Vol. 3, No. 12. March 2008

LEADING EDGE

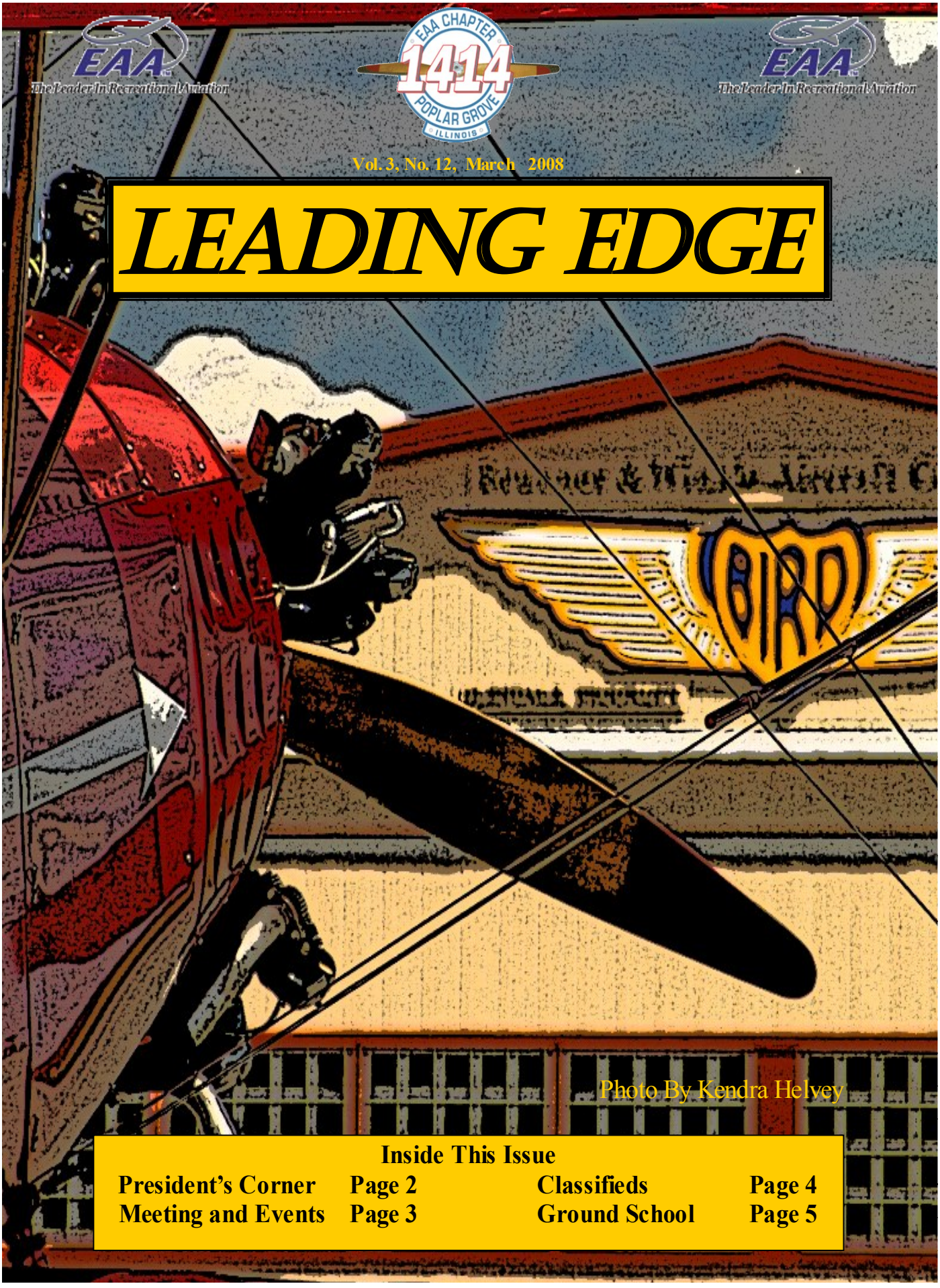

Photo By Kendra Helvey

Inside This Issue

EAA Chapter 1414

5151 Orth Road
Poplar Grove
IL 61065

Mission Statement

Promote, encourage and facilitate an environment that fosters safety, education and high standards in the design, construction, restoration and operation of all types of recreational aircraft, as well as, nurture camaraderie and friendship amongst all members!

