# International Comanche Society

Question and Answer Session

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## Aeroshell Greases and Oils

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Aeroshell

# Grease basics and AeroShell portfolio

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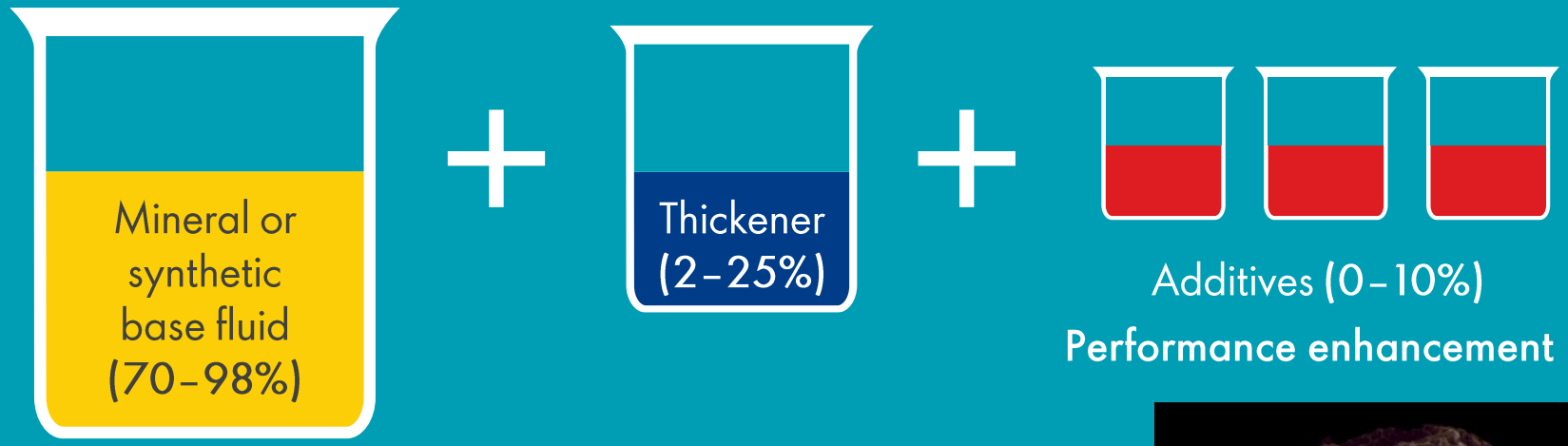
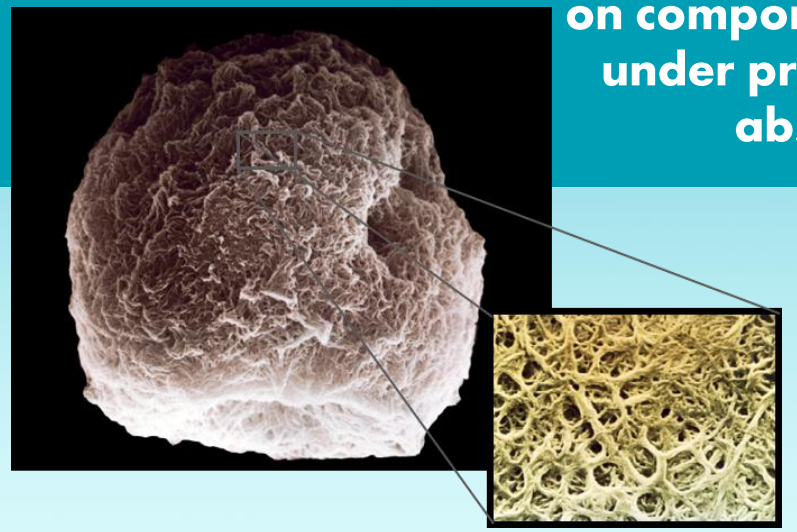
# What is grease and what does it do?

## Grease is a Thickened oil (not a thick oil) and both SOLID and LIQUID




**The thickener acts like a sponge, holding the base fluid on components, releasing it under pressure and then absorbing it.**



# Grease: More background

## The role of a grease is to

- Provide lubrication to minimise friction and wear
- Protect metal surfaces against corrosion
- Prevent dust and other contaminants entering, for example, a bearing.

