

Express LINK

NEWSLETTER



April, 1998 - No.15

Cafe Test Documents Express Features...

Factory Finding Daylight at The End Of The Tunnel

According to Larry Olsen, Chief of Operations for the fledgling *EXPRESS* Aircraft Company, "the months since the acquisition of the assets of EDI have been filled with activity planned to clear the way for production of molded and fabricated parts for both the Series 90 and CT models". "It has always been our intention to support completion of both models by supplying the required parts and technical support as well as promoting the sale of new kits". "We are gratified by the interest shown through visits to our web page and orders for parts and components. To date we have completed and shipped a lower fuselage, have orders for three upper fuselages and are working on additional component orders". Larry noted that it is "interesting that all current orders for upper fuselages are for the two door version, and I suspect that as we do some tooling standardization in the future, we will probably settle on the two door version as standard".

"We are definitely looking closely at ways to change the tooling and factory installation of components to the limit of the 51% rule to decrease the amount of measuring and potential for variation in construction of the basic airframe, while decreasing the

amount of individual time required to a minimum. Much of the work we do in this area will not impact existing builders directly, depending on their progress to date, but there will be some fallout benefits, such as listing acceptable sources for substitute components for fuel and electrical systems, approved engine and propeller combinations and providing additional components that will subsequently be furnished with new kits, such as lower wing fairings". "While we will be looking for ways to improve the ease of construction, safety and efficiency of the *EXPRESS*, we will not be spending our time, energy or resources on R and D not directly applicable to the kits that we are currently manufacturing and marketing". Larry also mentioned in a recent conversation that he had been contacted by an insurance company who may offer both liability and hull insurance from the first hour (depending on pilot record and competency) at very attractive rates. Stay tuned !

There will be (will have been, by the time you read this) an *EXPRESS* factory presence at Sun -N - Fun. N-90 ED has been refurbished and repainted and will be manned by Paul

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"Strange" Comment Questions Long Range Capability

Begging one of the last questions that one could possibly think of relative to the performance of the *EXPRESS* as reviewed by the prestigious CAFE foundation test program was the implication that the 90 gallons of useable fuel capacity in just two tanks was too much, and would lead to degraded performance when filled to capacity for relatively short flight legs. While perhaps technically correct, most pilots enjoy the option of carrying additional fuel, just like they enjoy a long runway in front of them, and altitude below them. At least the article went on to admire the long

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An Alternative Method Of Making Multi-layer Fiberglass, Hand Layups

The following article was prepared by Jerry Sjosstrand for use by builders unfamiliar with production standard layup procedures.

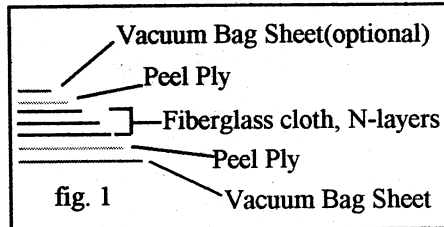
Abstract: Describes a method of making multi-layer, fiberglass, hand layups in an efficient and consistent manner. The method has several advantages when compared to traditional hand layup of individual layers - one on top of another.

Background: The traditional method for making fiberglass hand layups consists of adding one layer of dry fiberglass at a time wetting out each layer with resin before proceeding with the next. The drawbacks to using the dry method are as follows: 1) It is very time consuming; 2) It is impossible to consistently apply the proper amount of resin; 3) It is difficult to achieve precise positioning and dimensions of individual layers in a multi-layer layup; 4) It is difficult to remove all the air bubbles from within the matrix (resin/fiberglass composite), especially the very small air bubbles. The multi-layer method was developed to avoid these problems.

Description: Before actually starting the layup procedure, the surface to which the layup will be applied should be prepared by whatever method is recommended by factory documentation and be clean and dry.

Start the layup procedure by drawing an exact template for the final laminate on transparent nylon vacuum bag film. Be certain to include overlaps on all edges as required. This nylon film is the same as used in factory vacuum bagging of composite materials. The nylon film is cut to an oversize rectangle at least 3 inches larger all around than the template of the final laminate and taped to a flat (hopefully impervious) surface with the **MARKED SIDE DOWN**. (Note: If you intend to use the marked pattern to place the laminate, it will be necessary to use a reverse image of the pattern on some specifically oriented layups). All fiberglass layers required are then cut slightly oversize or to exact size depending on whether or not the edges are accessible for trimming or if they are buried inside other layers. The appropri-

ate number of layers of cut, dry cloth are then arranged over the template area, see fig. 1, below. Eight layers or more



can be handled in a single procedure - depending on size, resin speed and ambient temperature. Peel ply to be used is cut and set aside. The use of peel ply to "finish" all exposed surfaces of every layup is strongly recommended.

To determine the correct amount of resin, weigh all fiberglass and peel ply layers. **Note: Burt Rutan determined the optimum ratio of resin and glass to be 40% resin and 60% glass.** Record the weight in grams. With all necessary layers on the template in their final position, outermost layer first, catalyze an amount of resin that, by weight, is 10% more than the weight of the fiberglass/peel ply layers to be wet out.

Pour the resin over the fiberglass layers and spread evenly with a squeegee. Let the layers soak up all the resin they will take, adding as needed. Calculate about 90 seconds/layer to soak through. If the surface appears to become "dry", add more resin. When all layers of fiberglass are completely wet out, add the peel ply. At the stage when all layers, including the peel ply have been wet out, it will be possible to see through the entire laminate to the template drawn underneath. When satisfied that a sufficient amount of resin has been added to the laminate, place an additional nylon film layer (oversize as before) on top of the wet out laminate and, using a dry squeegee, work any trapped air and excess resin out to the edges. The top nylon film layer makes the laminate almost as clear as a window and makes it possible to see through at least 20 layers of 9 oz/sq yd fiberglass. If you have not done so in an earlier step, trim the laminate to exact size using large scissors to cut around the drawn template. Remove the

appropriate layer of nylon film (depending on orientation) and transfer the laminate pack, using the remaining nylon film layer as a "carrier", to its specific location and position it.

Do not pre-wet the surface where you will apply the laminate pack as this will make the surface "sticky". (ed note: CBROS does lightly coat the surface with resin to avoid any tendency to a lean bond and as an aid in positioning the laminate).

Any air now appearing in the laminate has been trapped between the structure surface and the laminate as there is no air inside the laminate at this step. As before, using the nylon film as your "window", work out any trapped air using a dry brush or squeegee. When pleased with the result, remove the nylon film, clean up the surface with a brush wet with resin and apply and wet out peel ply if it was not included in the original laminate pack. If applied at this stage, the peel ply must be wet out from the outside to avoid soaking resin from the layer(s) beneath, possibly ruining the result by their becoming too lean (or dry) of resin.

