



# GP-4 BUILDERS & FLYERS NEWSLETTER

February 2004  
GP4BFN 42

## WINTER WEATHER SAFETY - THINGS TO REMEMBER ABOUT ICE

\* There is no such thing as a little ice. Have an escape plan ready before you take off, and use your "out" at the first sign of ice.

\* Turn the pitot tube on briefly during preflight and feel it to be sure it is working. Have it on well before entering the clouds or reaching freezing temperatures.

\* Icing is very common over mountainous areas because of the lifting action and in the lee of the Great Lakes because of abundant moisture. Use extra caution in these areas and remember that alternate airports with instrument approaches may be scarce in the mountains.

\* When there is a chance of ice, be sure that you can reach temperatures warmer

than freezing, either above or below your altitude, or in clear air, within the performance of your aircraft.

\* If you are topping clouds to stay out of the ice, remember that the "tops" become higher near the low pressure center.

\* If you are flying an aircraft equipped with deicing boots, it is a good idea to cycle them periodically, even when ice is not expected. This keeps the valves in the pneumatic system from sticking.

\* If climbing above a freezing layer, don't climb at a steep angle of attack. This can allow ice to form on the underside of the wing, which quickly degrades performance.

\* When considering

PIREPs for ice encounters, remember that aircraft of different sizes and wing shapes accumulate ice very differently. Look for reports on aircraft types similar to yours.

\* A zero flap or partial flap landing may be best when landing with a load of ice. Use higher than normal approach speeds. Consult your airplane flight manual.

### OTHER THINGS TO REMEMBER IN GEN- ERAL ABOUT WIN- TER FLYING

Flight instruments need some extra time to spin-up when they are cold. Be sure the cockpit is warmed up and the gyros are up to speed before takeoff.

*From the FAA's Safety*

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## HYDRAULIC GEAR PLANS

Hydraulic Gear Plans are now available from Osprey Aircraft. Contact George for more information or pricing!

One side effect is that the tail sits higher because the main gear is moved one inch outboard and lengthened one inch, which making the plane sit more level.

## MORE ON GLUE

# “UNDERSTANDING AND USING T-88”

*Submitted by Matt Shepardson*

In the last issue of the newsletter, the use of epoxy was discussed—concentrating on using FPL-16A and what the GP-4 plans discuss for epoxy use. This month, we are going to take a closer look at T-88, a structural epoxy made by System Three Resins, Inc., of Auburn, WA.

T-88 is a two component structural adhesive. It is mixed, by volume, at a ratio of 1 part resin to 1 part hardener. It can also be mixed by weight, 100 parts resin to 83 parts hardener. One of the nice properties of T-88 is that it has a reasonably long working time—40 to 60 minutes at 77F. A good rule of thumb is 45 minutes at 70F. It will cure in any thickness without shrinkage and when fully cured, is unaffected by water, oil, gasoline and many chemicals—and is immune to fungus and rot.

Something to remember when mixing T-88, or any epoxy for that matter, is mixing accurate amounts of both resin and hardener. However, if you were to err on the ratio, it is better to err on the side of too much resin than hardener. For System Three's normal resin line, there is a safety factor in the mix ratios. It is tolerant to approximately 20 percent excess resin and tolerant only to about 10

percent excess hardener. Excess hardener will NOT expedite cure time—only degrade it.

T-88 hardens in approx. 6-8 hours and reaches functional strength in 24 hours. It is also temperature tolerant in the workshop. It will cure as low as 35F—but will take approx. one



week to do so. Below about 70 degrees, the epoxy will not flow nearly as well, which might affect wetting out a joint.

One of the greatest assets available concerning this epoxy is System Three's technical support department. When I first started gluing up my fuselage sides recently, I had some questions about use and technique. I started by looking on their website at [www.systemthree.com](http://www.systemthree.com) (Access to most of their literature and MSDS requires you to create a member profile, however, there is no cost.) There is a large amount of good info on their epoxy systems contained in their company book titled "The Epoxy Book." It's available from the website at no charge as a PDF download in their Tech.

Data Sheets section. Another excellent reference on the website is PDF files on their product line, including one titled "System Three T-88 Structural Epoxy Adhesive," which is also printed after this article.

I also took the opportunity to speak with their tech folks. They can be reached at 253-333-8118. They took the time to answer every one of the questions I had concerning T-88 and how to use it, which I have tried to incorporate in this article. Nice folks—very patient considering I have never used epoxy prior to starting the GP-4.

Let's discuss using T-88. First of all is safety. The Epoxy Book makes a very good recommendation: Work in a throwaway mode. That means gloves, brushes, mixing cups, etc. No time to worry about cleaning up disposable items. You should ALWAYS use some kind of barrier/protection for your hands. I personally use latex gloves. Also recommended is eye protection as hardener is considered a corrosive agent.

I know that many folks have many different techniques to do the same thing, but the intent of this article is to provide a starting point. Discussion in the newsletter and thru the online media is a great way to let others know what alternatives are

out there which aren't discussed here.

I mix small batches in small plastic medicine cups. I purchased them at a local Medical Supply store for about \$1.50 for 100 cups. They have accurate graduations on the side for measuring medicine in drams, ml, etc. On the advice of another GP-4 builder, I also purchased a couple palate knives from an Art Supply store. Mixing instructions say to mix for approx. 1 minute until all streaks are gone from the batch. It is important to get in the habit of frequently scraping all the epoxy off the sides and folding it back into the pot. If not thoroughly mixed off the sides, you may upset the ratio. The palate knives do a great job of mixing and can be used to apply glue into the joints. T-88 is easily cleaned up with vinegar prior to the gel phase ending, so you have a couple of hours to clean the palate knife up after your glue-up is finished.

