FAA CERTIFICATION REQUIREMENTS FOR FUTURE FUELS, FUEL SYSTEMS, AND POWERPLANTS

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As far as the FAA is concerned, the problem of fuel availability is not the only problem. Within the last two or three years, various proposals have been submitted to the FAA concerning the use of alternative fuels in general aviation aircraft. This morning, I would like to address the subject of certification requirements for alternative fuels for use in general aviation aircraft. Notice that the published title of my presentation has to do with future fuels. Trying to develop some comments with respect to future fuels, I found myself very inadequate to forecast what some of these future fuels might be. So I am going to address what are the current FAA procedures for approving fuels, along with a comment or two as to what might be done relative to assuring the safety of using these alternative fuels, whatever they may be.

Fuels used during engine and airplane type certification programs are approved by the FAA as part of the engine and airplane type design. The fuels are then listed on the type certificate data sheets for the engine and the airplane. The regulations pertaining to engine certification are contained in Part 33 of the Federal Aviation Regulations (FARs), and those with respect to the aircraft are contained in Part 23 of the Federal Aviation Regulations.

I think it is appropriate at this time to mention the reorganization process that is going on right now relative to both the engine and airplane certification programs. Previously, the regulations and policies pertinent to the showing of compliance to the rules were developed by the staff in the Washington Headquarters. Over the last several months, however, there's been a change in this approach and now the responsibility for developing the rules and policies has been transferred to lead FAA regions. With respect to engine certification, the lead region is the New England Region, headquartered near Boston, Massachusetts. With respect to general aviation airplanes, the lead FAA region is the Central Region, headquartered in Kansas City, Missouri.

Approval for the use of alternate fuels may be obtained by amending the existing type certificates. This is done when applications for approval for an alternate fuel are made by the engine and airplane manufacturers. When the application is made by someone other than the manufacturer, approval is handled by the issuance of a Supplemental Type Certificate, STC. In either case, the test programs that are required have to be approved and witnessed by the FAA. If a certain "future fuel" is used, and that particular future fuel happens to require "unique or novel" changes to the engine or the existing airplane fuel system, or both, special conditions will then have to be adopted to handle the particular unique or novel features.

Prior to conducting the certification tests, it is very desirable if the alternate fuel is covered by a specification that states the properties and limits by which uniform quality and composition of the fuel can be maintained, similar to the way the quality of current aviation gasolines are assured. In addition, the alternate fuel must be shown to be compatible with the airplane and engine materials in contact with the fuel and, depending upon the type of fuel, with any additives, lubricants or other approved fuels that are used in the engine and aircraft combination.

The engine test program, according to Part 33 of the FARs, must include calibration tests which establish the ratings and other limitations for the engine, a detonation test, and a 150-hour endurance test. At the completion of the 150-hour endurance test, a power check must be performed to assess any deterioration in power that may have occurred during the 150-hour program. In addition, the engine must be disassembled and inspected to make sure there is no evidence of abnormal wear, deposits, metal attack or other harmful effects that might have occurred during the test program.

Attention must also be paid, as far as the airplane certification is concerned, to the airplane's fuel system. The airplane fuel system, of course, must provide for a fuel flow at a rate and pressure established to assure proper engine operation. The test program must also include tests to simulate the most critical operating conditions; for example, using fuel at an initial temperature of 110°F to look for vapor lock, or possible unstable fuel pressure or fuel flow problems. Powerplant cooling tests with a particular alternate fuel is another example.

In summary, this is a very broad brush representation of what the requirements are for the current fuels and what the requirements would be in the future relative to the approval of alternate fuels.