Comments:

- Resin pot life and your skill will determine how many layers you will be able to wet out and place at one time.
- Allowing the fiberglass laminate to soak up resin by itself results in almost no entrapped air inside the laminate, and what is left is easily removed by working on the nylon film with your fingers, a stiff dry brush that has been cut short, a rag wet with acetone or a squeegee. You may also use a sharp pointed awl to release trapped air from under the layers.
- Compared to a layer by layer layup, the amount of resin used will be about 10% less.
- A tremendous amount of time can be saved in preparing and applying any laminate when three or more layers are required.
- Using an inhibitor to slow down the curing process will be of

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Multi-layer Fiberglass, Hand Layups

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help when working with many layers at a time. Contact the manufacturer of the resin being used for precise information. If you have resin that is slow from the beginning, this paragraph will not be applicable.

- This method is only compatible with resins capable of soaking through multiple layers of fiberglass. Use of high viscosity resins is generally not possible.
- The described method does not have all the same advantages when used on kevlar or graphite as these materials do not become transparent when wet out, but the method can still be used by examining the laminate from both sides to determine resin content.
- Becoming familiar with this method will allow one to be able to adopt this basic nylon film "window" technique on slightly different laminates where it is not possible to use the technique exactly as described.

The essence of this method is:

1. The laminate will readily absorb the appropriate amount of resin, thereby reducing the amount of resin needed.
2. The ability to see through all layers at once provides a high quality layup, free from entrapped air.
3. To make it possible to make larger, more complex, layups in far less time, often without the assistance of another person.
4. Using a template or pattern to trim the laminate to exact size after being wet out with resin increases the precision of the placement and coverage of the lamination.

Thanks to Jerry for providing this useful article. For additional information Jerry can be reached at (209)683-5523, or C.B.R.O.S. Inc. at (925)455-1036

Nuckoll's AeroElectric Connects To CBROS

Mark your calendar and make your reservations now for the Bob Nuckoll's AeroElectric Connection, aviation electrical seminar to be held on May 16 and 17, 1998 in the C.B.R.O.S. hangar in Livermore, CA.. It is expected that 25 to 30 builders will attend the 1 1/2 day seminar devoted to the basic, and not so basic, mysteries of modern aircraft electrical systems.

With 35 years experience with certified aircraft systems design and fabrication as well as publisher of the **AeroElectric Connection**, the definitive work in amateur built aircraft electrical systems, Bob comes prepared to provide the participants with enough information to allow them, as builders, to proceed with confidence to lay out, acquire materials and tools, and install a reliable electrical system in your "Mars Blaster SXY".

The program will began at 8:00 a.m. on Saturday the 16th with registration and organization. The morning session will include such subjects as: Parts selection; Failure mode effects analysis; DC power fundamentals; Batteries; Engine driven power sources; Voltage regulators; Grounding; Over voltage protection, and Electrical system instrumentation.

After lunch the afternoon session subjects will include: Wire selection and installation; Wire termination; Circuit protection; Switches, relays and contactors; Lighting; Antennas, and Engine instrumentation.

The Program will continue on Sunday morning at 8:30 and conclude at Noon, while covering such subjects as: Noise; Tools and techniques; and Wirebook development.

There will be time for questions and answers and, as an added incentive, several door prizes, including a Magellan GPS 2000 receiver, will be awarded at the conclusion of the session.

Tuition is \$150 for non-subscribers to the AeroElectric Connection and \$120 for current subscribers to the AeroElectric Connection. (The AeroElectric Connection is the textbook for the course. If you are a subscriber, plan on bringing your book with you)

For complete details including regis-

tration information, if you're on line, connect to:

aeroelectric.com/seminars.html
or E-mail from the Web site.
Telephone or fax to (316)685-8617.



Factory Daylight

(Continued from page 1)

Fagerstrom. The current plan is to leave the Series 90 demonstrator on the East Coast with Paul, to facilitate demo rides there. Larry did announce that builders and supporters will be able to find an official **EXPRESS** Aircraft Company space at Oshkosh this year. The display will include N-90 ED, the Series 90 model which was acquired from EDI, with several improvements including a new engine mount. The **EXPRESS** factory display will be located in Space 51. Plans for a "Pre" fly in as per last year, a dinner, and a forum are not clear at this time.

Strings Too Short To Save

- **C.B.R.O.S., Inc.** has changed E-mail service providers. Our new address is bnbent@pacbell.net. We will consistently check for new messages between 3:00 and 5:00 p.m. daily, when we are not off running around somewhere. We will try to answer as soon as we find your message - hopefully same day when research is not required. Also worthy of note, our area code changed to 925 effective March 14, 1998.
- **Reinhart Metz** visited C.B.R.O.S. in early February. He reports he is waiting out Winter by doing miscellaneous tasks such as installing a baggage door a-la Sjostrand and completing interior upholstery. Reports he will be ready to fly as soon as the weather breaks. Reinhart, in discussions with the Brand X builder who shares our hangar and who is installing every electronic gadget known to man, learned that the Brand X builder was readying a voice alert circuit board and chip to aurally warn of the failure of several important functions. During the conversation Reinhart noted that he had commercially manufactured and tried to market a voice alert system for three separate, programmable aircraft systems. He promised to send an example along when he returned home - and he did. We found the unit to be extremely well thought out and produced. Designed to fit in standard instrument panel holes, it's voice alert feature seems like a great idea. If you would like information on Reinhart's product you can contact him at (630)979-5508.
- Speaking of weather breaks, **Steve Backe** has started his engine and says he will begin test flights when El Nino cools off and better weather prevails. Steve has kindly furnished the final weight and balance sheet for his IO-360 powered version which will be reproduced in a future issue.
- In a telephone conversation with **Bob Pailca** in Tacoma, Washington, we learned that he has several flights on his conventional gear retract version. Says it is "fast" and will furnish details following further, more definitive test flights. Bob also noted that he has made what seems to be some rather dramatic changes to the surface areas of the vertical and horizontal tail components. He has promised pictures and a flight report when available.
- In a related vein, **Jeff Miller** of Fremont, CA has reportedly completed his cruciform tail and is ready to proceed with the installation of main retracts in his wings based on Pailca's design. That makes 5 conventional gear versions under construction that we know of.
- Start planning now for the first "**West Coast Oshkosh**" which is scheduled for September 25,26 and 27th, 1998 at the former Castle Air Force Base near Merced, CA. We think this event has the potential to rival Sun N Fun and perhaps Oshkosh within a few years. We will keep you informed as we receive more definitive information.
- **Dick Lind** of Complete Composites has flown his *EXPRESS* for a brand new magazine to be published in the near future. Dick reports that the flights went well.
- C.B.R.O.S. Inc., has agreed to host a **Bob Nuckolls** technical seminar on May 16 and 17. If you are anywhere near starting the wiring process on your *EXPRESS* and feel you could use some help, we think this would be a good event to attend. Check out Bob's web site at <http://www.aeroelectric.com/seminars.html> for more information.
- Sorry to say that we have heard from **Tom and Judy Carrillo** from Merced (Atwater/Monterey) that they have decided that they must part with their long time labor of love - their CT Kit. A significant amount of time and money has been invested in their project as it is quite far along in the construction process. See the Ad on Page 6 of this issue.
- We reported the crash which killed **Tom Wright and Roger Schneider** in the mountains of Oregon in the last issue. What we did not make clear, as **Russ Porterfield** pointed out, is that they were **NOT** flying an *EXPRESS*. We still do not have further information on the accident.
- Have you been to COSTCO or similar stores where they furnish little bitty samples of the latest in fat free(taste free) quickie foods? Well, you have just barely touched the tip of the "Sample" iceberg. I have been simply amazed by the amount of useful items one can acquire for use on your project merely by asking for samples. The Brand X builder in our hangar has become the world's leading expert in talking companies out of examples of their wares. From switches of all descriptions to wire to special tubing to subminiature connectors to plastic laminate to light bulbs small enough to disappear on the rug in the hangar to adhesives and paint - you ask for it, and almost invariably, he can come up with a "sample". You should try it. Here's how:
Decide what you think you want, call the company, tell them that you are an OEM operation -which you are by strict definition of the term - you can say "company" if you are one, or just as good, work for one, and ask for samples. Decide ahead of time how many you are going to need and ask for the lot. More often than not they are happy to send "SAMPLES". There is nothing more frustrating or expensive than trying to buy small quantities of anything, and when you do buy a large quantity, what can you do with the "leftovers"? (build another airplane?)
- Those of you who subscribe to *PRIVATE PILOT MAGAZINE* have already seen the article about **Kirke Watkins** building his *EXPRESS* at Valkaria Airport in Valkaria, FL. Kirke sent us a copy noting that "it was pretty much accurate - except the part about the sabre saw". Kirke

