DESIGNEE NEWSLETTER

THE PUBLICATION OF THE EAA DESIGNEE PROGRAM

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The DESIGNEE NEWSLETTER is a forum for the exchange of information and ideas of interest to aircraft and ultralight builders, restorers, and flyers. The sources of the materials published are EAA Designees, readers, Chapter newsletters, and other publications. Readers are encouraged to submit manuscripts, drawings, and black/white photos for consideration. Every effort is made to select accurate materials of interest to a majority of readers. Opinions expressed and responsibility for accuracy rests entirely with the contributor. All materials submitted become the property of EAA - no remuneration will be made. Materials should be sent to Chuck Larsen, EAA Designee Director.

Designees and Subscribers:

Fall and Winter bring many Designees and Members to return to their hangars and shops intent on making progress on the project or projects of their choice. I ask that each of you devote time to considering safety when you return to your shop. Shop cleanup is a first consideration for most as summers equipment and accumulation are put in their proper places. Power and hand tools in their place and in good repair make them more available and safer to use. Are guards in place? Safety glasses handy? Ventilation adequate? Have fire hazards been minimized? Think about it, a small investment for safety can save hours, days or even years of the consequences of an accident. **THERE IS ALWAYS TIME TO WORK SAFELY!**

The Winter Holidays bring a time of joy and fellowship with friends and family. We of the Headquarters staff wish you and yours the happiest of Holidays and that the new year will bring peace and prosperity to all.

Chuck Larsen, Editor

IMPROPER NICOPRESS INSTALLATIONS

Improper installation of Nicopress sleeves was the subject of a letter recently received at EAA Headquarters from Walt Horn of FAA's Chicago Aircraft Certification Office. These devices are a component in most production and amateur-built aircraft and ultralights. Their proper installation is essential for their functioning properly.

Designees, builders and readers are urged to review the installation instructions provided by the manufacturers. SPORT AVIATION has had articles on the proper installation of Nicopress sleeves in the "Craftsman's Corner", Page 13 & 14 of the July, 1980 and "The Sportplane Builder", Pages 39-41 of the October, 1981 issue.

MAKE YOUR OWN PARTS (LEGALLY) UNDER PART 21

From the Greater Green Bay, Wisconsin EAA Chapter 651 Newsletter

FAR Part 21, which deals with certification procedures for products and parts, contains a provision that allows an owner or operator of an aircraft to produce parts for the purpose of maintaining or altering his or her own product, without obtaining a PMA (Parts Manufacturing Approval). FAR 21.303(b)(2), permits you, as an aircraft owner, to fabricate any piece for your airplane.

The obvious problem, of course, is having the tooling and equipment available to make the part in question.

This regulatory provision is a boon, naturally, to restorers of simple aircraft such as Taylorcrafts and the Piper Ragwing series. Owners can fabricate ribs, spars, fuel tanks and even cowlings.

Whatever part you build must be able to withstand the A & P's scrutiny. This means that, for any part you supply, you will have to document the suitability and durability of materials used, if failure of that part could adversely affect safety. This means that if you bild a wing skin, you will have to document that the material used is 2024-T3 alclad, or whatever the service manual or drawing specifies. Additionally, workmanship must be of a high standard, and the completed part must meet whatever design data were used during fabrication of the original part. You should understand, of course, that this is not a carte blanche rule allowing you to indiscriminately manufacture and install critical parts, such as crankshaft bearings. That'd be considered a major alteration, which does require an FAA Form 337 and approval by an IA and the FAA. On the other hand, you could fabricate your own engine baffles without restoring to all the administrative complexity.

It is obvious that this proviso is a godsend to the owner/restorer of old airplanes. If you are skilled in your work, you could fabricate your own replacement fairings or cowling, or you could build up fuel or hydraulic lines or a wiring harness for a Nav-Com and drop it in the hands of your local mechanic, who could then install it, or, if he was sufficiently impressed, tell you to do it, and then supervise and sign off your installation.

From the BLACKHAWK Chapter 75 Newsletter:

What is the formula for building an aircraft?

(MONEY x TIME) x COMMITMENT x DESIRE = RESULTS

UNDERSTANDING ENGINE COLOR CODES

By Bob Gardner, EAA 85424, D/N 1120, as published in the Oshawa, Ontario, Canada EAA Chapter 364 Newsletter

Hundreds of Lycoming engines leave the factory monthly and are marked with a variety of colors on each cylinder. These colors have a definite meaning and provide valuable information about the engine. Questions concerning these colors and their meanings have been asked by many owners and maintenance personnel. In the past, color coding of cylinders was confined to colored bands around the base of each one. Today, new methods of painting (enameling) engines and a need for quick, easy engine identification are instrumental in changing color code locations.

