EAA MILE HIGH CHAPTER

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THIS MONTH: This month's meeting will be held on Saturday, June 14, 1986 at the Rocky Mountain Energy Center at 7:30 P.M. The program hasn't been finalized as of this writing, but a program is guaranteed.

LAST MONTH: With 70 members and guests in attendance, the meeting of May 10, 1986 was called to order at 7:50 P.M. by President Kirby White at the Rocky Mountain Energy Center. The minutes of the April meeting were approved as published in the Newsletter.

Guests: Guests present were Phil Todd of Fort Lupton -- who has recently been flying a rental Cessna 182, Mike Ladigo of Westminster -- a student at Colorado Aero Tech who would like to build an airplane some day, Tom Gregory and kids of Westminster -- who is a former member of Chapter 43 and is interested in getting active again, Ken Funk of Brighton -- who was a guest of Fred Seal and lives just north of Van Aire, John Thomas of Aurora -- who was a guest of Jim Thompson and is building a BD-4, Rick Skinner of Boulder -- who would like to build an amphibian, and Sid Berger of Aurora -- who was a guest of Curt Prentice and is building a Bobcat.

Treasurer's Report: There was none given.

Old Business: Kirby talked a little about the auction of Page Aircraft Salvage which was scheduled for May 23-25, 1986. He brought in some copies of the advertisement that was placed in Trade-A-Plane for the members to take. The ad listed generally what was to be auctioned.

New Business: Kirby said that Guy and Cathy Sheeon were not at the meeting because Guy's father had recently passed away. Kirby offered his condolances, which were felt by everyone at the meeting. Ken Lysek donated his copy of the videotape on the Cecomite 7600 covering process to Chapter 43's Library. Kirby thanked him very much, and told everyone to contact Librarian Cathy Sheeon to check it out for viewing. It is in the VHS format. Along the same lines, Kirby said that he had received a Cleveland Wheels and Brakes product catalog in the mail, and it would also be a part of the Chapter Library. The catalog is fairly complete, and covers subjects like a conversion kit directory, wheel and brake exploded views and part numbers, and other miscellaneous hydraulic assemblies. Kirby talked about some of the upcoming aviation events and fly-ins, and had a couple of posters for those interested to look at during the break. Bob Green showed a new propeller that a friend of his wanted to sell. He also read a list of other items for sale, and Kirby said that he would publish them in the June Newsletter.

New Business cont: Bill Landers reported that liability insurance costs have forced Amsoil to discontinue marketing their aviation oil. Mark Yelich said that there is room for another airplane in his hangar at Jeffco Airport.

Gene's Corner: Gene Horsman read several articles that he had come across recently. The release of the FAA's long-awaited report on the Beech V-tail Bonanza is imminent, but it has been met by a storm of criticism and legal blocking tactics by Beech Aircraft. Claiming that public airing of the report will cause it "irreparable injury," the Wichita manufacturer sued the FAA to prevent its release, at least until testing has been done on the aircraft at the Lockheed Corp. wind tunnels in Georgia. Some of the industry's top people gathered in March in Washington, D.C. to discuss battle strategy against the industry's current number-one nemesis: product liability lawsuits. The primary focus of the meeting was the so-called Glickman bill (H.R. 4142), a tort reform measure drafted by GAMA and now being sponsored by Wichita Democratic Congressman Dan Glickman. The Glickman bill applies only to general aviation aircraft accident lawsuits, and is designed to streamline the legal process and cut down on what the industry considers to be unfair and inflated jury awards. A new product designed to detect leaks has been introduced to the general aviation market. It is called Dye-Lite, and is a fluorescent tracer fluid that is added to an engine oil system, hydraulic system, or fuel tank. After a few minutes or hours of operation, the system is examined under an ultraviolet (black light) lamp. The leaking fluid will then glow brightly, allowing the source of the leak to be pinpointed. Gene read an article on crashworthy seats that have complex force-limiting substructures that collapse progressively, absorbing impact at a controlled rate. The article also went into depth about the crashworthy qualities and densities and prices of two types of energy-absorbing seat cushions -- Temperfoam and Sun-Mate. A recently proposed Airworthiness Directive would require annual detailed repetitive inspections and proof load testing of the wooden primary structure of the wing and empennage of about 352 Mooney M20 and M20A aircraft. The AD would also require repair or replacement to preclude structural failure. The cost of the inspection would average $1,200 per airplane. This AD would expand a 1976 AD that requires certain inspections of the aircraft's wooden wing and empennage structure. The U.S. Customs Service has proposed an annual $200.00 user fee for each general aviation aircraft entering the U.S. from other countries. Customs officials hope to raise the entire $580 million Customs budget from a system of user fees. AOPA has argued in the past that clearing customs is in no way a service to the individuals entering the country. Rather, customs procedures are measures taken to protect the population as a whole, and therefore customs activities should be funded from general revenues. The AOPA has asked the FAA for statistical records on telephone calls made by pilots to new consolidated flight service stations. The information on the number of calls placed to a facility, the length of time callers are made to hold, the number of calls waiting to be answered, and the number of lost calls is expected to provide evidence in support of AOPA's claim that pilot's are not receiving equal or better service at automated flight service stations than they would under the old flight service station network, as promised by the FAA.