One of the first important points is that the joint must be thoroughly wet out. Both sides of a joint should be coated with T-88. Sitka spruce will draw in a bunch of epoxy. Therefore, it is wise to apply the T-88, wait a couple minutes, and reapply—especially to end grain. I can attest by personal experience that not doing so will result in a dry joint!!!

For joints and small areas, I have had good luck using acid brushes to apply the T-88. These are the small black bristled brushed with aluminum han-

dles. Allows you to get into tight areas and also holds enough glue to cover a joint. For the spars, I have heard that System Three's 2 cartridge caulking guns work well to apply the epoxy fast enough for that large a lay-up. Hopefully someone that's been there might shed some light about gluing up spars on the yahoo group.

I make up test blocks during each gluing session. I take some of the scrap pieces (something I have had an ample supply of since the first cut was made!!!) and cut them into small strips, about 3/16 thick and a couple of inches long. Using three pieces, I apply glue to the inside of two pieces and to both sides of the third. Place the piece covered on both sides in the middle and the other two on the outsides. Align so that the middle piece extends out some from the outside pieces—that way, you can place the test block on something hard and hit it with a hammer to determine if the failure occurs in the wood or in the glue joint. A couple per gluing session should be adequate. Use one for your own destructive testing and occasionally save one for when an EAA Tech. Counselor drops by to inspect your progress.

When I spoke to George about glue-ups, he mentioned that Flox can be added to the mix since T-88 tends to settle in a joint. It is ground up cotton and will keep T-88 from vertically settling. The Epoxy Book covers some other types of filler, however, I have not experi-

mented with any of them.

By mixing small batches, you use up the epoxy fast enough so that it doesn't set up in the cup. As I assembled the fuselage sides, I went from joint cluster to joint cluster and also securely braced the pieces as I went. I found that using 4D Finish nails to hold down the hold blocks is much quicker and accurate than using screws to fasten them to the table. It is important to have a good supply of hold blocks and cam blocks on hand. I found some split when hammering down to the table and I could have used more on each glue-up.

As others have mentioned before, it is important to have all your tools, materials and epoxy ready to go. Even though you have a descent window to work in, once it sets up, that pot is done. T-88 is not difficult to work with. It does require some understanding and technique to use to its fullest.

And as a final note, for those of you who like value, System Three has a rebate offer. If you purchased over \$10 of System Three products since June 1, 2003 (\$25 if since Oct 31<sup>st</sup>), you can go to their rebate section at <http://www.systemthree.com/members/rebates.asp> Print out the PDF form, fill out and send with a copy of your purchase receipt.

*T-88 Technical Data Sheets Follow on pages 4, 5, 6*



SYSTEM THREE RESINS, INC.  
 3500 W. VALLEY HWY. NO.  
 AUBURN, WA 98001  
 SUPPORT: 253-333-8118

[www.systemthree.com](http://www.systemthree.com)

**TECHNICAL DATA SHEET**

**T-88<sup>®</sup> STRUCTURAL ADHESIVE**

**DESCRIPTION:**

System Three T-88<sup>®</sup> is a 2-component, poxy/polyamide adhesive. T-88 meets the specification requirements of MIL-A-81236(OS) and CID A-A-3053.

**RESIN PROPERTIES:**

Viscosity @ 25°C(77°F) . . . . .9000-11000 cps  
 Specific Gravity . . . . .1.10-1.12  
 Color . . . . . Clear

**HARDENER PROPERTIES:**

Viscosity @ 25°C(77° F) . . . . .8000-10000 cps  
 Specific Gravity . . . . .0.95-0.97  
 Color . . . . . Amber

**MIXED SYSTEM PROPERTIES:**

Mix ratio by weight resin/hardener . . . . . 100/83  
 Mix ratio by volume resin/hardener . . . . . 100/100  
 Working time @ 25° C . . . . . 40-60 minutes  
 Tack-free time @ 25° C . . . . . 4-6 hours  
 Coverage . . . . . 80 ft<sup>2</sup>/gal  
 Maximum Service Temperature . . . . . 160°F

**TYPICAL CURED PROPERTIES:**

Lap-Shear Strength, psi.	Polyester Laminate	2800*	Aluminum	2000
	Concrete	1100*	Galvanized Steel	1800
	Wood(Maple)	1800*	Copper	1650

\*Indicates substrate failure

Tensile Strength, psi. . . . . 7000  
 Tensile Elongation at break. . . . . 7.5%  
 Flexural Strength, psi . . . . . 11,500  
 Flexural Modulus, psi . . . . . 375,000  
 Compressive Yield Strength, psi . . . . . 12,500  
 Heat Deflection Temperature, ° F . . . . . 119

Lap-Shear Strength vs. Temperature:	67°F	2500 psi
(Aluminum Tensile Shear):	75°F	2000 psi
	150°F	1300 psi
	180°F	1000 psi

All tests were conducted in accordance with ASTM procedures.  
 Sizes available(kits): 8 oz. / 16 oz. / 32 oz. / ½-gallon / 1-gallon / 2-gallon / 10-gallon / 110-gallon/50 ml cartridges

For health and safety information concerning this product, please refer to the MSDS sheets for T-88 Structural Adhesive. MSDS sheets are available on our website at [www.systemthree.com](http://www.systemthree.com).

**PREMIUM COATINGS, ADHESIVES, AND COMPOUNDED RESIN SYSTEMS**

# SYSTEM THREE T-88<sup>®</sup>

## STRUCTURAL EPOXY ADHESIVE

### INTRODUCTION

T-88<sup>®</sup> is a high performance, non-brittle, two-part epoxy adhesive designed to give superior results under adverse conditions. The adhesive may be used without modification in normally fitted joints, and will cure in any thickness without shrinkage. T-88 is clear amber and becomes virtually invisible when varnished. T-88 exhibits outstanding adhesion and permanence on a wide variety of materials, and is endorsed by leading designers, builders, and organizations.