The factory color code, a large painted stripe, is now located on the cylinder head between the push rods from the spark plug boss to the bottom of the cylinder head. Additional color coding has been added to identify cylinders requiring long reach spark plugs versus short reach spark plugs. Location of spark plug identification color code is between the spark plug boss and the rocker box.

Color Code Engine Identification
Location: between push rods on cylinder head or band around base of cylinder barrel
Engine Gray or Unpainted: standard steel cylinder barrels
Orange Stripe: chromeplated cylinder barrels
Blue Stripe: nitride hardened cylinder barrels
*Green Stripe: steel cylinder, 0.010 oversize
*Yellow Stripe: steel cylinder, 0.020 oversize

Color Code Spark Plug Identification
Location: fin area between spark plug and rocker box
Engine Gray or Unpainted: short reach spark plugs
Yellow: long reach spark plugs

CAUTION: Use only approved spark plugs for all models of Avco Lycoming engines. See Service Instruction No. 1042 for approved spark plugs.

*Color Code Applicable Only To Engines Overhauled In Field.

TECHNICAL TOPICS

BASIC ELECTRICS AND FUSES

From a talk presented to Toronto, Ontario Chapter 41 by Ken Wilson, an instructor at Seneca College, Aviation Department

Wire must be stranded (not solid) (for improved resistance to vibration) and have the correct type insulation. Do not use automotive wire. Wires may be run singly or in bundles. Use Ty-RAP (Panduit or Thomas & Betts) (limited temperature rating) or nylon string lacing cord. Adel clamps may also be used, particularly where restricting movement of wire through a hole without a grommet is required. Keep wires away from hydraulic and fuel lines (to avoid insulation damage). Teflon wire is the very best but also very costly. It is therefore not generally used. Wires must be sized to handle the current — See Table 1. Prior planning of wiring arrangement is essential to result in a good installation.

CURRENT CARRYING CAPACITIES FOR AM-S-C-48 ELECTRICAL CABLE

AWG Wire Gauge	Continuous Rating AMPS		Intermittent Rating AMPS	AWG Wire Gauge	Continuous Rating AMPS		Intermittent Rating AMPS
	In Bundles Or Conduit	Single Cable Free Air			In Bundles Or Conduit	Single Cable Free Air	
20	7	10	15	4	80	125	155
18	10	15	20	2	110	170	210
16	13	20	21	1	125	190	240
14	18	30	35	1/0	150	230	300
12	24	40	48	2/0	175	260	340
10	32	55	67	3/0	190	310	410
8	44	70	90	4/0	225	375	500
6	60	95	115				

NOTES:
1. Ratings listed are absolute maxima. It is recommended that the cable size be selected from the above table for 2 times the required current carrying load.
2. Intermittent rating is for appliances that operate intermittently, e.g. starter.

Wires should be stripped using a proper stripper. Strip wires to correct length. After stripping DO NOT touch wire (body moisture causes corrosion), and do not twist wire. Insert stripped end into terminal and crimp, using a proper crimping tool. Do not use pliers for crimping. Crimp wire and crimp connector end onto wire insulation (i.e. 2 crimps). Crimping is satisfactory if done properly. If soldering, be very careful that the solder does not creep up cable (embrittles cable) and use a low wattage iron. Wires should be selected to result in a voltage drop not exceeding 2% to 3% (length of wire determines voltage drop).

TERMINALS

Use ring terminals. Do not use spade terminals (not secure enough re vibration). Terminals come in 3 sizes: Red 22-14 gauge; Blue — 12 & 10 gauge; Yellow — 10 & 8 gauge. Stud sizes vary to suit. Connectors for larger than 8 gauge require special equipment.

CIRCUIT PROTECTORS

Use circuit breakers (pull out type should be used — can double as switch) or fuses. Circuit breakers handle many times their rated current for a short period of time (30 seconds) before popping, and therefore are not as good as fuses which do not have overcurrent capacity. Fuses are also more reliable. Current breakers below 4 amps are suspect and should therefore not be used.

Circuit breakers or fuses protect the wire and should therefore have the same rating as the wire capacity (use this rule judiciously. eg. A 15 amp capacity cable serving a 3 amp appliance should obviously have, say a 5 or 7 ½ (not 15) amp protector).