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Cafe Foundation Report

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range capability as an attractive feature of the airplane.

On the whole the article fairly tested and described the current performance of a typical example of an *EXPRESS* if the exquisite construction and finish are considered separately. At slightly above the usually expected empty weight, with a 210 HP Continental, there were no surprises in the performance figures. With the exception of the amount of attention paid to the aerodynamic characteristics of the cruciform tail, (perhaps more than was necessary), builders now have a reasonable base line as to what can be expected if your CT model is flown in an uncoordinated turn in the low speed regime typical of landing patterns. There has never been any question about whether the tail would "stall" under certain conditions; we now know that the unwanted experience can be predicted by an increasing inability to hold the nose up in an uncoordinated turn. Like the Doctor whose patient had complained that "it hurts when I do this", the Doctor advised, "then don't do that".

Over all the article presented an up close and personal look at what is possible if you are considering construction of a kit airplane in terms of appearance, comfort, performance and safety. With new kit enhancements being considered by the factory for future kit production, the *EXPRESS* is still the best four place kit on the market. Jerry has said that he "fully appreciated the opportunity to participate in the test series, both personally and for the record, which has not always been so crystal clear". "Over the years many builders, including Jim Warner, the earliest, had discovered the unwanted tendencies of the tail, understood them well and felt perfectly safe in his CT - safe enough to fly with his wife and son". "Maybe now we can get on to looking at possible ways to improve aerodynamic performance instead of looking for ways to make the airplane safe enough to fly".

There are many *EXPRESS* CT examples out there, some with hundreds of hours in the air with no reported problems with the stability of the airplane.

Strings ...

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noted in his letter that, as it was implied in the article, he is presently in the process of permanently mounting his Series 90 horizontal stab. Check out the article; maybe someday some one will wander into your workshop and you'll want to be ready with the facts.

- Speaking of unsolicited publicity, **Larry Olsen** called to get our permission for our ugly mugs to continue to be included in the new *EXPRESS* info video, which has been re-edited and is ready for issue (caution, it's rated U - for ugly).
- Visitors to the CBROS shop since the last issue have included **Hardy Huber**, who shared with us that he was enroute to Florida to relocate his folding motor bike business to a "place where I can fly my *EXPRESS* more than once a month". (Is that true, you Northwest Builders?) Hardy also related that he now has about 460 hours on his *EXPRESS* and left the main gear U-bolts, which showed signs of fatigue, with us. He had new brackets of his own design fabricated and has them installed. The next issue of *EXPRESS* Link will detail his solution to the problem of failing U-bolts. Also visiting was "**Benny**" **Thordarson** from Luxemburg, who was on a layover in San Francisco from his "real" job of flying a 747 freighter. According to Benny, he has finished fabricating a mounting system for his instrument panel which will allow it to swing aft far enough to provide access for maintenance and adjustment. **Edwin Maudier** from France dropped in, but missed us. He reports that he has moved his *EXPRESS* project to Rheim and has solicited the services of knowledgeable mechanics who will inspect the entire airframe and systems prior to an anticipated early test flight. Captain **Nev Curry** from Australia was in the States for a short visit stopping in Olympia, and in Reno where he and **Steve Backe** were joined by **Irita and Dennis Warner**. Nev had promised to try to visit us, and I can hardly wait to hear

EXPRESS Your Dress

Factory announces new line of *EXPRESS* "fashions"

Get 'em while they're Hot!

Be ready for the airshow season and be the first on your block to get in on this scoop.

The factory has announced the availability of T-shirts, sweatshirts, and quality fleece lined jackets with embroidered *EXPRESS* logo and name. If you are willing to wait a little longer, they can be personalized with your name.

According to Larry Olsen these items are high quality and come in various colors and sizes. There is also a choice of a CT or Series 90 logo. A price structure has not been announced, so your best bet will be to call *EXPRESS* AIRCRAFT at: (360) 352-3554 for pricing and additional information.

(Ed Note: We understand that **Shawn and Nadine Kelly** have early examples of the sweatshirts and like them very much.)



his excuse.

- A new occupant getting comfortable in the CBROS hangar is new Series 90 owner **Bob Lowrance**, who lives in Los Gatos, CA, about an hour's drive south of LVK. Bob bought the second Series 90 completed by **Ken Boling** - Chico, CA and has been flying it as often as he can find the time and weather.



EXPRESS STUFF FOR SALE:

CRUCIFORM EXPRESS.

MOSTLY COMPLETE, INCLUDING ALL KIT FURNISHED COMPONENTS, A MID TIME (1135 HRS) LYCOMING, O-540, AND MANY OTHER "EXTRAS".

Brought to its present stage of completion by an experienced, careful builder who was killed in the crash of a Glassair, this project provides an outstanding opportunity for an owner who likes to fly as much as build. Left to complete construction are the flaps and ailerons, installation of windows and windshield, and mating of the wings to the fuselage.

