosity/Flashpoint:** If fuel is present in the oil, the viscosity and flash point will often be lower than what is stated in the "Values Should Be" line. A high viscosity may show oil stress from heat or contamination.

**Fuel %:** Indicates the amount of volatile gas found in the oil.

**Water %:** Indicates the amount of moisture found in the oil.

**Insolubles %:** Insolubles are solid materials present in the oil. They are typically free carbon from the oxidation of the oil itself, along with blow-by products past the rings.

# Understanding Your Aircraft Oil Report

P.O. NUMBER: CC: Visa  
CODE: 35/2779/66

This is how  
you're paying  
for this  
sample.

We use the  
registration  
number to  
ID the  
aircraft.

UNIT NUMBER: NSSSS7  
REPORT DATE: 4/12/03  
LAB NUMBER: B70629

For  
internal  
use.

CONTACT: OSCAR HUFF  
NAME: STONE AIRCRAFT, INC.  
ADDRESS: 3442 S. WASHINGTON RD.  
AUGUSTA, GA 30228

PHONE: (301) 555-1212  
FAX:  
E-MAIL: OSCARH@STONE.NET

We can e-mail your  
results the same day  
we do the analysis.

How many  
quarts of oil  
did you add in  
between oil  
changes?

EQUIPMENT MAKE: Lycoming  
EQUIPMENT MODEL: IO-360-A1A  
FUEL TYPE: Gasoline (leaded)  
ADDITIONAL INFO: Cessna 172 Eng. S/N 000001

OIL USE: 10 hours  
OIL TYPE & GRADE: Aeroshell  
MAKE-UP OIL ADDED:

OSCAR: Note aluminum are higher than universal averages at the piston type to get to the room. This is a good place to identify cylinder type, engine serial number, recent repairs, etc. If you are reading higher than they were in the beginning of a piston pin-plug problem case. We suggest a compression check. This is a cautionary report.

This column  
shows the  
averages for all  
the samples  
we've seen from  
this type of  
engine.

We can track total  
hours on the  
engine or hours  
since overhaul, as  
long as it's  
consistent.

Today's  
data.

From left to right, these are your past samples.

ELEMENTS IN PARTS PER MILLION	MI/HR ON OIL	30	UNIT / LOCATION	30	25	UNIVERSAL AVERAGES
	MI/HR ON UNIT	416	AVERAGES	386	356	
	SAMPLE DATE	04/09/03		12/21/02	08/31/02	
ALUMINUM	31	17	18	3	9	
CHROMIUM	4	3	2	2	8	
IRON	151	87	69	40	27	
COPPER	10	9	9	7	8	
LEAD	3591	3592	3621	3564	3058	
TIN	1	1	1	1	2	
MOLYBDENUM	0	0	0	0	0	
NICKEL	1	2	1	1	2	
MANGANESE	0	0	0	0	0	
SILVER	0	0	0	0	0	
TITANIUM	0	0	0	0	0	
POTASSIUM	0	0	0	0	0	
BORON	0	0	0	0	0	
SILICON	7	8	8	10	7	
SODIUM	1	1	1	0	1	
CALCIUM	2	2	3	2	2	
MAGNESIUM	1	1	2	1	2	
PHOSPHORUS	697	717	746	708	698	
ZINC	3	3	3	4	4	
BARIUM	0	0	0	0	0	

This shows the average wear for this type of engine for you or your business.

Elements that appear to be a problem are usually in bold.

The additives in the universal averages are a mix of all different grades & brands of oil, so they are not particular to your engine or oil.

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PROPERTIES	TEST	CST VISCOSITY @ 100 °F	SUS VISCOSITY @ 100 °F	VISCOSITY INDEX	CST VISCOSITY @ 100 °C	SUS VISCOSITY @ 210 °F	FLASH-POINT IN °F	FUEL %	ANTI-FREEZE %	WATER %	INSOLUBLES %
	VALUES WERE					74-85	>450	<1.0	-	0.0	<0.7
						74.8	480	<0.5	-	0.0	0.5

The tests in the  
Properties box examine  
the physical condition of  
the oil.