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GP-4 BUILDERS & FLYERS NEWSLETTER

November 2008
GP4BFN54

News for builders of fast wooden aircraft!

Another GP-4 Takes Flight ! This GP-4 was built by Tony van den Heuvel, South Africa, and flew for the first time on the 8th. of March, 2008. Congratulations !!

GEORGE'S CORNER

BY GEORGE PEREIRA

Fellow GP-4 Builders,

I recently received a call from a builder about a problem with his canopy installation. He said that at speeds of 200 KIAS or more he noticed some slight movement of the canopy at the base of both bows.

There is also some air leakage between the bows on each side at the canopy base. His fix was to install a latch on each side of the canopy to secure the canopy to the windshield and canopy base.

These latches would have not been necessary if the windshield fairing overhand (see drawing #49, top center) was overhanging the canopy glass by 7/16" as shown on drawing #49. His overhand was marginally short of this that allowed some movement at speed.

…the .050 aluminum fairing that holds the windshield to the bow must overhang…

The .050 aluminum fairing that holds the windshield to the bow must overhang aft over the canopy glass when closed to hold the canopy down during flight. The latch shown on drawing #49 was designed so access is available from the outside in an emergency.

The 3 part article by Mike Traud on canopy installation is excellent. (newsletters 47, 48, and 49).

The lift of the canopy at 200 MPH can be as high as 300 to 500 lbs. That is why it is so important that you have a very secure latch and hold down system. I have covered the canopy operation in previous newsletter articles but felt it important enough that we go over it again.

Regards to all.

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BUILDER'S RESOURCE

BY BOB FOSTER

Many GP-4 builders who have completed their fuselage have installed Jim Weir's antenna kit. Jim has many more "can't live without" electronic designs that will save you beaucoup bucks or as he says, "A champagne panel on a beer budget." He has published a full panels' worth of designs in Kitplanes for several years, from about 1996 to present. I have listed all the publications and subject that I have, perhaps someone else could fill in the blanks

Kitplanes Magazine

Jan 97, pg 87, Coaxial cable

Mar 97, pg 69, Extending landing light life

May 97, pg 72, ELT antenna

July 97, pg 79, Wire rack

Oct 97, pg 62, Radio Connectors

Feb 98, g 86, Radio "stuff"

Apr 98, pg 20, Altitude chamber

June 98, pg 86, Auto Am FM Radio

Oct 98, pg 60, Inexpensive intercom

(I missed most of 1999 & 2000)

Dec 99, pg 115, VHF nav antenna

Oct 00, pg 49, LED position lights

Nov 00, pg 65, GPS

Jan 01, pg 88, Dim Bulbs

Feb 01, pg 61, Antennas

Apr 01, pg 61, lamp dimmer

Aug 01, pg 68, Aviation software

Feb 02, pg 43, Engine monitor

Apr 02, pg 79, Battery sulfate buster

AN OSPREY GP-4 IS CREATED

By Tony Van Den Heuvel

Tony...

Many years ago in 1994, I was transferred to Uganda on a 4 year assignment. (Elton's Note—Tony works for Standard Bank Group Limited). In 1994 Uganda was emerging from their darkest ages and life in Kampala was rudimentary. No shopping centres or supermarkets, bad roads and a two-channel animated TV.

One activity was fishing on weekends and the sport was also taken at leisure, trawling at 4 kph along the shore for Nile Perch. On a good day when we had visitors from South Africa, we would receive a newspaper or two and this was used as reading material on the water waiting for the fish to decide what sport to entertain us with.

While the picture of lazing under an umbrella, reading the paper and drinking many lukewarm beers while trawling and watching a fish eagle steal your lure may seem idyllic, the simple carefree novelty soon wears off and you are faced with the real world for the remainder of the week.

During the evenings the weather was generally pleasant but there was really nothing much to do. Having just completed building an Evans VP1, ZU-ALT before departing to Uganda, life after fishing needed a kick-start again. Friends back home were all raving about their new RV projects and I was left to stew in the tropical heat of Kampala.

I spent many hours reading and re-reading Kitplane magazine hoping to find a new project that would spark my interest and compete with all the RVs that were due to be flying by the time I returned to South Africa. My skills in building were at the time limited to wood, fabric and composite, having completed a KR2 and the VP1.

As there was a lot of time at hand, comparisons were made on spreadsheets reviewing all performance and cost specifications using the RV as the cost and performance base. The VP1 flat out could not compete and would have to be retained as a local airport bug smasher. Through the years the VP1 has been a delight to own and has served well as a fun flying machine and has been flown by many pilots around the local community.

The selection process continued and the list shortened to those of wood construction, plans built, not in Kit form. The selection was further reduced according to cost and anticipation of my skill to complete the project (boy was I in for a shock). After many months of deliberation and consultation, the decision was made to go ahead and build the GP4. Now I was stuck in a small flat in Kampala and no place to build. Even if there was place – how would the project be re-patriated to South Africa?

Plans were purchased and again months were spent reviewing the plans and trying to understand the complexity of the

AN OSPREY GP-4 IS CREATED

project. This was not just an overgrown KR2. Well, the decision made, Aircraft Spruce and various other catalogues at hand, I started to place orders based on my interpretation of the requirements. Larger items like the wood and plywood would have to wait until I returned to South Africa. Two years were spent ordering parts and storing them. The collection soon grew into 17 boxes with all sorts of goodies. I made a trip to Oshkosh to further purchase the more sensitive items like instruments and radios.

In 1997 one of the remaining Uganda Air force Sia Marchetties crashed near Entebbe airport due to fuel starvation and the wreck was duly piled on a heap with all the others. 1 of 13 now remained airworthy. The local newspaper clipping reflected the attitude of the general public "at least it won't burn." Later in the year the Air force auctioned off their surplus goodies and I managed to secure an IO 360 B series engine, still with factory seals in place. One snag, the locals had removed the sparkplugs and left the engine on the floor for many years with the new cylinders exposed to the elements.