This project is very complete. For example, the engine is complete as removed from a Call Air within the last two years, including the original baffling, starter, alternator and oil cooler. At the same time, also furnished are a new, in the box, lightweight starter and alternator and vacuum pump, and an EDI engine mount. Also included are Cleveland brakes and wheels. Other "extras" include yellow tagged instruments such as a Collins Nav receiver and coupled, rectilinear glide slope indicator, with a power converter, a Collins Comm transceiver, a Collins audio panel, and a wet compass.

CBROS Inc. has personally inspected this project and have found the workmanship to be above average, and the kit very complete. We have made a video tape of this project which documents the stage of completion, the quality of workmanship and all components included with this project. If you are interested in obtaining a copy, a call to CBROS Inc., at (925)455-1036 and a check for \$15 (to cover cost of copying) will get one on its way.



A STRUCTURALLY COMPLETE SERIES 90 EXPRESS ORIGINALLY INTENDED AS THE EDI, SERIES 90, TURBINE DEMONSTRATOR.

Owner/builder Ed Watson is unhappily offering his "extremely" fast build **EXPRESS** kit for sale. Constructed by Ed, under the watchful eye and with the help of Dick Lind of Complete Composites, this aircraft provides a new owner with a quick way to a flying, Series 90, **EXPRESS**.

The only significant modification to the original kit design was to include extra reinforcing layers of fiberglass on the leading

edges and aft shear webs of the wings. Ed was contemplating the installation of an Allison B-250, with the support of EDI and Allison, to fly around the country as a factory demonstrator. When EDI quit and Allison was acquired by another company, his original plans went out the door.

All structural components, including control surfaces are complete, with the exception that the rudder has not been closed. Doors and windows have not been installed, but are included in their original packaging. No instrument panel installation has been planned, and no engine or engine mount is included. Also missing is a flap actuator and door hinges, both of which are easy to come by.

Ed is asking \$40K, and actually has more than that invested in kit components, not including the investment of his time.

For more detailed information contact Ed directly at:

7461 Batista Street, San Diego, CA
 Tele: (W)(619)291-7311, x1887
 (H)(619)277-8818



FOR SALE

New listing:

WHEELER EXPRESS CT Project
 Includes Lycoming IO-540, W3A5D, engine mount and stainless steel exhaust. All structural composite components completed, including flaps, ailerons, rudder and elevators. Experimental Aircraft Technologies fiberglass landing gear, nose gear reinforced, rear windows installed, Glassair door latch system installed, push pull tube elevator control system installed, off set instrument panel furnished - not installed, and much more. Leave a message for Tom at (209)357-2831



EXPRESS KIT FOR SALE

Complete kit. Engine mount and exhaust for IO-540. Factory built cruciform tail. Wings complete (not closed). Lower fuselage kit complete. All work open for inspection.

New Asking price - \$25,000 cash and carry!

Contact Jeff Arnold,
 Phone (540) 382-4965,
 Fax (540) 382-3859

FOR SALE

Cruciform kit, complete.

In an advanced state of assembly, this project was originally an EDI Quick-Build kit, mostly assembled by an A&P mechanic.

The wings are 95% complete and include 92 gallon fuel capacity, steel leg main gear fitted, VOR antenna installed, and the flaps and ailerons assembled.

The fuselage and tail have been assembled and are ready for engine mounting and detail work. A com antenna is installed in the fin in the factory built tail. The seats are assembled and installed with the front seats set up for air spring positioning. The rear seats have been modified to fold.

The kit is complete as furnished by EDI and includes windows, rudder pedals, MAC stick grips, and a multitude of small parts and sub assemblies.

The nose gear leg is an improved and reinforced unit as built by Larry Olsen. The cowling is an improved design as furnished with the "Moriah". No engine mount is included, but a design, approved by a certified stress engineer, for installing a PZL Franklin, 220 HP engine is available and can be furnished.

An Audio Visual Avionics engine monitoring system with all transducers is available.

NEW Asking price: \$17,000

For information contact:

Howard Zehetner
 15322 Daybreak Lane
 Fontana, CA 92337-0941
 Phone: Home: (909)356-4948
 (message and Fax)
 Hangar (909)982-6422
 E-mail: 103707.3431@compuserv.com



FOR SALE:

IO-540 Engine mount. Manufactured by EDI. Will not fit certain IO-540 models. Call to find out if yours will fit.
 John Kee (803)328-3286



Miscellaneous For Sale/Wanted

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"WAREHOUSE CLEARANCE SALE"

Partly through the good offices of a fellow builder, CBROS has for sale, a limited supply of the following items:

- 1) **ASTRO PNEUMATIC No. 2020 Complete sanding Kit** including: right angle - 20k rpm - die grinder, 1.8 in. pad, 2.75 in. pad, 10 heavy grit, 2in. sanding disks; 10 medium grit, 3in. disks; assorted stones and air hose adapter\$65.00
- 2) **ASTRO PNEUMATIC No. 2030 Complete Prep Kit** - same as 2020 except additional 2 in. and 3 in. medium grit disks\$75.00
- 3) **G M 706 Mini, Gravity feed spray gun.** Excellent for detail work\$29.50
- 4) **ASTRO PNEUMATIC Model No. AP-T210,** straight body die grinder only\$15.00
- 5) **FIBERGLASS CLOTH, 7781 STYLE,** 8.25oz., 50 inch width - as furnished with *EXPRESS* factory kits\$4.75/yd
- 6) **VACUUM BAG FILM,** Nylon filled, 50 inches wide, furnished in individual 10 yard rolls.....\$15.00ea.
- 7) **LOW TAC, PROTECTIVE WINDOW FILM** - furnished in 11 yd roll-enough to do complete set *EXPRESS* windows inside and out\$15.00 .
- 8) **BRASS REGULATOR**\$ 2.50 ea.
- 9) **THREE WAY SWIVEL W/REGULATOR** \$ 8.25 ea.
- 10) **ABRASIVE DISCS,** 60 or 80 grit\$ 0.50 ea.
- 11) **DIAL CALIPER,** 6 inch \$25.50 ea.
- 12) **SPRAY GUN,** gravity feed\$45.00 ea.
- 13) **SPRAY GUN HOLDER**\$ 6.50 ea.

| | |
|-------------------------|--------------------|
| C.B.R.O.S., INC. | |
| TELEPHONE: | |
| HANGAR - | (925)455-1036 |
| JOHN - HOME: | (925)449-4624 |
| | FAX: (925)449-5611 |
| BILL - HOME: | (925)449-1105 |
| | FAX: (925)606-7534 |
| E-mail: | bnbent@pacbell.net |

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New listing:

From Denise Waters

EXPRESS items:

- Set of steel main landing gear
- 4- way, 5 port, fuel valve
- CT empennage construction towers
- Wing tip strobes
- Rochester fuel senders and fuel drains (2ea.)
- Door hinges

Avionics:

- Bose, Series I headset
- PM2000 stereo intercom
- Electronics International EC-1 (EGT/CHT/OAT) with RS-1 remote switch for 4 cylinders.

