

The Cleco



Experimental Aircraft Association • Chapter 393 • Concord, CA

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JULY 1995

YOUR 1995 OFFICERS

PRESIDENT	Fred Egli 935-7551
VICE PRESIDENT	Lisle Knight 527-6846
SEC/TREASURER	Louis Goodell 682-4198
EDITORS	Ken & Linda McKenzie 283-3119

CHAPTER PICNIC - Saturday, July 15

Come enjoy a leisurely afternoon hangar flying with your fellow EAA'ers. Display your planes and projects on Navajo's ramp. As always, we will be offering Young Eagles rides.

Food preparation will begin around 11:00am on the lawn next to Navajo Aviation.

The chapter will provide hamburgers, hotdogs, buns, condiments, beer and soft drinks and paper plates and plastic utensils. Those of you who volunteered to bring chili, salads and desserts, please call Fred to confirm what you plan to bring.

MEMBERSHIP MEETING

Regular meetings resume August 23, 1995, (the 4th Wednesday of every month) @ 7:30pm, Old Buchanan Terminal Building, Concord Airport. Please wear your badges to help those of us who don't know everyone. Also, please bring chairs — we never seem to have enough.

BOARD MEETING

The board meeting is scheduled for 7:30 p.m., on the Wednesday following the Membership meeting at Fred Egli's house. If you are interested in attending or have a matter you wish to discuss, please call any of the Chapter Officers.

MINUTES OF THE CHAPTER MEETING

held June 28, 1995

The meeting was called to order at 1930 hours, Fred Egli presiding. The minutes of the May meeting were approved as submitted in the June 1995 Cleco.

The U.S. Air Tools catalogs were set out—it looks like every copy has been taken. Fred received a video of the approaches to Oshkosh -- call if you would like to view the tape before you leave.

INTROS: Glenn Werner announced that the new Lancair that he is working on will be getting winglets "to increase stability". Dick Rihn is taking delivery of the wood to begin work on his One Design. Duane Duis is rebuilding a second Luscomb. The wings and fuselage are just about done. Don Best put electronic ignition in his Glasair 1RG. Lou Ellis is almost done installing the Vari-eze's Chevron engine. Charlie Adkins announced that the planning for the "Tracy" Fly-In is coming along. He expects that each chapter will need to provide six volunteers. Ed Buckner has "900" gussets to cut out for his Pober Jr Ace. Rick Young sold the Neiuport, but it seems that this plane is continuing to create problems. Chris Kenyon has finally learned how to keep from riding his brakes. As a result his take-off roll has shortened about 150 ft. Tim Glenn has put 380hrs on his Kitfox model 5 in 1 year. And Harry Heckman has enlisted help from Bob Beishe for wiring up his avionics.

After an exciting raffle, Bruce Arrigoni of Formula Power spoke to us about the Subaru engines that he is marketing. The latest development is a six-cylinder for a Lancair based in Canada. Bruce plans to follow this engine closely. Formula Power currently does not sell or recommend specific props for use with their engines, although they do loan out props. In addition, the builder must choose between two different reduction gear systems: One is the Ross planetary system, the other is a belt reduction drive. Except for one or two kit types, the homebuilder must also work out the issue of cooling on his own.

PRESIDENT'S CORNER

My days as president of chapter 393 are numbered. The nominating committee will soon be making inquiries regarding those of you who might be interested in serving the next term as officers of the club.

Chapter 393 is a vital and active chapter with many interested, and interesting members. By our nature, we are generally interested in airframes, engines, avionics, flying, building, etc., leaving little time and energy for things like maintaining the organization. Though I can relate to this, I must say that serving as an officer of 393 has been a very rewarding experience for me and I know the other officers feel the same.

Being basically shy, I would like to relate to you that it has been really great to become acquainted with so many of you as has been necessary in dealing with club activities. Along with the satisfaction of keeping the club going each month, the friendships I have developed made the effort very worthwhile.

