May 1, 2008

Ethanol-blended Fuels

Problem

Ethanol-blended gasoline is not authorized for use in aircraft under the terms of the issued EAA or Petersen Aviation STC's.

Ethanol-blended gasoline is not authorized for use in aircraft per the FAA Special Airworthiness Information Bulletin (SAIB) number CE-07-06, dated October 27, 2006.

EAA has issued/sold 24,185 auto fuel STC's as of April 30, 2008 that prohibit members from using ethanol-blended auto fuel. In addition, there are an unknown number of EAA members flying experimental and light-sport aircraft that require ethanol-free auto fuel. This number is also estimated to be in the thousands. There are an additional 34,000 auto fuel STC holders that were issued by Petersen Aviation, many of which may be EAA members.

Issues

- The Air Pollution Control Act of 1955 was the first in a series of Congressional mandates aimed at managing cleaner air by providing air quality control measures. The series of acts are still being revised, amended, and strengthened.
  - The Clean Air Acts of 1963, 1970, and 1990
  - The Energy Policy Act of 2005
- The Clean Air Act of 1990 mandated reformulated gasoline (RFG) contain additives such as MTBE or ethanol to meet EPA fuel oxygenate standards.
- The Energy Policy Act of 2005 eliminated the mandatory oxygenate requirement from RFG.
- In 2006, the U.S. Congress had two bills before it that would require all auto fuel to contain 10% of renewal fuels by the year 2010 – called the "10 by 10" bills. Because of the direct involvement of EAA and our members, these two bills died in their respective House and Senate committees. EAA asked that all premium grade auto fuel be exempt from this requirement.
- On December 19, 2007, Congress passed and the President signed the Energy Independence and Security Act of 2007, which requires the use of 15 billion gallons of grain/corn based ethanol (renewable fuel) by 2015. About 6.5 billion gallons were produced in 2007.
- On April 29, 2008, Senator James Inhofe asked Congress to revisit the Energy Independence and Security Act of 2007. In his remarks to Congress, Senator Inhofe stated the current policy mandating ethanol usage "has skewed common sense and violated the principles of a sound energy policy and is the most expansive bio-fuel

mandate in our nation's history. Congress must have the courage to address this issue and address it now."

- Individual states are introducing legislation mandating 10% ethanol-blending in all grades of auto fuel. This action is not to meet federal EPA oxygenate standards, but to meet the demands of local/national ethanol producers or other mandated EPA emission requirements.
- Actual engine runs and in-flight testing studies by EAA, Cessna, and the FAA have shown that using 10% or 15% ethanol-blended gasoline is harmful to aircraft fuel systems.
    - Entire fuel systems are harmed as ethanol is a collector of water and other fuel contaminates – which, in turn, forms an acid that affects all types of components, attacking rubber and composite components, fuel hoses, fuel pumps, and fuel filters.
    - Ethanol-blended gasoline causes three primary concerns:
        - Adversely affects volatility of the fuel, leading to vapor lock;
        - Ethanol is not compatible with rubber seals and other aircraft fuel system components; and
        - Ethanol tends to develop "phase separation" as the aircraft climbs, the resulting water (that was held by the ethanol) could overwhelm fuel filters/sediment bowls.
- EAA has informed its STC holders on the current requirements and issues surrounding ethanol-blended auto fuel, as outlined below.
- The problems with ethanol-blended fuels cross recreational activity boundaries to include motorboats, snowmobiles, vintage cars, and other recreational vehicles. Problems include the same issues facing aircraft, to include damage to fiberglass fuel tanks and rubber gaskets/fuel lines, and corrosion damage to soft metals (aluminum, copper, etc.).

Discussion

EAA began testing and evaluating alternate fuels for aircraft piston engines in 1964. These included not only automobile gasoline, but also ethanol/alcohol. In 1982, EAA successfully changed FAA policy to consider the use of automobile gasoline in aircraft. The EAA supplemental type certificate program resulted in FAA Supplemental Type Certificates (STC) being issued for the use of automobile gasoline, rather than aviation gasoline, in the Cessna 150 aircraft, powered by a Continental O-200 engine. STC's SA01944CH (2004 version) and SE01943CH (2004 version) were issued based on EAA's efforts. As noted above, several studies have shown that ethanol-blended fuel is harmful to aircraft fuel systems, thus the prohibition against using ethanol-blended automobile gasoline under the terms of the STC's:

- To help prevent accidental use of ethanol-blended gasoline in aircraft:
    - EAA STC purchasers who are not EAA members, or EAA members who wish to purchase additional/replacement testing kits, may do so for $15.00.
    - EAA members who purchase an EAA Autofuel STC after March 1, 2006 will receive a free alcohol testing kit.
- Further discussion on the effects of ethanol-blended gasoline and details on how to perform a reliable field test.