ELECTRICAL LOAD ANALYSIS

Although not required by MOT, an electrical load analysis should be performed for every completed installation to ensure the generator or alternator can handle the load (maximum continuous load should not exceed 80% of generator/alternator capacity.

GROUNDING

The aircraft skin is usually a poor ground path because of imperfect continuity at junctures. Bring ground wires TO A FEW ground points and wire these back to the battery ground connection. Ground engine (using ground strap) to battery ground. Bad bonding results in noise. Avoid ground "loops" (result in noise).

GENERATED NOISE

Noise can be generated from electrical interference such as precipitation static. Use static wicks (carbon fibre) at movable surfaces (ailerons) to bleed off static charges from aircraft metal surfaces. (Not applicable to non-metal aircraft.) Bad magneto leads can also cause radio noise (tick-tick noise at low RPM). Low frequency radios are most affected by generated noise. A poor antenna location can cause noise. The generator (hash noise) or alternator (whine) contribute noise. Use filter rated for the capacity of the generator/alternator to overcome problem. Connect at source. Strobe noise can be overcome by a low pass filter (obtainable from Radio Schaak) at the strobe unit.

Shielded wire should generally be grounded at one location only (particularly so for radio wiring) to positively avoid ground "loops".

GENERAL

There are no MOT regulations governing aircraft wiring. However, it is prudent, just the same, to do a proper job. Your life may depend on it.

FORMULAE

E = Volts I — Amps R — Ohms P — Power (watts)

Cover the unknown with your finger. The visible remainder is the equation to calculate the unknown, e.g. E = IxR; E = P/I.

LETTERS 'N SHOP TALK

THOUGHTS ON BENDING TUBING

By Roy Clemens, EAA 87974, D/N 666, EAA Newsletter, Penticton, British Columbia, Canada

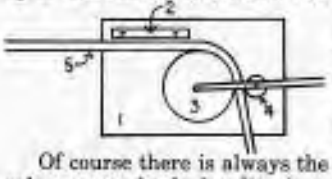
Everyone uses tubes in one place or another; an aircraft without a tube of some kind is a rarity and most aircraft require tubes to be bent. Bending can be done easily if the proper equipment is available. A professional looking job with very little skill required; however, everyone does not have this equipment so improvision is the next best thing.

Small ¼" copper and aluminum can be bent by hand to approximately 2" radius without flattening the tube. Copper should be in its soft annealed state; if not, it can be annealed by heating until soft annealed state; if not, it can be annealed by heating until peacock colors appear on the surface and quench in cold water. Don't try to anneal long sections as hard spots will result making it hard to form uniform bends. Long pieces should be heated as above and allowed to cool in the air. Annealing also makes copper tubes less liable to crack from vibration, and could be done to old tubes during overhaul.

To anneal dural tube in the shop, when it is not possible to have it furnace annealed, play a torce flame over it until a bit of wood held to it will char. (Aluminum will not change when heated.) Then allow it to cool slowly; a good coat of soot will slow the cooling process and can be obtained by using an acetylene flame when temperature has been reached.

Copper and aluminum tube comes in coil form. Unroll it on a long bench or board, roll and beat it with a block of wood to straighten it neatly.

Bending larger diameter tubes can cause problems if sharp radius bends are required; on light wall tubing hand bending will cause buckles. A simple jig can be made from wood, mounting a piece of hardwood or plywood cut to the desired radius on the flat work bench and using great skill and patience, work the tube around this die. A lever pivoted at the center of the radius with a grooved roller or piece of hardwood and adjusted so that there is a right fit between the tube and die can be rigged to make a better job and will be wll worth the effort if several pieces of the same radius be required. With some work and if metal working tools are available, a very versatile bender can be made for tubes up to one inch as illustrated below:



1. Base or Bench
2. Bending Stop
3. Radius Die
4. Pivoted Roller with Groove
5. Tubing

Of course there is always the filling of the tube with sand or salt or several tube bending low melt alloys which are available. Since sand or salt is the most easily obtained in our area, I will deal with them. Plug one end of the tube by driving in a block of wood, fill with sand or salt, tamping as you fill, then drive a wood plug in the end and proceed to bend the tube using a form tacked to the workbench as a guide. Bend cold. Torch heating would burn the wood and only heat one side of the tube. When heated on one side only it will cause the tube to stretch and crack.