Sooo- if and when one of your friends suggests you as a candidate for a 393 office, please consider it as the special opportunity it is.

It has been an honor serving you and I look forward to seeing many of you at the picnic on Saturday.

Fred Egli

MINUTES OF THE BOARD MEETINGS

The board met for its monthly meeting on Wednesday, July 5 at Fred Egli's house. Attending was Fred Egli, Lisle and Valerie Knight, Louis Goodell, and Ken and Linda McKenzie.

In Toni Tiritilli's absense the board is heading up the committee to put on the July picnic.

UNCLASSIFIEDS

FOR SALE: True airspeed indicator, 0-240 MPH new, never used (cost \$172) \$90. — Angle of attack indicator, used (cost \$96) \$50. — Voyager miniature eyeball cockpit lights, new, never used (cost \$40) 2 for \$20. — Vari-eze servo motor, new, never used (cost \$25) \$10. — Gear motors, 28 volt, 2 for \$10. — Dial torque wrench with memory needle, new, never used, \$10. — Tire gauge, 0-130 psi, new, never used (cost \$10) \$5. Call Russ Giffin 510-935-2887.

[5/95]

FOR SALE: Ray Nilson ran into Herb Ross at the IAC gathering at Tracy. Herb is looking to get out of the airplane building game and has 2 Pitts S1S "kits" that he has assembled. Herb will part with these for at least

\$10,000 less than they are worth. Each kit consists of wings, fuselage, landing gear, empennage, fiberglass cowling pieces and a lot of et ceteras. All welding and parts needing special jigs have been completed. You will need to cut and fit aluminum panels, cover, and do the details that finish the airplane. If you are interested, Herb can be reached at (209) 478-0122.

[5/95]

FOR SALE: RV6/6A tail kit in box with complete set of plans, plus construction video. \$600. Contact Jim King at (818) 504-1147.

[5/95]

EAA Chapter 62 (San Jose) is selling a Mustang II kit that was donated to the chapter.

Details of the sale:

- * Sealed bid only. Mail bids to Mustang II Sale, 2502 Yerba Hills Court, San Jose, CA 95121.
- * Bid opening is at the August chapter meeting, 2nd Thursday, at Reid-Hillview airport.
- * The kit is in Sunnyvale, CA, and is available for inspection.
- * Crating is not included, and must be arranged if you do not pick up the kit.

Details of the kit:

- * Plans are dated 1968, builder's log dated 1979.
- * All of the wing ribs and fuselage bulkheads have been hand formed, and the workmanships appears to be excellent.
- * There is very little scuffing of the aluminum.
- * 4 pieces of 2024T6 (?) L angle stock, 1 3/4 x 3/16 / 6.5 feet
- * 8 pieces of the above, machined down as for fuselage longerons
- * 5 sheets of 2024T3, .032 x 4 ft x 12 ft
- * 2 pieces .125 L stock, 1 x 1 x 12 feet
- * Lotsa other small aluminum parts, some steel parts/scrap/junk

Not included:

- No hardware
- No fiberglass pieces
- No cowl
- No canopy
- No landing gear

All of the above is believed to be true and correct. Sale is final.

Caveat Emptor.

Ed Wischmeyer
President, EAA Chapter 62

Calendar of Events

Chapter Events

July 15 - Annual Picnic held on the lawn next to Navajo Aviation.

Dec 17 - Annual Awards Dinner @ Petar's Restaurant in Lafayette.

Fly-ins & Airshows

July 15 - VACAVILLE, CA - Solano Air Fair. 707-466-0322.

July 16-20 - SPOKANE, WA - American Bonanza Society Annual Convention. 706-290-0792.

July 18-23 - OSHKOSH, WI - 380th Bomb Group Reunion. 501-362-2891.

July 22 - SUSANVILLE, CA - Susanville Airfaire. 916-257-0334.