Call Denise at: (315)699-7826



New listing:

Matched set of original *WHEELER EXPRESS* wings . The left is closed out, with complete documentation. The right is still in the crate.

I am unable to complete the project due to financial limitations. Asking \$7,000. Contact Jim Phelps (volunteer builder on Factory No. 3) 12015 246th Street N.E., Arlington, WA 98223. Call (360)435-6845



WANTED:

Need an exhaust system for a Lycoming, IO-360. Stainless steel preferred. Call Jack Volkamer at: (501)443-9191

New Listing:

For sale: Two each, Wheeler IO-360 (Lycoming) engine mounts. One is fabricated for use with the larger diameter pucks and one requires the use of the smaller pucks.

Wanted:

Engine mount to fit a Lycoming IO-540-C4B5

Call Ralph Kenner at (509)838-6807

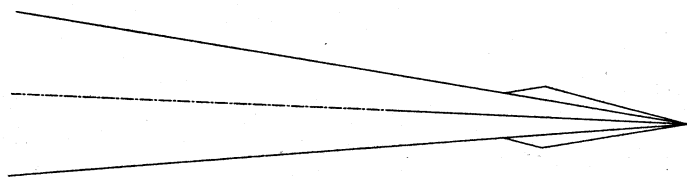
Aerodynamic Enhancement Of Aileron Forces

From an unimpeachable source comes the definitive word on the installation of aerodynamic "wedges" on the aft edges of the ailerons which are said to lighten the usual complaint of "heavy" aileron forces, coming from many *EXPRESS* pilots.

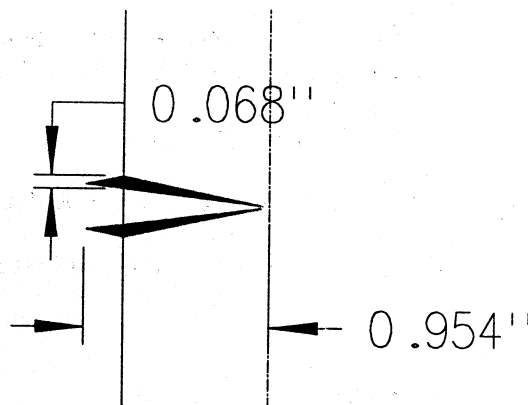
The information is provided here with the caveat that dimensions shown should be followed as accurately as possible and be reproduced on both upper and lower sides of the aileron. In this case "bigger" is not necessarily better, and, in fact, is likely to be **dangerously worse!** Proceed at your own risk (Ed. note: We think that there is little advantage to be gained through making the trailing edge sharp. In fact, the factory documentation for the Lancair 360 leaves the aft edges of the aileron approximately 0.250 inches thick with the theory being that such an arrangement substantially **decreases** the "null" around the zero point of aileron deflection which makes the ailerons "lighter" or more sensitive).

The drawings reproduced below show the general location of the "wedges" on the aft edge of the aileron(s), a detail of the dimensions to be reproduced using Micro or Micro with Milled fiber, and one idea for a tool to be used to shape the micro is included as well. After installation and paint, don't forget to re-balance the ailerons, as the amount of extra weight added by this installation is considerable, and a long way aft of the hinge center line. Good luck!

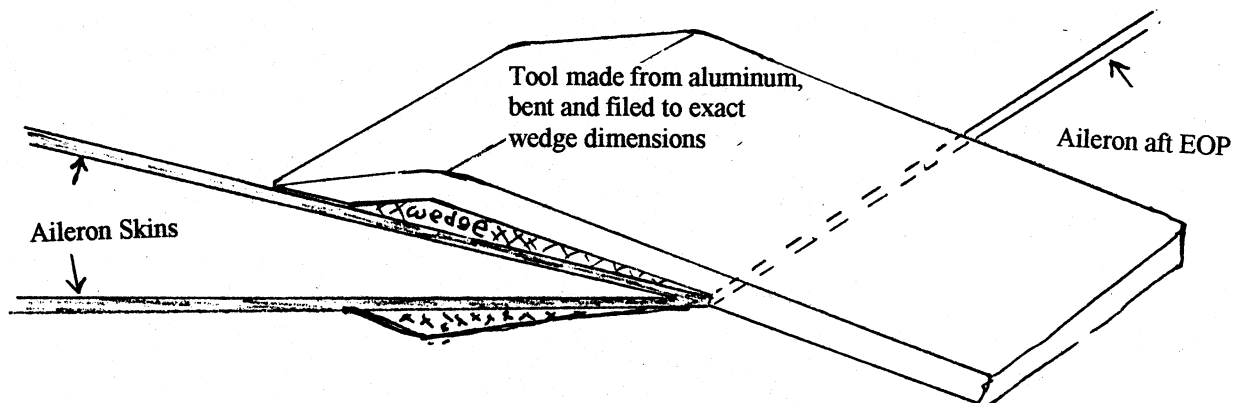
General Location



Detailed Dimensions



Suggested Installation Tool



Could This Be Your Next Project?

From *EXPRESS* builder Ed Watson we have learned some details of the project with which he is currently occupied.

The three view shown here is of a new, high altitude, PILOTLESS recon aircraft with a wingspan of 116.2 feet, which is being developed by Teledyne Ryan Aeronautical, called the "Global Hawk". According to Ed, who is working directly on the project at Mojave, the first flight took place on February 28th of this year. The flight was considered an unqualified success as the pilotless, computer controlled aircraft reached the test goal altitude of 32,000 feet and when returned to land, stopped within 6 inches of the runway center line.

Using inertial aided GPS for enroute and cruise modes and DGPS for corrections to the nav system for takeoff and landing, the "Hawk" interfaces with ATC, just like any other aircraft, including such maneuvers as stopping at the Hold Short line per ground control and the Tower, while climbing out through tower and Center airspace.

The "Hawk" is three deep, or more, in redundant features, and has a range of 14,000 miles. The aircraft is monitored from the ground via either LOS (line of sight) or satellite (SATCOM) from anywhere around the globe. In operational use, for example, if a spoiler actuator fails, the system will sense the failure and alert ground support for a replacement upon return to base in a day or two.