In 1998 I was repatriated with all my goodies and engine in tow. Once settled at home, the first step was to build a workspace to accommodate the project. A garage of 30 feet by 23 feet was built and work started 6 months after my return on the wing spar. During the garage construction phase, the spruce and plywood required for the project was purchased.

The GP4 primary structure is mainly constructed of wood and the decision to stick to plans was made to avoid any penalties in weight by substituting other timber types. Yes, alternatives are available at a much reduced price but the increase in mass would be evident in degraded performance. One of the features of the GP 4 is speed and as the engine sourced in Uganda was only 180hp as opposed to the 200 recommended, I had to pull out all the stops to maintain performance specifications at the reduced power, especially at the higher altitude of the Rand.

Work progressed slowly at first during construction of the one piece spar, a whopping-great-big-one-piece box structure, 6.5 inches wide and 7 inches deep at the root, extending from wing tip to wing tip. Top and bottom spar caps are of ½" laminations which taper off towards the tip. The main spar is rated at +8 / -6 G. That is: the main spar alone; not including the extra strength gained by adding ribs, rear spar and the plywood skins; and this is very evident in the structure of the main spar.

During this period I was alternating between woodwork and metalwork according to the seasons so that gluing would only take place during the warmer period within the glue specifications. The metalwork, while not too extensive, was a challenge as all parts were fabricated and individually taken for tack welding, returned for fit and check, before returning to the long-suffering welder. This is one skill I have

AN OSPREY GP-4 IS CREATED

not mastered and rather leave for the professionals.

The GP 4 specification features indicate an aircraft having a low, one-piece wing, with retractable tricycle gear. The retraction is via an electric/hydraulic pump and has a manual emergency extend system. Ailerons and elevator are manipulated via pushrods with centre walking beams to minimize flexing of the pushrods. The rudder is conventional using cable to the rudder pedals. Only the pilot has toe breaks and extensions are provided for the vertically challenged passengers. The side-by-side seating, semi-reclined position provides a cosy environment and visibility on the ground is adequate.

Back to the wings: The retractable gear legs were fabricated using the then newly developed hydraulic option. Once all fabrication was complete, with seemingly millions of little fiddly fittings, the balance of building of the wings was routine. Each wing has a fibreglass tank built into the leading edge 'D' section to feed the thirsty engine. Covering is completed with plywood skin at 45 degrees. A final protective weather barrier of fibreglass cloth completes the structure.

By the end of 2001 the wing building was complete; I had married and was again transferred for secondment, this time to Tanzania for two years. The fuselage structure was only just covered in ply and the whole lot had to be packed away for the next two years, house rented out and all other components put in storage.

While in Tanzania, I again returned to sourcing materials for the project. A constant speed propeller, more radios and instruments, the cowlings and canopy were imported and held for the return trip to South Africa.

Returning items from Uganda and Tanzania to South Africa again provided its own set of challenges and frustrations. When importing into one of the countries, they charge VAT and anything else they can extort. On returning these items to SA, VAT was again applied – hey, no way will I pay twice. After long negotiations, applications and refunds all goodies arrived at home. Work could now resume.

In January 2004 all the major components were mated; the rigging and alignment all had to be perfect. One of the features of the structure is that all fittings can be removed for service / replacement in need. All holes through wooden components are sleeved and bushings / bearings are fitted in all joints. Being of composite structure, most of the nuts would be inaccessible after closing of the structure, again all are fitted with backing plates, screwed to the surface and nut-plates riveted to the plate. This is great it there is a need to remove a part but a real pain to fabricate if progress is to be made.

The next challenge was the fabrication of the nose gear system.

AN OSPREY GP-4 IS CREATED

The wheel well is small, deep and only 6 inches wide. The space houses the mechanism for the hydraulics, manual extension and steering system and the nose gear when retracted. Raw knuckles, special spanners and screw drivers were required to access and fit all the components. This must surely rate as the most difficult portion of the build as all parts had to work in union. In retracting the gear, first the mechanism must hold the nose gear door open against the airflow, then the gear strut must be disconnected from the rudder pedals and centred; allow the gear to retract, then activate the up-lock mechanism and close the nose gear door. Little micro switches process the progress and manage the up switches in coordination with the main landing gear. 12 of these are wired together with their indication lights.

The engine rebuild was started and the teardown revealed a near-perfect new engine. The plugs removed only caused corrosion to number 3 cylinder and all the rings were in poor condition. Having sourced a new cylinder, the engine was rebuilt with all new bearings, valves, valve springs, nuts, bolts, gaskets, etc. as required. The engine was now new, with all AD's up to date and ready for action. A new airflow performance fuel injector system was installed and accessories connected. The RH magneto was replaced with a Light Speed Electronic unit with Hall sensor in the mag hole.

Fabrication of the engine mount was one of those classic builder's nightmares, measure twice and cut once. Two months were spent building a jig and welding up the mount. When installing the engine, the oil filter would not fit. Checking measurements, the mount was 2 inches too short. Oh well, into the bin with that one and start again. The learning curve never stops.

In 2005, the ideal home environment for the home-builder was shattered forever; the family was expanded with a baby boy, two dogs and house alterations. Now time was to be shared and focused on the family and work progressed slowly. When the opportunity did arise to sneak off to the garage, either the dogs would carry off parts or Nicholas would get his little hand into everything, Glue, resin, paint, oil and the list goes on and on. Spanners would disappear in seconds, glue pot emptied; grubby soiled handprints would decorate everything in reach and so on. If there is anyone out there who would like a challenge in patience, get a two year old into the garage just when you need to focus on a task. Other obstacles included packing tools away out of reach, then trying to remember where you put them. Some days were fun.

