The Cleco

Official Publication of the Experimental Aircraft Association
EAA Chapter #393 POBox 272725 Concord, CA 94527-2725

DECEMBER 1997

CHAPTER MEETING

Meetings normally begin at 7:30 PM on the 4TH Wednesday of the month in the terminal building at the end of John Glenn Drive. This month's meeting is the annual Christmas dinner. See box.

Chapter 393 Christmas Dinner/Meeting

Our annual Christmas bash will be on Sunday, December 14, at Petar's in Lafayette. Happy hour begins at 5:30, dinner at 6:30. See you all there.

CHAPTER MEETING MINUTES

November 19, 1997. President Bruce Seguine opened the meeting at 7:30, the minutes were approved as written in the Cleco.

Jeff Fleming and Guy Rasmussen, pilots involved with the Civil Air Patrol's Search and Rescue operations, gave a presentation on search and rescue operations, emphasizing the need for flight plans, working ELTs, and proper survival equipment.

TREASURER'S REPORT

Bank Balance:	Checking	2320.46
	Savings	2797.82
		5118.28

Ken McKenzie gave an update on the progress of the fly-in organization. He also posted a organization chart which has many empty jobs waiting for volunteers.

Pat Peters pointed out that there is a position open on the Airport Advisory Committee. He is applying for the job and requested support from the chapter.

Duane Allen is looking for the pictures taken at the last Young Eagles event. If you know where they are, give him a call.

There being no other nominations, the candidates nominated last month were elected by acclimation. The new officers will begin their two year terms in January. Congratulations and thanks to all for volunteering to serve the chapter.

President	Ron Robinson
Vice President	Scott Achelis
Newsletter Editor	Doug Page
Treasurer	Louis Goodell

BOARD MEETING

Board meetings are held in Bruce Seguine's hangar at 6:30 PM on the Wednesday after the chapter meeting. All members are welcome. Topics for the December 3 meeting were final arrangements for the Christmas party and chapter by-laws. Present were Bruce Seguine, Bruce Hobbs, Louie Goodell, and new VP Scott Achelis.

EDITOR'S NOTE

As I assemble my final issue of the Cleco, I would like to thank all the people who helped me with information and other assistance during my term as editor. My special thanks go to Doug Page. Though he is already very busy with his nearly completed RV6A, he has agreed to take over this project as well.

RULE OF THUMB

Here's a simple method for converting Centigrade temperature to Fahrenheit:

Multiply C by 2, subtract 10%, and add 32. Mathematically this is the same as multiplying by 9/5, just a little easier to do in your head.

HOW SAFE ARE AMATEUR-BUILT AIRCRAFT?

From the EAA web pages.

Studies by FAA and the National Transportation Safety Board (NTSB) show that Amateur-Built/Custom-Built aircraft have an accident rate less than one percentage point higher than the general aviation fleet. In fact, the accident rate for Amateur-Built/Custom-Built aircraft is dropping. The total number of registered homebuilt aircraft is increasing by about 1,000 per year, while the total number of accidents has stayed virtually the same. Another good barometer of safety is insurance rates. Companies that insure both homebuilts and production aircraft charge about the same rates for owners of either type of airplane. That indicates a similar level of risk.

TECH TOPIC:

Licking Alternator Whine

Is that whine in your earphones driving you nuts? It might well be alternator-induced radio noise. Here's how to identify alternator and regulator noise, what causes it, and how to get rid of it.

by John Schwaner (jschwaner@avweb.com)

Identifying the problem

Alternator induced radio noise is a high pitched whine whose pitch and intensity increases and decreases with changes in engine speed. Turning the alternator master switch off also turns off the radio noise.

Solid state regulators that use a pulse-width-modulated field control system can also create a whine in the radios. Regulator-caused whine can be distinguished from the alternator-caused whine in that the intensity and pitch of regulator-induced noise changes with changing current load at a constant engine speed. Thus, turning on the landing lights won't increase alternator whine but will increase regulator whine.