Gene's Corner cont: There is an FAA amendment in progress that will establish rules requiring aircraft crewmembers to submit to chemical tests for alcohol given by law enforcement officers under certain conditions. It is based, in part, on the NTSB determination that alcohol is a cause or factor in a significant number of aircraft accidents annually, many of which are fatal. The proposed amendment would facilitate the enforcement of the present alcohol regulations. It is intended to reduce aircraft accidents and incidents attributed to consumption of alcohol. A record 7,872 pilots were hired by scheduled jet airlines in 1985, according to the Future Aviation Professionals of America (FAPA), a private organization that maintains a computer database of pilot, maintenance, and flight attendant resumes. Regional airlines hired 3,050 pilots during 1985, FAPA said. The brisk hiring pace has continued into 1986: in January, 841 pilots were hired by airlines that operate large jets. FAPA's projections for future hiring indicate demand will continue to be strong as new airlines are formed and existing ones expand, while many pilots at established airlines reach retirement age in the next few years. The American Medical Association (AMA) has recommended that the FAA adopt tougher standards for obtaining first, second, and third class medical certificates. The AMA also urged that aviation medical examiners check pilots for "risk factors" to identify potential health problems. The recommendations are contained in a 700-page report that details the AMA's two year study of FAR Part 67, medical standards and certification. AMA was contracted by the FAA to conduct the study. AOPA's Medical Advisory Panel has conducted an independent review of Part 67 and has developed its own recommendations for updating Part 67 to reflect modern medical practice and research findings. The panel will review and respond to the AMA report. The FAA has issued a Notice of Proposed Rulemaking (NPRM) that, if adopted, would lead to an Airworthiness Directive requiring inspection and maintenance of seat rails and latching mechanisms on 19 different models of Cessna aircraft. This AD would require relocation of seat stops on certain models, installation of a warning placard concerning proper locking of the seats on all models, and inspection of the seat rails and locking mechanism on all models. The actions specified in the proposed AD are necessary, the FAA maintains, to preclude possible inadvertent slippage of the pilot's seat due to improper engagement of the latching mechanism. Such slippage could result in the pilot's loss of control of the airplane. Canada's Expo 86 begins May 2 in Vancouver, British Columbia, with a flying exhibition of about 20 polar and arctic aircraft and continues into the summer and fall with a DC-3 rally, airship display, aerospace trade show, a fly-by of historical commercial air transports and an international air show. The planned $1.5 billion world exposition, held May 2 to October 13, will focus on man's achievements in transportation and communications on land and sea and in the air. More than 50 nations are scheduled to participate in the exposition, and at least 80 national, provincial, state, and corporate pavilions will highlight the history and modern development of transportation and communications. The event is expected to attract 15,000 general aviation aircraft.

Progress Reports: Scott McKenna told us that he had gotten his private license the morning of the meeting, which everyone at the meeting congratulated him for. He said that, to celebrate, he would buy the first round of drinks at Pizza Hut after the meeting.

Progress Reports cont: Earl Ellis reported that he was planning to take his Vari-Eze to his hangar at the Longmont Airport the next day for final assembly. He hopes to make the first flight sometime in June. Roy Maneely said that he would fly his Bellanca 260 from Platte Valley to his hangar at Jeffco Airport by the end of May. Gaylon Overton told us that he has been spending a lot of time at work lately, and hasn't had much time to work on his Mustang II.

A&P: The business portion of the meeting adjourned for coffee at 8:30 P.M. After the break, Chapter 43 member Fred Hart showed his copy of Duane Cole's new videotape that covers many aspects of VFR flying. It was quite good, and was well received by all at the meeting. Many thanks to Fred for bringing the tape, the VCR, and the T.V.

ROSTER UPDATE: Please add the following members to your Roster:
Bruce Collins, 1747 E. 83rd Ave., Thornton, CO 80229, H. 288-2960
1956 Cessna 172
Chuck Sabados, 131 2nd St., Dacono, CO 80514, H. 833-2404, 1958 Cessna 175, Tri-Z
The following member has a new address:
Mark Yelich, 13650 Silverton Dr., Broomfield, CO 80020, H. 469-0557
Original Design Biplane

GLOSSARY: From "I'd Rather Be Flying" by Donna Vasco
Relative Bearing: a polite way of saying your sister-in-law is pregnant.
Reporting Points: triangular mark on a chart to alert airborne traffic spotters that they'll be on the air soon.
Roger: government records indicate it to be the first name of 91% of air traffic controllers.
Roll: money required to take airport cafe waitress to Las Vegas.
Runway: ramp extending from stage into audience area at all good burlesque houses.

CONGRATULATIONS: Ellora Larson, the daughter of Chapter 43 member Glen Larson, has been chosen as a participant in the 1986 EAA Air Academy! She has wanted to go ever since her sister Ericka attended last year. Congratulations, Ellora, and we would enjoy hearing about your experience upon your return.