Everything eventually came together with the support of all and in 2007 the aircraft was eventually moved out of the garage to Baragwaneth Airfield for final assembly. This task worked out easier than expected but the assembly did take several months to complete. Assemble, check, cross-check and check again, all the time. Once all the inspections were complete, the paperwork done and submitted, we were ready for the first test flight.

AN OSPREY GP-4 IS CREATED

Initial taxi testing showed minor issues which were soon resolved and the big day arrived on the 8th of March 2008 with Chalkie Stobbart as the test pilot, supported by Mike Davis as the systems engineer.

The first flights revealed several minor adjustments were required, which were not apparent on the ground. The landing gear, which would lock up in retraction tests on the ground, would not lock up in flight. The focus of the adjustments were the micro-switches and latching mechanism of the gear in the retracted position. The good news was that the gear did extend and lock down on each cycle, but in flight, airflow seemed to prevent the gear from locking up. The final solution was to install an additional air vent in the nose gear tunnel to bleed off ram air pressure from the engine area, as the speed increased, causing the nose gear up lock not to engage. After fitting a modification to the nose gear door; an APANGCMFVFA , (air-pressure activated nose gear closing mechanism for very fast aircraft) the landing gear finally retracted fully and testing continued with increased speed and slowly the hours accumulated without restrictive snags.

Flying qualities of the GP4

As ZU-CLC is the first flying example of the type here in South Africa, there was no opportunity to sample the qualities first hand. Chalkie and Mike undertook the initial test flying. Here is their story:

Chalkie....

The first flight of a new home-built is always a challenge with the most important aspect being preparation. The flight has to be planned and the pilot has to be familiar with the aircraft and its systems. The day started with a thorough inspection of the aircraft and whilst Tony and Mike busied themselves replacing engine cowls and inspection covers, I took the time to become familiar with the cockpit.

The GP 4 is not a large aircraft and I just manage to fit in, leg-room is sufficient, but headroom is only just enough to fit in with a headset. The controls are similar to my RV-6; stick between the legs is operated by my left hand, engine controls on the centre console for the right hand. Flight instruments are standard 'six pack' with the addition of the gear switch on the centre console and the emergency gear extend system which includes 'T' handles to ensure engagement of the down-locks. The gear was cycled with the aircraft on the jacks and an emergency gear extension simulated too. In flight, pulling the nose gear forward into the slipstream with the lock-down 'T' handle would be a bit more difficult.

For the first flight Mike and I taxied out to the active runway and because the GP 4 has a tightly cowled, new engine, the ground running needed to be kept to a minimum. Ground checks complete it was time to go, advancing the throttle to full power resulted in a brisk acceleration, at 70 mph I raised the nose and the aircraft flew off at about 85 mph, a reduction in power and pitch attitude held us a few feet off the ground as I sampled control authority. All felt good, so full power was added again and pitch attitude increased to keep

AN OSPREY GP-4 IS CREATED

the speed at about 90 mph for gear retraction. Normally the gear would be left down for the first flight, but due to the new engine requiring 75% power to prevent glazing the cylinders, and the fact that this would exceed VLE (maximum speed with gear extended) we had decided to retract the gear. Only the left gear locked up, the other two remained amber. We continued around the circuit, did a fly-by so that Tony could confirm the gear not up-and-locked, then returned to land. Fortunately all three gears locked down positively when selected down.

The approach was flown at 100mph, with speed reduced as we approached the runway threshold, at 85 mph the controls started to feel loose so this speed was maintained till the aircraft touched down. This was repeated for the next three flights, till the gear problems were solved and the test flying could continue.

The GP4 is not for a low time pilot. George Pereira designed the aircraft to be neutrally stable as this reduces trim drag, which increases performance. The result is an aircraft that is sensitive in pitch and once trimmed at an indicated speed of 220 mph, if the aircraft is slowed to clean stall speed, it is not necessary to trim the aircraft at all as it stays in trim. This could become a problem with low fuel and full baggage as at the end of a long cross country and for this reason it was recommended to Tony to move the battery forward to move the C of G forward. This was done, and the aircraft now has positive longitudinal stability; and performance does not seem to have suffered much. At 10,000 ft with full throttle and 2450 rpm, the aircraft settles down at 185 to 190 KTAS; with 200 hp it should be an awesome performer.

Mike....

After a few more flights with me in the right hand seat, Chalkie and I swopped around and it was now my turn to frighten him. Having spent most of my recent hours in slower puddle jumpers I was a little apprehensive to start off with, the aircraft stiffens up quite quickly after takeoff and a gentle two finger technique rather than a fist full of stick is required. After some GF work and some circuits as well as the necessary paperwork being completed I had the honour of being the first guy to get airborne alone in the GP4, PHEWWWWW! The climb out with only my 67 kg bum in the seat is impressive to say the least. The plane accelerates very quickly once cleaned up and stabilizes at an indicated 190-205 Mph with the power set at 2550 RPM & 24 Inches. Reducing the power back to 2450 RPM and 22 Inches yields a very comfortable 185 Mph IAS and fuel burn of around 32 L per hour, so with the 205 L on board a range of 1000 miles with reserves is no problem . Midday flying in the GP4 is not for the feint hearted, you feel every pea in the air and when a reasonable size rock is encountered you are left feeling a bit beaten about. One late afternoon a flight in smooth air came along, and that my friends, it was absolutely incredible. The GP4 purrs along and all you can do is sit there, enjoy the ride, and be astounded.

We are approaching the end of the proving flight requirements and have not had any real problems to speak of, with each sortie the comfort levels are growing and I am really enjoying the plane. I cannot thank Tony enough for giving me the opportunity to fly this amazing plane; which in my opinion he has done a fantastic job of building. Well Done. It is a real go places airplane.

[Elton—Tony has promised some more pictures of his GP-4 soon. Plus there is some more exciting news, read on …..]

Tony — We have now committed to undertake a challenge on the 1939 world record established by Alex Henshaw, a flight from London to Cape Town and returning using the GP-4. We will fly the reversed route, and this is going to be a real challenge for both man and machine.