Grease = thickened lubricant

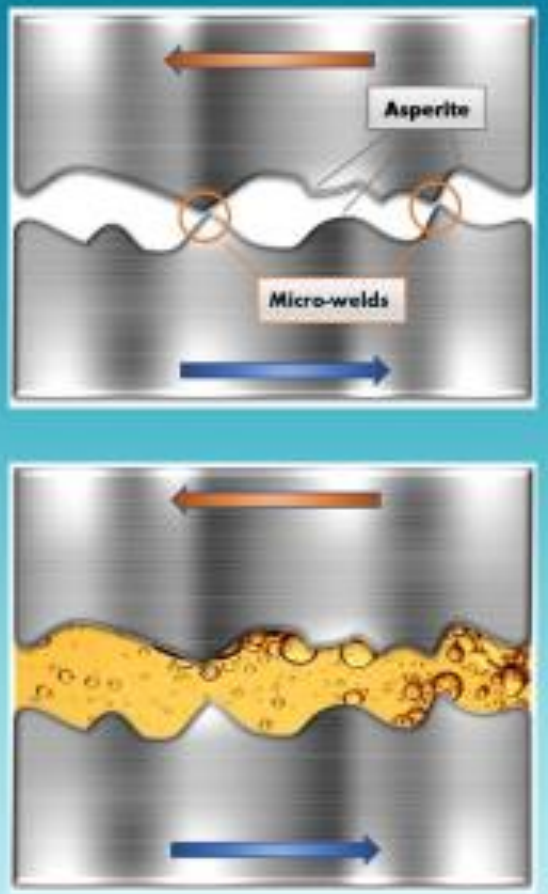
Thickener keeps the lubricating fluid in place and releases it to allow lubrication, when needed.

## Important to know

- Grease is **not** a thick oil; it is a **thickened oil**.
- Grease is **both solid AND liquid**.
- A **grease's behaviour can change** depending on the conditions, for example, with temperature, pressure or (shear) stress.
- Greases can contain **performance additives** to improve their basic properties.
- **The quality and performance of a grease depend crucially on the manufacturing process:** the best ingredients cannot make an excellent product if the manufacturing process goes wrong!

# What is lubrication

- When one solid surface slides over another, there is always some resistance to movement. This resistance force is called friction.
- Friction occurs because even the smoothest metal surfaces have microscopic peaks and valleys known as asperities.
- Two surfaces that appear to be in full contact actually only touch one another at the peaks of their asperities, which results in high pressures and temperatures and as a consequence tiny micro-welds. If those surfaces are in relative motion, the micro-welds constantly fracture and re-form, resulting in friction and wear.
- The purpose of lubrication is to reduce friction and wear on the component's moving parts, to prevent the moving parts from coming into contact by providing a separating film between them.
- Any procedure that reduces the friction between two moving surfaces is called lubrication.



# What is the industry trend in thickeners?

- Most aviation greases use lithium soap/complex or treated-clay thickeners.
- These greases are incompatible. Mixtures are typically softer than the individual greases.
- To avoid incompatibility issues, aviation is moving to a universally inter-compatible set of greases.

**Lithium complex greases are the obvious choice for mainstream standardisation owing to their inherent good performance and additive compatibility.**


Aircraft manufacturers recommend that greases with different thickeners are **not** intermixed.

# What advantages do lithium-complex greases offer?

| | Clay | Li complex |
|---|---|---|
| **Ability to stay where needed** | | |
| Mechanical stability | ✓ | ✓✓✓ |
| Water and washout resistance | ✓✓ | ✓✓✓ |
| **Ability to perform for longer** | | |
| Shear stability | ✓ | ✓✓✓ |
| Oxidation stability | ✓✓✓ | ✓✓✓ |
| High and low-temperature performance | ✓✓ | ✓✓✓ |

Compatible with a wider range of high-performance additives for superior:

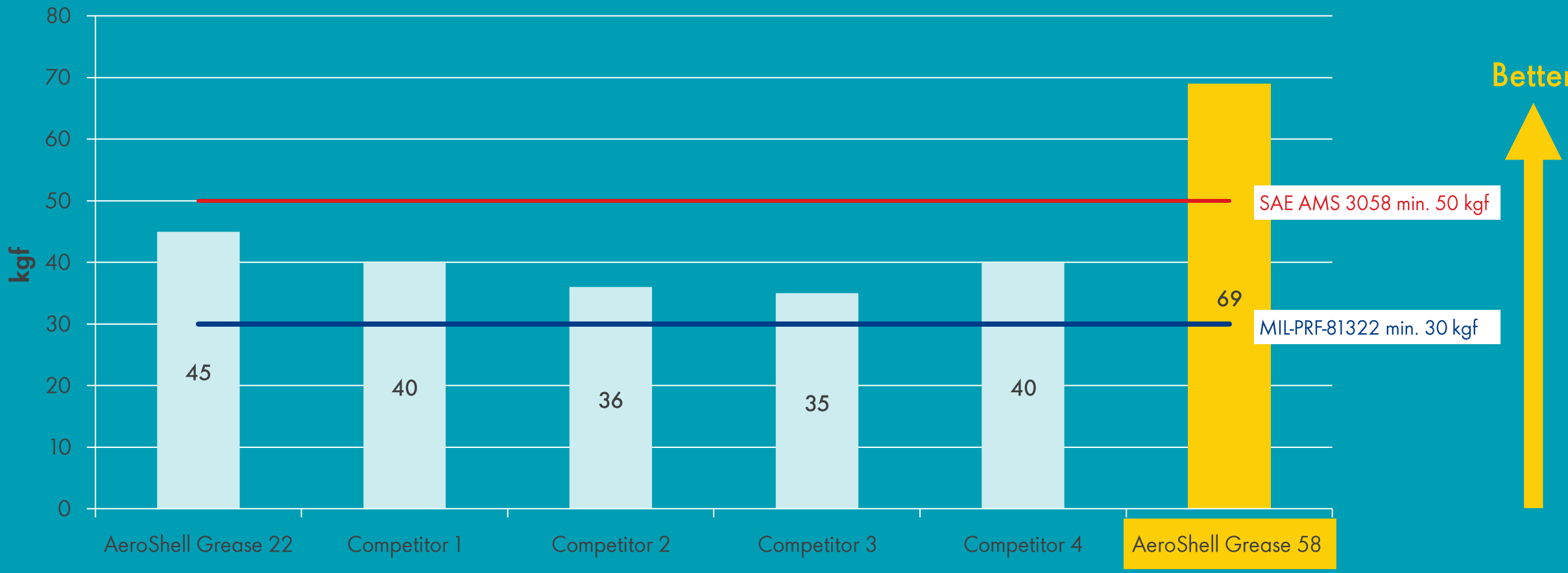
- oxidation and corrosion control
- wear protection
- extreme pressure load carrying capacity.

**Switching helps to improve safety and cut costs**

# The AeroShell Grease Portfolio

| | Wheel Bearing | | | Airframe/Multi-Purpose | | | Extreme | Helicopter |
|---|---|---|---|---|---|---|---|---|
| | 5 | 22 | 58 | 6 | 7 | 33 | 64 | 14 |
| Application | High-temperature wheel bearing grease | Advanced wheel bearing/ multi-purpose | Advanced wheel bearing/ multi-purpose | General airframe and propeller | Advanced airframe/ multi-purpose | Advanced airframe/ multi-purpose | Extreme pressure airframe | Helicopter multi-purpose |
| Oil type | Mineral | Synthetic hydrocarbon | Synthetic hydrocarbon | Mineral | Synthetic ester | Synthetic hydrocarbon / ester | Synthetic hydrocarbon /ester | Mineral |
| Thickener | Microgel (clay) | Microgel (clay) | Lithium complex | Microgel (clay) | Microgel (clay) | Lithium complex | Lithium complex and 5% molybdenum disulphide | Calcium soap |
| Specification | MIL-G3545C | MIL-PRF-81322G | SAE AMS 3058 | MIL-PRF-24139A | MIL-PRF-23827C (Type 2) | MIL-PRF-23827C (Type I) | MIL-G-21164D | -MIL-G-25537C |
| Colour | Amber | Amber | Cream/ yellow | Brown | Brownish yellow | Green | Dark grey | Tan |
| Temperature Range | -18°C to 149°C -0.4°F to 300°F | -54°C to 177°C -65°F to 350°F | -54°C to 175°C -65°F to 347°F | -40°C to 121°C -40°F to 250°F | -73°C to 121°C -99°F to 250°F | -73°C to 121°C -99°F to 250°F | -73°C to 121°C -99°F to 250°F | -54°C to 75°C -65°F to 167°F |