MARKETPLACE: For Sale: One pair Scott parking brake valves, $50.00. Ron Denight 452-0458
For Sale: Continental C-85 or C-90 generator, Lycoming 180 generator, Lycoming 180 regulator, Lycoming 180 flywheel, Scott 6" tailwheel, Sensenich propeller 72CK55. Bob Green 659-5829
For Rent: Hangar space at Jeffco for Skybolt-size airplane, $59.00 per month. Mark Yelich 469-0557
For Sale: 72x48 wooden propeller for Continental A-65; Starter and generator for Lycoming O-290 D2 -- both "O" time since overhaul and yellow tagged. Mark Yelich 469-0557
For Sale: Sensenich 64x56 and McCauley 64x55 metal props, $200.00 each. Larry Pickerell evenings 772-3923 in Longmont
Wanted: 6.00x6 (preferably) or 5.00x5 wheels & brakes & tires for a Dyke Delta project. Gary Spoering 833-4397 in Frederick
For Sale: RV-4 plans, $100.00; Complete Monerai sailplane kit with about 350 hours completed by A&P, most all welding done, many parts fabricated, $3,000. Tom Melsheimer 772-6084 in Longmont

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FLYING SAFETY UPDATE ARTICLE #50

Emergency Landings In Small Fixed-Wing Aircraft-Part I

Report No. NTSB-AAS-72-3

This study consolidates the guidelines presented by the NTSB's statistical data showing that about 25 percent of all general aviation accidents are associated with emergency landings. For the purpose of this study the different types of emergency landings are defined as follows:

1. Forced Landing: An immediate landing, on or off an airport, necessitated by the inability to continue further flight.
2. Precautionary Landing: A premeditated landing, on or off an airport, when further flight is possible but inadvisable.
3. Ditching: A forced, or precautionary, landing on water.

A precautionary landing is less hazardous than a forced landing because the pilot has more time for terrain selection and the planning of his approach. In addition, he can use power to compensate for errors in judgment or technique. Too many situations calling for a precautionary landing are allowed to develop into immediate forced landings when the pilot uses wishful thinking instead of reason. A low-flying pilot who is trapped in weather and does not give any thought to the feasibility of a precautionary landing accepts an extremely hazardous alternative: inadvertent flight into an obstacle.

Psychological Hazards

Several factors that may interfere with a pilot's ability to act promptly and properly when faced with an emergency are:

1. Reluctance to Accept the Emergency Situation: A pilot who allows his mind to become paralyzed at the thought that his aircraft will be on the ground in a short time, regardless of what he does or hopes, severely handicaps himself in the handling of the emergency. An unconscious desire to delay this dreaded moment may lead to such errors as: failure to lower the nose to maintain flying speed, failure to lower collective to maintain rotor rpm (in helicopters), delay in the selection of the most suitable touchdown area within reach and indecision in general.
2. Desire to Save the Aircraft: A pilot who has been conditioned to expect to find a relatively safe landing area, whenever his instructor closed the throttle for a simulated forced landing, may ignore all basic rules of airmanship to avoid a touchdown in terrain where aircraft damage is unavoidable. The desire to save the aircraft, regardless of the risks involved, may be influenced by the pilot's financial stake in the aircraft and the certainty that an undamaged aircraft implies no bodily harm. There are times when a pilot should be more interested in sacrificing the aircraft so that he and his passengers can safely walk away from it.
3. Undue Concern About Getting Hurt: Fear is a vital part of our self-preservation mechanism. When fear leads to panic we invite that which we want to avoid the most. The survival records favor those who maintain their composure and know how to apply the general concepts and techniques that have been developed throughout the years.

The success of an emergency landing under adverse conditions is as much a matter of the mind as of skills.

Basic Crash Safety Concepts

A pilot who is faced with an emergency landing in terrain that makes extensive aircraft damage inevitable should keep in mind that the avoidance of crash injuries is largely a matter of:

1. Keeping vital structure (cockpit / cabin area) relatively intact by using dispensable structure (wings, landing gear, fuselage bottom, etc.) to absorb the violence of the stopping process before it affects the occupants.
2. Avoiding forceful bodily contact with interior structure.

a. Energy absorption: The advantages of sacrificing dispensable structure are demonstrated daily on the highways; a head-on car impact against a tree at 20 mph is less hazardous for a properly restrained driver than a similar impact against the driver's door. Accident experience shows that the extent of crushable structure between the occupants and the principal point of impact on the aircraft has a direct bearing on the severity of the transmitted crash forces and, therefore, on survivability.

b. Occupant restraint: Avoiding forcible contact with interior structure is a matter of seat and body security. Unless the occupant decelerates at the same rate as the structure surrounding him, he will not benefit from its relative intactness but will be brought to a stop violently in the form of a so-called second collision. A classic example of partial restraint is the frequency of head and chest injuries of car occupants who jackknife over the seatbelt in a severe front-end collision. The same injury mechanism has been responsible for fatalities in survivable aircraft accidents.

c. Attitude and Sink Rate Control: The most critical and often the most inexcusable error that can be made in the planning and execution of an emergency landing, even in ideal terrain, is the loss of initiative over the aircraft's attidude and sink rate at touchdown. Steep bank angles just before touchdown should be avoided; they increase the stalling speed and the likelihood of a wingtip strike. A flat touchdown at a high sink rate on a hard surface can be injurious without destroying the cockpit / cabin structure, especially during gear-up landings in low-wing airplanes.

NOTE: This is Part I of a two-part study on the problem of emergency landings. Part II on Techniques completes this study, detailing methods and actions necessary when an enforced or emergency landing is imminent.

Knowing your aircraft and familiarizing yourself with all the aspects of a possible problem landing will improve your "walking away" chances immeasurably! Remember your A-B-C's (Always Be Careful) — "There are no old, bold pilots"!

Pilot of this 210 noticed smoke coming under the panel at 5,000 feet. Spotted a nearby airport when smoke filled the cockpit. No reply on emergency frequency or airport unicom. Switched engine off assuming engine fire. Then hydraulic line burst. Landing gear did not drop after using hand pump. Saw and avoided power lines, while attempting to land, but plane was 500 feet short of runway, stalled and bellied into vacant lot between two homes. Injuries fortunately minor.