July 27-Aug 2 - OSHKOSH, WI - 43rd Annual EAA Fly-in -and Sport Aviation Convention. Wittman Regional Airport. Contact John Burton, EAA, P.O. Box 3086, Oshkosh, WI 54903-3086, 414-426-4800.

Sept 14-17 - RENO, NV - '95 National Air Races.

Sept 29 - SAN JOSE, CA - Reid-Hillview Airport Day.

Sept 30 - PALO ALTO, CA - Palo Alto Airport Day.

Oct 7-8 - TRACY, CA - Golden West Fly-in

Oct 12-15 - PHOENIX, AZ - Copperstate Regional Fly-in. 602-750-5480.

Oshkosh Travel Partners

Don Baldwin is planning to drive back again this year with his trailer. Anyone interested in spending two weeks for the trip should contact him now.

Bob Russell from Chapter 512, Placerville, would like to fly back in a light plane. Says he will share expenses and can help navigate. Call him at 916-642-1084.

Recipe for a Successful Chapter

an Article submitted to the Rec.Aviation.Homebuilt by Ken McKenzie

As a member of a reasonably healthy EAA chapter (393, Concord, CA) my perspective is a little different. Our club consists of about 110 members at any given time. We sign-up anywhere from 5 to 20 new members a year. We also lose a similar number annually. Out of the enrolled members there are about 50 that are truly active. By which I mean regularly attend monthly meetings and events. There are about 20-30 projects going on at any given time. Strangely enough, there are several projects being built on the airport by EAA members who have chosen not to affiliate with the chapter. We also have many members who don't own planes, have no project,

and may not even be pilots, they are just interested in experimental airplanes.

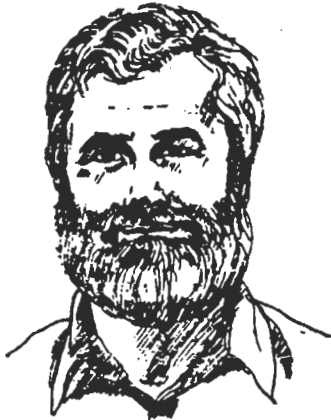
It seems that in our recipe for success, the most important elements of our chapter are, in order of importance:

1. Monthly meetings, including a speaker with relevance to aviation in general and homebuilding in particular. Sometimes we use chapter members to give a slide show on the progress of their project. Other times we will get an air show pilot (they usually fly highly modified experimental planes) or a parts supplier, or a local business involved in the projects (like painting). Anybody in the business of selling kits, parts, services or even people written up in Sport Aviation are good candidates, who are more than happy to speak and the club may only have to provide a ride to and from their home base.

2. A monthly newsletter. This is the best mechanism to bond the membership together. I say this not because I'm the newsletter editor (I am) but as a member for many more years than my current 2 year term. I always looked forward to getting the newsletter and finding out about the next speaker and if I didn't make the last meeting, what I missed. Also I found out what was new or significant with some of the club members (a great place to publicize rights or new certificates or ratings, and of course new members). We also have an on-again off-again feature where we will do a biography/interview with some of the more significant members who may not be known to the newer members, to give the club a greater sense of familiarity.

3. Rotate the leadership! Every two years we elect new officers. Many times not one board member returns. I was part of a "clean slate election" almost 2 years ago and we, the new board, had to essentially re-invent the board, with a little help from the outgoing officers. This allowed a group of essentially unknowns to be thrust into the view of the membership, which leads to people getting to know their fellow members who might not ever come to be noticed through normal means (like building planes). Before I became a board member the only members I knew were the previous board members and the relatively few people who spoke out in the group during the general portion of the meeting. Now I know at least 1/2 of the people who show up regularly at the meetings.

Sorry this dragged out so long but our chapter seems to have a formula that works and it might just work for others. That said I'm afraid that there is no substitute for membership. I do believe that there is a critical mass for a viable chapter and below that nothing short of heroic devotion will keep a club alive. I also realize how difficult it is to attract AND keep new members. I don't think that 25% of our new members stay for even 2 years. Most just disappear. I'm not sure that anything can be done to change that.