As advised earlier, I only had the 180 hp engine and have ordered the Aero Sport XP 1360 with a HP rating of 195HP for the attempt. We will also be fitting a South African made glass panel to give us all flight information needed.

Hot Off The Press!

Cape Town – London – Cape Town

Maximum weight:	1000kg
Time to beat:	4 days 10 hours 16 min.
Aircraft:	Osprey GP 4 'Homebuilt'

Summary:

In May 2009 an attempt will be made to better a long-standing aviation record for light aircraft, using a GP 4 non-type certified (homebuilt) light aircraft.

Chalkie Stobbart an airline captain with South African Airways (SAA) will attempt to break the record which was set in February 1939 for a return flight between London and Cape Town, solo, using a single engined aircraft.

FEBRUARY 1939

03:35am: Gravesend Airfield (south east of London, UK) on the 5th February 1939, Alex Henshaw opened the throttle of his heavily laden Percival Mew Gull G-AEXF. His destination, Wingfield, (Cape Town, South Africa) then after a short 27 hour rest it was all the way back to Gravesend, arriving there to a hero's welcome at 13:51 on 9th February 1939.

4 Days, 10 hours and 16 minutes. Solo, London - Cape Town – London in an aircraft powered by a 200hp de Havilland Gipsy Six series II motor. This record still stands today, almost 70 years later! Awesome.

Charles 'Chalkie' Stobbart plans to break this record, the flight will be made in an Osprey GP 4 'homebuilt'. An aircraft which a friend, Tony van den Heuvel, built at his home in Johannesburg over a period of ten years.

Stobbart is an Airbus A340 Captain with South African Airways with over 20000 flying hours and has done other long-range flights in light aircraft. Refer to summary at end of article.

Stobbart plans to depart from Cape Town International Airport, which is slightly south of the original Wingfield airfield and proceed to Biggin Hill, which is also slightly south of the original Gravesend Airfield; then back to Cape Town. The plan is to do this flight in less than 4 days.

When? May 2009.

To date, the fact that no successful attempt at the record has been made, attests to the magnitude of the feat, which was accomplished by the late Sir Alex Henshaw all those years ago, in February of 1939.

May 2009

Stobbart will fly the GP 4 from Cape Town to London and back with 2 fuel stops for the route northbound and again southbound. In 1939 logistics and the range of the Mew Gull called for 4 fuel stops for the record setting flight. Using the speed of the Mew Gull, Henshaw still managed to complete the return flight in the record time referred to above: ***An absolutely amazing feat of skill, courage and endurance.***

Changes in aviation in the 20th century have been rapid. From the Wright brothers' fledgling flight in 1903, through Charles Lindbergh's crossing of the Atlantic in 1927, through the 2005 Global Flyer's solo circumnavigation of the globe. Giant strides have been made in aviation; the 'next frontier' sub-orbital space flight has already been proved as feasible. As with the Wright Flyer, SpaceShipOne was built by a group of amateurs, without government funding and soon SpaceShipTwo will start commercial operations taking passengers on sub-orbital flights into space.

One would expect that all these advancements would mean that there are many differences in the flight as attempted in 1939 and the flight that will be conducted in 2009. Interestingly enough the "mechanical" differences are not as dramatic as one might have first thought!

How they compare

Aircraft	Osprey GP 4	Percival Mew Gull
Construction	Wood / plywood, fiberglass covered.	Wood / plywood, fabric covered.
Engine	195 hp 4 cylinder 375 cubic inch engine (Horizontally opposed)	205hp (nominal) 6 cylinder (Inverted) Gipsy Six Series 2
Propeller	Hartzell Constant Speed	Ratier constant speed
Max speed	250 mph	247 mph
Max cruise	230 mph @ 10 000 ft	235 mph @ 7000 ft.
Stall Speed (at normal gross)	66 mph	76 mph
Fuel	Avgas 100 Low lead	Avgas 100-130
Fuel capacity	Approx. 420 liters	Approx 410 liters
Fuel burn at cruise	Approx. 35 l/h	Approx. 40 l/h
Endurance	3 600 km	3 200 km
Oil Capacity	8 liters	23 liters
Maximum Take-off wt.	1000 kg (FAI class)	1068 kg
Navigation	GPS and standard IFR instruments	Compass and chronometer
Autopilot	Two axis, with vertical speed and altitude hold	None
Radio	VHF, VOR, ILS, GPS, HF, SatCom and transponder	None
Airports	Modern International airports.	Basic aerodromes, little or no facilities

From an aircraft perspective the major differences therefore exists in the efficiency of the newer generation powerplants, the increased reliability of these powerplants and more importantly, new generation satellite navigation and pilot aids including the new generation digital autopilots.

From a straight side-by-side performance measurement yardstick, the Mew Gull is capable of higher speed than the GP 4 at sea level, but this ability is reduced, even reversed at the altitude due to the GP 4 having retractable landing gear as opposed to the Mew Gull's fixed gear.

The GP 4 has a larger wing area than the Mew Gull (104 ft² / 88 ft²) which results in more docile handling qualities and better altitude capabilities, resulting in a better true airspeed at cruise at a higher altitude, which translates to better fuel economy.

Why a GP 4?

In 1939 the Percival Mew Gull, G-AEXF, was extensively modified for the record breaking flight. In all only six Percival Mew Gulls were ever produced. Modifying and flying the Percival Mew Gull for this record flight required absolute dedication and extraordinary skill to set a record that has stood the test of time. Based on the extraordinary performance of this aircraft the question must be asked as to why a highly successful range of general aviation light aircraft based on the design of Percival Mew Gull were not manufactured.

The answer to this question lies in the flying characteristics. The Mew Gull was purpose built; it was designed specifically for racing and in 1939 in racing trim G-AEXF was faster than a Hawker Hurricane at sea level! The Hurricane was then the leading fighter in the RAF. Whilst G-AEXF set an important landmark and a record which still remains unchallenged almost seventy years later, its overall performance envelope including stall speed, stability, visibility and performance was not suited for the day's GA pilots.