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FLYING SAFETY UPDATE NO. 51

Emergency Landing Techniques In Small Fixed-Wing Aircraft Part II *(continued from Flying Safety Update #50)*

Techniques

A forced landing requires the following sequence of immediate actions: Maintain aircraft control (establish a glide at the proper speed), select a field and plan an approach.

Attempts to troubleshoot the cause of the emergency should be made only on a time-available basis.

Concerning the controversial subject of turning back to the runway following an engine failure on takeoff, each pilot should determine the minimum altitude at which he would attempt such a maneuver in his particular aircraft.

1. Terrain Selection: A pilot's choice of emergency landing sites is governed by the route he selects during the preflight planning, his height above the ground when the emergency occurs, and his airspeed.

When he is beyond gliding distance of a suitable open area, the pilot should judge the available terrain for its energy-absorbing capability. Terrain appearances from altitude can be very misleading and considerable altitude may be lost before the best spot can be pinpointed. For this reason the pilot should not hesitate to discard his original plan for one that is obviously better. However, as a general rule, he should not change his mind more than once; a well-executed crash landing in bad terrain can be less hazardous than an uncontrolled touchdown on an established field.

2. Aircraft Configuration: Since flaps improve maneuverability at slow speed, and lower the stalling speed, their use during final approach is recommended. However, the associated increase in drag and decrease in gliding distance call for caution in the timing and the extent of their application.

In rugged terrain and trees, or during impacts at a high sink rate, an extended gear would definitely have a protective effect on the cockpit/cabin area. However, this advantage has to be weighed against the possible side effects of a collapsing gear, such as a ruptured fuel tank.

A gear-up landing on level but soft terrain, or across a plowed field, may result in less aircraft damage than a gear-down landing. De-activation of the aircraft's electrical system before touchdown reduces the likelihood of a post-crash fire.

3. Approach: When the pilot has time to maneuver, planning of the approach should be governed by three factors: wind direction and velocity, dimensions and slope of the chosen field and obstacles in the final approach path.

These three factors are seldom compatible. When compromises have to be made the pilot should aim for a wind/obstacle/terrain combination that permits a final approach with some margin for error in judgment or technique. The most important consideration is to get into such a position with regard to the selected spot that it can be reached by using normal techniques.

4. Touchdown: The importance of having control over the aircraft's attitude and sink rate at touchdown has already been explained.

a. Confined Areas: Once the intended touchdown point is reached, and the remaining open and unobstructed space is very limited, it may be better to force the aircraft down on the ground than to delay touchdown until it stalls. An aircraft decelerates faster after it is on the ground than while airborne. A river or a creek can be an inviting alternative in otherwise rugged terrain. The same concept applies to road landing with one additional reason for caution: manmade obstacles on either side of a road may not be visible until the final portion of the approach. Road traffic must be given priority.

When planning an approach across a road it would be remembered that most highways and even rural dirt roads are paralleled by power or telephone lines.

b. Trees (Forest): Although a tree landing is not an attractive prospect, the following general guidelines will help to make the experience survivable:

Use the normal landing configuration; keep the groundspeed low; make contact at minimum indicated airspeed, but not below stall speed; avoid direct contact of fuselage with heavy tree trunks; low, closely spaced trees with wide, dense crown close to the ground are much better than tall trees with thin tops; aim for the softest and the lowest part of a tree or tree line.

If heavy tree trunk contact is unavoidable, once the aircraft is on the ground, it is best to involve both wings simultaneously by directing the aircraft between two properly spaced trees. Do not attempt this "maneuver" while still airborne, as recommended in some textbooks.

c. Mountainous Terrain: Although the variety and irregularity of mountain terrain makes it impossible to list general rules, the pilot should learn to avoid situations where an emergency would leave him without any choice. Only a short glide may be sufficient to bring the aircraft over lower lying terrain, thereby increasing effective altitude and terrain choice. Slope landings should be made upslope. When landing on a pronounced upslope, enough speed should be maintained to change the aircraft's descending flight path just before touchdown into a climbing one that approximately parallels the slope. A descent at 50 knots and 500 feet per minute results in a 6° flightpath. In combination with an approach to a 24° upslope, an uncorrected 6° + 24° = 30°.

d. Water (Ditching): a well-executed water landing probably involves less deceleration violence than a poor tree landing or a touchdown on extremely rough terrain. When considering the feasibility of ditching, the following factors should be taken into account:

The water temperature and the estimated time to be spent in the water; the proximity to land; the occupants' ability to swim; availability of life vests and other water-survival equipment; number of occupants and number of usable exits.

Loss of depth perception may occur when landing on a wide expanse of smooth water, with the risk of flying into the water or stalling-in from excessive altitude. To avoid this hazard, the aircraft should be "dragged in" when possible. Use no more than intermediate flaps; keep a retractable gear up; insist that all occupants keep their restraint systems fastened until the aircraft has come to a complete stop. Ditching downstream in a swift running river has the same effect as a headwind — it reduces the relative groundspeed.

A pilot who knows his aircraft and understands the what and why of the emergency landing under adverse conditions has no reason for morbid preoccupation with the possibility of being forced down. The peace of mind associated with this knowledge should improve the pilots overall performance, which, in turn, may prevent an emergency or benefit its outcome. □

PILOT ADVISORY

Autogas: Cautions abound, and the jury is still out.

