SURVIVAL:

How Sean Tucker Avoided Plunging Into Lake Michigan

By Mario LePera and Sean D. Tucker
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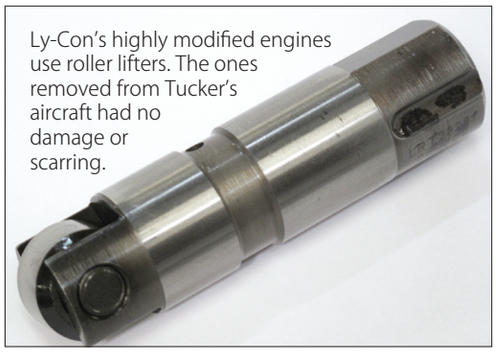
In July 2009, aerobatic stunt pilot Sean D. Tucker experienced a near disastrous event: an oil line rupture. Luckily, he managed to land without causing harm to himself or anyone else. His firsthand account of the experience follows.

While performing at the Milwaukee Air & Water Show over Lake Michigan with the four-ship Collaborators aerobatic team, one of my aircraft's state-of-the-art, high-pressure, lightweight oil lines ruptured during the solo portion of the routine. It occurred during a 7.5 g negative push from an inverted to a vertical tumble at a starting altitude of 20 feet above the lake. As I recovered from the maneuver, it became impossible to see out of the front of the windscreen because it was covered in oil. As I was powering back and at the same time climbing, the propeller rpm began decaying because of the loss of oil pressure. (Aerobatic propellers default to coarse pitch when they lose oil pressure.)

I notified my wingmen that I was experiencing an engine failure and canceling the rest of the performance. The right and left wingman joined up as a two ship, cleared the area and provided communication to the airshow air boss and General Mitchell tower, which was approximately 12 miles away.

Above: Can you guess which piston was removed from Sean Tucker's aircraft? If you guessed the one of the right, you are incorrect. Surprisingly, the piston on the left is from Tucker's aircraft and sustained no noticeable damage; the piston on the right shows the damage that was expected to occur during his six minute flight with nearly no oil.



Ly-Con's highly modified engines use roller lifters. The ones removed from Tucker's aircraft had no damage or scarring.

Bill Stein, the slot pilot, joined at my tail to become my eyes because of the oil-covered windscreen.

In less than a minute, the oil pressure read zero on the digital engine analyzer and the engine could only maintain 900 rpm. Attempting an emergency landing on the beach or any nearby road was not an option because of the 200,000 spectators attending the event. The only two alternatives were ditching in Lake Michigan or trying to make it back to General Mitchell. I felt the latter was pure fantasy but the girl made it, barely flying, chugging along at 900 rpm and 90 mph. It was a lonely six minutes, but I was able to declare an emergency and land safely at General Mitchell.

The entire aircraft was covered in oil inside and out. When we drained the 12-quart sump, it only had 8 ounces of oil left in it. The data file from the on-board engine analyzer indicated that the engine ran successfully for almost six minutes without any oil pressure. The failure happened 9:23:39 into the flight and shut down at 9:29:19.

Sean D. Tucker (in the red aircraft) has flown over 1,000 performances at more than 425 different air shows. *Photo courtesy of Rocka*Rho Photography*

Nearly everyone with even the most basic understanding of engines can immediately grasp how lucky Tucker was and pilots can guess how badly his aircraft's engine was damaged. Tucker had his highly modified, six-cylinder Lycoming AEIO-540 engine sent to his engine repair shop, Ly-Con Aircraft Engines in Visalia, Calif., for teardown and inspection. To everyone's surprise, the engine had no damage. How could this be possible?

Tucker credits his good fortune to a number of positive attributes: the quality product that Lycoming produces, the detail of assembly tolerances of his highly-modified engine by Ly-Con, and also to the fact that he religiously added two cans of AVBLEND at every oil change. Tucker's aircraft's engine, which had 225 hours of flight-time prior to this instance, looked nearly brand-new even after running six minutes with practically no oil. This is the kind of additional protection that AVBLEND provides.

AVBLEND, a commercialized metal interface treatment, is a uniquely processed mineral oil that has demonstrated its ability to reduce engine deposits and reduce wear through the process of micro-lubrication. This micro-lubrication improves performance by reducing engine friction and reducing wear and deposits in critically high temperature sealing areas. AVBLEND micro-lubricant is able to both adsorb onto and into the pores, cracks and fissures in the engine's metallurgy, a new mechanism of micro-lubrication for improving the overall lubrication and performance of aircraft engines.