How the alternator works

Current generated in the alternator stator windings is three-phase alternating current, but diodes convert it from AC to DC before it leaves the alternator. Six diodes are required to rectify the three stator phases. Each of the three stator windings is connected to a pair of diodes. Three diodes are connected to the positive output terminal of the alternator, and the other three are connected to the negative (ground) terminal.

As the voltage of each stator winding increases, the corresponding pair of diodes becomes forward biased and allows alternator current to pass. Which stator winding and diode pair is conducting at any moment depends upon rotor position. After the diodes rectify the three AC phases and sum them all together, the combined result is a DC voltage with only a slight amount of AC ripple voltage remaining.

The best way to detect ripple voltage on the electrical bus is with an oscilloscope. Another method is to use an ordinary volt-ohmmeter (VOM) set to measure AC volts. You may have to connect a capacitor in series with the positive meter lead to block out the DC voltage so that only the ripple voltage gets to your meter. (Some meters do this automatically when you select AC volts.) The capacitor is an open circuit to DC but passes AC, so the voltmeter reading you see is the amount of AC ripple voltage on the bus. You will need to do comparison readings with other aircraft to determine what AC voltage level is normal.

What causes alternator whine?

Normally, there is not enough ripple voltage to cause radio noise. But, there are two conditions that can cause an increase in ripple voltage sufficient to create radio noise. These are diode failure and increased circuit impedance.

If an alternator diode fails, the amount of ripple voltage increases markedly. Alternator whine can be a symptom of a bad alternator diode. Two test methods can be used to test the alternator without disassembly.

There is a hand held unit with a probe that clamps over the alternator output wire. A bad diode will show up on the meter. These meters were originally sold as the Ward Aero Alternator Tester model 647. They are currently sold by Support Systems Inc. as model 10-647-01.

The second test method is to use an oscilloscope to check the alternator output for excessive voltage ripple or rectifier spikes caused by a bad diode.

Checking the diodes

With the alternator apart, the diodes can be checked with a VOM set to measure ohms. This test makes sure that each diode conducts in only one direction. You need to unsolder the stator leads from the each diode. Calibrate the VOM on the R x 1 multiplier range scale so that there is zero reading with the VOM leads shorted together.

Connect one test probe to the alternator's positive output terminal and touch the other test probe to each of the three solder terminals of the diodes mounted to the positive rectifier plate. Note the three ohmmeter readings: they should be identical. Now reverse the test probes and repeat the test. Note the three ohmmeter readings: again they should be identical to each other, but not the same as in the previous step. Three of the ohmmeter readings should show a low resistance reading of approximately 6 to 20 ohms and three should show an infinite reading (no meter movement).

Repeat the same test procedure for the three diodes on the negative rectifier plate, connecting one test probe to the negative output terminal and checking all three diodes with the other probe. Then reverse the leads and check again. The diodes should show low resistance in one direction, and infinite resistance in the opposite direction.

Circuit causes

Alternator whine can also be caused by poor electrical connections, especially at the battery. Normally, the low impedance of the battery keeps the aircraft's electrical circuits at a DC potential. (Impedance is simply resistance to an AC current.) Any AC ripple voltage in the aircraft bus is absorbed by the battery. Thus, the aircraft battery acts as a big ripple absorber.

If the battery provided zero impedance (i.e., a short-circuit for AC current), alternator noise could not occur. In the real world, there will always be some impedance. But the lower it is, the less ripple voltage there will be.

Let's assume that the battery positive terminal is corroded. Although DC resistance as measured with an ohmmeter may still be low, the high-frequency resistance (i.e., impedance) may be very high. The higher this impedance, the greater the ripple voltage on the bus and the more whine you hear in your radios.

Circuit impedance can be lowered by making sure the battery posts are clean and making good contact. DC resistance should be less than 0.01 ohm...virtually zero. Also check the alternator ground connections, including the engine grounding strap. DC resistance between the alternator and the negative post of the battery terminal should be as low as possible.