T-88 has exceptional adhesion to most clean surfaces including wood, fiberglass, concrete, aluminum, steel and many plastics. T-88 does not bond well to tin, zinc or waxy thermoplastics such as polyethylene. When fully cured, it is unaffected by water, oil, gasoline, and virtually all chemicals. It will not stain wood and is immune to fungus and rot.

T-88 is unique in that it may be applied to damp wood, provided the adhesive is worked well into the surface. Glue line thickness is not critical and clamping is not necessary if the

joint is undisturbed during set-up of the adhesive. However when bonding wood where end-grain is exposed T-88 may be thickened slightly to prevent excessive absorption. Coverage in average bond joints is 50-100 sq. ft. per gal. See special instructions below for bonding oak and teak.

At best we are experts on epoxy resin formulating and students of boat building and repair. If you have an oddball use give it a try. If you call and ask us this is probably the answer you will get. At best we can only give you our honest opinion and maybe tell you why we think it might not work. But don't take our word for it. Give it a try. Just like on a boat, you're the captain of your project.

## PRODUCT APPLICATION AND USE

T-88 A and B are mixed one-to-one by volume using a graduated measuring cup. Weight ratio is 100 parts of A to 83 parts of B. Excessive Part B will degrade, rather than expedite cure and should be avoided. Care should be taken that mixing is thorough and streaks can not be seen. Pot life of the mixed adhesive is approximately 45 minutes at 70°F. However, a coated joint may still be pulled up tight for two hours. Cap containers promptly after use. Mixing in small lots or with large surface area exposure will extend pot life.

At 70°F, T-88 will harden in 6-8 hours and will reach functional strength in 24 hours. T-88 has been specifically formulated to cure as low as 35°F without reduction in strength; this cure will require approximately one week. At 150°F, T-88 will set within 30 minutes and develop maximum bond strength and impact resistance after 2 hours. If excessive flow-out occurs, allow 2-4 hours at room temperature before heat cure.

### BONDING WOOD

#### WHITE OAK AND TEAK

White oak is a highly porous wood with a strong tendency to absorb resin and yield starved joints of substandard strength. Preferred practice is to apply a liberal coat of T-88 to both surfaces, and without mating allow the separate parts to stand open for 30-45 minutes. Dull spots indicate complete absorption and should be touched up with more T-88, after which the structure should be assembled and clamped with minimal pressure -- just enough to ensure contact. Alternatively, oak can be

presealed with a thin coat of T-88 on both mating surfaces and cured separately; then sand each surface lightly to level, apply fresh T-88 and join lightly.

Teak, being an oily wood, must be freed of surface oil to achieve optimum adhesion. With a clean cotton rag liberally moistened with lacquer thinner, vigorously wipe area to be bonded. While surface is still moist with solvent, wipe with a dry rag and allow to dry. If necessary, repeat wiping until surface dries to a whitish color indicating extraction of surface oil. Bond within eight hours of cleaning.

#### DOUGLAS FIR

Because of its resinous nature, Douglas fir tends to exude minute amounts of material which may act as a weak interlayer when adhesive is applied. To prevent difficulties of this type, sand the wood with 60 to 120 grit abrasive and thoroughly remove sanding debris. Apply adhesive within 48 hours.

### BONDING METAL

#### DEGREASING — ALL METALS

##### Method 1

1. Vapor degrease — suspend the part in an approved vapor degreaser until solvent droplets no longer condense and drain from the surface. Remove from vapor and allow to dry.

- Solvent wipe — wipe the surface with clean white cotton ragsmoistened in clean lacquer thinner.
- While the surface is still wet with solvent, wipe dry with a second clean dry cotton rag. This will help pick up oil residues rather than allowing them to re-deposit on the surface as solvent evaporates.

### ALUMINUM/STAINLESS STEEL

#### Method One(Recommended)

- Degrease.
- Apply an aluminum pretreatment primer or solution.
- Rinse the metal thoroughly in cold running tap water followed by distilled or deionized water rinse.
- Bond within 3 hours.

#### Method Two

- Degrease.
- Sandblast to white metal. (Grinding, filing, or sanding can be substituted although sandblasting is preferred).
- Scour with clean cotton rag and abrasive cleanser.
- Rinse thoroughly in running cold tap water followed distilled or deionized water rinse.
- Air dry or oven dry at 500 F. maximum.
- Bond within 3 hours.

### STEEL (OTHER THAN STAINLESS)

#### Method 1(Recommended)

- Degrease.
- Apply a commercial phosphoric acid solution/primer per manufacturer's instructions.
- Remove black deposit by scrubbing with a clean bristle brush (not plastic) under cold running tap water; follow with distilled or deionized water rinse.
- Dry metal promptly for 1 hour at 500°F maximum.
- Bond within 1 hour.

#### Method 2

- Degrease.
- Sandblast to white metal. (Grinding, filing, or sanding can be substituted although sandblasting is preferred).
- Degrease again.
- Bond within 1 hour.

### COPPER AND COPPER ALLOYS (BRASS, BRONZE)

#### Method 1(Recommended)

Prepare the following solution:

Ammonium Persulfate 20 pbw

- Dist. or Deionized Water 75 pbw
- Stir at room temperature until powder dissolves.

Treat the metal as follows:

- Degrease.
- Immerse In the above solution for 30 seconds at room temperature.
- Wash thoroughly in cold, running distilled or deionized water.
- Dry immediately with a room temperature air stream; hot air may cause staining and tarnishing of the surface.
- Bond within 1 hour.

#### Method 2

(Follow Method 2 under Steel other than stainless).

### CONCRETE OR FERROCEMENT

Fresh Concrete — if well cured, scrub with a stiff bristle brush with abrasive cleanser (Ajax, Comet, etc.), rinse well, dry thoroughly before bonding.