Bob Nuckolls

Here is the premier issue of *TechTips*. I've developed this product to fill a perceived gap in publishing for homebuilders. *TechTips* will carry no advertisements, four-color illustrated articles on completed projects or editorials. It will carry timely dialog between builders with problems and individuals who can help solve them. Q&A topics in this issue are

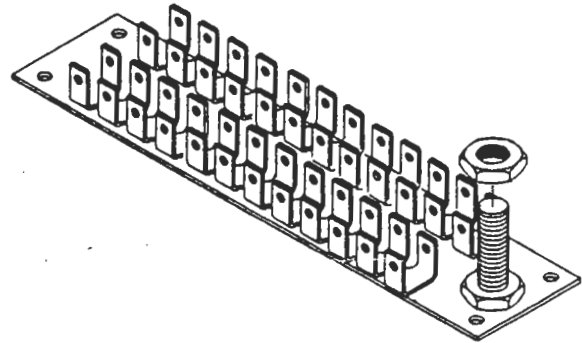
obviously electrical in nature; that is the area of my personal expertise. However, questions on any topic are welcome. 34 years experience working with designers in the aviation industries has rewarded me with many valuable associations; if I do not personally have an answer to your questions, I can probably find one.

Trends for the past 20 years have convinced me that the composite airplane is here to

TechTopic of the Month

stay... from a systems standpoint, a big problem with this technology is a lack of good electrical grounding. The carbon fiber ships provide a modicum of grounding capabilities for antennas but you can't run 200+ amps of starter current though a graphite skin. So, whether your airplane is glass or graphite, plan on installing your first wire, a nice, fat 2AWG conductor from battery minus (-) directly to the engine crankcase. The next wires to go in are ground bus feeders and sized according to the alternator capacity: 40-amp alternator, use 6AWG; 60-amp alternator, use 4AWG; 100-amp alternator, use 2AWG. If your airplane is a pusher with the battery up front, your second wire runs from battery minus to the instrument panel ground bus; if your engine is in the front, run a ground bus feeder from engine crankcase to the instrument panel ground bus. My favorite ground bus is a strip of brass with 48 Fast-On spade lugs soldered to it. It's also got a fat brass stud for attachment of a ring terminal and wire. Incidentally, never use steel bolts in your cranking current conductor path. If your engine is forward, a 48-point bus can be mounted on the back side of the firewall behind the panel and a smaller one, say 24 points,

interconnected by means of a single, brass stud on the front side of the firewall.



Fast-On Ground Bus

One to two of these bus bars provides *all* of the grounding points for everything in the airplane. This single location grounding technique has several advantages: First, the conductive quality of the ground is good; bringing individual wires for each load to a common point behind the panel discourages the use of "daisy-chain" ground wires commonly found on plastic airplanes. The single location grounding greatly reduces possibilities for "ground loops" which can cause instrument errors, noises in headsets, etc.

Keep it simple. Minimize the number of joints in the cranking current path. Put ground busses in convenient locations but keep their numbers low too (airplanes with battery on opposite end from engine can include a small ground bus right at the battery which is also tied to battery minus). Next month we'll discuss more techniques for minimizing electrical noise and maximizing electrical system performance in both metal and plastic airplanes.

The Doctor is IN

Since this is the first issue, I've not yet received questions through the *TechTips* conduit. However, in 7 years of publishing the *Connection*, I have accumulated a fat file of letters from readers. Here is a small sample of past work:

Q: "I've seen some ads comparing alternator regulators, one with 'crowbar' overvoltage protection, the other purported to have a 'relay' instead of 'crowbar.' The implication was that a relay might be the more desirable of the two. Which one do you recommend."