BY J. JEFFERSON MILLER

More than 20,000 pilots now are operating their aircraft legally on automobile gasoline. They are doing so under the provisions of supplemental type certificates issued by the Experimental Aircraft Association (EAA) and Peterson Flying Service of Minden, Nebraska. Both organizations gained FAA approval to issue STCs only after extensive flight testing indicated that autogas could be used safely in low-compression reciprocating aircraft engines.

But flight testing, no matter how rigorous, cannot simulate every aspect of daily flying over a span of several years. The final, conclusive test of autogas is now being carried out in the harshest environment of all—the real world of general aviation flying.

Preliminary indications, after nearly four years of legal autogas use, show that autogas is safe for aircraft—when the proper type of autogas is used in the proper type of engine. But data collected by the FAA, the National Transportation Safety Board (NTSB) and EAA also reveal that autogas can lead to engine failure or component deterioration where certain precautions are not observed.

The dwindling supply of 80-octane avgas was the impetus for seeking approval to use autogas in aircraft. But to most pilots who use autogas, the main benefit is the reduced cost of flying. In 1985, AOPA studied the price of autogas at the approximately 300 airports where it is sold. The association found that the price of a gallon of unleaded autogas averaged 43 cents less than a gallon of avgas. Less expensive unleaded autogas can be found off the airport, and in many locations regular (leaded) autogas can be found for less than a dollar a gallon. Such cheap gas, however, may not be a bargain, as it may contain ingredients that can damage the engine and other aircraft components.

Unlike 80-octane fuel, 100-octane "low-lead" avgas (100LL) is in plentiful supply on airport ramps, but it can cause certain problems in low-compression engines. Contrary to its name, 100LL contains a fairly high lead content (four times as high as the lead content in 80-octane avgas). When operating a low-compression engine on 100LL, special leaning and operating techniques should be followed to reduce the chance of lead deposits building up on valves and other surfaces. Such build-ups can cause a number of engine problems, including extreme engine roughness due to stuck valves and loss of compression due to stuck rings. (For a discussion of the operating techniques that will prevent these problems, see "Red Gas Blues," November 1983 *Pilot*, p. 51. Also see *AOPA's Handbook for Pilots 1986*, p. 12.)

Petroleum refiners/distributors and aircraft engine manufacturers (Continental and Lycoming) maintain that the use of autogas in piston-engine aircraft is potentially dangerous. Pilots operating under an autogas STC or considering doing so should be aware that if they use autogas in their aircraft they may not be able to collect on warranty claims against the engine manufacturers.

The oil and engine companies warn that autogas has a number of characteristics that make it unsuitable for use in aircraft. Autogas, they say, is not handled with the same care as avgas and is more likely to contain dirt, water and other impurities. EAA suggests using a funnel with a metal screen and chamois cloth during fueling to prevent impurities from entering aircraft fuel tanks. The association also suggests that a water filter (available at auto parts stores) be used.

Another criticism leveled by these companies is that autogas is less stable than avgas—that it tends to separate into component parts if left in storage (or in an airplane's tanks) for too long. The concern is that gums and resins that precipitate out of the gas will clog fuel lines, quick drains, fuel pumps and other components. However, according to the FAA and EAA, this problem is not occurring on a significant scale, if at all.

Oil companies also speculate that chlorine, a lead scavenger found in leaded autogas, could have a corrosive effect on engine components. Only those pilots operating under the provisions of the Peterson STCs are permitted to use leaded fuels. EAA's STCs are for unleaded autogas only. The FAA has not received any service difficulty reports indicating that chlorine is indeed eroding engine components. However, Superior Air Parts of Addison, Texas, reports that some valves have been returned to the company showing signs of chlorine corrosion.

Autogas is the fuel of choice for many. To use it safely, precautions must be observed.

A fourth concern is the relatively high aromatic content of autogas. Aromatics such as benzene, xylene and toluene are used in unleaded fuels to boost their octane rating. The octane rating is a measure of a fuel's ability to resist detonation. One way to boost a fuel's octane rating is to add lead, but this is potentially harmful for certain engines and is considered an environmental hazard. As a substitute for lead, fuel companies add aromatics to autogas to achieve the desired octane rating. Aromatics also are present, to a lesser degree, in 100LL avgas.

Aromatics can deteriorate synthetic aircraft components, including fuel tank sealants, fuel lines, gaskets, O-rings and other types of seals. The number of service difficulty reports collected by the FAA having to do with deteriorated synthetic components is on the rise and is related at least in part to the use of autogas. Quick drain seals in Cessna singles appear to be among the most commonly affected components.

Bendix neoprene float needle valves in Continental 65- to 90-hp engines and Marvel-Schebler plastic carburetor floats also have been subject to deterioration, possibly due to aromatics. Replacement parts are available that are not subject to deterioration.

Neither the FAA nor EAA is certain that aromatics are responsible in all cases of deterioration of synthetic materials. However, another type of octane booster—alcohol—is a definite problem for individuals operating their aircraft on autogas. Alcohol compounds, such as methanol and ethanol, which frequently are found in autogas, will deteriorate synthetic components.