The ideal low-noise circuit would have the alternator power output going directly to the battery's positive terminal. This dumps ripple voltage into the battery, where it is absorbed. The radio power lead would also go directly to a pure DC source, the battery.

If the alternator power lead and the radio power lead connects to a bus, then voltage ripple can go from the alternator to the radio power lead. The amount of voltage ripple at the bus depends upon the impedance between the bus and the battery. This impedance is higher than at the battery.

The return path is from the alternator to the engine, engine mount, firewall, and through the fuselage to the battery. These connections should have low resistance. Flat braided ground straps are ideal for grounding the airframe to the engine mount. Flat braided straps are used because impedance is less with a braided, flat conductor than a round wire conductor.

Filter capacitors

There are two methods of filtering ripple voltage: bypassing the ripple voltage back to the source, or blocking the voltage ripple so that it cannot pass. Capacitors are used to bypass ripple voltage, whereas inductors are used to block noise currents. The most effective approach depends primarily on the circuit impedance.

Capacitors bypass noise currents back to the alternator return path (commonly referred to as ground). To be effective, a capacitor must have a low impedance path back to the alternator. Consequently, a filter capacitor must be mounted as close to possible to the alternator. The capacitor is installed with one lead connected to the power output and the other lead to ground, so that it is in parallel with the circuit.

For DC voltages the capacitor forms an open circuit (high impedance) and doesn't allow any current to pass. At noise frequencies the capacitor forms a short circuit (low impedance) and bypasses noise currents back to the alternator. In this manner we have formed a low-pass filter. The effectiveness of using a capacitor as a noise filter depends upon matching the capacitance rating of the capacitor to the frequency of the noise currents.

The frequency at which the capacitor's capacitance and inductance are equal is where it has the lowest impedance and the best filtering. This is the resonant frequency. The correct size capacitor is one where the frequency we wish to bypass is the same or less than the resonant frequency.

Smaller size capacitors (picofarad range) are effective at high frequencies, while larger size capacitors (microfarad range) are effective at lower frequencies. If you're filtering conducted interference (as you are in an alternator), then this is low-frequency and the capacitor should be in the microfarad range. If you're filtering radiated interference (where the conductor is acting as an antenna), this is high-frequency and the capacitor should be in the picofarad range.

Typically, an alternator filter uses a .5 to 50 microfarad capacitor. Cessna has a 5.72 microfarad capacitor filter available as part number S1915-1.

The best types of capacitors for filtering are ceramic and tantalum capacitors, ceramic for the picofarad range and tantalum for the microfarad range. Electrolytic capacitors are relatively poor noise filters, and also have a short life.

Capacitor resonance can be approximated with the following formula: resonant frequency (in MHz) equals 1/2 pi times the square root of lead length times capacitance. Notice that lead length has a significant effect on the capacitor's resonant frequency. For example, a 500 pf capacitor with 1/4 inch leads resonates at 100 MHz. But with 1 inch leads, it resonates at 50 MHz. So capacitor lead lengths used in filter circuits should be kept as short as possible.

Inductive filters

The other way to filter radio noise is to block the ripple with a series inductor. The most common style of inductor for noise filtering is a ferrite core. These come in many different styles but typically the wire with the noise currents is wrapped around the core, creating an inductor in series with the circuit. DC current passes through the core but high frequency currents induce a magnetic field in the ferromagnetic material of the core. This magnetic field raises the impedance and effectively blocks noise currents. Ferrites are effective on radio power input leads and strobe power input leads. In the first case they prevent noise currents from entering the radio, and in the second case they prevent noise currents from exiting the strobe.

To be effective, ferrite impedance must be larger than circuit impedance. To filter the output of an alternator would required an impractically huge ferrite core. So alternator voltage ripple is usually bypassed to ground by use of a capacitor. However, ferrites are simple to use and have an amazing filtering ability.