Aviation is a compromise. You want speed? Well that will cost you something, stability, complexity, expense, weight. Any one thing or all.

The GP 4 by comparison is a low wing plans-built aircraft that can be built in a suburban home garage and is flown by general aviation pilots around the world. Aside from the modifications to increase fuel capacity the record aircraft will be fitted with locally produced Electronic Flight Instrumentation (EFIS), be approved for flight by Instrument Flight Rules and be equipped with an autopilot, to reduce the workload on the pilot..

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Context and objectives of the record

1. Break the seventy year standing record and lodge an officially sanctioned FAI record for the route "Cape Town – London – Cape Town" in the 1000kg aircraft class including records between enroute airports.
2. Raise awareness of (sponsor) in Europe, the USA, Africa and the potential of increasing market share / exposure internationally.
3. Raise awareness of the impact of developments in Sponsor's Field….
4. Raise awareness of the future of general aviation and prospects for growth in the sector given the current rapid advances in technology.
5. Produce a high quality video documentary of both the flight, the history of the flight and preparation for the flight.

Background to the record

- Sir Alex Henshaw's flight was documented and is available in the book "Flight of the Mew Gull" ISBN 1-84037-021-1
- The Experimental Aircraft Association (EAA) is an organization dedicated to the freedom of flight and the promotion of the ability of anyone to be able to build their own aircraft.
- The route will be on the western side of Africa, as close to a great circle track as modern airways will allow, with stops in Point Noire (Congo) and Tamanrasset (Algeria).
- The aircraft will be powered by an Aero Sport Power XP-IO-375 205hp engine. http://www.aerosportpower.com/
- Cruise height to be 10 000 ft – 12 000 ft with oxygen supplementation for the pilot. Flight testing will determine most economical altitude, and speed.
- In July / August 1992 Stobbart flew his 1941 Fairchild F24W-41A to Oshkosh (USA) to demonstrate the ability of antique aircraft.
- In July 1994 Stobbart operated as co-pilot on the SAA Historic Society's DC4 flight from Johannesburg to Oshkosh.
- In July / August 2003 Stobbart flew his RV-6 homebuilt to Oshkosh AirVenture and back to celebrate the Centenary of Aviation.

Additional Information

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DRILLING GUIDE

By

ADRIAN McCLELLAND
AUSTRALIA

You know when you want to drill a hole/holes to attach a fitting to the airframe but there is insufficient room for the drill. And using a 90deg.angle drive of a flexible drive on your drill cannot guarantee a nice perpendicular hole.

I found this problem when starting to fit out the nosegear tunnel. (Fig.1)

(Fig.1)

So I thought it would be great if I could just drill from the opposite side to the fitting, where there was plenty of room for the drill, and I could use a drill guide for a nice straight hole, but how would I get the hole in exactly the right spot.

I needed something that would locate the drill guide exactly opposite the point at which the mounting hole/holes on the fitting needed to be.

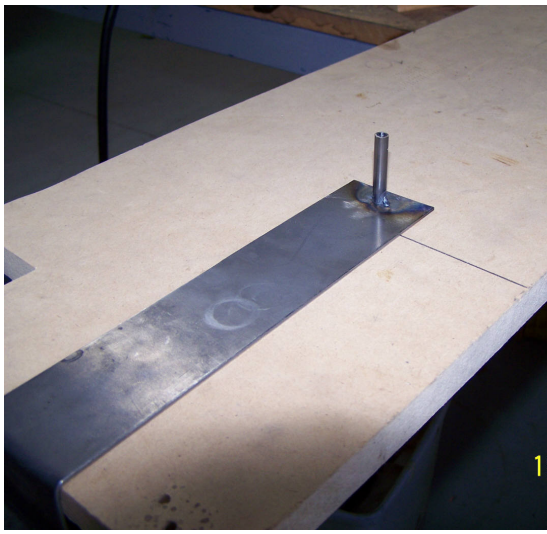
So I made myself a drill guide that would aligned a drill guide with the desired exit point of the drill bit .

If this is of use to you, here's how I made it.

Start by cutting a small length (about an inch) of 4130 round-stock . (I will say now that mild steel would also be OK for this). Then cut a "T" shaped piece of 1/8th flat 4130, about 8inches long and the "T" about 4inches wide, the stem of the "T" about 2inches wide. None of these measurements are critical, apart from making sure the length is a good 8 inches. I'll explain why later. Then weld the round stock to the "T" end of the flat, near the edge and in the middle. (Fig.2)

(Fig.2)

Next cut a 9 1/2inch by about 2inch length of .063 4130 (thickness not critical). Near one end drill a 3 /16 hole. Put a 90deg. bend about 1 ½ inches from the other end. Then cut a short length (about an inch) of tube with an inside diam. of 3/16inches . Locate the tube over the 3/16 hole (I did this by drilling an old 3/16 bit half way into a block of wood using the drill press, so that the part of the drill sticking out was at 90 deg. to the surface.) Place the flat section hole over the bit, clamp it to the wood block, slide the tube over the bit, and tack weld to them together. The tube must be at rt. angles to the flat. The welding will destroy the bit, so use an old one.(Fig. 3)



(Fig. 3)