A. Over the years, I've designed and certified dozens of overvoltage relays. Most functioned as intended but when we did have problems, it was nearly always a difficulty with the electro-mechanical relay. I can advise you that mean time between failures (MTBF) calculations per military handbook No. 217 yields 2 to 10 times better life figures for the solid state crowbar system as compared to an OV relay. Some people are uncomfortable with the idea of deliberately creating a short downstream of a breaker to shut off an offending alternator/regulator; the idea of simply breaking the line with a set of relay contacts seems somehow less "violent."

I can assure every dubious builder that the dead short on your field breaker is much less violent than the little fire that can start inside a relay that's trying to open a 32-35 volt, 3-5 amp, very inductive field circuit. See Sport Aviation, Dec 1993, page 68 and chapter 6 of The AeroElectric 'Connection for more details. In my humble opinion, putting an OV relay on a new airplane is like choosing a carburetor over electronic controlled fuel injection! Crowbar style protection has been used in large computer systems for over 20 years.

Q. "I have an electronic EGT/CHT meter that presently monitors the hottest cylinder. Can I install more probes and use a switch to select any desired cylinder for monitoring?"

A. Certainly. Just be sure that you use a two-pole, 4 or 6 position switch. Everything you do to one side of a thermocouple lead must be done exactly the same in the opposite lead. This is because your switch and connections create new thermocouples at every joint. By putting equal and opposing couples in adjacent wires, their undesirable effects cancel each other. Chapter 14 in the 'Connection discusses this in detail.

Q. "My Kitfox does not have (nor recommend) any form of overvoltage protection. Should I install it? What kind do you recommend?"

A. The alternators on the small engines are capable of 12-20 amps. If your battery is in good shape, a failed regulator won't drive the voltage to fire breathing levels like a 40-60 amp alternator will. If you have a means for timely OV warning installed, you can probably rely on your own reactions to shut down an offending system. I would recommend both over and under voltage warning lights mounted in prominent places on the panel. You can install true OV protection using a crowbar OV module and an inexpensive relay for a total outlay of less than \$50; pretty cheap insurance! An OVLV Warning Light project as described in Appendix K of the 'Connection can be purchased from B&C Specialty Products, (316) 283-8000. Hot Flash #8 in the 'Connection describes the construction of a crowbar OV module. I can also supply them assembled and calibrated for \$35 each. Drop me a #10 SASE and ask for OV module construction details.

Q. My VariEze has a miniature, horizontal scale voltmeter that constantly shows more than 15 volts with the engine running. My friend's Radio Shack digital meter shows 14.3 volts. Is there some way to recalibrate my panel meter?

A. Yes, since it is reading high you can add a fixed resistor in series with it to bring its reading down where it belongs. However, if this is the meter I'm thinking of, it reads 0-16 volts in a very small space; it's also a poor quality device. For a voltmeter to be very useful, it needs to give an accurate indication over a relatively narrow range. I recommend expanded scale voltmeters which cover the range from 8-16 volts and have at least a 2-1/4" case size.

If your instrument cannot resolve voltage readings to the nearest 0.2 volts (0.1 volts preferred) it isn't very useful. There are a number of low cost digital instruments; see J.C. Whitney mail order catalog. Also, B&C has a nice one for about \$40. The digital instrument is fine for most situations but very difficult to get a useful reading during cranking (the best load test you can give your battery!). Westach makes suitable analog models sold through various distributors.

Q. "I've got a very small, Japanese alternator for my RV project. It has a built-in regulator. I know a lot of pilots are flying this product but my A/P buddy says I shouldn't use it. Can you help us out?"

A. The little automotive alternators are fine examples of how technology develops in an unregulated, competitive market. The built-in regulators in automotive alternators have amazing track records in cars but I cannot recommend them for airplanes. First, I've not seen an internal schematic for any of these products so that I can do a proper failure mode effects analysis and to determine whether or not they can be controlled externally should over voltage occur. Built-in regulators have no voltage adjustment; the new gas recombinant batteries like to run on a little hotter bus . . . about 14.6 volts. I recommend you keep the alternator, but modify it to accept an external regulator and OV protection.

