

Unleaded Fuels Research Program

Unleaded fuel research activities are underway in direct support of the FAA's intent to meet compliance with the 1990 Clean Air Act Amendments and the ban on low-lead aircraft fuels.



As established by the US Environmental Protection Agency (EPA), the 1990 Clean Air Act Amendments mandated the removal of lead from all fuels by 1998. Although the EPA temporarily exempted the general aviation industry from the lead ban, the implications of several other provisions have the practical effect of making leaded fuels too expensive to use. These provisions included the anticipated increased cost of lead additives as the demand dwindles and the environmental concerns related to the use of ethylene dibromide in the production of aviation gasoline. Ethylene dibromide is one of many compounds affected by the ban on leaded fuels. These concerns were presented to Congress by the Aircraft Owners and Pilots Association and the General Aviation Manufacturers Association. Congress subsequently mandated that an unleaded fuel program activity be initiated. In response, the FAA Administrator made a commitment to the General Aviation Coalition in January 1994 to complete research covering the development of unleaded aviation gasoline for civil aircraft.

As a result, engine and fuel testing at the FAA's small-engine and fuel test facilities were initiated in early 1994. Such testing, including in-flight performance verification tests using a modified FAA Aero Commander 680E airplane, is being conducted in cooperation with an FAA-and

industry-established Coordinating Research Council (CRC) Committee to address issues such as engine detonation, material compatibility, volatility (vapor lock), engine performance, storage stability, water reaction, emissions, fuel consumption changes, and durability (engine and component life). Data from this testing, when completed, will aid the FAA in certifying the existing fleet of general aviation aircraft on a replacement fuel. Data will also be used in developing a specification with the American Society of Testing and Materials (ASTM) for an unleaded aviation gasoline that will replace the currently available 100 octane low-lead fuel. This development effort demonstrates the FAA and industry involvement to ensure the availability of a safe and reliable fuel for the general aviation fleet.

Engine and fuel tests have been conducted to validate the octane requirement that is acceptable for engines within the existing general aviation fleet. Octane has been identified as the single most important characteristic of any new fuel formulation. At present, test procedures have been developed and tests have been performed on a selected number of representative general aviation aircraft engines including two Textron Lycoming (models TIO-540 and IO-540) engines and two Teledyne Continental (models IO-550 and TSIO-550) engines. Using an experimental unleaded



fuel and standard reference fuels, initial octane rating tests have been conducted on the four engines mentioned and derivative model designations of these same engines. At the conclusion of these tests, minimum octane requirements for candidate unleaded fuel formulations will be specified as a development goal for participating oil companies within the CRC Committee.

These candidate fuels will then be evaluated by the FAA through a series of performance- and safety-related engine fuel tests. The photograph above shows a piston engine valve test rig installed in the FAA Fuels Research Laboratory at the FAA William J. Hughes Technical Center, Atlantic City International Airport, New Jersey.

The outcome of the unleaded fuel research activity will be the test and technical data that will aid in the development of an industry ASTM unleaded fuel specification. This specification in turn will serve as a basis for the development of advisory material covering the certification of new piston

powered engine designs under 14 Code of Federal Regulations (CFR) 33 and their application to the performance of new general aviation airplanes under 14 CFR 23.

Further testing at the FAA's small-engine test facilities is anticipated to define the safety and performance of other critical in-service aircraft engines that have not been tested with the newer unleaded fuels, as well as to develop other new or alternate fuels.

To find out more about the Unleaded Fuels Research Program, contact:

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