The mixing of alcohol with gasoline raises the fuel's Reid vapor pressure (RVP), which is a measure of the fuel's volatility—its readiness to vaporize. Adding alcohol makes gasoline more volatile, therefore more prone to detonation, which can severely damage an engine. Raising the RVP also increases the likelihood of fuel vaporizing in the fuel lines, leading to "vapor lock" and engine stoppage. For all of these reasons, autogas containing alcohol should not be used in an aircraft. (It may not be very good for your car either, although automobile manufacturers say a 10-percent alcohol content is acceptable.)

Alcohol is used in both leaded and unleaded fuels and has been found in some in-

stances to constitute 30 percent of an autogas sample. Alcohol in concentrations of greater than one percent is potentially dangerous when used in an aircraft.

The increasing reliance on alcohol as an octane booster can be traced to two developments. One is the low price of grain and other agricultural products from which the alcohol is distilled. The other is the Environmental Protection Agency's program to reduce the lead content of autogas. The greatest effect of the EPA program has been on the make-up of regular (leaded) autogas. In the last year, lead content in regular autogas has been reduced by 90 percent. Pilots operating their aircraft under a Peterson autogas STC, which allows the use of leaded autogas, may be more likely to encounter problems with alcohol-containing fuel.

PILOT ADVISORY

Premature detonation caused by alcohol in the fuel can severely damage an engine.

Most states have laws requiring gas pumps dispensing fuel containing alcohol to be so labeled. The following states have no such laws: Alaska, Hawaii, Idaho, New York, Pennsylvania, Tennessee, Texas and West Virginia. (Gas-pump labeling laws are pending in Pennsylvania and Tennessee.) In other states, enforcement is spotty at best, and it is entirely possible to buy alcohol-containing fuel unwittingly. EAA warns that alcohol-containing autogas appears to be most widely available in California. It also is sold widely in midwestern farm states.

Fortunately, there is a simple test for determining the alcohol content of autogas. The most precise method requires a graduated cylinder and is explained in detail by an EAA service letter available from the EAA STC department (414/426-4800). The service letter, warning of the potential for alcohol contamination, was sent to all EAA STC holders in October 1985.

A quick and easy alcohol check can be made using a simple glass jar. Pour about a half inch of water into the jar and draw a line on the glass at the water level. Then add approximately nine parts fuel. Shake for two to three minutes and let stand for five to ten minutes. Alcohol will mix with fuel or water, but it will mix more readily with water. If there is alcohol in the fuel, the shaking action will cause some alcohol molecules in the fuel to mix with the water. Alcohol is present if, after letting the sample sit for several minutes, the apparent water level has risen.

Another concern about autogas is its Reid vapor pressure, whether or not the fuel contains alcohol. The volatility rating of avgas remains relatively constant from batch to batch, with an RVP between 6 and 7. By contrast, the RVP of autogas varies with the season and the part of the country in which it is sold. There are summer blends of autogas with low RVPs around 8.5 and relatively low volatility. There are winter blends with high RVPs around 14 and relatively high volatility. And there are in-between blends used during fall and spring.

These autogas RVP figures are for gasoline that meets specification D-439 of the American Society for Testing and Materials (ASTM). Only autogas meeting ASTM D-439 is approved for use under the autogas STCs.

Oil companies and engine manufacturers argue that high-RVP autogas is not safe for aircraft use because of the potential for vapor lock. However, EAA and Peterson Flying Service claim that even the highest RVP winter blends allowed under these standards could be used safely in STCed aircraft under hot summertime conditions, according to their flight testing.

The FAA has not imposed any flight restrictions on STCed aircraft. But it is worth noting that Great Britain's Civil Aviation Authority, acting out of concern that vapor lock could occur, has adopted a more conservative policy for autogas use. The CAA permits aircraft to be flown on autogas only at altitudes of 6,000 feet or lower and only when fuel tank temperature is 68°F or lower at takeoff.

As a general practice, flying in hot weather with winter-blend fuel is not a good idea because the higher RVP means there is a lower margin of safety against vapor lock. Regardless of the autogas's RVP rating, EAA recommends that certain precautions be taken on hot days or when the engine compartment has become heat-soaked, as can happen when an engine is restarted shortly after a period of prolonged operation. Before takeoff, says EAA, a full-power runup and a check of the fuel pressure gauge (if one is installed) should be made to ensure that full power is available for takeoff.

One of the biggest problems for autogas STC holders is that it is difficult, and often impossible, to know whether one is buying ASTM D-439 fuel. Most states (see box, p. 94) require vendors to sell only gasoline that meets these specifications. However, as with the alcohol labeling laws, enforcement may not be extensive.

The FAA, EAA and Peterson Flying Service all suggest that the best method of ensuring that one is buying ASTM D-439 fuel is to buy from a name-brand service station or to buy from one of the FBOs that offers autogas. Brand-X gas probably is safe for your car, but it may not be for your airplane. Additionally, Peterson Flying Service sells a "volatility tester" that will indicate whether the fuel is within a safe RVP range. It costs $38.50 plus shipping for holders of a Peterson STC and $48.50 plus shipping for non-STC holders.

The National Transportation Safety Board lists 29 "misfueling accidents" between 1979 and 1985 in which autogas had been used. In many cases, the aircraft involved did not have autogas STCs. (STCs first became available in 1982.) In some cases, fuel was found contaminated by water or dirt. In others, pilots simply ran out of gas. In yet others, pilots flying aircraft with high-compression engines tried to take off, lost power and crashed.