Q. "My Cessna 310 came equipped with generators and they seemed to balance ship's loads quite well. I had alternators installed and they never seem to share the load except for the few hours after my mechanic has adjusted them. He says it doesn't matter. . . ."

A. He's right. There's nothing inherently bad about one alternator taking most if not all of the ship's electrical loads. A properly designed and installed alternator doesn't wear faster simply because it carries more of the total load. Your observation is a common one. Generators and their companion regulators were easy to set up for load sharing in twins. Alternators require special regulators designed for load sharing. The C-303 was the first Cessna to have a production regulator specifically designed for balancing two alternators. Most aftermarket conversions simply put

two single-engine alternators on which do not have paralleling capabilities. B&C has paralleling regulators which replace your existing regulators and take servo signals from a balancing amplifier.

Have you considered installing two batteries and separating the system into fully redundant, right and left systems with crossfeed capabilities for cranking and during alternator failure? I've done some designs for Defiants and twin Pipers that split system loads between two identical systems with crossfeed. Paralleling problems go away and you gain true redundancy which you do not now have. Further, after replacing two generators, two starters and one battery with two alternators, two light-weight starters and two gas recombinant batteries, the airplane came out almost 22 pounds lighter! It's quite a bit of work and requires a one-time STC but it will breath new life into your airplane's electrical system! In the mean time, don't be unduly concerned about your perceived "imbalance."

Q. I'm getting ready to build a switch panel for my VariEze project. I plan to use toggle switches but my hangar mate has a Cessna type, split-rocker for battery master and alternator control. Is there some advantage of using this switch?

A. No advantage what-so-ever! In fact, I have a plastic bag full of these critters that appeared to be okay but were causing voltage instability problems in both certified Cessnas and some homebuilts. This switch was designed for Cessna back in the 60's with interlocking that prevented shutting the battery master off and leaving the alternator on. Most alternators don't run well with the battery off-line ; alternators of the time were no exception. The interlocking feature does allow you to turn the alternator off without shutting off the battery. The switch has acquired some aura of magic about it; you do find it on a lot of homebuilt panels even when it doesn't match the rest of the switches!

My current designs run both alternator field and battery master switching through a single, double pole switch. Battery and alternator come on and off together. If you need to shut down an alternator in flight (rare) then pull the field breaker. There's nothing magic about the Cessna style, split rocker so I recommend you plan a simple toggle switch that matches the rest of your panel.

Q. "I plan to put a new B&C starter on my Q200 along with a new starter contactor on the firewall. I do not presently have a battery contactor, just a "master" switch in the panel bus feed. Should I have a battery contactor too?"

A. It's not a bad idea. The reason is to provide some means for shutting the system down in case the starter contactor sticks shut. I've had several subscribers suffer terminal meltdown of battery and/or starter when the starter contactor stuck and there was no second, backup control. There is a second option: The B&C starter (and similars)

has a built-in contactor. The built-in contactor should not be used as the primary starter contactor (see HotFlash #6 in the 'Connection'). However, this contactor can be used as a standby "disable" for the starter. Change your panel master switch to a two pole device. Use one side to control your bus feeder just like you do now. Use the second side to break the auxiliary contactor coil lead on the B&C Lightweight. If your primary starter contactor does happen to stick, shutting of the battery master will break the control lead on the secondary contactor and stop the motor. Don't forget to protect that control circuit for the contactor, use 16AWG wire in the contactor coil circuit protected with a 10-amp in-line fuse at the source-end. This scheme is used on several airplanes including the new Super Stinker aerobic bi-plane.

Q. I took my RV out of winter storage and for the second year in a row, found it contained a shot battery! I used a solar cell to maintain the battery during the winter. Could the solar cell be too small?