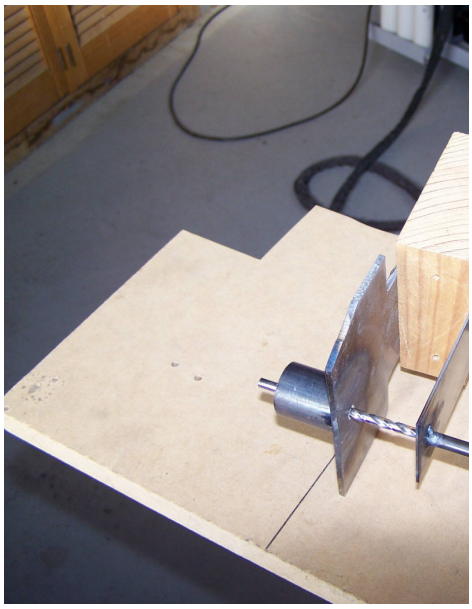
DRILLING GUIDE

Clamp the "T" piece in the drill press and drill a 3/16th hole through the centre…it's important that this hole is exactly 90deg. to the flat as this will be the drill guide. If this is not right, the whole thing will not work properly. (Fig. 4)

(Fig. 4)

Then clamp both halves to a suitable thickness block of wood, placing a drill bit through the drill guide and into the tube so that both halves of the jig are aligned. (Note…you may have to drill/clean out the tube after welding so that a 3/16th bit will slide in comfortably) . Seam weld both halves together while clamped to the wood block.

(Fig. 5)

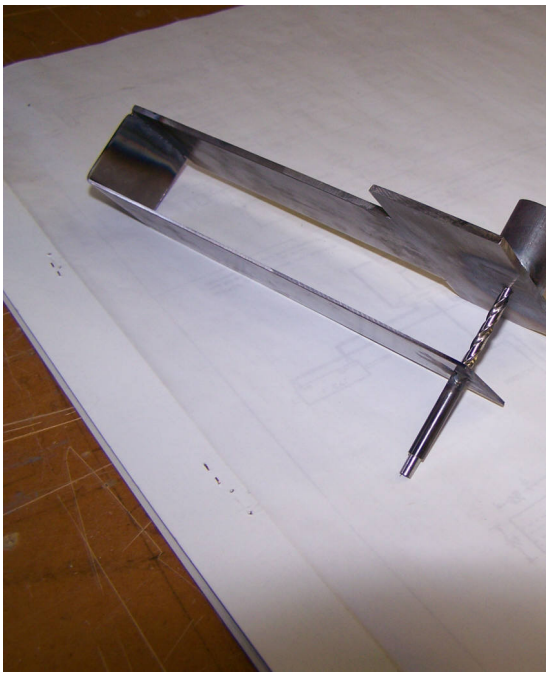


(Fig. 5)

Your drilling jig is now completed, and should look something like this. (Fig. 6&7)

(Fig.6 &7)

You should now be able to push a 3/16th drill bit through from one side to the other. (Fig. 8)



(Fig. 8)

Now's the exciting part…using the drilling guide. Here is how I used it to fit my retract. link pivot plates.

I had already done the locating of the pivot plates by clamping and adjusting so that my retract. fork moved freely and true, etc., so I needed these plates to be in that exact position…here I am telling you guys how to suck eggs….you all know that stuff.)

As I said at the start, you can't fit a drill onto the wheel well (6 inches width is not a lot of room), and I wasn't happy drilling perpendicular holes with flex. or angle drives.

STEP 1: Clamp your fitting in place. (Sorry, I forgot to put on a clamp for the photo…I was working backwards with this article because I had already drilled for the fitting…after all, I had to make sure it was bomb proof before I

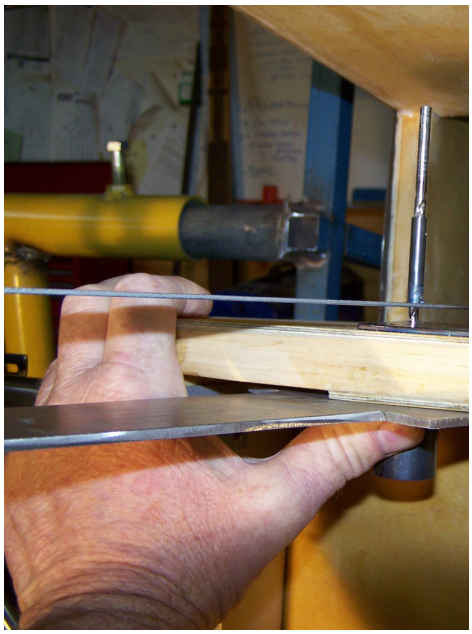
DRILLING GUIDE

told you guys)

(Step 1)

STEP 2:

Position the jig over the fitting, by sliding a 3/16th bit down the tube and adjusting the position of the fixture so that the head of the drill bit sits squarely in the hole in the fitting. This will locate the drill guide on the opposite side of the wood airframe in exactly the right spot for drilling.



(Step 2…note the drill bit)

STEP 3:

Now clamp the jig to the airframe, being careful not to move it. This is why the "T" shape, to allow room for the clamps and to keep them clear of the drill. When you are happy that it is in place, remove the drill bit from the locating tube. You can now, using a 3/16th drill bit, drill through the drill guide, and it will appear exactly through the hole it the fitting. (I must admit I was very excited when it worked so well…you know how it is…you roam around the shop, telling yourself how clever you are….it's a good thing nobody is around at these particular times of self congratulations)

(Step 3. Note the tip of the drill coming through the hole in the fitting.)

And that's about it. Just a couple of points. I used thicker flat section for the "drill guide" side of the jig so that the guide would not flex or distort and effect the accuracy of the hole. The locating tube side can be thinner as it allows a bit of flexibility when positioning the drill bit guide.

The depth of the jig is about 8 inches. I figure this will allow enough reach into the wheel well from top or bottom to drill attach holes for any of the U/C fittings.

I hope this is of some use to some of you.