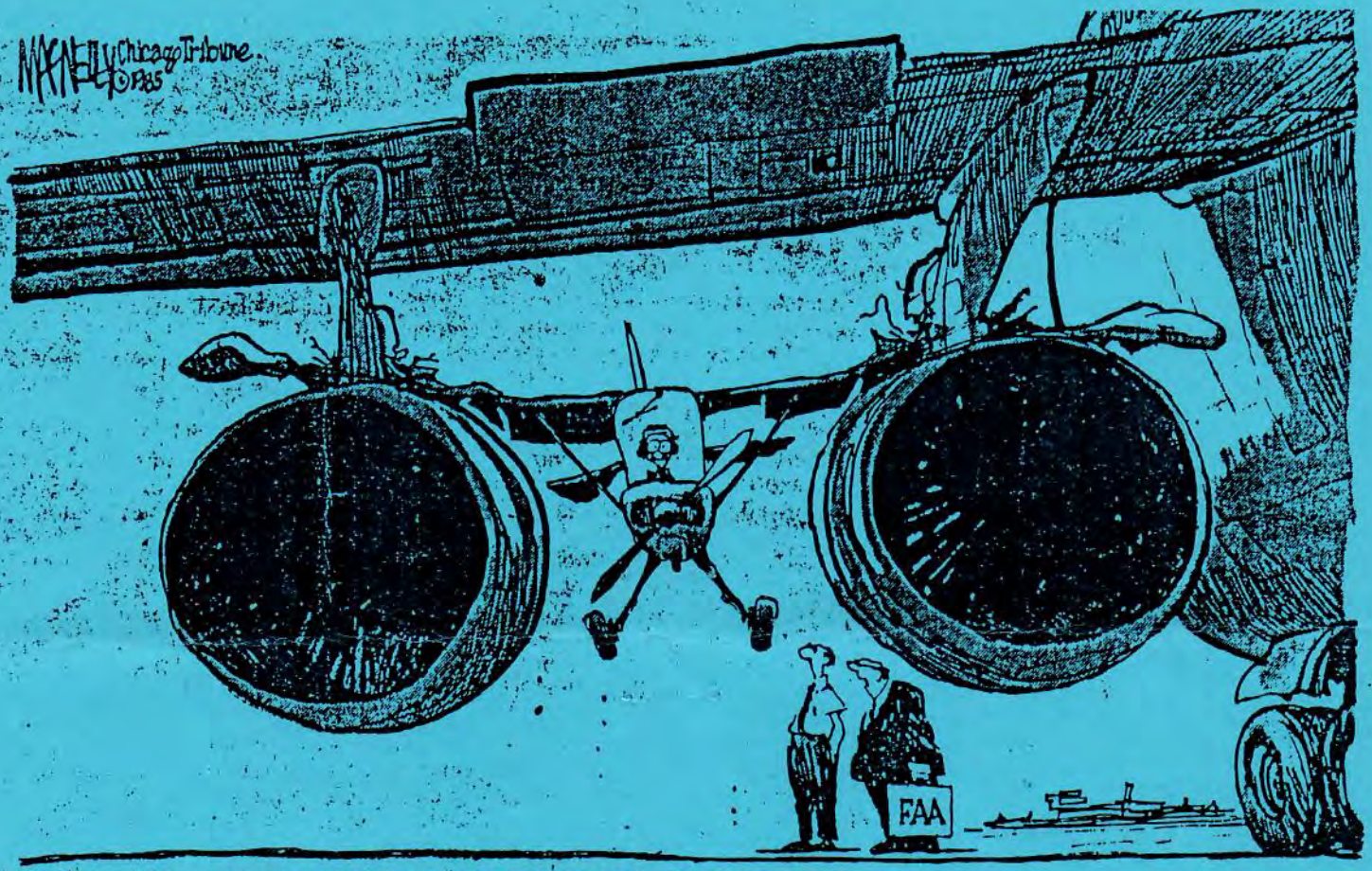
There also were several unexplained cases of engine failure. Whether they were due to vapor lock, carburetor icing or some other cause was not determined. However, FAA researchers have found that carburetor icing will occur more rapidly and at higher ambient temperatures when using autogas. Pilots using autogas in their aircraft, therefore, should be alert to slight decreases in engine power that may signal the onset of carburetor icing.

More thorough accident investigation and analysis is needed, including the long-term effects of autogas on aircraft components. In the meantime, pilots using autogas should exercise extra caution in fueling and operating their aircraft and should be particularly vigilant for autogas containing alcohol.

