

AeroShell TECH TALK

MULTIGRADE OILS IN HOT CLIMATES!

It's been around 60 years since the venerable Lycoming and Continental engines that most of us fly, were introduced to the market in their early forms. During this period there have been numerous improvements made to these engines by the manufacturers to assist with both reliability and durability. Not all of these changes have proved to be as successful as we aviators and owners would like to have seen. One significant and very successful change that has taken place during this period is the major improvement in lubrication technology. Almost 20 years ago Shell introduced AeroShell Oil W 15/W50 and over the years this oil has proven itself in all operating environments no matter how cold or hot.

However, there are still many questions asked by aviators about the logic in using multigrade oils in hot weather conditions when they appear so thin at normal ambient temperature – hopefully the information below will answer some of your questions.

DEFINITIONS

Mineral Oils – Mineral oils are refined oils that have been sourced from the ground.

Synthetic Oils – Synthetic oils are “manufactured” oils produced from chemicals in a petrochemical plant. They are very pure substances with special properties.

Single grade oils – this term describes an oil (usually mineral) that does not have viscosity modifier additives designed to adjust it's normal viscosity profile.

Multi grade oils – Multigrade oils are oils that do have additives or a blend of different oils that change the

viscosity profile versus what would be expected of a normal mineral oil. These oils generally have a description like 15/W50 or 10W40.

FUNDAMENTALLY DIFFERENT

Multigrade oils can be produced a number of different ways. In some instances, a mineral oil can be blended with viscosity improving additives to change the viscosity profile at warmer temperatures. These oils are Mineral Multigrade oils, and there are a couple of these Aviation oils in the market. However, the high level of viscosity index modifiers necessary to achieve the necessary viscosity profile using mineral base oils, result in potential high temperature oxidation and high sheer breakdown problems. Another method of producing multigrade oil is to use some (or all) synthetic base oil in the formulation, so that at low temperatures you get very thin oil, but at high temperatures, you have the quality of the synthetic oil protecting the engine. AeroShell Oil W 15/W50 is produced this way.

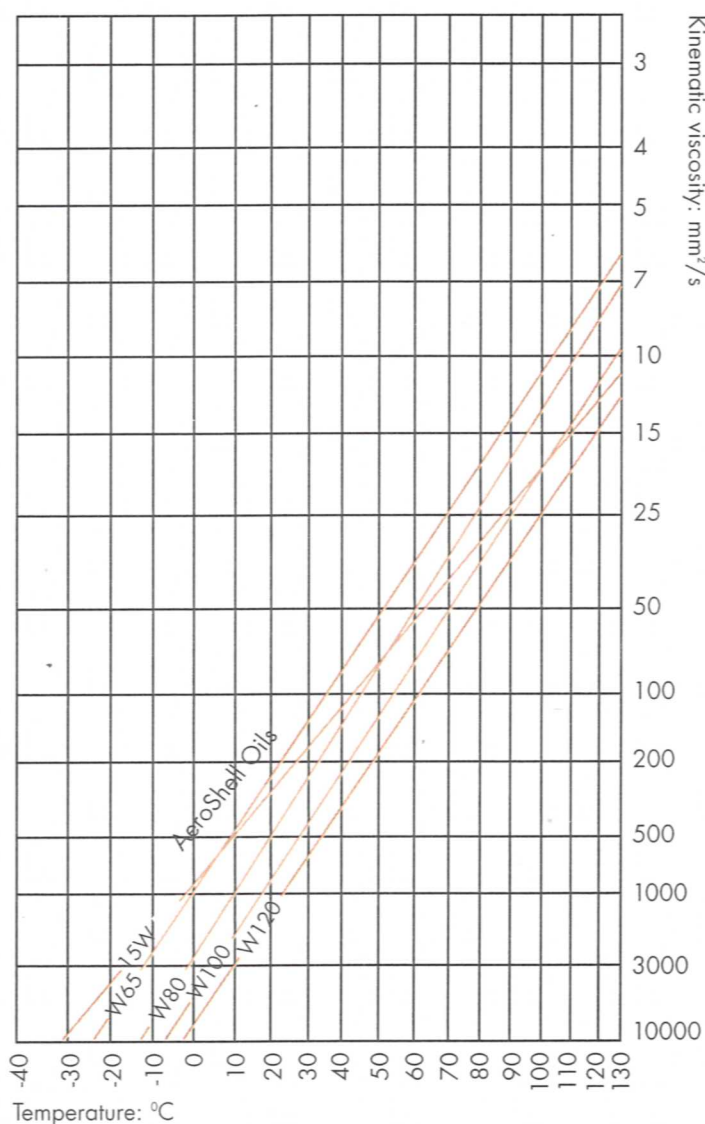
The advantages of synthetics over mineral base oils are fairly widely known these days, and their properties are superior in almost all applications. This is an important statement as our aircooled GA piston engines run on leaded Avgas, and this means that we need a very important property in the final blended oil - good lead solvency. Synthetic oils do not have good lead solvency, which is why we use a balance of both synthetic and mineral oils in W15W50 – in technical terms AeroShell Oil W 15/W50 is called a semi-synthetic oil.