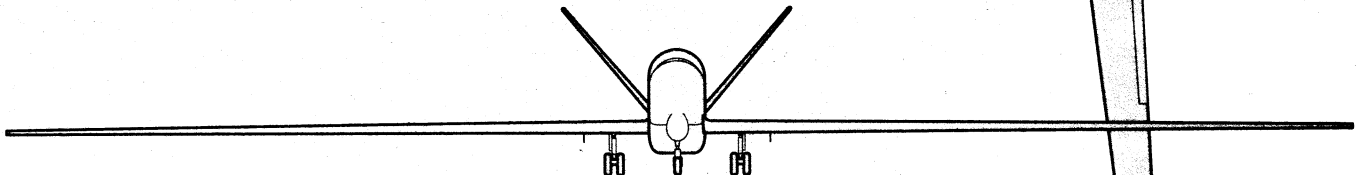
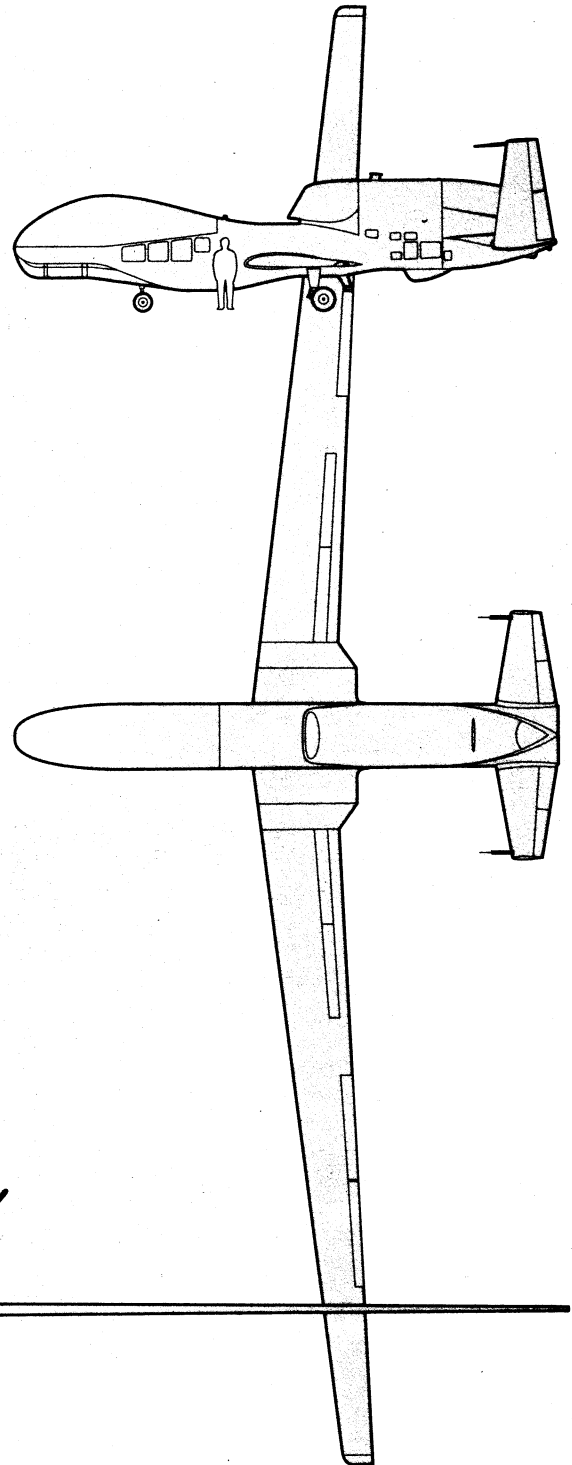
The initial role envisioned for this special aircraft is recon. This is accomplished through the use of three basic sensors - SAR, EO and IR cameras and has the ability to relay its data (pictures with resolution to 12 inches) in virtual real time to battlefield commanders. Using the SATCOM link the aircraft can be redirected to make a second pass over a particular area, and change the flight profile to avoid threats (for those areas where the threat detection/evasion system cannot be relied on to be effective).

Thanks, Ed, for this interesting insight into the "future". Readers can reach Ed at 7461 Batista, San Diego, CA 92111. Telephone: (610)277-8818. His temporary address in Lancaster is 2051 Westwood Ct. #81, Lancaster, CA 93535. Telephone (805)948-8724.

Ed has two E-mail addresses: ewatson@tdyryan.com (Temp), and ewatson144@aol.com.

For a look at the "Global Hawk" web site try:
<http://www.darpa.mil/haeuav/flight/>

If you are interested in acquiring an *EXPRESS* project, check out Ed's ad on page 6 of this issue.



'gimmie 40 degrees !

All You Will Ever Need To Know About Your Flap Driver

By: Reinhart Metz

Flap Motor Selection:

The EDI supplied flap motor has been shown to be inadequate and unreliable. If you ever take one apart, you will be appalled at the idea you were expected to head into the sky depending on such a flimsy thing! After a search of the Thomas register, Internet, and ads in Design News, I took a closer look at three companies - RACO, Warner Electric, and SKF, and evaluated and/or tested units from each.

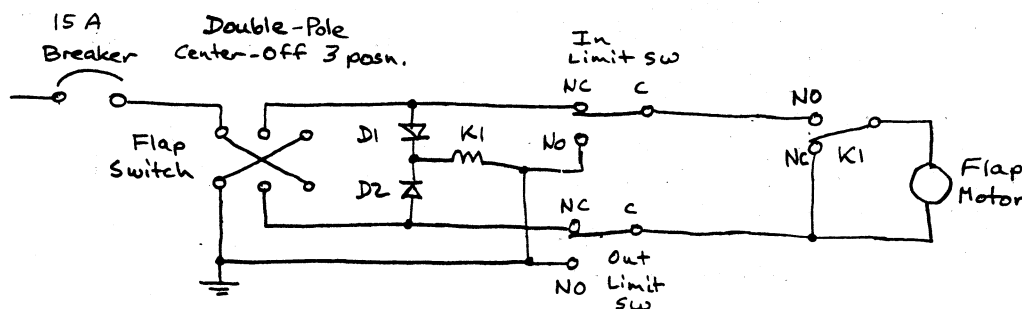
RACO was the original supplier of the units shipped by Wheeler. The force capability of these is not fully known, but operationally appears marginally acceptable. These units also had a belt as part of the reduction system, which could strip under overload conditions. RACO now sells another series of actuators with no belts, but they are expensive, and the company is difficult to deal with for small quantities. If you feel you want an RACO unit, their LA30.1-3.94-12-001, rated at 600 lb., is probably their most suitable product, though heavy and expensive.

The second units I looked at and tested were from Warner Electric, in the Elektrak 2 or 10 series. Their Elektrak 2 (D12-05B5-04) unit is acceptable in performance, being capable of 500 lb. of push. However, these are again expensive (\$302) and very heavy (about 12 lbs.). They also have an exceptionally high restraining torque value, which is hard on the bracket and bellcrank under heavy load or a limit condition. They make a less expensive Elektrak 2 model, good for 250 lb., \$209, but also heavy; -10 lb., (D12-20A5-04D). Their units are also relatively noisy. Warner's phone number is 815-389-3771, and a major distributor is Berry Bearing. (In the midwest?)