Heating only works well when the whole tube is placed in a furnace and heated uniformly, then quickly taken out and bent around a form. One of the common jobs is the bending of exhaust tubing; here the wrinkle bending method can be used, as all wrinkles are on the inside tube diamter and flow is not decreased to any great degree.

In general, from seven to fifteen degrees may be allowed for each wrinkle . . . ten degrees being common. For tubing between one and two inches in diameter take two plates, 4 inches square by ¼ inch thick, drill a hole in the center the same size as the tubing, saw these across the hole and m ake collars out of them so they can be clamped around the tube where the wrinkle is to be. This confines the torch heat to a narrow band; by playing the torch back and forth across the tube while applying pressure at the end of the tube, as the metal softens, the pressure will be felt to slacken off and by playing the torch and applying more pressure the wrinkle can be worked in. A bubble protractor clamped to the end of the tube and set the desired angle will be helpful in getting uniform bends.

ENGINE COWLINGS — MAKE THEM EASY TO OPEN

From the TRIPLE FIVE FLYER, EAA Chapter 555, El Paso, Texas

This bit of trivia came to mind while in the process of removing the 14 DZUS fasteners and 10 machine screws that it takes to open both sides of the cowl on the Starduster Too. I couldn't help but to compare this to the Fournier. Six DZUS fasteners and the entire top half of the cowl comes off. Two more and the bottom half drops off. The Fournier has almost never been flown without a good preflight check of the engine compartment, but already the temptation to just check the oil through the flip-open door on the "Duster" and go fly is getting strong. Well, why not? After all, a lot of "store bought" aircraft use this arrangement. True, but I've always suspected that this was a compromise used to sell airplanes to well-dressed businessmen who don't care to poke around oily engines in their three-piece suits. Most of them would be surprised at how much things can deteriorate under a cowl in as little as five hours time. Cracked baffles, chaffing of cables and wires, nuts missing from exhaust stack attachments, loose generator mounting bolts and a disconnected mixture control are among the items I personally have found over the years. Guess I'll keep unlatching those 14 fasteners and 10 machine screws. When the plate nuts wear out, I'll redesign the cowl. You guys who have your cowl construction ahead of you remember, an engine compartment with easy access will get inspected. Otherwise it will tend to get neglected. It's just human nature.

CRUISE CONTROL

By Dave Harmon, From the El Paso, Texas Chapter 82 Newsletter

The question asked by many pilots is "How do I go the furthest and the fastest for the least amount of fuel?" The answer is to fly high and with the throttle wide open and the engine leaned. But how high, and how much power, and how much fuel consumption to you figure on?

Below you will find a handy dandy chart. These numbers are good for all standard, non-turbocharged gasoline engines. It is based on a standard day, which is 29.99" HG and a temperature of 59 degrees F. Since we seldom ever find a "standard day", these percentages are an approximation, but the error is not enough to make any great difference in your actual performance figures.

There is a number which is sometimes referred to as the "magic number" — it is ".075". If you multiply this number times the actual horsepower at altitude you are flying, you will have the gph you are burning. These figures can be checked against engine/altitude power curves and fuel consumption charts. It is amazing how accurate these numbers are and the best part is you can work them out in the cockpit while flying.

CHART FOR NORMALLY ASPIRATED ENGINES
Full Throttle HP At Altitude

Altitude Ft.	% S.L. HP	Altitude Ft.	% S.L. HP
0	100	8500	74.8
500	98.5	9000	73.5
1000	96.8	9500	72.6
1500	95.3	10000	70.8
2000	93.6	10500	69.5
2500	92.0	11000	68.3
3000	90.5	11500	67.2
3500	89.3	12000	65.8
4000	87.5	12500	64.7
4500	85.9	13000	63.4
5000	84.6	13500	62.3
5500	83.2	14000	61.0
6000	81.7	14500	59.8
6500	80.2	15000	58.7
7000	78.9	15500	57.6
7500	77.5	16000	56.5
8000	76.2	16500	55.4

DESIGNEE VISITS

One of the important services provided by our DESIGNEES is visiting aircraft building/restoration projects to discuss and offer suggestions about them. The DESIGNEES in the following listing are to be commended for their efforts in helping to make sport aviation a safer activity by providing this service. Comments for publication are selected for the purpose of providing guidance or assistance to builders and the DESIGNEES visiting them. DESIGNEES are requested to note problems or procedures observed in their project visits in the comment's section of the Designee Visit Report.

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