- On October 27, 2006, the FAA issued Special Airworthiness Information Bulletin (SAIB) number CE-07-06 that describes the FAA's concerns with the use of ethanol in aircraft engines.
- In-depth information on all EAA gasoline STC's can be found at the main EAA STC web page.
- EAA auto fuel STC's are sold based on your aircraft's engine model.
- To apply for an EAA auto fuel STC.

The problem with the EPA required ethanol-blended fuel (oxygenate requirement) hit a high point (April 2006) with the U.S. wide switch from winter gasoline mixtures to summer gasoline mixtures in EPA mandated reformulated gasoline (RFG).

- The Energy Policy Act of 2005 was modified by Federal Register direct final rule on February 22, 2006 and included two provisions affecting ethanol-blended RFG:
    - Effective April 24, 2006, California became exempt from the oxygenate (MTBE, ethanol. etc) requirements. This included in-state retailers, and out-of-state retailers who produce RFG for California consumption.
    - All other states were exempt from the oxygenate (MTBE, ethanol. etc) RFG requirements effective 270 days from the effective date of the Energy Policy Act of 2005 final rule, or May 5, 2006. This action was finalized in a May 8, 2006 EPA final rule.
    - As of today, there are no federal EPA oxygenate requirements for RFG.
    - However, individual fuel producers are free to add oxygenates to fuels to meet other EPA mandatory emission and benzene cap requirements in high density population areas (nonattainment areas), or to comply with state law.
    - Areas of the country where air pollution levels persistently exceed the national ambient air quality standards may be designated "nonattainment." It is in these areas that the EPA has established more strict air quality standards that must be met.
    - Many STC holders in states like TX, NJ, PA, etc., are seeing an increase in the use of ethanol in gasoline. In these states, neither the EPA or the state government have mandated the use of ethanol-blended fuels to meet the EPA emission standards – it is the manufacturers themselves who have elected to add ethanol to their gasoline as their way to meet the more strict emission/air quality standards.
    - Individual states are free to develop their own ethanol fuel blending laws.

EAA has assisted members in several states (WI, WA, MT, ID, HI, OR, OK) with modifying state legislative proposals/bills mandating a 10% ethanol blend in all grades of gasoline. In those states, EAA members have been successful in changing the bills to exempt premium grade gasoline (91 octane of higher) from state mandated ethanol-blending requirements.

- Montana – EAA MT members had success equal to MO members.
    - Senate Bill (SB) 293 was introduced with the 10% ethanol-blending requirement for all grades of gasoline. On April 28, 2006, the Montana Governor signed the bill into law with the following exemptions: "**Section 2. Exemptions from use of ethanol-blended gasoline.** (1) Gasoline that is not ethanol-blended as required

in [section 1] may be sold or dispensed at a public or private racecourse if the gasoline is intended to be used exclusively as a fuel for off-highway motor sports racing events. (2) Gasoline retailers and wholesale bulk distributors shall hold, store, import, transfer, and offer for sale or use nonethanol-blended unleaded premium grade gasoline with an antiknock index number of 91 or greater. (3) Aviation fuel is not subject to an ethanol-blending requirement." http://data.opi.state.mt.us/bills/2005/billhtml/SB0293.htm

  - This was considered a very successful effort by EAA members - they discovered the bill, learned its deficiencies, developed a state-wide member and general aviation pilot action plan, carried their message to their individual state legislators, and won the day when the Governor signed the bill into law.
  - The biggest success was the wording of exemption "(2)", in that it applies to all levels of the fuel distribution system, making it very clear that premium grade gasoline shall be ethanol-free when delivered to all customers. The success was compounded by the fact this group of EAA members also created a success for the entire recreational industry that can't use ethanol-blended gasoline.
  - EAA members in states fighting this issue should use this effort, and wording of the bill, as their guide.