A. Your solar array is probably too big! Actually, almost any rate of continuous, unregulated charging is hard on a battery. A charger for long term storage should be set for no more than 12.5 to 13.0 volts . . . the idea is NOT to charge the battery . . . just keep it from falling into the self-destruct range below 11.0 volts. Next year, take your battery home and keep it inside. Charge it once about New Year's Day and it'll be ready to go to work next spring. If a solar cell maintenance system is attractive, drop me a #10 SASE. I'll send you the scoop on building a regulator to keep your solar array from sunmering the battery away over the winter!

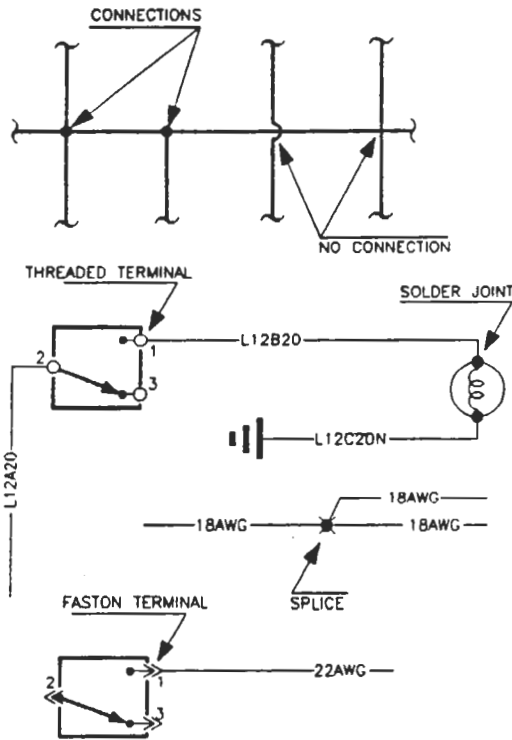
Q. I'm building a LongEze and I've just about finished with the wiring. I have shielded all the alternator wiring. There's a filter on the regulator, alternator b-terminal, and nose gear extension motor. Would you recommend any additional filtering?

A. (I had to call this guy-to find out that he had not yet flown his airplane!) First, I wouldn't put any sort of filtering on until you know you need it. There are hundreds of airplanes flying with no special action taken or needed to reduce noise. The noisiest device after magnetos is your alternator. If you plan to fly a low frequency radio like ADF or Loran, you may find that the alternator needs some filtering. Alternator noise in intercom system is usually best filtered at the intercom. Alternator noise in radios may require filter at radio, alternator or both. To make a long story short, there is no standard recipe for noise elimination or reduction. Each case is different. See if you have a problem first. Identify the victim, antagonist, and mode of propagation. Only then can proper action be prescribed and applied.

Schematic Symbols of the Month

The schematic symbols for this month are used to depict wires, how they are brought together; how they

are kept apart. A conductor path or wire on a diagram is simply a line. The artist may use variable line widths to depict special paths like primary bus feeders or especially fat wires like 2AWG battery and starter feeds. But as a general rule, don't try to read anything into thickness of a line unless some legend on the drawing defines what the thickness means.



Wires, Wire Numbers and Terminals.

Wires on schematics may be tagged with a variety of information about the wire. On most production airplane drawings numbers on schematics match numbers stamped on the wire itself. Most manufacturers use some sort of system. In the diagram above there's a wire marked "L12C20N." If we were looking at an old Cessna, I'd know that "L" says the wire is part of a lighting circuit. "12" says it's the 12th lighting conductor path to be described in the drawings. "C" means it's the 3rd wire along the path from bus to ground. "20" means it's 20 gage wire. "N" says this segment is ground wire. Nothing says you must be so elaborate as to individually number each wire, physically or on the diagrams. However, it's a good idea to document your work with enough "road signs" so that you can

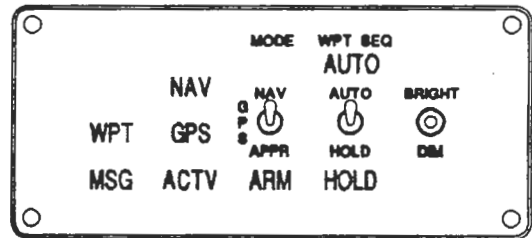
maintain or modify the system later. Of course, most homebuilders don't have the equipment to actually stamp wires. There are ways for Podunk Hollow Airplanes to inexpensively number wires. A future *TechTopics* article is planned to discuss wire numbering philosophies and techniques.

