# BLACKSTONE LABORATORIES

# AIRCRAFT REPORT

You'll need your client ID if you want to log on to www.blackstone-labs.net and view your reports.

| | | | |
|---|---|---|---|
| **LAB NUMBER:** | D70629 | **UNIT ID:** | NSSSS7 |
| **REPORT DATE:** | 7/25/2018 | **CLIENT ID:** | 28751 |
| **CODE:** | 22/16 | **PAYMENT:** | CC: Visa |

This is a good place to identify things like cylinder type, oil screen, recent repairs, etc.

**UNIT**

| | | | |
|---|---|---|---|
| EQUIP. MAKE/MODEL: | Lycoming IO-360-A1A | OIL TYPE & GRADE: | Aeroshell 15W/50 |
| FUEL TYPE: | Gasoline (leaded) | OIL USE INTERVAL: | 25 hours |
| ADDITIONAL INFO: | Cessna 172 Eng. S/N 000001 | | |

**CLIENT**

| | | | |
|---|---|---|---|
| OSCAR HUFF | | PHONE: | (828) 123-5897 |
| OSCAR'S WORKSHOP | | FAX: | (828) 123-1547 |
| 132 PERIWINKLE RD | | ALT PHONE: | (828) 123-1564 |
| STE. 102 | | EMAIL: | oscar@bellsouth.com |
| SWANNANOA, NC 18752 | | | |

**COMMENTS**

**Sample report**

OSCAR: Note aluminum. This level is reading higher than it was back in October and it's higher than universal averages for this ty[illegible]e the beginning of a piston or piston pin-plug problem. Iron [illegible]olubles are okay, so the oil filtration system is working well. Air filtration looks good too (see silicon). The engine has been flown frequently, so corrosion is not the problem. We suggest a compression check and borescope. If those turn out okay and the filter is free of metal, we suggest resampling for another look. This is a cautionary report.

The amount of oil you added between oil changes.

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

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

The additives in this column are a mix of all different types of oil, so you can't compare them to your sample.

**ELEMENTS IN PARTS PER MILLION**

| | | UNIT / LOCATION AVERAGES | | | | | UNIVERSAL AVERAGES |
|---|---|---|---|---|---|---|---|
| MI/HR on Oil | 40 | | 35 | 25 | 30 | 29 | |
| MI/HR on Unit | 416 | | 376 | 341 | 311 | 282 | |
| Sample Date | 12/02/15 | | 10/08/15 | 07/12/15 | 05/21/15 | 04/16/15 | |
| Make Up Oil | 4 qts | | 3 qts | 2 qts | 2 qts | 5 qts | |
| ALUMINUM | **31** | 17 | **18** | 3 | 3 | **3** | 9 |
| CHROMIUM | 4 | 3 | 2 | 2 | 2 | 2 | 4 |
| IRON | **151** | 31 | **69** | 40 | 31 | 33 | 23 |
| COPPER | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| LEAD | 3591 | 3599 | 3621 | 3012 | 2989 | 3014 | 3058 |
| TIN | 0 | 1 | 0 | 1 | 2 | 2 | 1 |
| MOLYBDENUM | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NICKEL | 1 | 1 | 1 | 1 | 0 | 1 | 1 |
| MANGANESE | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| SILVER | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TITANIUM | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| POTASSIUM | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| BORON | 0 | 0 | [illegible] | 1 | 0 | 1 | 32 |
| SILICON | 9 | 14 | 1[illegible] | 8 | 9 | 13 | 11 |
| SODIUM | 4 | 3 | 3 | 3 | 3 | 4 | 3 |
| CALCIUM | 2 | 3 | 2 | 1 | 2 | 2 | 1 |
| MAGNESIUM | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PHOSPHORUS | 697 | 765 | 746 | 823 | 678 | 766 | 877 |
| ZINC | 3 | 3 | 3 | 4 | 3 | 2 | 2 |
| BARIUM | 0 | 0 | 0 | 0 | 0 | 0 | 2 |

From left to right, these are your past samples.

The tests in the Properties box look at the physical condition of the oil.

**PROPERTIES**

| | | Values Should Be* | | | | |
|---|---|---|---|---|---|---|
| SUS Viscosity @ 210°F | 91.9 | 82-105 | 100.9 | 103.7 | 102.4 | 102.8 |
| cSt Viscosity @ 100°C | 17.74 | 16.0-21.8 | 18.85 | 20.79 | 19.16 | 19.29 |
| Flashpoint in °F | 455 | >440 | 445 | 455 | 465 | 460 |
| Fuel % | <0.5 | <1.0 | <0.5 | <0.5 | <0.5 | 1.0 |
| Antifreeze % | - | 0.0 | - | - | - | - |
| Water % | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Insolubles % | 0.5 | <0.6 | 0.5 | 0.5 | 0.5 | 0.5 |
| TBN | | | | | | |
| TAN | | | | | | |
| ISO Code | | | | | | |

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

## Aircraft Report Element Explanation

**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.

**Wear Metals**
**Aluminum**: Pistons, piston pin plugs, bearings, and the case
**Chromium**: Rings, (replacement) cylinders, steel alloy, valve stems
**Iron**: Cylinders, rotating shafts, the valve train, and any steel part sharing the oil
**Copper**: Brass or bronze parts, bushings, bearings, oil coolers
**Lead**: Primarily leaded gas blow-by, bearings (but lead from bearings is usually masked by 100LL)
**Tin**: Bearings, bronze parts (with copper), anti-wear coatings
**Nickel**: Valve guides, replacement cylinders, trace element in steel

**Trace Elements**
**Manganese**: Grease additive
**Silver**: Trace element in some types of bearings
**Titanium, Potassium, Boron**: Trace elements
**Molybdenum**: Anti-scuff piston coating, some cylinder types

**Contaminants**
**Silicon**: Abrasive dirt (via intake air), silicone sealers, and gaskets
**Sodium**: Antifreeze and brine-filled valves

**Oil Additives**
**Calcium/Magnesium**: Oil additives, rare in aircraft engine oils
**Phosphorus**: Oil additive
**Zinc**: Component of brass (with copper), oil additive common to auto engine oils
**Barium**: Oil additive, not commonly used in aircraft oil

**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.