- Missouri - EAA MO members had success equal to WI members.
  - House Bill 1270 was delivered to the Governor on May 26, 2006 for signature.
  - The bill requires 10% ethanol-blended gasoline, but state EAA members were equally successful in fighting for the exemption they needed to operate their aircraft (and all recreational vehicles/equipment) safely. The final bill states: "5. The following shall be exempt from the provisions of this section: (1) Aviation fuel and automotive gasoline used in aircraft; (2) Premium gasoline; (3) E75-E85 fuel ethanol; (4) Any specific exemptions declared by the United States Environmental Protection Agency;"
  - This was considered a very successful effort by EAA members - they discovered the bill, learned its deficiencies, developed a state-wide member and general aviation pilot action plan, carried their message to their individual state legislators, and so far have their desired provisions in the bill that was delivered to the Governor for signature.
  - The biggest success was the wording of exemptions "(1) and (2)", in that it applies to all levels of the fuel distribution system, making it very clear that premium grade gasoline shall be ethanol free when delivered to all customers. The success was compounded by the fact that this group of EAA members also created a success for the entire recreational industry that cannot use ethanol-blended gasoline.
  - EAA members in states fighting this issue should use this effort, and wording of the bill, as their guide.

- Wisconsin – EAA WI members were successful in convincing state lawmakers to add two statements to the proposed bill that would have mandated adding 10% ethanol to all grades of automobile gasoline:

- "Premium gasoline (octane 91 or higher) is exempt from the 10% ethanol requirement", and
- "Gas station pumps will be marked with the percentage of ethanol the gas contains".
- This change was viewed as very successful because the exemption also provided relief for the other recreational vehicle activities that also need ethanol-free gasoline – four wheelers, motorboats, marinas, snowmobiles, as well as yard appliances like gas powered trimmers and chain saws, vintage automobiles, and car race tracks. Thus, ethanol-free premium gasoline will be available at every gas station in the state.
- Because of this issue, and many others, this bill was tabled with no final action taken.
- Tabling the bill actually created a problem in itself. Without state regulatory guidance stating otherwise, auto fuel distributors are now free to meet "public demand", real or perceived. For example (real life), there are three gas stations located on a corner in Green Bay – all different dealers. One offers ethanol-blended auto fuel in all grades; one offers 10% ethanol-blended regular, a 5% ethanol-blended mid-grade, and ethanol-free premium; and the third displays a sign that says all grades of gasoline are ethanol-free. This creates a "buyer beware" situation, as one must know what they pumping into the gas cans for their aircraft or other recreational vehicles.

- Idaho – EAA ID members also had success, although the wording was less than hoped for.
  - State Senate bills S1267 and S1364 were changed to read: "(4) A person responsible for the product may hold, store, import, transfer, distribute, offer for sale or use, or sell the petroleum product that is not blended in accordance with subsection (3) of this section, so long as the product is for use in aircraft legally authorized to use motor vehicle fuel. The person responsible for the product shall comply with the following:

    (a) The petroleum product shall be unleaded premium grade with an octane rating of ninety-one (91) or greater;

    (b) The outlet shall use no more than one (1) storage tank for the petroleum product under this exemption; and

    (c) The pump stand dispensing the petroleum product under this exemption must be posted with a permanent notice stating: "NONOXYGENATED GASOLINE FOR USE IN AIRCRAFT LEGALLY AUTHORIZED TO USE MOTOR VEHICLE FUEL ONLY." This notice must be posted at least two (2) feet above the ground."
  - This was viewed as less successful because there were no exemptions for other recreational activities, and there was no added incentive for airport owners to install ethanol-free premium grade gasoline tanks or other dispensing units.
  - Because ethanol-free gasoline is only exempted at airports, there was no requirement to mark gas station pumps.