#### Old Concrete

- Degrease if necessary, scrub as above.
- Wearing rubber gloves, apron and eye protection, apply 15 per cent hydrochloric acid solution (CAUTION!) at the rate of 1 gallon to every 5 sq. yds. Allow to stand until bubbling subsides.
- Rinse thoroughly with high pressure hose and scrub with stiff bristle brush. Rinse again to flush away loose particles.
- Dry thoroughly before bonding.

#### Method 2

Follow Method 2 under Steel (Other than Stainless)

### CLEAN-UP

Wear disposable gloves or barrier skin creams when working with epoxy resins. Never use solvents to remove epoxies from your skin. Some solvents present hazards worse than epoxies and can actually be absorbed into the body. Use a good waterless handsoap and plenty of paper towels to remove epoxy from your skin. Then apply a good medicated skin cream to replace the natural oils removed by the handsoap. If you get gummy, half-cured material on your skin, let it cure and peel it off the next day. Cured epoxy doesn't stick well to skin or hair.

### STORAGE

Separate resin and hardener components will have a stor age life in excess of one year if containers are kept well closed and stored below 90°F. Allow cold containers to reach room temperature before opening.

The information contained herein is based on the data available to us and is believed to be correct. However, System Three Resins, Inc. makes no warranty, expressed or implied, regarding the accuracy of these data or the results to be obtained from the use thereof. System Three assumes no responsibility for injury from the use of the product described herein.

## GEORGE'S CORNER

BY GEORGE PEREIRA



### Fellow GP-4 Builders:

After receiving Elton's first GP-4 Newsletter I found it interesting and informative. It could be more so if you builders continue to send Elton photos and progress reports. Your failures and building problems are also welcome as it gives me a chance to address them either to you or in our newsletter.

It looks like Jim Christian is doing some nice work. His concern on changing the landing gear for a more level stance is done automatically when using the hydraulic gear plans. The main gear is moved one inch outboard and lengthened one inch. This raises the tail considerably higher.

### Metal Parts:

As you may know, Raymond Beazley is now fabricating most of the metal parts. If you decide to use his services, it may affect how you order your steel 4120 tubing. Raymond has all the stock on hand. The same is true of fiberglass for the cowling and

Bob Ringer does a beautiful job on the GP-4 cowlings. (See newsletter classified.)



### Fuel System:

I can't stress enough the importance of a reliable fuel system. My prototype has served me well since 1983, and some 900 flight hours. It's so important to use reliable AN hardware throughout your fuel system.

Don't compromise and use auto type fittings and copper lines. The 3/8" OD aluminum lines are

easy to fit into #6 AN fittings, using a good 37 degree flaring tool. You can save a lot of money if you make up your own hoses. You should use a mandrel tool when using stratoflex or aeroquip hoses. This tool keeps the neoprene hose interior from getting cut, which can stop or restrict fuel flow. Wicks have the mandrels in different hose sizes. (P/N M2701-3H through -10H)

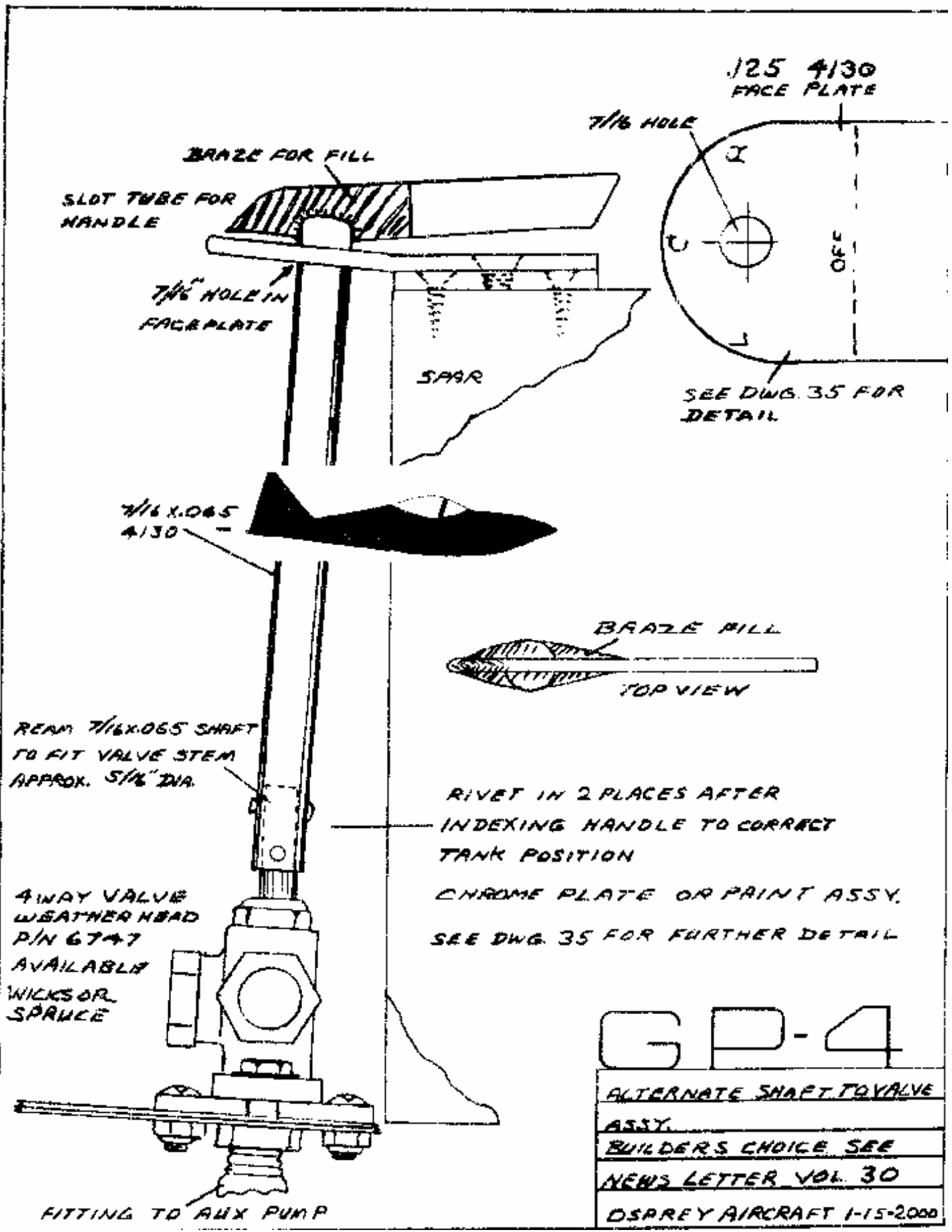
I recommend using fire shield hose covers on all plumbing on the engine side of the fire wall. You should have one inch blast tubes that come off the rear en-