# ASTM D2596: Extreme pressure properties
(load wear index*)



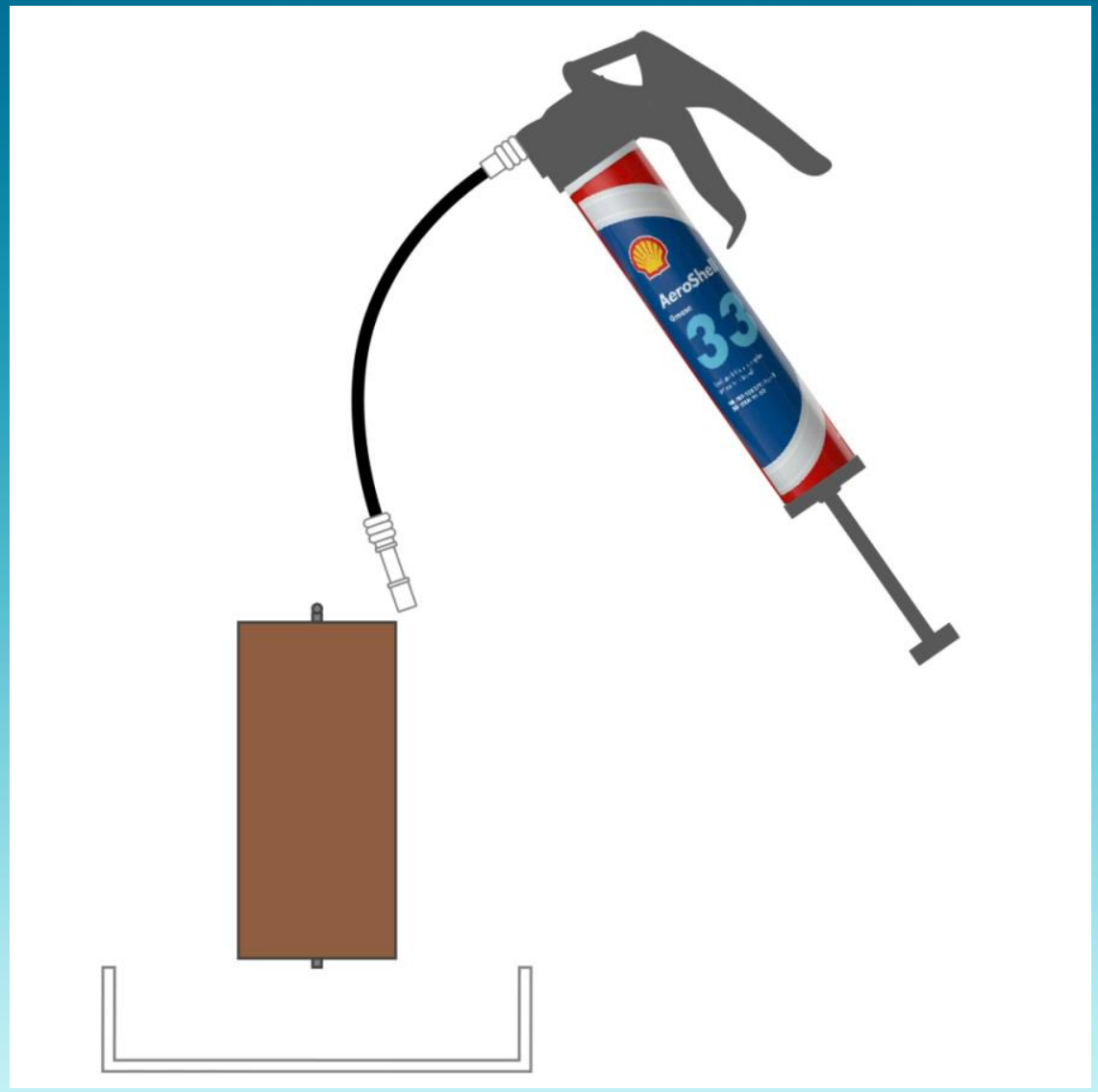

AeroShell Grease 58 supports higher loads compared with MIL-PRF-81322 approved greases.

*Formerly Mean-Hertz Load test

# Changeover

- The recommended changeover procedure is to clean out all the old grease.
- If this is not practical, slowly flush out (purge) as much of the previous grease as possible with the new grease.
- Continue until only new grease comes out. This normally results in about 90% replacement.

Please consult your aircraft manufacturer's maintenance manual for its recommended purging or changeover procedure.



# Grease shelf life and storage

- Shelf life is the time a material may be stored, under certain conditions, while remaining fit and serviceable for use (i.e., undergoing minimal chemical degradation).
- In military, civil and general aviation, greases may be subjected to thermal cycling and outdoor storage, including during shipment.
- Shell adopts NATO AFLP (Allied Fuels Logistic Publication) 4714 recommendations that
  - greases should not be used after 6 years of storage
  - retesting is performed every 3 years.