- As of May 26, 2006 these two Senate Bills have not made it out of their respective committees (S1267 – Transportation Committee and S1364 – Environmental Committee).
- http://www.eaa.org/news/2006/2006-03-29_ethanol.asp

- Washington – EAA WA members had success equal to Idaho.
  - State Senate bill 6508 was amended to read: "Nothing in this section is intended to limit the use of high octane gasoline not blended with ethanol for use in aircraft." http://www.leg.wa.gov/pub/billinfo/2005-06/Pdf/Bills/Session%20Law%202006/6508-S.SL.pdf
  - This was viewed as less successful because there were no exemptions for other recreational activities, and there was no added incentive for airport owners to install ethanol-free premium grade gasoline tanks or other dispensing units.
  - The state also required gasoline pumps to be labeled with the percentage of ethanol in the gasoline.
  - The Governor signed this bill into law on March 3, 2006.
  - http://www.eaa.org/news/2006/2006-03-02_ethanol.asp

- Illinois – State legislators have introduced SB 2236 that will require all gasoline in the state to contain a 10% ethanol blend by January 1, 2008, and 15% ethanol blend by January 1, 2012.
  - There are NO EXCEPTIONS for aircraft or other recreational activities/vehicles.
  - http://www.ilga.gov/legislation/fulltext.asp?DocName=&SessionId=50&GA=94&DocTypeId=SB&DocNum=2236&GAID=8&LegID=&SpecSess=&Session=
  - This bill did not survive the Rules Committee review, primarily due to the hardships ethanol-blended fuels caused to all recreational vehicles and aircraft.

- Hawaii – State legislators have introduced HB 2611 and HB 2246 to extend the mandatory gasoline 10% ethanol blend to April 2, 2008.
  - There are NO EXCEPTIONS for aircraft or other recreational activities/vehicles.
  - HB 2611
  - HB 2246
  - These two bills would modify an existing Hawaii Revised Statute (HRS), No. 486J-10, which requires all gasoline used in "motor vehicles" to contain a 10% ethanol blend. http://www.capitol.hawaii.gov/hrscurrent/Vol11_Ch0476-0490/HRS0486J/HRS_0486J-0010.HTM
  - HRS 486J-10 does not contain any exemptions for aircraft use.
  - In 2006/2007 EAA Chapter 1182, in partnership with local personal/commercial boaters, launched an aggressive educational advocacy program to exclude premium autogas from the pending 10% ethanol-blended autofuel mandate. They were successful in raising awareness within the state Legislature of the problems ethanol-blended fuels cause small engines and their fuel systems. However in the end, the state legislators voted to give industry one more year to solve the fuel support problem on their own before passing a law mandating ethanol-free auto-fuel. http://www.eaa.org/news/2007/2007-05-03_hawaii.asp and http://www.eaa.org/news/2007/2007-04-04_hawaii.asp

- Louisiana – State legislators introduced HB 685 to establish the minimum ethanol and bio-diesel standards for gasoline and diesel within LA.
    - HB 685 - http://www.legis.state.la.us/billdata/streamdocument.asp?did=399857
    - Like all other states, the bill states that the use of "ethanol" as a renewable fuel is a "grave public necessity and is vital to the economy of Louisiana."
    - The governor signed the bill into law on 6/12/2006.
    - This bill is technically based on future ethanol production projections, since there are no plants currently producing ethanol in the state. The bill states that when ethanol production within the state equals or exceeds 50 million gallons, then 2% of total gasoline sold by volume will be ethanol-blended.
    - The bill does exempt aviation fuels from the minimum ethanol and bio-diesel requirements. Worldwide, aviation fuels are referred to as *avgas*, so the question that remains unanswered is: "Do the state legislators consider automotive fuels purchased by owners of aircraft authorized to use auto fuels (STC, or other authorized method), exempt from the future ethanol-blending requirements?"
    - This bill does not provide exemptions for other recreational activities (boats, etc.) that also require ethanol-free auto fuels.

- Oklahoma – State legislators started developing an ethanol blending mandate in 2008.
    - EAA Chapter leaders in the state are working (4/30/2008) proactively with their state leaders to ensure the bill development takes into account the ethanol use issues noted in this paper.

- Oregon – In mid-2007 state legislators passed House Bill 2210 that mandated all gasoline sold in Oregon contain a 10% ethanol blend.
    - Alert EAA members discovered this bill after its passage and notified EAA HQ's, which in turn issued an EAA e-Notice to all Chapter leaders in Oregon alerting them to the flight safety issues created by this bill.
    - EAA members contacted their state legislators and the OR DOT Director of Aviation, who all urged the members not to act until the next full legislative secession, late into 2008. Knowing there was a special legislative secession scheduled for February 2008 EAA members aggressively worked the issue.
    - Success - the Governor signed special secession Senate Bill 1079 on March 11, 2008. This bill allows non-ethanol blended gasoline to be sold in Oregon for the specific purposes of aviation, watercraft, ATV, snowmobile, and hand tools.
    - Problem – the bill does not provide a means for delivery of non-ethanol blended gasoline for any of the approved specific purposes. This will be an on-going issue that must be worked during the next full legislative secession.
    - Oregon EAA members and EAA HQ's co-authored an ethanol-blending white paper to help educate state legislators.