FLAP CABLES IDLER PULLEYS

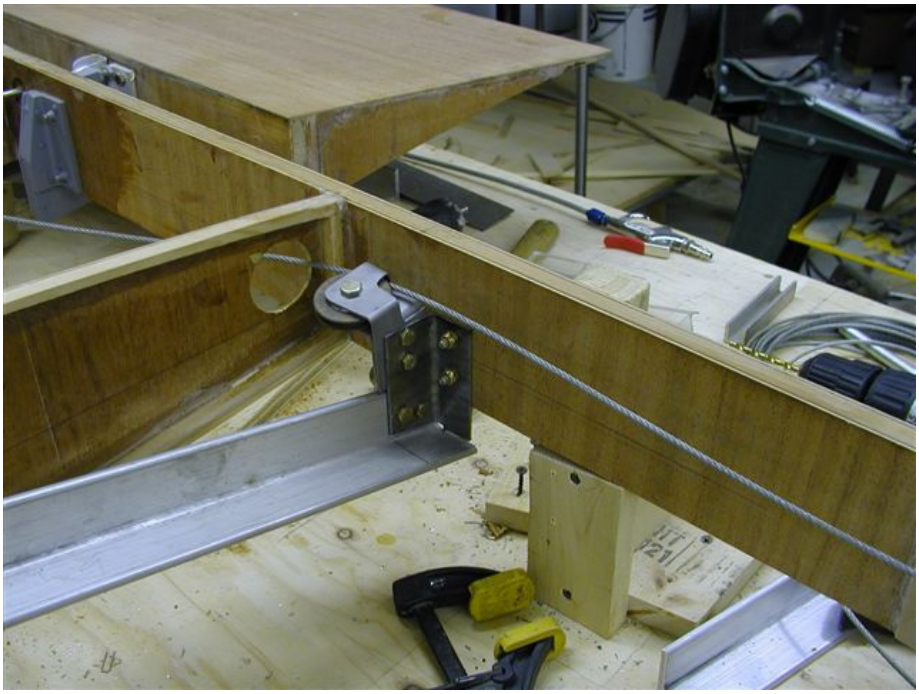
By Bob Ringer

When fabricating the flap cable idler pulleys that attached to the outside seat rail rear mounting brackets I noticed the method of installing cable guards was left to the individual builder. Cable guards for the flap cables are especially important to prevent a cable from departing a pulley thereby creating a situation where only one flap deploys which would create an in flight emergency.

When installing the pulleys, I noticed the pulley is tipped forward a bit to get the best pulley alignment . George confirmed this is necessary to match the wing dihedral.

I made the inside (lower) bracket first, obtaining the correct amount of tilt to ensure correct cable/pulley alignment. I then made a template of the outer bracket from cardboard and allowed enough material to bend one edge down to create a cable guard. Figure 1 shows the angle. Note: the seat rail has not yet been trimmed for height.

I transferred the template to .080 inch 4130 steel, cut and bent to shape and it works great. I did not use rivets but simply bolted everything together with AN3 bolts. One AN4 bolt removes the pulley and the assembly can be taken apart for cable replacement or simply push a new cable in past the pulley. (See Figure 2) I intend to make a cable guard for the two center pulleys by adding a top doubler that is held in place by the pulley center mounting bolt and is bent down over the rear of the pulleys to prevent the cables falling off if they go slack.



CANOPY

I was fortunate to have another visit from my friend Wayne Tomkins, Melbourne, Australia who is building a beautiful example of the GP-4. During Wayne's last visit we cut and fitted the windshield on my project. During this visit, it seemed like a good time to build the canopy frame and fit it to the fuselage.

bolt the rail into position immediately under the canopy base. I glued bolts into the wood so the rail can be removed for service. This has placed the rails one inch lower (so the forward bracket must be one inch longer) and outboard one half inch on each side.

(See Figure 1)

During the early part of my project I was fortunate enough to obtain rides in three different GP-4's. Those rides convinced me this is a truly outstanding airplane and the only concern I had was the somewhat tight shoulder room. So I looked for ways to gain as much room as possible in the cockpit. The forward canopy rails seemed the logical place to change so I moved the rails under the fixed canopy base by simply welding two tabs under the rail and installed two sitka mounting blocks in the fuselage sides to

Although a total gain of one inch shoulder room does not seem like much, when my wife and I stood side by side under the canopy in the position you would normally sit, the gain was very noticeable. As a bonus, there are no screws inside the track to snag the bearings and to pull the track clear of the airframe in flight would require a force sufficient to pull the fixed canopy base off as well. A small amount of adjustment is required in the width of the moving canopy base but does not effect the integrity of the base.

Bearings were another concern as it is difficult to get a bearing to fit properly inside a one half inch by one inch rectangular tubing. Seven eights bearing is two tight and the next most common smaller bearing is three quarters inch and it is too loose. I elected to go with the three quarter bearing and taking a suggestion from Jim Simmons, I cut a narrow one sixteenth thick piece of stainless steel and will glue it into the bottom of track after chroming the track. Leave the spacing strips lightly short at the rear and when you push the canopy open the bearings drop off the end and this very nicely holds the canopy open.

Prior to starting work on the canopy I copied all three really excellent articles submitted to the News Letter by Mike Trout and bound them in booklet form. This booklet was constantly referred to as we progressed and saved us many hours of labor and undoubtedly some potentially costly mistakes. Wayne took the booklet back to Australia with him.

This should be considered a two person job if swearing is to be kept down to an acceptable level. I did not like the idea of reaching in and up to place the inside fiberglass skirt as I thought it would add to the difficulty of obtaining a smooth fit. So, to make things easier, we cut a twenty six by twenty six inch opening out of the center of the three quarter inch plywood jig and I was able to stand inside

CANOPY

and Wayne passed the wetted cloth to me.

(See Figure 2 above)

This made fitting very easy with Wayne checking the outside for fit and bubbles. We had covered the canopy glass with clear packing tape and although this left a glue residue from the tape it came off quite easily with a gasoline soaked cloth. If you accidently touch the bare glass with resin do not panic as a large drop will crack off easily and a smudge will rub off with your soaked cloth and a thumb nail. Do not use a hard object to scrape.