gine baffle aimed at the engine driven fuel pumps and fuel filter. The drawing here with shows an alternate way of securing the fuel valve handle to the valve stem on the weather-head valve. There should be no play in the 7/16" X .065 tube to the valve stem. The two rivets will stop any play so the handle will detent into whatever tank selection you rotate the handle to.

Regards to all,

George

(See Drawing Next Page)



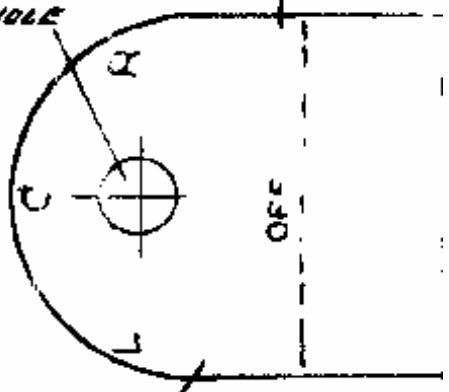
.125 4130  
FACE PLATE

7/16 HOLE

BRAZE FOR FILL  
SLOT TUBE FOR HANDLE

7/16 HOLE IN FACE PLATE

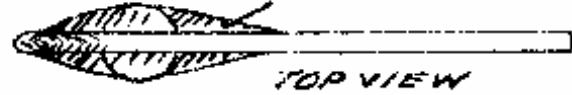
SPAR



SEE DWG. 35 FOR DETAIL

7/16 x .065  
4130

BRAZE RILL



TOP VIEW

REAM 7/16 x .065 SHAFT TO FIT VALVE STEM APPROX. 5/16" DIA.

RIVET IN 2 PLACES AFTER INDEXING HANDLE TO CORRECT TANK POSITION

4 WAY VALVE WEATHER HEAD P/N 6747 AVAILABLE WICKS OR SPRUCE

CHROME PLATE OR PRINT ASSY. SEE DWG. 35 FOR FURTHER DETAIL

GP-4

ALTERNATE SHAFT TO VALVE ASSY.

BUILDER'S CHOICE SEE NEWS LETTER VOL. 30

OSPREY AIRCRAFT 1-15-2000

FITTING TO AUX PUMP

## **BUILDER'S UPDATE**

### **STEC 30 AUTOPILOT INSTALLATION**

#### **BY JIM SIMMONS**

(The pictures in this article are of Jim's gorgeous aircraft—Ed)



After deciding to construct my GP4, which we all know is a fine, fast, cross country airplane, I also decided that I would equip mine for IFR. Additionally, I debated with the prospect of installing an autopilot. My autopilot research drew me to the STEC System 30 autopilot system. This system provides full roll axis autopilot functions as well as an altitude hold function. The primary system is housed within its own turn coordinator and doesn't take any additional panel space, which is premium in a GP4. My limited knowledge of autopilots included the fact that autopilot systems need to be 'tuned' to match the performance characteristics of the particular aircraft.

While at Oshkosh 2001, I met with Jackie Yoder, who had built a GP4 (named Cotton Candy) and successfully installed an STEC 50 autopilot. Jackie was nice enough to explain the installation options he selected and the trials and tribulations he encountered in tuning the sys-

tem. Since he knew of no one who had previously installed an autopilot, Jackie selected an STEC System 50 as it would be configured for a Glasair III. Jackie believed that this package would most closely match his GP4 performance.

Jackie installed the STEC 50 and had no issues with roll performance. However, he did encounter major problems with pitch oscillations which required multiple changes.

The three changes which were required to resolve the pitch problems were:

1. The pitch servo incorporated a bridle cable attachment for the pitch control. Jackie determined that he needed to greatly reduce the travel of the pitch servo and he achieved this by reconfiguring the cable for the pitch control around a pulley attached to the pitch control rod, then fastened this to a deadhead on the fuselage frame. This reconfiguration effectively cut the travel in half and resulted in a major improvement.
2. Jackie originally had the pitch transducer attached to the line from his static sensor which was part of a combination pitot/static sensor under his right wing. Jackie theorized that the long run of the static line created delayed sensing for the pitch

transducer. Jackie placed a static port on each side of the aft fuselage, teed them together, and connected the pitch transducer as close as possible to the tee.

3. Lastly, Jackie worked with his local avionics shop and STEC and they created an electrical gain change that was incorporated in the pitch computer.

Armed with the great feedback from Jackie, I was then able to meet in Oshkosh with Butch Nimmo, Asst. Mgr. of Customer Service and Product Support for STEC. After explaining all of the above details from Jackie Yoder's installation issues to Butch, and then stating that I wished to install an STEC System 30, clearly I would need his help in ordering the correct solution. I was very fortunate that Butch took the time to listen to my questions and he was highly supportive and responsive in my quest for answers.