**AeroShell greases have a 6-year recommended shelf life.**

# Navigating Piston Engine Oils and their Benefits

AeroShell

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Regional Technical Manager; OEM & Sector Manager Americas

# AeroShell PEOs

**Highly regarded by the general aviation community**

**Two basic types:**

| NON-DISPERSANT MINERAL OILS SAE J1966 |
| --- |
| ■ AeroShell Oil 80 |
| ■ AeroShell Oil 100 |
| ■ AeroShell Oil 120 |

| ASHLESS DISPERSANT OILS SAE J1899 |
| --- |
| ■ AeroShell Oil W80 |
| ■ AeroShell Oil W80 Plus |
| ■ AeroShell Oil W100 |
| ■ AeroShell Oil W100 Plus |
| ■ AeroShell Oil W120 |
| ■ AeroShell Oil W 15W-50 (multigrade) |

# Selecting the right AeroShell PEOs

## BREAK-IN OIL[1]

**AeroShell Oil 80, 100, 120**

- High-quality straight mineral oil
- Aids engine break-in
- Prevents cylinders glazing
- Clean burning

## ENGINE OILS

### SPARK-IGNITION/ AVGAS ENGINES

**AeroShell Oil W 15W-50**

- Reduced maintenance costs
- Fast-acting protection
- Climatic versatility
- Fuel saving

Greater temperature range and advanced corrosion protection

**AeroShell Oil W80 Plus, W100 Plus**

- Added wear protection
- Added corrosion protection
- Proven ashless additive technology

Enhanced wear and corrosion protection

**AeroShell Oil W80, W100, W120**

- Improved performance
- Proven ashless additive technology

### COMPRESSION IGNITION/ JET A ENGINES

**AeroShell Oil Diesel Ultra**

- Promotes long engine life
- Reduced maintenance
- Developed with equipment manufacturers
- The only oil designed for diesel aero engines burning jet fuel

### LIGHT SPORT 4-STROKE ENGINES

**AeroShell Oil Sport Plus 4**

- Aviation-quality oil
- Multigrade climatic versatility
- Developed with Rotax

[1]AeroShell oils are used primarily during the break-in of many new or recently overhauled four-stroke aviation piston engines and in a few engines that require them for normal operations.

# SAE viscosity grade and temperature application

## Engine oil recommendation in relation to air temperature (°C / °F)

| °C | below −17 | −15 | −10 | −5 | 0 | 5 | 10 | 15 | 20 | 25 | 30 | above 32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| °F | below 1.4 | 5 | 14 | 23 | 32 | 41 | 50 | 59 | 68 | 77 | 86 | above 89.6 |

AeroShell Oil 80, W80 & W80 Plus
SAE 40 (−17 to 21°C / 1.4 to 69.8°F)

AeroShell Oil 100, W100 and W100 Plus SAE 50
(16 to 32°C / 60.8 to 89.6°F)

AeroShell Oil 120 and W120 SAE 60
(above 26°C / 78.8°F)

AeroShell Oil W 15W-50
SAE multi-grade (all seasons)

# What do you get from all this?


High quality non-dispersant lubricant, Ideal for engine break-in.

SAE J-1966


+

- ✓ Ashless dispersant
- ✓ Engine cleanliness


+

- ✓ Enhanced performance additives package
- ✓ Corrosion protection
- ✓ Rust protection
- ✓ Wear protection (anti-scuffing)