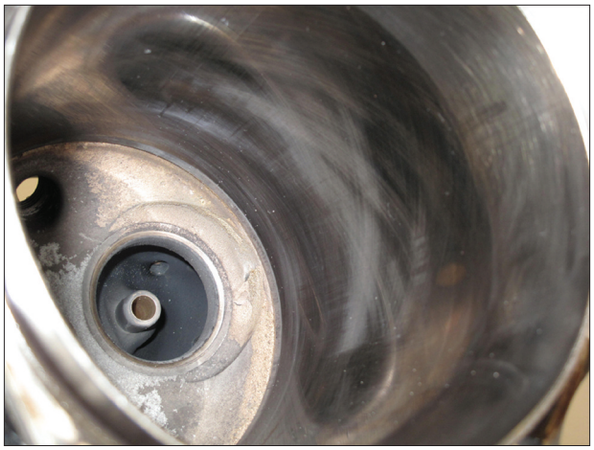
Since AVBLEND is added to the engine oil, a misconception may exist that AVBLEND is an additive for engine oils; this is incorrect as the Society of Automotive Engineers (SAE) defines a lubricant additive agent as "a material designed to enhance the performance properties of the base stock or to improve the base stock properties that do not naturally exist."

AVBLEND does neither of these two functions as it is not designed to improve or enhance any qualities of the oil. Introducing it to the engine oil is merely the means to transport AVBLEND directly to the engine's metallurgy. In support of this, laboratory testing was conducted to further demonstrate that AVBLEND does not react or interact with any of the additives already present in engine oil formulations. This involved the testing of engine oils with and without AVBLEND using a series of laboratory tests designed to reveal any possible additive interactions which subsequently revealed that AVBLEND was essentially inert to the other additives.

The metal penetration qualities of AVBLEND have been confirmed using Auger electron spectroscopy, which can measure the penetration and migration of fluids. Using metals similar to those found in aircraft engines, comparative testing using engine oils with and without AVBLEND revealed the presence of AVBLEND contributed to a significantly greater increase in the penetration depth of the engine oil over that of any of the other individual engine oils without AVBLEND.

The ability of AVBLEND to improve the overall performance of engines has been documented using a series of industry standardized laboratory and engine dynamometer tests. In every instance, the presence of AVBLEND resulted in reduced wear and engine deposits. Additionally, laboratory testing revealed the presence of AVBLEND protected against rusting from atmospheric corrosion. Using three different aircraft engine oils with and without AVBLEND, the time before any rust appeared on the metal panels using the standard humidity cabinet test was significantly increased when AVBLEND was present.

In addition to these laboratory tests, controlled field tests were conducted to fully validate the ability of AVBLEND to significantly improve the performance of aircraft engine systems. One such example involved Executive Helicopter Inc. of Chicago, Ill., a company that operates a fleet of helicopters powered by Lycoming HIO-360-CIA engines and had been experiencing difficulties with sticking valves in addition to deposit and wear problems with exhaust valves and guides.



Above left: The rod and main bearings show no sign of "grabbing" from the loss of oil pressure. **Above right:** Cylinders from Tucker's aircraft still show the "cross-hatch" from honing and no scuffing, something you would not expect to see from a loss of oil pressure.

Sean D. Tucker poses with his Oracle Challenger bi-plane. *Photo courtesy of Rocka*Rho Photography*

Prior to the testing with AVBLEND, the normal procedure required that engines received overhauls after 1,000 hours operation at which time either oversizing and/or re-chroming of piston walls was required to restore the engines to their proper dimensions. However, when AVBLEND was added to the engine oil, cylinder wear (e.g., bore size, out-of-roundness, choke) was greatly reduced and the exhaust valves and guides were free of deposits and with minimal wear (i.e., 0.001 inch increase in valve/ guide clearance).

Because of these findings, the FAA approved the extension of time between overhauls in several increments up to 1,500 hours while AVBLEND was being used. The cylinders from one particular engine were continuously monitored until they were retired after 7,800 hours of use. Normally, cylinders can only achieve one overhaul cycle before they are required to undergo oversizing and/or re-chroming. Based on this field demonstration, the FAA granted approval for the use of AVBLEND as a supplement to the engine oil. This is the only product of its kind which has received such an approval.

Tucker puts his faith in AVBLEND. He proclaims, "I am a believer! The price of two cans of AVBLEND at each oil change is pretty cheap insurance ... a lot cheaper than trying to get a $400,000 one-of-a-kind showplane off the bottom of Lake Michigan."

For additional information on AVBLEND, visit www.avblend.com or call (877) AVBLEND (282-5363).

About the authors: Mario LePera has been president of LePera and Associates, a consultant firm in the applications and utilization of petroleum products and related technologies, since 1998. Prior to this appointment, he spent over 40 years working with the Department of Defense in testing, developing and integrating fuel and lubricant requirements into engine systems, as well as working over 35 years as the associate director for fuels and lubricants with the U.S. Army.

Sean D. Tucker has been flying in international airshows since the 1970s and has won numerous competitions. He founded a flight training institution called the Tutima Academy of Aviation Safety, which focuses on safety not only in aerobatics, but in aviation in general. Tucker has received several honors and awards, including being named as one of the Living Legends of Aviation.