After Oshkosh, further communications occurred between myself, Jackie and Butch. The end result was a highly customized order for my GP4. This included a servo which functioned at half the speed of Jackie's as well as factory installed pitch gain resistors to match Jackie's system.

The STEC System 30 and its installation package include all of the necessary electronic components (Turn Coordinator with built in autopilot, pitch servo, roll

servo, pitch computer, pitch transducer and miscellaneous switches and hardware). The roll servo is connected to the aileron control linkage via a short push/pull tube. The pitch servo is connected to the elevator control system via a bridle cable system. The bridle cable attachment was highly recommended for the elevator system by STEC. The customer (me) specifies the required cable lengths for all interconnecting cables and STEC pre fabricates all cables.

The only mechanical fabrication necessary for the installation is to create the locations and the mounting brackets for the roll and pitch servos.

I had opted to install a Garmin 430 GPS/NAV/COM System as my primary avionics device. Since the Garmin 430 provides roll steering commands for interfacing with the autopilot, I also opted for the STEC GPSS converter. This provides complete steering capabilities from the 430 to the autopilot. I also have incorporated a heading bug in my DG which provides another source for autopilot control. See

the attached STEC illustration.



During the test flying of my GP4, I turned on the autopilot and the roll functions worked perfectly. When I engaged the altitude hold function, the GP4 would either dive, and increase its pressure to dive; or climb, and increase its pressure to climb. This is a clear indication the servo is wired backwards. This is very common since the mechanical installation of these devices is easily reversible. I contacted STEC and they informed me of the 4 wires which simply needed to be reversed within the pitch servo connector. I performed the rewiring and returned to the air. To my great satisfaction and amazement, the system worked perfectly! Not one iota of fine tuning was required. The servo choices suggested by

Butch, the gain resistor changes installed in the factory and the suggestions from Jackie about pitot static system improvements were right on the mark.

This system tracks courses and holds altitude (including in moderate turbulence) better than I can 'hand fly' the aircraft. I am very pleased to report that I am completely satisfied with its performance.

The cost of the STEC System 30 is approx. \$5,000, installation package is approx. \$600 and the GPSS converter was \$950. I fully realize that there are less expensive solutions on the market and I am only writing to inform GP4 builders of one possible autopilot option which works very well.

(See STEC illustration Next page)



The installation is very detailed but straight forward. If someone is interested in duplicating this installation, feel free to contact me and I'll provide you with the specific part numbers and modifications which are required for a similar installation.

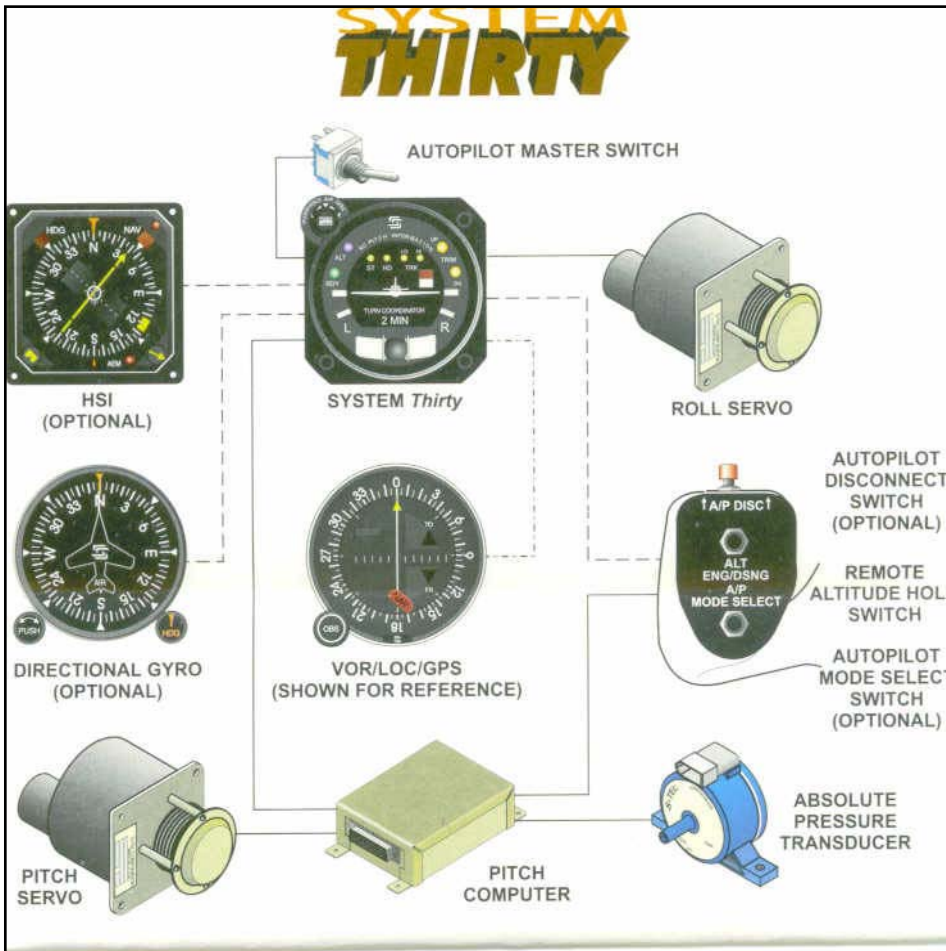
This article reflects my personal experience with STEC sales and

support, and with excellent, detailed feedback provided by the late, Jackie Yoder. I will forever be thankful to Jackie for making my autopilot installation a complete success.