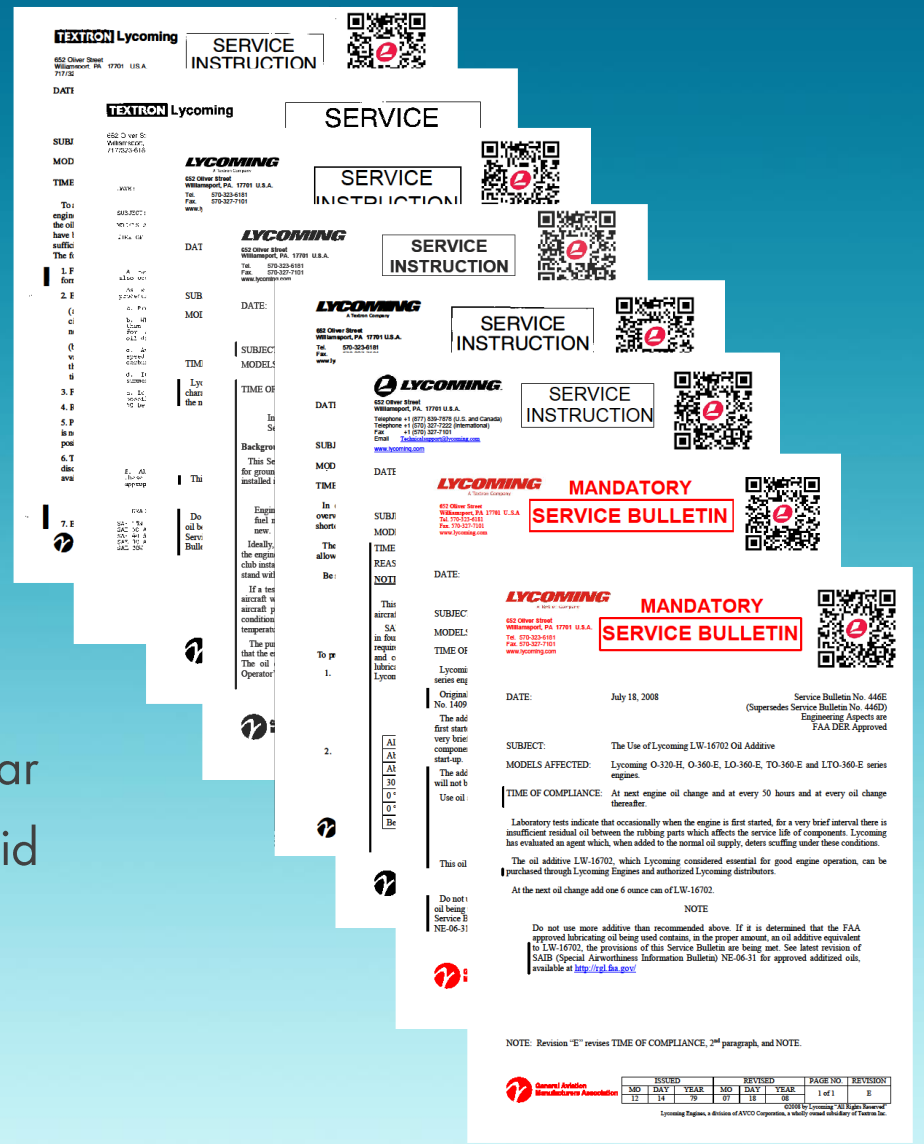
SAE J-1899


+

- ✓ Wider operating temperature range
- ✓ Semi-synthetic base oil formulation
- ✓ Superior anti-oxidation properties