- EAA is not aware of any other states that have ethanol-blending bills pending at this time (5/26/2006). However, EAA has been informed that several states are considering mandating 10% ethanol-blended gasoline. In these states, bills have not yet been introduced, but could be at any moment so **it is imperative for EAA members to keep an eye out for ethanol legislation.**

Questions and Answers

1. I'm an auto fuel STC holder and have noticed gas stations are now advertising their fuel contains a 10% ethanol blend. Can I use that fuel?
   Answer: No. The auto fuel STC issued to EAA by the FAA prohibits the use of ethanol (of any percentage).

2. How can I check to see if the fuel actually contains any ethanol?
   Answer: EAA offers a simple testing kit that will allow you to determine if the auto fuel you are considering using contains ethanol. The test kit costs $15.00 – to order use https://secure.eaa.org/STC/stcapp_secure.html or 1-800-236-4800 (ask for Debi Walker at extension 4843).

3. How or where can I find ethanol-free gasoline?
   Answer: EAA is not aware of a web site or single source that provides this information for both airports and your local gas stations. Our best recommendation is to call your destination airport to see if ethanol-free auto fuel is available either at the airport or at surrounding gas stations.
   - EAA's Flight Planner web site does contain an auto fuel (mogas) locator, but it does not indicate if the auto fuel will be ethanol-free. Use the phone numbers on the locator for your selected airport to make that determination: http://map.aeroplanner.com/tools/fbomap.cfm

4. Gas stations in my state are starting to sell 10% ethanol-blended gasoline, is this a Federal law?
   Answer: No
   - Effective May 5, 2006 (April 24, 2006 in CA) the Federal Energy Act of 2005 was amended to eliminate the requirement to "oxygenate" gasoline with products like MTBE or ethanol, so there is no federal law requiring this.
   - The EPA does have other automobile emission laws that gasoline refineries and local distributors have "voluntarily" elected to meet by using ethanol – but there is no federal requirement to use ethanol.
   - Is this a state law? The answer is "maybe"
     - Several states have passed 10% ethanol-blending laws, so check with your local state representatives to determine mandated requirements. Montana (SB 293) and Missouri (HB 1270) have exempted premium grade gasoline from their state ethanol-blending requirements to support all types of recreational activities. Idaho (S1267) and Washington (SB 6508) have exempted ethanol-blending gasoline requirements only for aviation/aircraft use. Illinois (SB 2236) and Hawaii (HB 2611) have 10% ethanol-blending laws, becoming effective in 2008, for all grades of gasoline, with no exceptions for any recreational activities, including aircraft, motorboats, four-wheelers, snowmobiles, etc.

5. My airport does not sell automobile gasoline for STC holders or other aircraft authorized to use auto fuel – why not, and what can I do to change that?

   Answer:

   - First, there are no federal, state, or local requirements to sell gasoline, non-ethanol-blended gasoline, avgas, or other authorized aviation gas at airports. For those who wish to sell gasoline (i.e., auto fuel, MOGAS, etc.) the requirement to do so comes in the form of minimum commercial standards established by airport managers to keep the airport competitive and profitable (income). The minimum standards to sell any type of gasoline are generally, but not always, directed toward on-airport FBO's or other specialized fuel service providers.
   - Most, if not all, airports supply products based on supply and demand. If they don't know that there is a need to provide auto fuel, they won't offer that service. Some also believe there is a higher risk to selling auto fuel vs. only selling avgas – which falls into the "ole wives tale" syndrome.
   - In order to change that – show the need. Find out how many aircraft at the airport and within the surrounding 50 –100 miles use auto fuel (include both STC holders, amateur-built aircraft, ultralights, and light-sport aircraft) and would be willing to refuel at your airport if premium non-ethanol-blended gasoline was offered. You can also work with your state DOT Department of Aeronautics to determine if state or federal funds could be used to offset the cost of adding an auto fuel tank and aircraft refueling points to the airport as an improvement project. Also, check with your local gasoline distributor to confirm premium gasoline can be delivered to the airport ethanol-free. The auto fuel storage tank and refueling points also need to be incorporated into the airport's master plan.
   - You can also work with your airport management (commissioners, etc.) and ask them to adopt the light-sport aircraft minimum standards for commercial aeronautical activities that contain standards for adding auto fuel facilities to your airport. These standards would be part of the Specialized Aviation Service Operations (SASO) section of the airport minimum standards manual. The EAA Government department can provide assistance for the wording of what an SASO can/can't do for you to submit to your airport manager and airport board for approval.