Jim Simmons  
 295 Contour Drive  
 Cheshire, CT 06410-2104  
 Tel. No: (203) 272-9346  
 Email: jsimmons619@aol.com

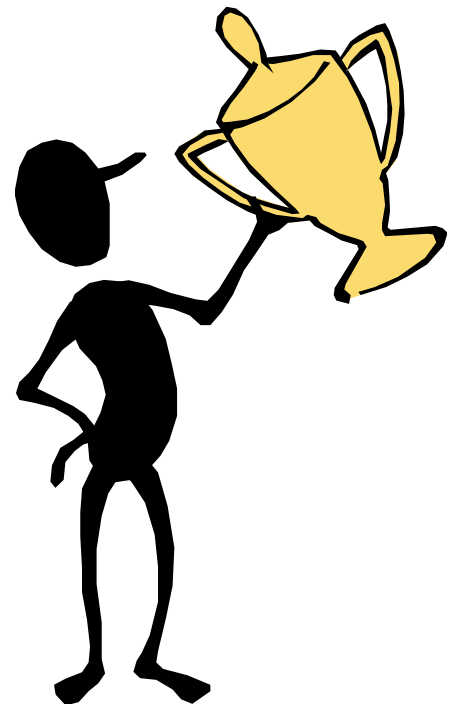
**CONGRATULATIONS**

- Jim Simmons reports that as of early January, he has flown off his 25 hours and he is now free to see the country.
- Lynn, gp4lynn@aol.com, reports a First Flight on December 31, 2003. Lynn stayed in the pattern with the gear down, and the plane flew just fine.
- John Evans, New Zealand, reports a First Flight on February 13, 2004 in his Subaru EG33 powered GP-4. The flight lasted 25 minutes and was carried out with all gear doors removed and the gear down; and the propeller, a four blade electric constant speed was kept in fine pitch. All went well with no trim corrections required.



**HARTZELL PROPELLER / SPINNER ASSEMBLY**

The recommended Constant Speed propeller and spinner assembly that mates with the cowling fabricated by Bob Ringer is available from Osprey Aircraft at considerable savings. These are new components recommended by Hartzell engineers. Contact George for price quotes.



# AIRCRAFT & FLYING REGULATIONS

*With builders / readers in so many different countries around the world, I thought it might be interesting to compare the rules and regulations that govern building and flying. In this issue, Bob Ringer from Hubley, Nova Scotia, Canada tells us about Canadian Homebuilt Aircraft Inspection Requirements—Ed*

The ongoing inspections during the building process and final approval for flight for builders of homebuilt aircraft in Canada has been delegated by Transport Canada (equivalent to FAA in the United States) to a Company in London, Ontario called Minister's Delegates - Recreational Aviation (MD-RA).

They have on staff, in strategic areas across Canada, persons who have, through building their own aircraft and through additional training, become qualified to inspect homebuilt aircraft during the building process to ensure proper aviation techniques and quality of work is being maintained to ensure an airworthy final product.

As a rule of thumb no enclosed area of the homebuilt project can be closed without an inspection. Examples would be vertical fin, rudder, elevators, wooden box spars, etc. When these areas have been examined and the work has been approved, the builder is issued a letter certifying their efforts to that point.

Areas that can be viewed such as inside the main fuselage need not be inspected prior to

the final inspection granting flight authority.

1. The first step in the building process is to file a "Letter of Intent to Build" with MD-RA.

2. If it is a kit and on Transport Canada's approved list of 51% kits no further action is required until first inspection. If it is not on the list you must submit forms with enough detail to prove you will be fabricating 51% of the finished aircraft. If it is plans built, such as the GP4, it is assumed you will be building at least 51%, so again no further action until first inspection.

3. In addition to ongoing inspections prior to closing an area, there is a pre-covering or pre-painting inspection.

4. Final inspection is at the airport after all run ups, taxi test, etc. are completed and the builder is ready to test fly his creation. Permission is given for one flight, and if the builder and the airplane survive this phase, a permit is issued to fly off the remaining qualifying hours and the file is turned over to Transport Canada and remains with them throughout the life of the aircraft.

5. There is a fee schedule for



(GP-4) Upper rudder hinge  
by Bob Ringer, Canada



(GP-4) Fin, rudder and stabilizer ready for skin  
by Bob Ringer, Canada



(GP-4) Looks fast even at this stage  
by Bob Ringer, Canada

the inspections and the builder also pays mileage for the Inspector to travel to his building site.

Further information is available at [www.md-ra.com](http://www.md-ra.com).

Bob Ringer

Hubley, Nova Scotia, Canada

# LAUGHTER—THE BEST MEDICINE

Well—to start out with .....

The pilot was sitting in his seat and pulled out a .38 revolver. He placed it on top of the instrument panel, and then asked the navigator, "Do you know what I use this for?"

The navigator replied timidly, "No, what's it for?"

The pilot responded, "I use this on navigators who get me lost!"

The navigator proceeded to pull out a .45 and place it on his chart table.

The pilot asked, "What's that for?"

"To be honest sir," the navigator replied, "I'll know we're lost before you will."



Wouldn't you know it .....

Taxiing down the tarmac, the 757 abruptly stopped, turned around and returned to the gate. After an hour-long wait, it finally took off.

A concerned passenger asked the flight attendant, "What was the problem?"

"The pilot was bothered by a noise he heard in the engine," explained the flight attendant, "And it took us a while to find a new pilot."



"Flight 2341, turn right 45 degrees for noise abatement."

"But Center, we are at 35,000 feet. How much noise can we make up here?"

"Sir, have you ever heard the noise a 747 makes when it hits a 727?"



ATC: "N123YZ, say altitude."

N123YZ: "ALTITUDE!"

ATC: "N123YZ, say airspeed."

N123YZ: "AIRSPEED!"

ATC: "N123YZ, say cancel IFR."

N123YZ: "Eight thousand feet, one hundred fifty knots indicated."



A new mother boarded the airplane with her little infant. Very proudly gracing her way to her seat...and settling in.. she uncovers the infant's head..

The passenger seated next to her said, 'Lady, that is the ugliest baby I've ever seen, IT LOOKS JUST LIKE A MONKEY!"