President's Corner

Last month's meeting was a great example of what is good about chapter membership. When Chuck Jansen came to share his experience of almost losing a engine in flight, we all learned from it. We would like for every meeting to be as beneficial and enjoyable to all. Let us know what you enjoy about our meetings or what you would like to see at a future gatherings.

Lee

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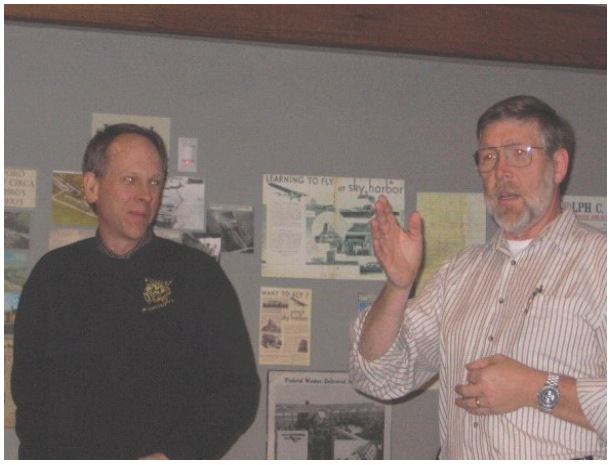
February Meeting



Dave and Chuck

When Chuck and Holly Jansen set off for an afternoon's flight on January 27, they expected nothing more that a pleasant Sunday. Instead, a failed stud resulted in an emergency landing at Cottonwood Airport. Chuck was on hand at the February Chapter 1414 meeting with his guest Rockford air traffic controller Dave Gustafson. They talked about the event from each point of view. They stressed how having proper training and following procedures is critical for a safe outcome during a grim situation as was the case for Chuck.

Our next meeting will be March 11 at 7:00PM in the Vintage Wings & Wheels Museum.

Chuck's damaged engine head

How Are We Doing?

A new year and a new slate of officers brings questions of how a group is doing and whether there should be changes to make it better. To that end, a mini-survey was circulated at the last meeting. The attendees were asked why they like to come to the meetings.

The almost unanimous response was that people enjoyed listening to the speakers and learning something about airplanes. With that in mind we would like more feedback on what kind of speakers would be most beneficial to the group. Therefore, we would like for you to be thinking about what kind of speaker topics you would most enjoy.

Thanks for your input thus far. We are all looking forward to a great 2008.

Notice

Members are reminded to pay their 2008 dues, if they have not done so. We also need your input for the 2008 directory update. The form on page 4 may be used for both purposes.

Welcoming Our New Members!

Recent new members are

Larry and Ruth Salerno of St. Charles
Glenn Sportsman of Elgin

The officers and members of EAA Chapter 1414 wish to bid a warm welcome to our group.

Events Calendar

March 11	Chapter 1414 Board of Director's Meeting, **Vintage Wings & Wheels Museum**, 5151 Orth Road, 5:45PM . All Members are welcome.
March 11	Chapter 1414 Monthly meeting, **Vintage Wings & Wheels Museum**, 5151 Orth Road, 7PM
March 15	Rockford EAA Chapter 22 Frank Murray Award Dinner
April 5	Vintage Wings & Wheels Museum Veteran Carrier Pilot's Forum
April 8 – 13	Sun 'n Fun Fly-in, Linder Regional Airport, Lakeland, FL (LAL)
May 3	YEA Introduction to Flight, Vintage Wings & Wheels Museum
May 30-June 1	Army Wings & Wheels 2008, Vintage Wings & Wheels Museum, Poplar Grove (C77) L-Bird Fly-in and living history re-enactment, Pancake Breakfast

Buy, Sell, Trade, Give Away, or Participate!*

Tailwheel Endorsement

Bob O'Quinn, CFI, is offering tailwheel check-out and endorsement in a Piper J-3 Cub, Cessna 140, or your personal aircraft.

For more information
Telephone (847)358-7554 or

1967 Cherokee 140 for sale

Same owner 28 years. IFR Certified, S-Tec Autopilot with altitude hold, annualed till October 2008, hangared C77, like new paint and upholstery, Midtime engine, many STC's to update aircraft including autofuel STC

For details and pictures
e-mail gkujawa@verizon.net
or call 8 AM to 8 PM 815-544-4571

ARMY WINGS & WHEELS
MAY 30TH-JUNE 1ST
L-Bird Fly-in and WWII Re-enactment
Poplar Grove Airport

Cover Photo: (See August 07 issue) A version of an earlier cover was shared by Kendra Helvey.