6. Will EAA be doing further auto fuel STC studies to add ethanol-blended gasoline to the STC in the future?

   Answer:

   - No. EAA, the FAA, Cessna, and others conducted studies – they have all determined that a 10% ethanol and gasoline mix is not compatible with aircraft use. Further testing will not change the basic fact that to use ethanol-blended autofuel in your aircraft will require a total fuel system re-design costing well over $10,000 per aircraft.

7. What can I do to ensure ethanol-free gasoline will be available in my state?

   Answer:

   - Use the successful legislative examples of Montana (SB 293) and Missouri (HB 1270) that have exempted premium grade gasoline from their state ethanol-blending requirements to support all types of recreational activities.
   - Work with all EAA Chapters and members in your state to conduct a letter writing campaign to educate the Governor, the state DOT Director, the state DOT Director of Aeronautics, and all your state legislators concerning the problems you are facing, and that the best solution would be for a state ethanol bill to exempt premium gasoline for all ethanol-blending requirements. Use the Oregon white paper and this document as the basis for your letter writing campaign.
   - Enlist the aid of local recreational activity groups (owners of boats. snow mobiles, four-wheelers, etc.) to support this effort and conduct their own, similar, letter-writing campaign. You all face the same concerns when using ethanol-blended autogas.

8. I fly a Special Light-Sport Aircraft (SLSA), how will ethanol-blended auto fuel affect my aircraft?

   Answer:

   - The manufacturer of the special light-sport aircraft has the option of equipping the aircraft to handle ethanol-blended auto fuel or not. The manufacturer is required to state the acceptable types of fuel(s) for the aircraft in the manuals provided with the aircraft. If you cannot find the acceptable fuel list, contact the manufacturer/dealer in order to verify that the aircraft, i.e., the entire fuel system from the tank to the engine, will tolerate the ethanol-blended fuel.
   - If you can obtain ethanol-free auto fuel in your area, then this will not be an issue.
   - The FAA does not have jurisdiction in mandating what fuels may be allowed in SLSA aircraft.

9. If I fly an ultralight vehicle, an experimental LSA, an experimental amateur-built aircraft, or a type-certificated aircraft with an FAA-approved autofuel STC how will ethanol-blended auto fuel affect my aircraft?

   Answer:

   - The bottom line is that you must know your vehicles. If your vehicle is equipped with a fiberglass or other composite material-type of gas tank, and/or has rubber fuel lines – then your vehicle/aircraft could be affected like any aircraft.
   - If you can obtain ethanol-free auto fuel in your area, then this will not be an issue.
   - Not sure if the fuel you are using contains ethanol? http://www.aviationfuel.org/autogas/test_kit.asp

10. Rotax engines are one of the more popular ultralight vehicle and LSA aircraft engines; how will ethanol-blended auto fuel affect their performance and flight safety?

    Answer:

    - In the June 2006 edition of the EAA *Sport Pilot & Light-Sport Aircraft* magazine, page 56, Phil Lockwood provides a very good synopsis of what occurs when ethanol-blended auto fuel is used in Rotax engines. http://www.sportpilot.org/magazine/feature/2006%20-%2006%20June%20-%20Power%20On.pdf
    - Rotax has approved up to a five (5) percent ethanol blend for use in their engines.
    - Even at a 5% blend, "Ethanol, or any type of alcohol, readily absorbs water. It may even absorb significant amounts of water from the atmosphere in humid conditions. If too much water is absorbed, phase separation can occur, which results in the water and ethanol combining and falling to the bottom of the fuel tank. This combined water and ethanol can be quite corrosive to metal (fuel) tanks, electric fuel pumps, and other fuel system components, especially if the water (absorbed) and alcohol are allowed to remain at the bottom of the fuel tank for some length of time."
    - The operators manuals for the Rotax 447, 503, 582, 912 (series), and the 914 (series) engines all carry the same warning in chapter 10 – "▲ ATTENTION: Fuels containing alcohol always carry a small amount of water in solution. In case of temperature changes or increase in alcohol content, water, or a mixture of alcohol and water may settle and could cause troubles."

