



AIR TAP Briefings

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Beyond 100LL: The transition to an unleaded avgas

Editor's note: This issue of Briefings features guest writer Elaine Croft McKenzie, an associate with Cambridge Systematics Inc.

Saying goodbye to 100LL (one-hundred-low-lead), which has served as the standard piston aviation fuel for decades, could be one of the biggest changes the general aviation (GA) community will ever face. Thanks to the ongoing efforts of the Federal Aviation Administration (FAA), private industry, and many others, we will be welcoming in an unleaded aviation gasoline (avgas) replacement in a few years. Unprecedented research is under way not only to create a new fuel but also to ensure that the end result will be compatible with new and existing aircraft and engines. However, we are still early in this process and many unanswered questions remain, including the nitty-gritty of how this change will affect airports, fixed-based operators (FBOs), and the private companies that will be buying, selling, and distributing any new fuels.

The shift to an unleaded avgas

Leaded fuels offer benefits to engine power, performance, and fuel stability, yet we have

known for decades that lead negatively impacts human health. The transition to an unleaded avgas, driven by the FAA and Environmental Protection Agency (EPA), is being overseen by the Piston Aviation Fuels Initiative, or PAFI, a joint industry–government effort. The group's steering committee, representing the FAA, EPA, aviation advocacy groups, and private industry, is overseeing the multi-year testing process to find a replacement for 100LL. The process consists of two phases: Phase I (begun in 2014) is essentially laboratory testing of the fuels to evaluate them for suitability and screen out unviable candidates. Phase II, which will begin in 2017, will focus on testing the fuels across the spectrum of the aircraft fleet. The FAA has noted that the goal is to create a fuel that has “fleet-wide” approval, which means that it can be used by essentially all piston aircraft that fly on 100LL today.

100LL has never been an easy fuel to love. Indeed, it was the compromise standard developed during the 1980s to satisfy

the first call to reduce lead in fuels (hence the “low lead” designation). Although adequate for most aircraft requiring aviation gasoline today, it serves as a less-than-ideal compromise between the high-octane, high-lead content fuel and the lower-octane, lower-lead fuel that were the two standards many piston aircraft from the golden ages of aviation were designed to use. Developing a new aviation fuel wasn't easy a generation



ago, and it isn't any easier now. The current GA fleet spans over 100 years, and engines designed in the 1930s just don't have the same characteristics as a modern engine. Creating a drop-in replacement fuel that can not only use existing storage and distribu-

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An airport's story: Southwest Minnesota Regional Airport

Located one mile west of the central business district of Marshall, Minnesota, the Southwest Minnesota Regional Airport primarily conducts general aviation services that include business operations, cargo delivery, and medical transport.

The airport recently underwent a nearly 15-year development process that resulted in the extension of the main 7,220-ft runway; the construction of a 4,000-ft crosswind runway, arrival and departure facilities for pilots, and parallel taxiways; and designation of multiple areas to be used for later development. The new development area, located east of the airport, will allow the airport to accommodate more commercial and private development in the future, a move that could generate revenue and expand transportation operations, says airport manager Glenn Olson.

In April, the expansion project won the Key General Aviation Airport 2014 Project of the Year award from the Minnesota Council of Airports.

“I think that award really acknowledged the work done to expand commercial operations in Southwest Minnesota,” Olson said. “The expansion project was

ultimately important for future transportation opportunities in the area.”

The airport currently boasts a number of commercial operations, including Schwan Food Company, which has been a major tenant of the airport since the late 1990s. Olson said Schwann has always been instrumental in airport development projects, especially the construction of the arrival–departure buildings as well as the development of several hangars.

Charter First, operated by Midwest Aviation, is the airport's fixed-base operator and conducts private charter flights across the U.S. and Canada. Olson said Midwest Aviation has also been highly instrumental in the development of airport facilities, specifically construction of hangars and maintenance operations. Charter First also operates a training program for new pilots, conducts an on-site ag-spraying operation, and

owns and manages the fueling system of the airport.

Olson says he will continue to focus on development opportunities at the airport over the next few years. With the momentum gained from successful past projects, he looks forward to managing the continued efforts to accommodate expanded



commercial and transportation opportunities in Southwest Minnesota.