**Classified ads may be submitted by any member free of charge. Ads will run for three months unless cancelled, renewed or otherwise instructed..*

Have you paid your 2008 dues?

Interested in Joining Chapter 1414?

Application For Membership

1414 Member Information Card

Name (last, first)_____ _____
Spouse: _____ _____
Address: _____
_____
Home Phone: _____ Work Phone: _____
E-mail: _____

Military: Highest Rank: _____ Branch of Service: _____ Specialty: _____

Aviation Interest:
Pilot Rating (past or current): _____
Type of Airplane(s) I own: _____
Type of Airplane(s) under construction: _____
Type of Airplane(s) I have an interest in: _____

Would like to join a partnership to buy or build a plane (type): _____
Would like to see more: ☐ Social Functions ☐ Ground School
☐ Outside reps from aviation tech. dealers Other: _____
Would attend additional tech sessions (i.e. painting, welding etc.) ☐ Yes ☐ No

EAA Membership No. _____ Dues: $20 email newsletter ___ $30 print newsletter ____

Send to:
EAA Chapter 1414
5151 Orth Road
Poplar Grove, IL 61065

Ground School Revisited

By Dean May

When in flight, four forces are acting upon an aircraft --lift, drag, weight and thrust. Lift acts perpendicular to the surface of the airfoil, drag acts parallel to the flight path, weight acts towards the center of the earth, and thrust acts parallel to the thrust vector. While in steady state flight, these forces are equal to each other, with lift equaling weight and thrust equaling drag.

When lift is acting exactly opposite to weight and thrust is acting directly opposite to drag, it is easy to analyze the situation and see if these forces are equal. But what happens when these forces are not acting directly opposite to each other, such as during slow flight? As the aircraft is pitched nose upward, the lift generated is tilted backward and the thrust is tilted upward, and are no longer acting directly opposite to their opposing force. In order to analyze the effect of these forces on the aircraft, we need to utilize vector analysis. This involves looking at each of these forces and breaking them into their associated vertical and horizontal components. We then discover that some forces have both a vertical component and a horizontal component. We now must look at the total of the upward vertical force components and compare that to the total of the downward vertical force components on and aircraft. Also, we must look at the total of the forward horizontal force components and compare that to the total of the rearward horizontal force components on the aircraft.

Anytime an aircraft is pitched nose up in level flight (slow flight), a portion of the lift generated acts towards the rear of the flight path, similar to drag. The vertical component of lift is now no longer equal to weight. In order to compensate for this reduction of vertical lift, we need to increase total lift, normally be increasing angle of attack. This combination now causes an increase in total drag on the airframe, which requires an increase in thrust to maintain equilibrium. But, because thrust now has a vertical component in this nose high attitude, not all of the thrust is acting opposite to drag. Therefore, more thrust is required so that the horizontal component of thrust may equal the drag on the aircraft. As thrust is increased, however, more vertical component of thrust is generated, which now means that less lift is needed to be generated by the wings, which reduces the total rearward component of drag, which reduces the total thrust required. As can be seen, all four forces are constantly interacting with each other at all times in flight.

During climb, the forces are again shifted from acting exactly opposite to each other. It is easier to see what is happening to the aircraft if we analyze the forces in reference to the flight path of the aircraft instead of the horizontal and vertical axis. Weight still acts towards the center of the earth, but because the flight path of the aircraft is no longer level, we now also must to break weight into its two components, and we see that we now have a rearward component of weight, acting similar to drag. Thrust must again be increased to compensate for the additional rearward force caused by weight. Because of this additional rearward component, an aircraft must have some excess thrust available over level flight in order to be able to climb. The rate of climb is directly proportional to the excess thrust available. At different airspeeds, more or less thrust is required for level flight, therefore, different airspeeds during a climb, result in different rates of climb.