11. What are the modifications I must make to my aircraft to be able to use ethanol-blended auto fuel?

    - In July 2002 Cessna engineers researched and produced a document called "Evaluation of Ethanol-Based Aviation Spark-Ignition Engine Fuel."
    - In this study Cessna noted that ethanol has the potential to produce up to 15% higher power outputs along with cooler exhaust gas and cylinder head temperatures than 100LL. However, they also noted that to obtain those results required them to have a fuel flow 47% higher than 100LL.
    - Cessna indicated that ethanol-blended fuels are not compatible with airframe parts (aluminum, etc.), and fuel bladders and rubber parts (hoses, O-rings, etc.) – the "soft" parts of an aircraft fuel system. The report also indicated problems with calibrating capacitance-type fuel indicating systems, and long-term fuel storage issues (refer to question 6. above).
    - The Cessna team attempted to develop a solution to these issues, and stated the easiest solution was to raise cylinder compression ratios by installing taller pistons in each cylinder. This solution was not promoted due to the very high cost of the conversion and the years it would take for the FAA to recertify the engine with the new components.

- Bottom line, EAA does not believe solutions available in today's marketplace would be economically feasible for the average general/recreational aircraft owner.

12. If I notice gas stations in my area starting to sell ethanol-blended auto fuel, what can I do to help ensure there is a source of non-ethanol blended fuel for my aircraft?

    Answer:

    - As mentioned earlier, there is no Federal mandate to use ethanol in any auto fuel product – remember the Clean Air Act of 2005 and the Energy Policy Act of 2005 DO NOT require the use of ethanol in auto fuel.
    - Your first step should be to call your local state legislator to determine why this is occurring. In 90% of the cases, there is no state law requiring this.
    - **One of your points should be that you are not against the use of ethanol in auto fuel,** but that a means should exist for the citizens of your state to be able to obtain a product that will not be harmful to your equipment or to you in case of an equipment malfunction cause by ethanol related fuel problems in your fuel supply systems (gas tank, rubber fuel lines, etc.).
    - If there is no state law, then your local gasoline distributor is making the decision to add ethanol. Your local gas station or your state legislator can provide you with the distributors phone number – give them a call and ask why?
    - Sometimes, the only way to stop local gasoline distributors from adding ethanol is either through public pressure or a state law.
    - The best method to affect state law is by uniting all EAA chapters and members in the state, especially those members flying aircraft that use auto fuel, in an effort to educate your state legislators on the problems associated with using ethanol-blended auto fuels in aircraft fuel systems. The goal should be to seek one grade of fuel that will be ethanol-free – premium. Use the existing laws in Montana and Missouri as a tool to show a working example of a success story of state legislators supporting all recreational activities.
    - When conducting the educational effort use the tools provided by the Governor and legislators themselves – their e-mail, their phone number, their mailing address, and by all means make a personal office call with your legislator at either their state office or their office in your area. If you make that personal visit, remember that numbers count so take others who feel the same way you do to help in the discussion. A fly-in or drive-in to visit the state capitol (Governor and/or legislators) is an excellent way to show support and to get your cause covered by the media.
    - Also, don't forget to enlist the aid of other recreational groups who are just as affected by ethanol blended auto fuel as you are. Make a visit to your local marina and ask the boat owners and repair facilities about their problems. Ask them to also contact their state legislators with the same

message, or at least sign a petition (which will show a unified front on the issue).

- The same educational techniques can also be used successfully with the local gasoline distributors.
- If you need advise on meeting with your local media, call EAA Public Relations, at 888-322-4636, ext. 6523 (for media issues only).
- If you need advise on the best methods on how to approach your state legislators or your governor, call EAA Government Relations at 888-322-4636, ext. 6522.
- If you need advise on additional ethanol-blending issues call the EAA STC office at 888-322-4636, ext. 4843. And by all means visit the EAA auto fuel STC web site for additional information – www.aviationfuel.org