Ferrites are best used in low impedance circuits whereas capacitors are best used in high impedance circuits. It is best to install ferrites on the radio power input leads, and to use a filter capacitor at the alternator output terminal.

The poem "High Flight" has a special meaning to all pilots, and has spun off a couple of others which were sent to me by Ken McKenzie..

"High Flight"

Oh! I have slipped the surly bonds of Earth,
and danced the skies on laughter-silvered wings;
Sunward I've climbed, and joined the tumbling mirth
Of sun-split clouds- and done a hundred things
You have not dreamed of- wheeled and soared and swung
High in the sunlit silence. Hov'ring there,
I've chased the shouting wind along and flung
My eager craft through footless halls of air.

Up, up the long delirious burning blue
I've topped the wind-swept heights with easy grace,
Where never lark, or even eagle flew;
And, while silent lifting mind I've trod
The high untrespassed sanctity of space,
Put out my hand, and touched the face of God...

-J.G. Magee, Jr. [WWII fighter pilot)

[For all you gliding enthusiasts...]

"Bronte Flight"

Oh, I have slipped the surly bonds of rope
A few feet from "The Road".
I whip the Schweitzer 'round so fast
Exceeds the max'mum load.
I've slipped, I've stalled, I've spiral dived,
Spun past the sixth full turn.
"You can't do that!" the new ones say,
They've got a lot to learn.

I find a thermal, turn in it
To try and gain some height.
But I must beat the towplane down
Or this is my last flight!
On 2-3 fly a crooked base
Then crank the plane around.
Or 2-9: pass the hangers then
I dive straight for the ground!
But the best is 3-6 final when
I know I should be higher,
Put out my hand and touch
The passing telephone wire!

-Author Unknown

"Low Flight"

Oh! I've slipped through the swirling clouds of dust,
a few feet from the dirt,
I've flown the Phantom low enough,
to make my bottom hurt.
I've TFO'd the deserts, hills, valleys
and mountains too.
Frolicked in the trees,
where only flying squirrels flew.
Chased the frightened cows along,
disturbed the ram and ewe,
And done a hundred other things,
that you'd not care to do.
I've smacked the tiny sparrow,
bluebird, robin, all the rest,
I've ingested baby eaglets,
simply sucked them from their nest!
I've streaked through total darkness,
just the other guy and me,
And spent the night in terror of
things I could not see.
I've turned my eyes to heaven,
as I sweated through the flight,
Put out my hand and touched,
the master caution light.

-Author Unknown

Santa Claus, like all pilots, gets regular visits from the Federal Aviation Administration, and it was shortly before Christmas when the FAA examiner arrived.

In preparation, Santa had the elves wash the sled and bathe all the reindeer. Santa got out his logbook and made sure all his paperwork was in order.

The examiner walked slowly around the sled. He checked the reindeer harnesses, the landing gear, and Rudolph's nose. He painstakingly reviewed Santa's weight and balance calculations for the sled's enormous payload.

Finally, they were ready for the checkride. Santa got in and fastened his seat belt and shoulder harness, and checked the compass.

Then the examiner hopped in carrying, to Santa's surprise, a shotgun..

"What's that for?" asked Santa incredulously. The examiner winked and said, "I'm not supposed to tell you this, but you're gonna lose an engine on takeoff."

A RECOMMENDATION FROM WILL PRICE

When my HSI gyro quit working, I was afraid it would be a very expensive repair job. Fortunately, I took it to Instrument Pro in San Leandro, where Dave Rogers put it on his test set and found it was working perfectly. Evidently the gyro had become unstuck while taking it out of the panel and transporting it. Dave wouldn't even take any money for the test. I would unhesitatingly recommend Instrument Pro to anyone who needs this kind of work done.