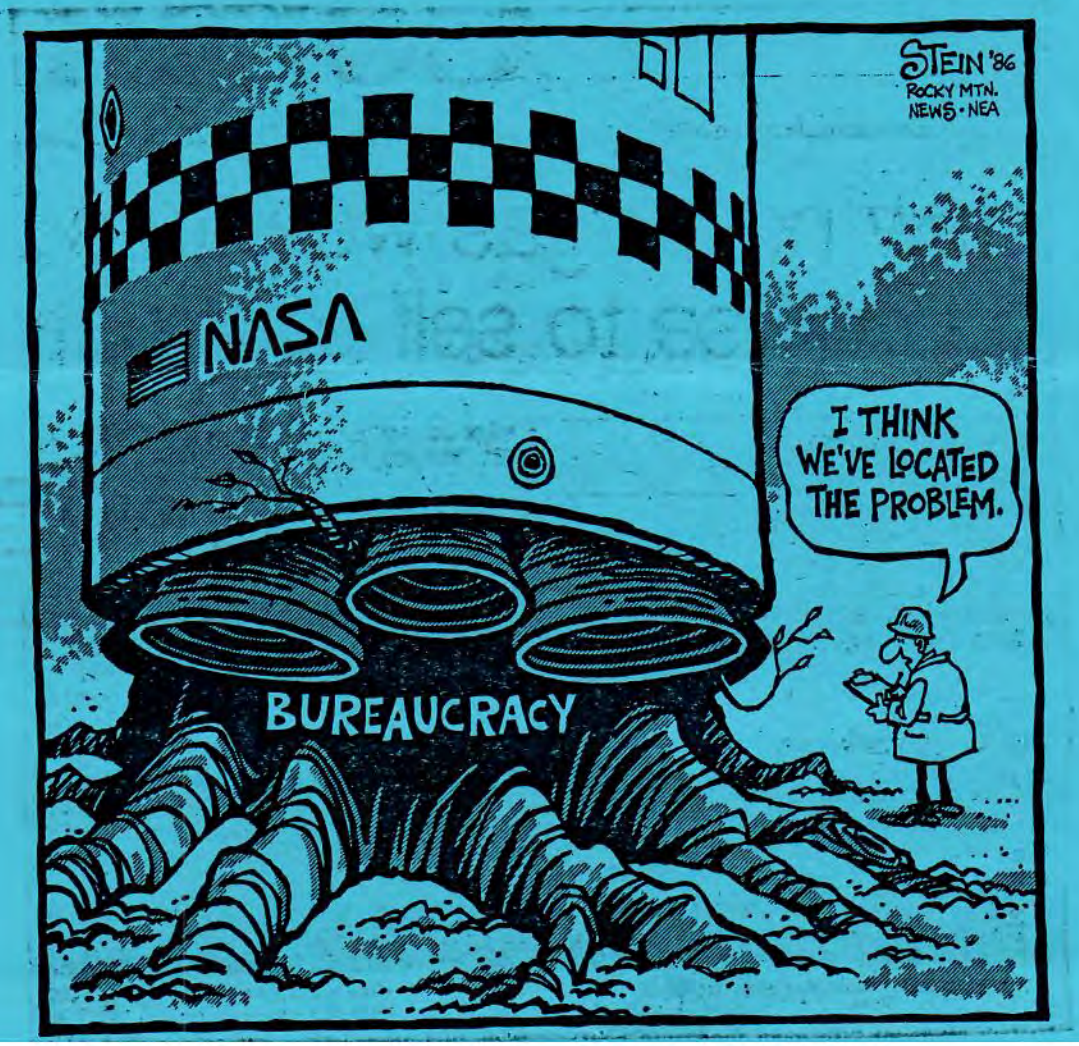
For more information on autogas STCs contact EAA at 300 Poberezny Road, Oshkosh, Wisconsin 54901 (telephone 414/426-4800), or Peterson Flying Service at Route 1, Box 18, Minden, Nebraska 68959 (telephone 308/832-2200). □

States that require conformance with ASTM D-439 autogas standards:

Alabama
Arizona
Arkansas
California
Colorado
Connecticut
Delaware
Florida
Georgia
Hawaii
Idaho
Illinois
Indiana
Iowa
Kansas
Louisiana
Maryland
Minnesota
Mississippi
Montana
Nevada
New Mexico
North Carolina
North Dakota
Oklahoma
Rhode Island
South Carolina
South Dakota
Tennessee
Utah
Virginia
Wisconsin
Wyoming



"WELL, HERE'S ONE NEAR MISS THAT'LL BE DAMN HARD TO SHRUG OFF..."



AVIATION HAPPENINGS: June 14-15, 1986 Space and Aviation Fair at the Colorado Springs Municipal Airport. There will be aircraft displays and seminars. See seminar schedule below.

August 1-8, 1986 Oshkosh

September 5-7, 1986 Greeley Fly-In and Airshow

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SATURDAY, JUNE 14

10:00 The Use of Computers in Aerospace Technology, by Paul Ceruzzi, Associate Curator, Smithsonian National Air and Space Museum

11:00 The History of Ballooning, by Stephen Blucher, Pilot, Rocky Mt. Hot Air Lines

12:00 The Cockpit to the Drawing Board, by Mike Machat, Artist

13:00 Search and Rescue, by (TBA), Civil Air Patrol

14:00 Zero-G Research, by Bob Williams, Test Director, NASA

15:00 Aviation Law, by Keith Doyon, Attorney

16:00 Accident Investigation, by Dr. Mel Anderson, Institute of Systems Management, University of Southern California

17:00 Helicopters, by Thomas (Woody) Wood, Pilot US Army and Earnest R. Dill, President Emery Aviation College

SUNDAY, JUNE 15

10:00 Pilot Factor, "Cop Out" of Aviation Safety, by George Parker, Institute of Safety, University of Southern California

11:00 Opportunities in Aviation Maintenance, by Barry Scoles, Colorado Aero-Tech

12:00 Experiments in Space, by (TBA), University of Colorado

13:00 Keeping Pilots Current and Safe, by Bruce Landsberg, Flight Safety International

14:00 The Military in Space, by Col. Dickman, Deputy Commander, 2nd Space Wing, USAF

15:00 Careers for Professional Pilots, by Pete Halle, Chairman, Aero Science Department, Embry-Riddle Aeronautical University

16:00 Gliders, by Mark and Alice Palmer, Instructors

17:00 (TBA)

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