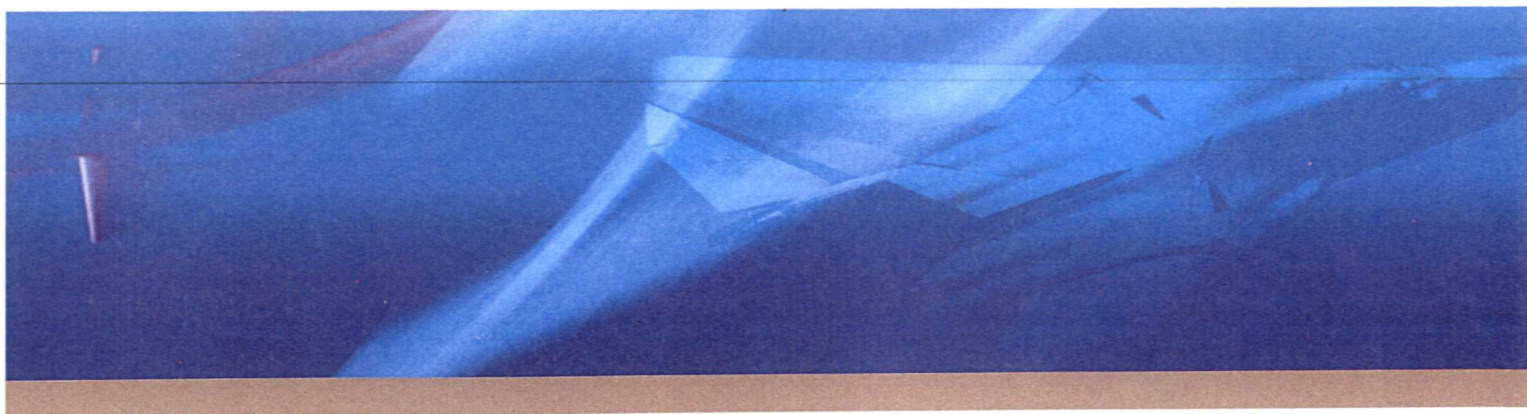
MULTIGRADES AREN'T THINNER AT HIGH TEMPERATURES

There is a commonly held belief that if an oil looks so thin at low and even moderately hot temperatures, it can't possibly provide sufficient oil viscosity (thickness / resistance to flow) in really testing conditions at high temperatures. This is actually not correct. There are certain mandatory properties that an oil must exhibit to be labelled using the SAE designation of 15/W50. One of these is that it must have the viscosity of an SAE 50 oil at 100°C. Aeroshell oil W 15/W50 meets exactly the same viscosity specifications at 100°C as all other aviation SAE 50 oils. Remember that an aviation 100 weight oil, is actually an SAE 50 oil. Regardless of how multigrade W 15/W50 oil might look like to the eye at any temperature, it is actually the same viscosity as a monograde Aviation 100 oil at 100°C.

Now for the even better news! Multigrade oils have a much higher VISCOSITY INDEX than monograde oils, and this is what makes them 'multi-grade'. Viscosity Index is an index calculated from the oil's change in viscosity with change in temperature. What this means is that as oil temperature exceeds 100°C in really difficult and hot conditions, despite appearing thinner at lower temperatures, Aeroshell multigrade W15W50 is actually THICKER than monograde aviation 100 oils. The hotter the oils get over 100°C, the larger the viscosity difference becomes (see chart). What this means is that the multigrade will protect your valuable engine EVEN BETTER in really high temperatures than traditional monogrades.

TYPICAL TEMPERATURE/VISCOSITY CURVES OF AEROSHELL W OILS





LESS LIKELY TO SUFFER OXIDATION

The high temperature performance benefits of AeroShell W 15/W50 don't end with viscosity. One of the most damaging results of the high temperature operation of our air-cooled GA engines is thermal oxidation of the engine oil. Thermal oxidation produces two undesirable outcomes. The first of these is the accumulation of acidic compounds in the sump which leads to well known consequences such as premature cam lobe and follower failure amongst other things. The second is the formation of the chemical by-products of organic oxidation which cause the loss of the oils lubrication barrier protection properties and formation of gummy deposits. These gums find their way to such places as piston ring grooves preventing proper operation resulting in excessive oil consumption and poor combustion characteristics.

A wonderful property of synthetic base oils is the significantly higher operating temperatures that they can endure without suffering from oil oxidation therefore allowing the engine to operate as it was designed even in the most arduous conditions. AeroShell W 15/W50 being a semi-synthetic lubricant with significant levels of synthetic base oils provides the best possible protection you can buy – not only at start-up, but also at high temperatures. It truly gives you the best of all worlds. A Mineral Multigrade oil may provide the first benefit, but because it has no synthetic portion, the oil is still more prone to oil oxidation.

SUMMARY

At Shell we are finding more and more customers are switching to our AeroShell W 15/W50 because of the benefits outlined above. The security in knowing that the oil being used is able to provide significant advantages over traditional mineral aviation oils at both cold and hot ends of the engine operation cycle, for most is worth the extra cost. Particularly when compared to the repair bill should excess wear be found!!

Happy Flying

Murray Wilkes

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Shell Aviation