FROM THE NTSB FILES

NTSB Identification: NYC98LA031

Accident occurred NOV-23-97 at TIVERTON, OH

Aircraft: Aeronca 7AC, registration: N83101

On November 23, 1997, at 1104 eastern standard time, an Aeronca 7AC, N83101, was substantially damaged during landing near Tiverton, Ohio. Visual meteorological conditions prevailed for the unmanned flight that originated at Urbana, Ohio, at 0916. No flight plan had been filed for the flight conducted under 14 CFR Part 91. According to a report from the Urbana Police Department, the pilot landed on Runway 23 at Grimes Field Airport (I74), Urbana, Ohio. The airplane's engine stalled, and the pilot taxied the airplane to a grassy area to attempt a restart. According to the report: "[The pilot] attempted to restart the aircraft by hand-propping the propeller, standing to the side of the single propeller. After 4 or 5 attempts, [the pilot] turned the ignition off and turned the propeller in reverse to remove any excess fuel and then attempted to restart the plane again. The plane's engine reportedly backfired and started as [the pilot] began walking away from the aircraft. The airplane began travelling eastbound through the airfield nearly striking a plane taking off on the runway, and a nearby hangar as it became airborne...[The airplane] started circling the interior of the field at low altitude, then flew out of the airport traffic area travelling east." A private citizen in his airplane followed N83101 from Urbana, to Marysville, Ohio. The Ohio State Police monitored the remainder of the flight from a helicopter. The police report further stated: "The State Highway Patrol tracked the aircraft near Delaware, Ohio, at 10,000 feet above ground level and observed the aircraft climb to 12, 000 feet into Coshocton County, Ohio, where the aircraft ran out of fuel and crashed in a bean field..." The airplane flew unmanned for 1 hour and 48 minutes, and the certificated private pilot was not injured.

CHAPTER 393 VIDEO LIBRARY

We have recently acquired the ESPN production covering EAA '95. This video will be in the library for the June meeting. The complete list of titles is listed on the box which is brought to each of our meetings. Check out the offerings and, if something interests you, CHECK IT OUT. The rules for the library are very simple. It is run on the honor system. You sign out for the tapes you borrow; and you return them at the next meeting so they are available for others.

NEWSLETTER SUBMISSIONS

All contributions for the newsletter are welcome! If you have something to say or share with the rest of the club members, do it here! Please submit any articles and/or photographs you think others will enjoy and learn from. Submissions should be done in writing and mailed directly to the newsletter editor. Submissions may be **e-mailed**, hand written, typed, or on any IBM diskette (in ASCII or MS Word). The deadline for submissions to the editor is the 14th of every month (newsletter is produced and mailed by the 17th). The editor's e-mail address is: **rab@netcom.com**.

EVENT CALENDAR

Dec 21 **PANCAKE BREAKFAST**
9:00 a.m. to Noon
Everyone is Welcome!!
Fly-In or Drive Over!
Sponsored by the Mt. Diablo Pilot's Association MDPA Club House, Buchanan Field Airport (CCR), West Side, 200 Sally Ride Drive (510) 685-7073
Pancakes, Sausage, Juice, and Coffee $4.00 (members and non-members) Bring your family and friends!! Fly-in and park right in front of the Club House in our spacious, paved tie-down area. Just ask the tower to taxi to MDPA for breakfast!

Dec 14 **Chapter 393 Annual Christmas party at Petar's.**

CLASSIFIED ADVERTISING

Items for sale by club members may be placed in this newsletter for **FREE**! *Please submit your **FOR SALE** items to me in writing no later than the 14th of the month. Normally, your ad will run for two issues, unless you request more or tell me that the item is no longer for sale.*

Wheeler Express Kit

4 place, fixed gear, approximately 200 MPH cruise, uses engine up to IO540, Cost $20k originally, asking $10k. This kit was donated to Solano Community College. contact Paul E O'Hara, 707-864-7154.

THE EXPERIMENTAL AIRCRAFT ASSOCIATION
CHAPTER #393 NEWSLETTER, DECEMBER 1997

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(46) Dues paid to 2/28/98

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Christmas Dinner Meeting: Sunday, December 14, 1997