EASTMAN | aviation solutions

The Eastman advantage: Aviation Lubricant Advanced Deposition Simulator (ALADS)

Exclusive to Eastman Aviation Solutions, the ALADS system is a one-of-a-kind lubricant performance simulator that has provided invaluable, critical insights to new product development programs. Such insights have enabled new high performance products that offer the potential for improved reliability and lower maintenance costs.

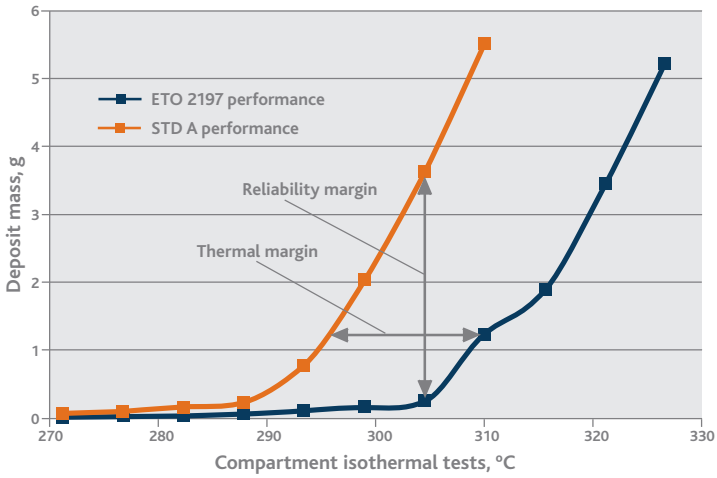
Eastman Aviation Solutions continues to be a global leader in the aviation lubricant market, specifically with Eastman Turbo Oil 2197™. Eastman's unique ALADS system was an integral part of the development of class-leading ETO 2197 and continues to be critical to research and development of next-generation products. The ALADS test apparatus is located at Eastman's headquarters and corporate research center in Kingsport, Tennessee.

The ALADS history of success

The ALADS unit was originally conceived and developed more than 25 years ago following the unsatisfactory performance of an approved turbine oil in revenue service. This experience highlighted failings with the oil formulation as well as the industry testing methods used to certify oils for flight use. It was clear that a better understanding of oil deposition characteristics (i.e., cleanliness) was needed, especially in high-temperature bearing regions where excessive stress on lubricant can result in formation of coking deposits. These deposits can be very detrimental to engine health. Initially, the ALADS operating parameters were modeled on the #5 bearing compartment within the Pratt & Whitney JT8D-200 engine, which at the time represented the most arduous thermal regime for any turbine oil to experience.

The use of the ALADS during the development of ETO 2197 was pivotal in the extensive performance testing process, which ultimately resulted in a best-in-class turbine oil offering unrivaled high-temperature cleanliness. This could not have been achieved relying solely on standard industry test methods available at the time, which were based on fairly static glassware-based testing protocols and very unlike the dynamic lubricating environments within a jet engine.

Figure 1. ALADS comparing STD A performance oil breaking point vs. ETO 2197 breaking point



Still meeting challenges

The oil formulators' challenge, both then and now, hinges on comprehensive demonstration of oil performance in a laboratory environment that will be truly reflective of in-service, on-wing experience. Understanding that passing all required specification laboratory tests does not always provide sufficient confidence that the oil is ready for in-flight service, the Eastman team utilizes the ALADS system to add additional rigor to the product development process. The use of a very dynamic testing apparatus that mimics the turbulent environment within a bearing compartment provides unique and valuable insight which simply cannot be gleaned by any other single oil specification test.

The extensive data archive from many years of ALADS testing represents a treasure trove of opportunity for assessing the relative strengths and limitations of all commercial turbine oils developed over the last 50 years.

EASTMAN TURBO OILS

How it works: Our proven process

The ALADS system works by simulating the very dynamic and turbulent environment of an engine bearing compartment within a jet engine. Such conditions contribute to differing physical and thermal stresses on the lubrication system, which serve to degrade the oil formulation, leading to carbonaceous deposits commonly referred to as coke.

It is important to also consider postflight conditions when one engine may be shut down for taxiing, reducing oil flow around the very hot internal bearing compartments and supply/scavenge tube areas. Heat exchange with the oil then becomes a very localized event which, in severe cases, can result in significant coke deposits being generated. This is known as "heat soak."

The ALADS test protocol follows a 72-hour regimen that simulates many flight cycles, including takeoff, cruise, reverse thrust on landing, taxiing, and shutdown (with heat soak effect). All carbonaceous deposits formed are weighed, and the residual pump oil after testing is filtered. Any deposits are also weighed. Very clear coking propensity differentiations can be observed between lubricant types, and more importantly, clear differentiation can be made with lubricants approved within the same performance class.

The Eastman Aviation Solutions research team also utilizes the ALADS system to verify new raw material sources by using the rig as a relative performance assessment. This supports rigorous quality assurance tools used by our expert staff to ensure product performance and consistency, never undermining operational reliability or safety for our customers.

Improved reliability

The ALADS technology has notably contributed to the performance and customer trust in Eastman products, leading to over 450 million successful in-flight hours for ETO 2197. This simulator delivers critical value by generating oil performance data under high temperature and dynamic conditions in a laboratory environment—none of which is provided for within current industry approval specifications. This is just another example of how Eastman Aviation Solutions continuously goes above and beyond specification testing and, ultimately, above what any other oil formulators can provide to the industry.

Figure 2. Aviation Lubricant Advanced Deposition Simulator (ALADS) rig

In a sense, ALADS allows the end user a chance to see comparative side-by-side oil performance before making a fleet-wide conversion. We can provide greater levels of insight and confidence in the tested oil because the simulator goes beyond basic oil approval data.

Optimum benefits for future planning

ALADS provides a path to the future for Eastman as well as our customers, including engine OEMs and fleet operators. The system is a one-of-a-kind simulator exclusive to Eastman Aviation Solutions and is critical to the future development of next-generation turbine oils. Even more exciting are the prospects for inclusion of novel chemistries, offering thermal stability well beyond those of current commercial products. As we move into this new realm of chemistry, existing oil specification test methods will become more outdated and unfit for the task. Eastman believes the untapped capabilities of the ALADS apparatus will become an even greater asset in providing a means to support development of new and innovative aviation lubricants.

For more information on ALADS or any of our products, visit Eastman.com/Aviation.

EASTMAN
The results of insight™

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