The last unit I tested, and recommend, is from SKF. It is a type CATR33x100x1D12C and is rated at 400 lbs., which is just a bit more than the maximum required. These units are light (about 4.4 lb.), very quiet, and well-built. Unit cost is \$254. They feature a pancake style motor, which takes less space, and a built in limit clutch, in case the stops are hit, or the force exceeds 400 lb. The 4" stroke is perfect, given the requirement of about 3.6", which gives you automatic safety stops in case of a limit switch failure. The EDI unit would just run the nut off the jack screw on one end (leaving the flaps to "flap", or jam up on the other end.) And if you are smart, you will plan on what happens if a limit switch fails. If you are interested, call SKF sales at 800-541-3624 for a distributor near you. (See spec sheet)

In any case, don't tell them the unit is going into an airplane, as they will freak out and refuse to sell to you.

Under light load, these actuators, and most others, will coast after power is disconnected. This is stopped by providing circuitry to short the motor when it is off, to provide dynamic braking. Below is a diagram of the control circuit I have used that incorporates this feature.



Note: K1 shorts the motor when power is turned off by the flap switch (intermediate flap positions). The limit switches disconnect power and short the motor when the In or Out limit is reached. K1 is a 30 amp relay (Potter & Brumfield T90N5D12-12, D1 & D2 are IN4002)

Flap Mechanism Forces

The flap mechanism in the *EXPRESS* raises some questions about adequacy based on two elements of design: The push point is at the end of the flap (giving rise to substantial torque), rather than the middle; and the leverage at the actuation point is poor, only about three inches. To determine if there is a problem, I have built a model of the flap, using a Lockheed originated tool, to arrive at the forces generated at various flap positions and airspeeds. The actual full wing dimensions and airfoil characteristics were used. The results were as follows:

Torque, per flap @ 100mph = 50.4 ft.lbs., @120 mph = 72.6 ft.lbs.

Flap push rod arm = 2.2"

Bellcrank arm = 4.65"

| | @100 mph | @120 mph |
|----------------|----------|----------|
| Push rod force | 274# | 394# |
| Actuator force | 260# | 374# |

The reader is left to draw his/her own conclusions.

Nose Gear Loading - A Pragmatic Diagnosis Of An Oft Discussed Problem/Solution

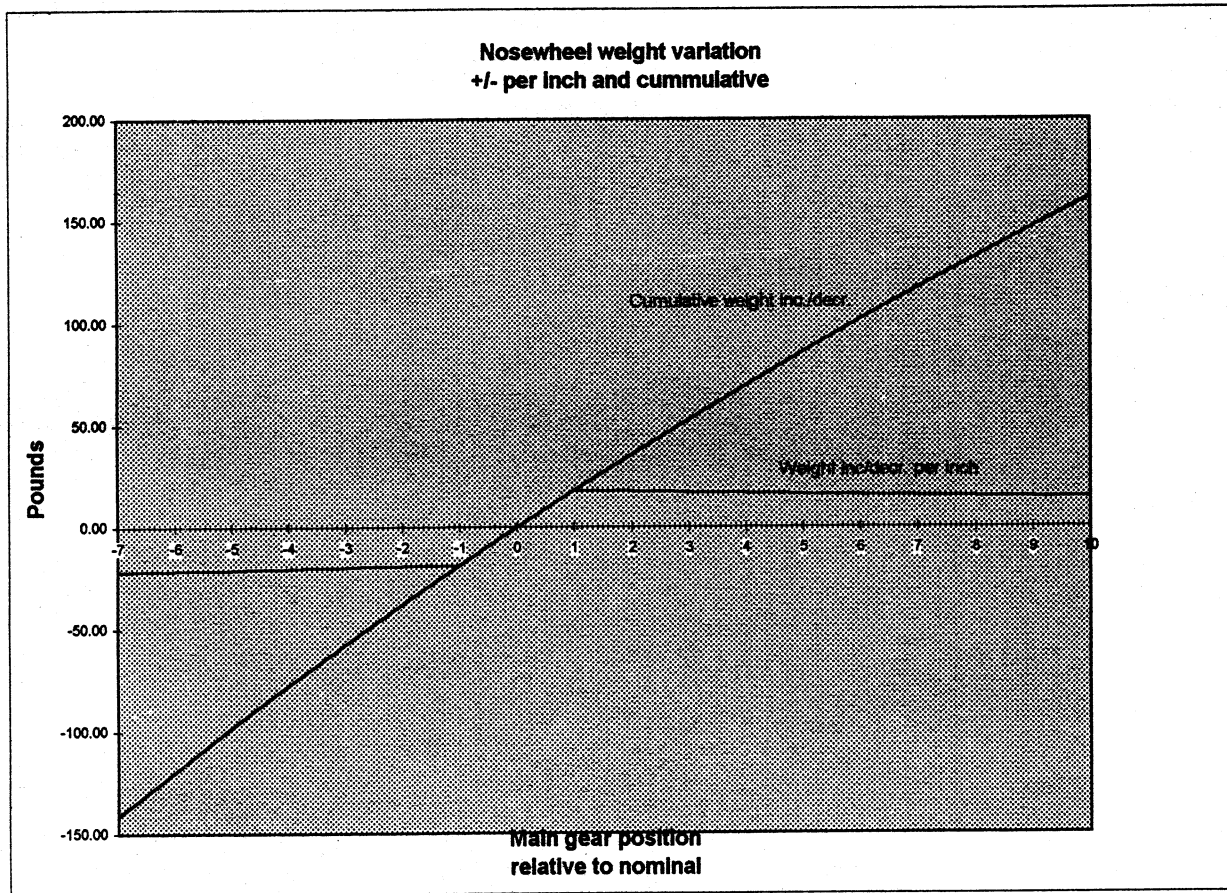
By: Reinhart Metz

One characteristic of the *EXPRESS*, common in its folklore, is a reputed tendency to nose heaviness on landing, apparently producing unwanted strain on the nose gear strut/spindle weldment as a result. One remedy offered is the positioning of the main gear more forward, changing the angle of the gear legs to reduce the arm and its effect on the aircraft CG. It has been suggested that the weight on nose gear is relatively sensitive to the main gear position, say to the tune of 100 lbs. for a small forward movement of the mains, on the order of an inch or two. Before fixing my gear position, I decided to model the situation to get a grip on reality, and came to the conclusion that there is not nearly the sensitivity suggested.