During a turn, again, the forces on an aircraft are not acting directly opposite each other. While maintaining an angle of bank, lift now has a horizontal component, which reduces the total effective lift needed to compensate for the weight of the aircraft. Therefore, more lift is needed to be generated by the airfoil to maintain equilibrium. This is normally accomplished by increasing the angle of attack of the airfoil. At shallow angles of bank of an aircraft, not much of the total lift generated by the airfoil is lost to horizontal component, so not much increase in angle of attack is needed to maintain equilibrium. But as angle of bank is increased, more and more lift is lost to horizontal component, and therefore, more and more total lift is needed to remain in equilibrium, which means that the airfoil must be placed at increasingly higher angles on attack. During level flight, there is usually a large safety margin between the critical angle of attack (stall) and the angle of attack at which the airfoil is presently flying. At any angle of bank, a higher angle of attack is required from that required for level flight, which results in a reduction in the safety margin between critical angle of attack and the angle of attack presently flown. At some angle of bank, the angle of attack needed to maintain level flight can and will reach the critical angle of attack despite the airspeed. This is refereed to as an Accelerated Stall.

The discussion now centers upon thrust and how it is generated for an aircraft. There are three basic types of power plants utilized by aircraft, these being Propeller, Jet, and Rocket. Many variations of there three basic types have been developed over the years. The basic principle of any aircraft power plant is to accelerate a mass of air to a faster speed. A propeller accelerates a large mass of air to a relative slow speed, whereas a jet engine accelerates a smaller mass of air to a higher speed and a rocket engine accelerates a very small mass to a very high speed. The efficiency of any power plant is dependent upon how fast the mass of air is needed to be accelerated. It takes energy to accelerate anything, and the energy required is related to the square of the velocity change. To accelerate a mass of air from 0 to 200 kts requires four times the energy of that needed to accelerate the same mass of air from 0 to 100 kts.

A propeller is nothing more than an airfoil that is rotated to cause air flow over the surface. But a propeller is much more complicated that a wing. First of all, the speed of the airflow over the propeller varies with the distance from the hub to the tip. The tips of a propeller at times reaches the speed of sound, somewhere around 700 kts, while portion near the hub will reach only about 70kts. The shape of the airfoil and the angle of incidence of each position along the propeller from hub to tip needs to be different to optimize the lift generated. At the tip, a small size and very low camber airfoil with a low angle of incidence is used while a much larger airfoil with much greater camber and a higher angle of incidence is used nearer the hub.

If this were the only thing affecting a propeller, it would easy to design an efficient propeller, but there are other factors in play also. Once an airplane starts its forward motion, the relative wind arriving at the propeller changes. This in turn changes the angle of attack of the airfoil sections of the propeller. However, the angle of attack does not change for all the airfoil sections equally when this happens. The tip sections, traveling at 700 kts is less effected by a 50 kt forward speed that the hub sections, traveling only 70 kts. While the airplane is traveling forward, if the engine RPM is changed, the speed of the various sections of the propeller is changed, also changing the angle of attack of this section. The tip section traveling at 500 kts is more affected by a 50 kt forward speed than when traveling at 700 kts.

What we end up with is a propeller that is at its optimum efficiency at only one airspeed and one RPM. Different propellers can be designed to operate efficiently at different airspeeds and RPM settings. But, a propeller that is efficient at take-off speeds and power settings is not very efficient at cruise, and would not allow the aircraft to fly very fast. Similarly, a propeller that works well at high cruise speeds and power settings would require a very long take-off roll. This is the reason why variable pitch propellers were invented. With a variable pitch propeller on the aircraft, pilot has the ability to change the efficiency of the propeller depending upon the phase of flight for optimum performance.

Premeeting Checklist

___ • **Bring suggestion for activities, etc.**
___ • **Your member profile for the Newsletter**
___ • **Any aviation article of interest that you would like to share With the other members**

EAA Chapter 1414 meets on the second Tuesday of the month in the Vintage Wings & Wheels Museum, 5151 Orth Road, unless notified otherwise in the newsletter. The meeting starts at 7:00 PM.

Directions: From Belvidere, IL, go north on Route76 approx. 3.5 miles and turn right on Orth Road. Make the first right turn and the museum is on the left.

The Newsletter is always looking for interesting articles and pictures by our chapter members. Please submit anything you have written, would like to write, or any pictures that you believe would be of interest to the chapter membership. The preferred method for the editor to receive articles is by e-mail to: ***mayge46@verizon.net.*** Alternately, a ZIP disk or CD with articles written with any major word processor with a printed copy may be submitted to any board member at the meetings.

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5151 Orth Road
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The Leader In Recreational Aviation