# AeroShell Oil W80 Plus, W100 Plus and W 15W-50

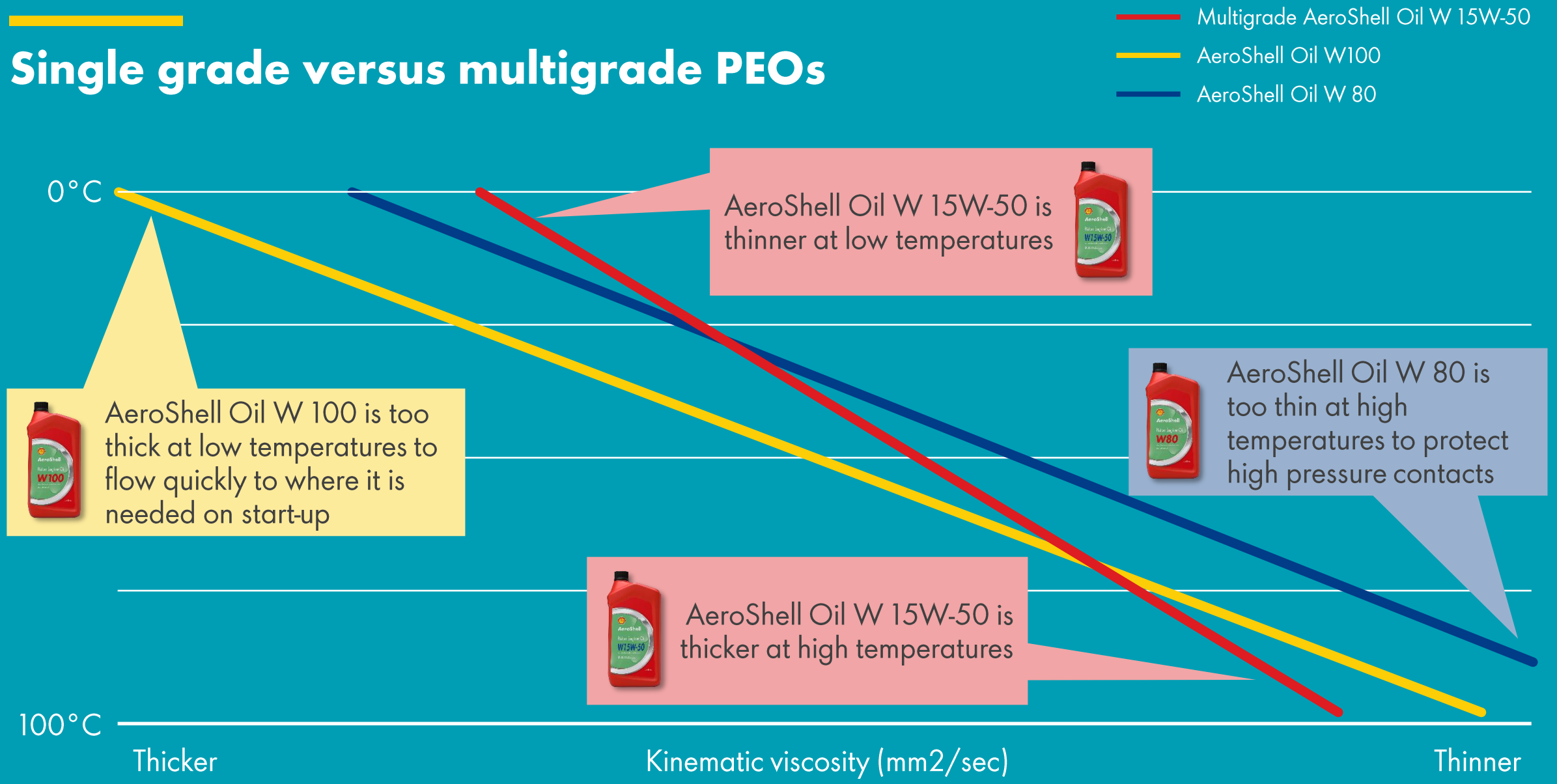
- Lycoming O320H, O360E, LO360E, TO360E and LTO360E series engines require oil additive LW-16702
- AeroShell Oil W80 Plus, W100 Plus and W 15W-50 contain this additive in the right proportions
  - Operators using one of these three oils do NOT need to add this Lycoming additive
  - The anti-wear additive package helps to prevent scuffing and wear
- Lycoming & Continental have both stated separately they would void warranties if using non-approved 3rd party additives



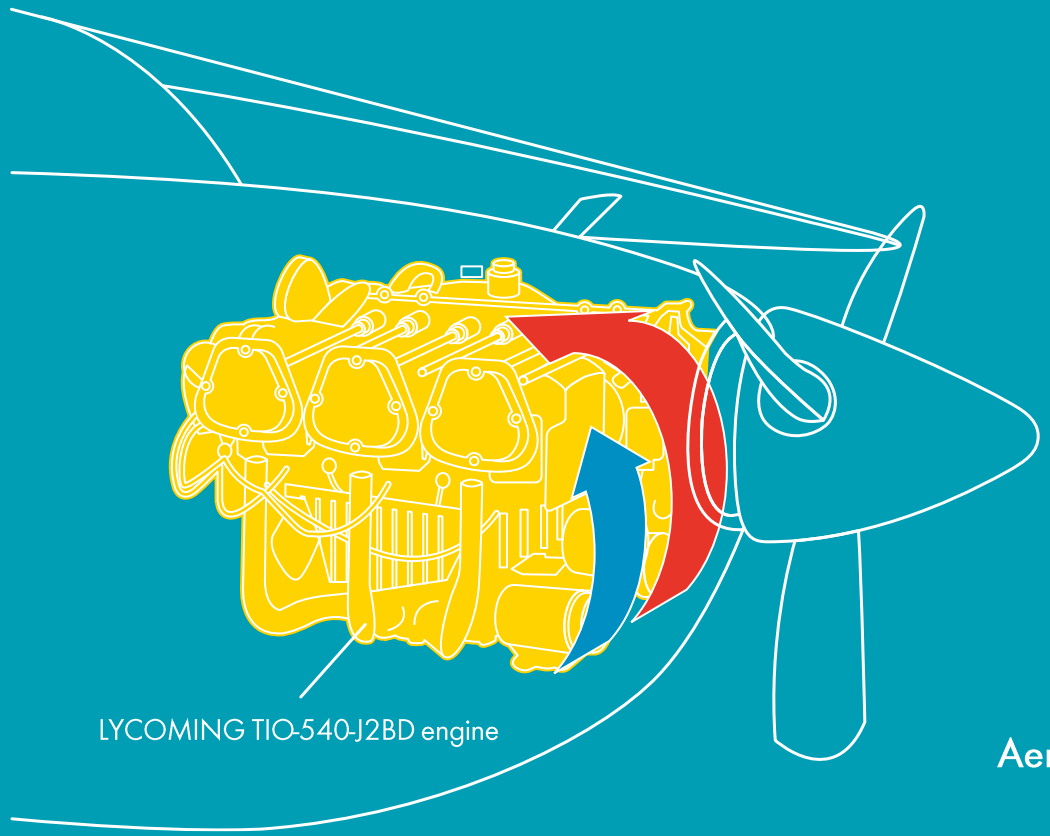
# AeroShell Oil W80 Plus, W100 Plus and W 15W-50