“The airport is a wonderful facility,” he says. “It's really a gem in this part of the state.”

tion infrastructure but also mix with older fuel specifications and perform adequately in different engines will be a heroic feat.

Out of the fuels submitted to PAFI in 2014, four were selected as candidate fuels for the Phase I testing currently under way. Two are from Swift Fuels, an Indiana-based company that is barely a decade old but has quickly become a leader in the technological development of new fuels, including bio-fuels, for piston and turbine aviation. The other two fuels are from larger, established oil and gas operations—Total (French) and Shell (U.S., with a Dutch parent company). Both of these are among the world’s largest oil and gas companies, setting the stage for a David-and-Goliath storyline with the outcome very much in doubt.

Looking toward the future

What does this all mean for the airports, operators, and private businesses that buy and sell avgas as part of their operations? By 2018 the FAA is expected to announce the outcome of the two-phase PAFI process. Even if a replacement fuel is given the stamp of approval—and there may be more than one, which will increase the complexity even more—significant issues will still need to be ironed out. One critical question no one has yet answered is how much the replacement fuel will cost, not to mention who will produce the fuel and whether it can be distributed using existing methods. With the alternatives coming online, as well as the possibility that more than one fuel will pass the FAA’s testing process, it is quite likely that we are returning to a state where multiple piston aircraft fuels will be available. Although the general, if tacit, consensus has so far been a “wait and see approach,” we have reached the point where the transition to a new fuel is likely less than five years away—well within the planning horizon for many airports and FBOs.

Planning for this transition should begin now, which means that the GA community—including airports and businesses that serve GA—needs to continue to put pressure on the FAA and the PAFI initiative to not only address the technical questions about a 100LL replacement, but also provide guidance on commercialization of the fuel or fuels—the questions of economics, production, and distribution that will be critical to making the planning and infrastructure investments to support the transition. Currently, most airports need only two, or at most three, fueling systems to serve their aircraft population. With new standards and multiple fuel producers, airports may have to make choices about which fuels to invest in, and subsequently which of their customers they are going to serve. Some fueling infrastructure projects may qualify for state funding; the Minnesota Department of Transportation classifies fueling infrastructure projects as “revenue generating,” which means they could qualify for a 60/40 state/local funding match. However, currently these projects must compete against other critical infrastruc-

ture investments and priorities. Ideally, when or even before the FAA announces the replacement for 100LL, the decision will come with funding dedicated to state and local operators to support the transition.

Another concern is safety. Providing accurate information will be critical to ensuring a safe transition to a new fuel. Not all fuels are compatible with all aircraft and engine types. Aircraft owners and pilots will always be responsible for fueling their aircraft with the appropriate fuel, but today there are essentially only two and rarely three choices available: 100LL, JetA, or in some cases, Mogas. Adding



more choices and replacing existing options naturally increases the probability of error. Even fuels that are similar will likely have at least minor differences in terms of performance characteristics, which means reexamining the airplane’s operating capabilities and personal limitations of the pilot. Fuel providers will need to provide more information than ever before about the type of fuel or fuels available: a sign for “aviation fuel” will no longer be sufficient. In an ideal world this information will be standardized and available to all airports and pilots, including guidance in terms of different aircraft types and limitations—which essentially means this must be driven by the FAA.

The GA world is moving away from 100LL, a change that has been a long time coming. These new fuels will have many benefits, including not only making the current GA fleet more environmentally friendly, but also opening possibilities to new manufacturing and engine technologies. This transition is essentially giving GA engine and airframe manufacturers accessibility to new formulations that may lead to more advanced aircraft, better performance, and better fuel efficiency. Unfortunately, there are still too many questions that need to be addressed. The FAA and PAFI need to step up their time frame to address these questions of commercialization so that our airports, FBOs, and fueling providers are able to have plans in place that will allow them to be open for business the day that we say goodbye to 100LL.

For more information on the FAA fuels program, PAFI initiative, and recent updates, visit <https://www.faa.gov/about/initiatives/avgas/>.

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