When I do drawings for people, the only nomenclature I always put on a wire segment is it's gage. As shown in the illustration, I simply break the conductor and insert "2AWG" or "22AWG" as appropriate. Obviously, the ends of wires have to attach to something using an appropriate terminal. Every company can have it's own conventions and will describe them in the glossary to their wire books. For our purposes, I suggest we agree to the ones shown in the adjacent figure. A open circle means some form of ring terminal is used to attach the wire to a threaded stud. A filled circle or dot means a soldered connection. A dot with an "X" through it is a crimped splice. A two interlocked arrow heads means either a Fast-On spade terminal (for single conductor connections) or a pin-socket plug (for multiple conductor connections). When wires cross on a diagram, a dot on the intersection says they connect at that point. No dot, or a little "camel hump" says they do not connect.

Next month we'll start to talk about switches. There are interesting things you can deduce about how a switch works just by reading its schematic symbol!

Catalog Watch

This month's catalog watch features an unusual buy for those who anticipate installing a Garmin GPS155 or King KLN-90B, IFR approved GPS receiver. B&C Specialty Products has a limited number of the dead-front, annunciator and switch panels used to switch a single CD/OBS indicator between the GPS and VOR receivers.



IFR GPS/VOR Nav Source Selector

Shown here about 2/3 size, these 14/28-volt boxes include front-panel press-to-test, dimming and backlighted switch legends. These are new units in a discontinued style. They come with full warranty and service support. Normally retailing at \$700, these are available to homebuilders at just over \$400 including mating connector. I helped design these so I can honestly assure you that they're nice! Contact Bill at (316) 283-8000.

Q. "Can you give me a source for AMP PIDG or similar, copper sleeved insulator ring terminals? My local sources stock only all plastic sleeved terminals."

A. I recommend you obtain a catalog from Digi-Key Corporation at 1-800-344-4539 and request a catalog. They stock a wide range of AMP PIDG terminals. The best feature is that they offer both full boxes (100 count) and bags of 10 terminals each. Quite often, one needs only a few each of larger sizes; Digi-Key's re-bagging service provides an excellent alternative to buying too many of one size to fill small requirements. Waldom also manufactures PIDG-style terminals at somewhat lower prices if full boxes but I'm not aware of any mail-order supplier that re-bags. Does anyone have a suggestion?

Here's a short list of some of my favorite vendors for hardware and tools. If you don't have catalogs from these folk, I suggest you give them a call and get on their mailing lists.

C & H SALES
P.O. Box 5356
Pasadena, California 91107
(800) 325-9465

Batteries (Wet NiCad Cells), D.C. Motors, some with gearboxes (Landing gear, flaps and trim systems), Solenoids, Blowers, Heat Exchangers (anyone for using hot engine oil for cabin heat?), Relays, Capacitors, Switches, Rheostats, Valves (manual and electric), Gear boxes, Tools, Some Electronic Components.

MARLIN P. JONES
P. O. Box 12685
Lake Park, FL 334030685
(407) 848-8236
Variety of industrial surplus electronics parts.

J. C. Whitney
1917 Archer Avenue
Chicago, IL 60680
(312) 431-6102

Electric fuel pumps, light fixtures, tools, gages and lots of stuff for your cars also (most of us work on our earthbound iron too, right?).

Mouser Electronics
P.O. Box 699
Mansfield, TX 760630699
(800) 346-6873

Fast turnaround mail order house for electronics parts.

Zefronics
2205 Moberly Avenue
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