- Anti-corrosion additives help to protect low-usage engines or engines in high humidity climates from rust and corrosion
- For long periods between uses, AeroShell Fluid 2XN is recommend

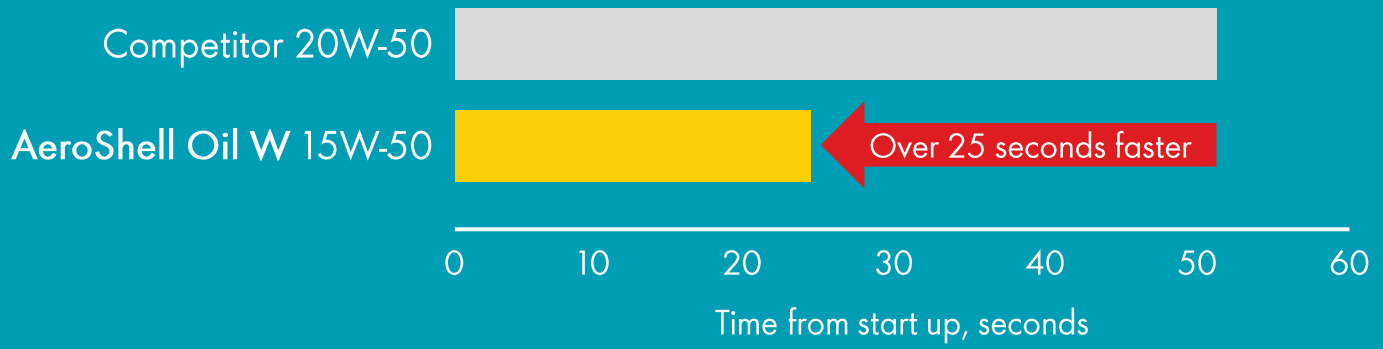
# Single grade versus multigrade PEOs



# AeroShell Oil W 15W-50 – start-up protection




- AeroShell Oil W 15W-50 helps to prevent wear during cold start-ups
- In tests at 0°C, it reaches full pressure in the front oil gallery more than **25 seconds quicker** than a competitor's 20W-50 oil



# Compatibility


- AeroShell single-grade oils are compatible with multi-grades
- Replace at next oil change – drain and fill
- All approved SAE J-1899 and SAE J-1966 AeroShell oils are compatible

# Updated Guidance on Specifications

| Specification in original Piper manual | Current Spec | Corresponding AeroShell Product | Comments |
|---|---|---|---|
| MIL-L-7870 | MIL-PRF-7870F | AeroShell Fluid (ASF) 3 | |
| MIL-G-23827 | MIL-PRF-23827C | AeroShell Grease (ASG) 7<br>OR<br>ASG 33 | ASG 7 is Type 2 (Clay Based)<br>ASG 33 is Type 1 (Lithium Soap Based) |
| MIL-H-5606 | MIL-H-5606J | ASF 41 | |
| MIL-L-6082 | SAE-J-1966 | AeroShell Oil (ASO) 80, 100, 120 | Non-dispersant; J-1899 covers ashless dispersant oils (ex. ASO W80, W100, W15W-50) |
| MIL-G-6032 | MIL-L-6032C/SAE AMS G6032 | N/A | Gas and oil resistant grease |
| MIL-G-3545 | MIL-PRF-81322G (DEF STAN 91-52) | ASG 5, ASG 22 | |

- Please also refer to the AeroShell Book (https://www.shell.com/business-customers/aviation/aeroshell/knowledge-centre/the-aeroshell-book.html)

# Q&A