A typical I/O-360 *EXPRESS*, with an empty weight of 1775 lb., will have a nominal nose gear weight of about 384 lb. Repositioning the main gear will affect the nosewheel weight by only about 18-19 lb. per inch of movement. That means an unachievable relocation of over 5 inches would be required to cut 100 lb. (not desirable for static (ground) stability anyway).

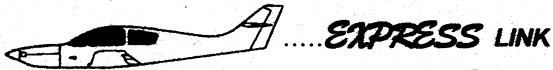
A typically achievable forward inclination of 4 degrees (or 2") will only yield about a 38 lb. reduction. Below is a spreadsheet and graph summarizing the results.

| | Nom. Posn. | | | | | | | | | | | | | | | | | | |
|-----------------------------|------------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--|
| Main gear posn. rel to nom. | -7 | -6 | -5 | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| Main gear Station | 86.5 | 87.5 | 88.5 | 89.5 | 90.5 | 91.5 | 92.5 | 93.5 | 94.5 | 95.5 | 96.5 | 97.5 | 98.5 | 99.5 | 100.5 | 101.5 | 102.5 | 103.5 | |
| Nose weight | 243.10 | 264.98 | 286.25 | 306.93 | 327.04 | 346.60 | 365.65 | 384.19 | 402.26 | 419.86 | 437.01 | 453.73 | 470.05 | 485.96 | 501.49 | 516.65 | 531.46 | 545.92 | |
| Diff. per inch | -21.88 | -21.27 | -20.68 | -20.11 | -19.57 | -19.05 | -18.54 | 0.00 | 18.06 | 17.60 | 17.15 | 16.72 | 16.31 | 15.91 | 15.53 | 15.16 | 14.80 | 14.46 | |
| Cum. diff. from nom. | -141.10 | -119.21 | -97.94 | -77.27 | -57.18 | -37.59 | -18.54 | 0.00 | 18.06 | 35.66 | 52.82 | 69.54 | 85.85 | 101.77 | 117.30 | 132.46 | 147.26 | 161.72 | |
| gross | 1775 | | | | | | | | | | | | | | | | | | |
| nose arm | 59.55 | | | | | | | | | | | | | | | | | | |
| Main arm | 18.45 | | | | | | | | | | | | | | | | | | |



Ed Note:

The editors will be eternally grateful to Reinhart for his generous supply of information of specific technical interest to all *EXPRESS* builders. We encourage anyone of a similar bent to send articles or pictures on any subject related to *EXPRESS* construction or custom construction options or tips. Form is not important, with your permission we will format and edit your submission and give you credit (or anonymity if you prefer).



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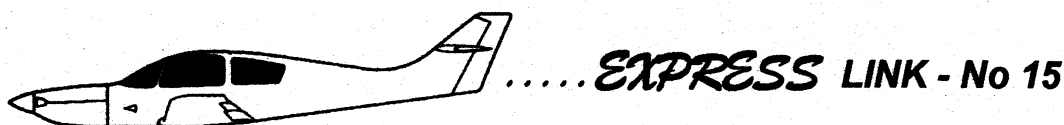
Documentation: CBROS, Inc. has retained an extensive file of patterns and templates for most procedures. We will be happy to share them with any builder for the cost of copying and postage. If you have a particular need, give us a call at (925) 455-1036 or Fax to (925) 606-7534. E-mail to bnbent@pacbell.net.

Materials/Supplies Available: CBROS, Inc. can furnish vacuum bag release film, 7781 fiberglass cloth, and self stick window covering, for use on your *EXPRESS*. We also offer a limited selection of air tools such as angle grinders, together with support supplies which we use, based on our experience. If you are interested in any of the above, call John or Bill at CBROS, Inc. for prices.

Component Construction: CBROS, Inc. is prepared, on a limited basis, to assist other builders with their projects. It is not our intention to build complete airplanes, but to assist with component construction of parts such as wings, lower fuselage/firewall, empennage, and control surfaces. Our plan is to parallel the Factory "quick build" program, but on a more customer controlled basis. As each project is unique, if you are interested in speeding up your *EXPRESS* project, call CBROS, Inc. to discuss rates and scheduling.

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FLIGHT SAFETY MESSAGE

EXPRESS AIRCRAFT CO LLC

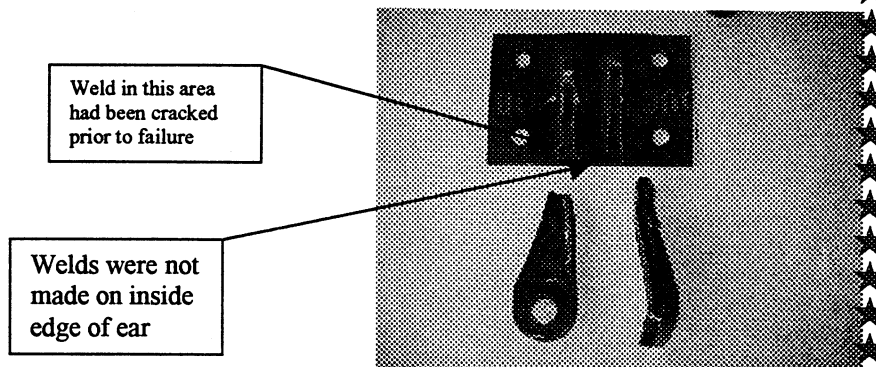
NUMBER 980001
January 31, 1998

SUBJECT: MAIN LANDING GEAR INBOARD ATTACHING BRACKET

SUMMARY OF PROBLEM

Two incidents have been reported involving failure of the main landing gear bracket (part number 115-14-004). In both cases the aircraft were equipped with the EDI steel gear and IO540 engines. One aircraft was the S90 version and the other a CT. The inboard bracket failed on landing, resulting in the inboard end of the main landing gear puncturing a hole in the lower wing skin. This allowed the wing to settle until the wheel pant came in contact with the wing. No additional damage was done to the aircraft.

Investigation indicates that the bracket is failing because of increased horizontal loads caused by the wider wheelbase of the EDI steel main landing gear and the higher gross weights, at which the aircraft is operating. In addition, an inspection of several brackets indicated less than satisfactory manufacturing procedures.



RECOMMENDATIONS

1. Immediate inspection of both inboard landing gear brackets for cracks in the welded areas. If the bracket installed does not have both sides of the ear welded, bracket should be replaced immediately.
2. Follow-up inspections should be conducted in 10 hour intervals and after every incident of hard braking.
3. Bracket should be replaced immediately if any defect is found or during the next scheduled condition inspection, which ever occurs first.

Replacement brackets are available. These brackets have additional gussets to absorb the increased horizontal loads and are normalized and heat treated. For additional information contact Larry Olson, Express Aircraft Co. (360) 352-3554.

NOTE: This advisory does not apply to aircraft with Express Aircraft Company LLC. Fiberglass Landing Gear installed.