The new mother became extremely upset and started crying...

A Flight attendant heard the lady crying and walked over to console her.

Flight Attendant: Ma'am, may I get something for you? Coffee, tea, milk, or a banana for your monkey?"



Did you ever?

A student became lost during a solo cross-country flight. While attempting to locate the aircraft on radar, ATC asked, "What was your last known position?"

Student: "When I was number one for takeoff."



Finally .....

There's a story about the military pilot calling for a priority landing because his single-engine jet fighter was running "a bit peaked."

Air Traffic Control told the fighter jock that he was number two behind a B-52 that had one engine shut down.

"Ah," the pilot remarked, "the dreaded seven-engine approach."

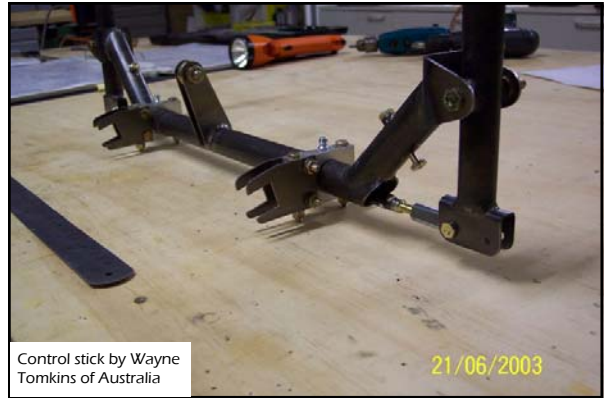


# GALLERY



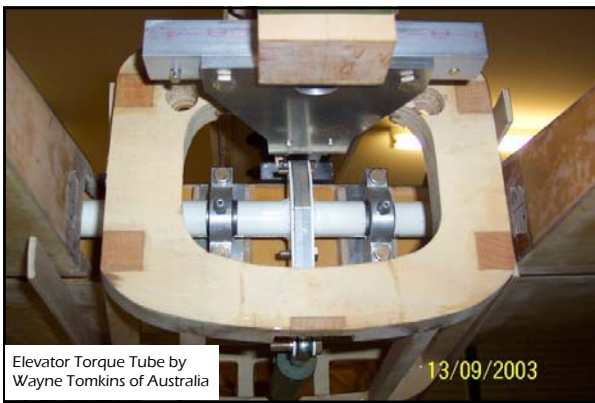
Control stick by Wayne Tomkins of Australia

21/06/2003



Control stick by Wayne Tomkins of Australia

21/06/2003



Elevator Torque Tube by Wayne Tomkins of Australia

13/09/2003



Rudder Counter Weight by Wayne Tomkins of Australia

13/09/2003



New builder Matt Shepard-son of Colorado



Matt's 2 & 3.5 year olds approve of the cockpit size



Ahhhhhhhhhhhh



I want one !!!

## CONTACT INFORMATION

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Yahoo Group at:

<http://groups.yahoo.com/group/GP-4/>



## CLASSIFIEDS

For Sale:

Pre-fabricated composite components for the GP-4. Cowling, Exhaust Blisters, Inlet Ramps, and Tailcones. Individual parts or complete package available.

Cowls are constructed with West System Pro Set 125 Resin and 225 Hardener. They are hand lay-ups of 4 layers of 6 ounce cloth, and 2 layers of 10 ounce cloth.

I get great discounts on shipping and I pay for the packaging. For current pricing, please call or e-mail: Bob Ringer—Halifax, Canada.

Phone: 902-876-2871.

Cell: 902-483-4611.

E-mail: [bobringer@eastlink.ca](mailto:bobringer@eastlink.ca)

(Bob has all of Jake Jackson's molds so everything fits the firewall when using the recommended engine and prop;



[GP4] Elevator torque tube and pillow blocks fabricated by Raymond Beazley, who is supplying all the metal parts

For Sale:

Quality custom fabricated metal components for the GP-4. State of the art equipment used by a certified welder to construct parts on the jigs obtained from Darry Capps. A complete price list is available from: Raymond Beazley, Dartmouth, Canada.

Phone: 902-465-6141

Cell: 902-497-4187

E-mail: [ray1beazley@accesswave.ca](mailto:ray1beazley@accesswave.ca)

(Raymond has all the material on hand, so you may need to adjust your materials order, contact Ray for more info).

Both Bob and Raymond are recommended by Osprey Aircraft. Contact Bob, Raymond, or George for more info.

# NEWSLETTER BACK-ISSUES

I now have in my possession copies of all the past issues of the newsletter, from GP4BFN1 to present day. Thank you very much to one of our readers. I have been experimenting with different methods of delivery and here's what I have learned so far....

- The files would be too large to be placed on the yahoo group site or to be e-mailed around. Might be ok if you are on a high speed connection (cable, dsl, etc)
- There are a minimum of 336 pages to copy if we were to copy them - it appears all previous newsletters were black & white, and 336 assumes 8 copies per newsletter.

I am open to ideas and suggestions, but I'm thinking that burning CDs and including them with the next newsletter might be a good route. CDRs are inexpensive, and wouldn't add anything to the mailing cost of the newsletter. After this newsletter gets into the mail, I'll start vigorously working on scanning them.

I will also go ahead and run one copy off at the local copy shop just to see what it would cost if anyone wants them hardcopy.

Elton



## DID YOU KNOW

The gorgeous aircraft above belongs to John Reinhart. John received his airworthiness certificate in June 03.

In the two photos below, George is the pilot, Mike Traud, another builder/flyer, is the passenger, and the photographer was John. John was flying with Jake Jackson. (Jake's hangar being just around the corner from George's).

John gives away a free CD with all his construction photos and a lot of photos of Darry's, George's, and Jakes. E-mail John at [cjr1@us.ibm.com](mailto:cjr1@us.ibm.com)