After the fiberglass dried, the canopy parted from the base with little effort. We then trimmed the inside skirt, replaced the canopy and cut the glass with an angle grinder and zip wheel. (See Figure 3)

The outside skirt was next and would have been easier had I followed Mike's instructions more carefully. It is important to match the surface of the fuselage to the surface of the canopy glass so as to get a smooth close fitting outside skirt. You can tape on anything such as foam or wood strips to make both surface match. This prevents the skirt from drying in a wavy fashion which takes considerable time and some filler to correct. However, the finished product looks great and makes you proud.

(See figure 4 next page)

CANOPY

(Figure 4)

GEORGE'S E-MAIL ADDRESS

Gayle has created a new e-mail account for builders to contact George. The address is: ospreyairgp4@aol.com

Gayle reports that there is a lot less unwanted spam and trash traffic on AOL.

AIRCRAFT WOOD

Builder Jim Schulz reports of an additional, high quality wood source at:

www.westernaircraftspruce.com

The company is:

Western Aircraft Supplies Ltd.

PO Box 79

Slocan, BC

V0G 2C0

Phone: (250)355-0003

E-mail: aircraft@telus.net

HYDRAULIC GEAR PLANS NOW AVAILABLE

The prototype GP-4 uses a manual landing gear retraction system. After numerous repeated requests from builders, George developed an electric hydraulic gear for the GP-4.

The advantages of the hydraulic system are obvious, flip a switch and fly the airplane. The disadvantages include extra weight, possible electric/hydraulic failure, a back-up system, and maybe some more expense.

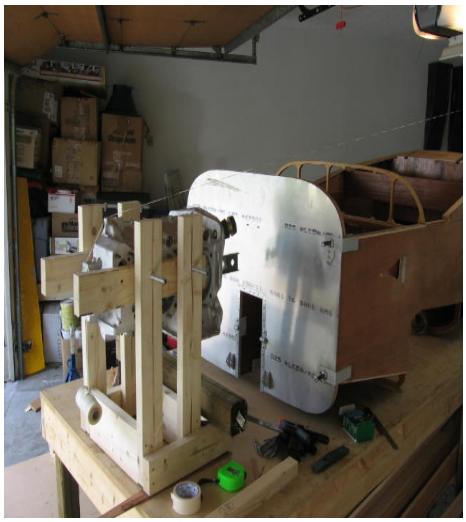
No machine work is required for any of the components. Plans are available for $150 from Osprey Aircraft. You can find the address and an order form on the website and on the last page of this newsletter.

BUILDING THE ENGINE MOUNT

By Doug Turner

Hello everyone. Here is yet another article on how to build an engine mount. One of the worst things you can do for an engine is let it sit around for a few years while you finish the rest of your airplane. I purchased a LIO-360-C1E6 engine case off of eBay for approx 550 dollars.

The case looks serviceable but it has no yellow tag, but that wasn't the point of buying the case itself. After bolting the case together I built a wooden cradle to hold the engine off the work bench exactly 3 7/8 inches below the top of the fuselage and of course 21 inches from middle of case to the firewall as the plans call out for.



Then I made sure the fuselage was level, and I ran a string from the top of my vertical stabilizer all the way to the center line of my firewall and over the top of the engine block, I used that as my reference line for engine alignment. After I was sure everything was perfect and level (including the engine) I ran a screw thru the front side of the wooden cradle to make sure the alignment with the center of the fuselage didn't change.

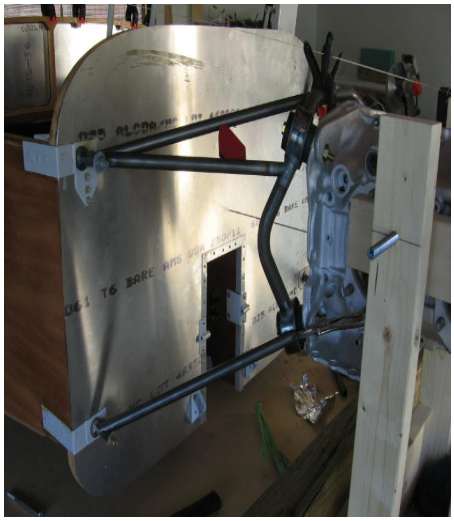
I then used a piece of welding rod and placed it in the engine case down the center of the engine crankcase at the split line. I measured ¾ of an inch from the firewall center line and made a reference mark, I then moved the aft end of the engine case to match the reference line I just made and secured the wooden cradle.

I then mounted the engine mounting ring purchased from aircraft spruce with the aerobatic rubber mounts. So far so good. I found that using a pipe notcher from harbor freight works pretty good and the hole saw screws right on the end of the shaft.

BUILDING THE ENGINE MOUNT

The hole saws you purchase from Home Depot work great except they don't come in ½ inch, you will have to use a regular drill bit for this hole. I recommend the Ridgid brand of hole saw because they come with a life time warranty, you will wear out two or three of them ! I then proceeded to measure the angles with an angle finder and fit the tubing from the firewall to the mount ring.

The hard part after you drill the ½ inch hole on the firewall end of the tubing is getting the angles to match on the engine mount ring. You have to remember that there are two angles at the engine ring; one from the firewall mount assembly and the other is the angle up or down from the firewall mount. After getting all the tubes cut properly I tack welded the tubing using gas welding equipment.



Before I go any further, I visited with Les Conwell in Tampa, what a nice guy, we had a wonderful time with him and his wife, his GP-4 is really moving along, and he should be done soon ! He told me and showed me on the bottom X member aircraft left from the engine mount ring to the X member tubes that the high pressure fuel pump will hit the mount if you don't angle this tube straight back. After tack welding every thing I mounted everything to the mount jig that Les gave me when I was there. I used a block of wood with the same dimensions as the nose gear to keep every thing straight on the nose gear pivot points.

I then tig welded the whole engine mount, sand blasted everything and painted with epoxy paint.

I am very happy with the results as you can see in the photos it turned out pretty nice if I do say so myself.

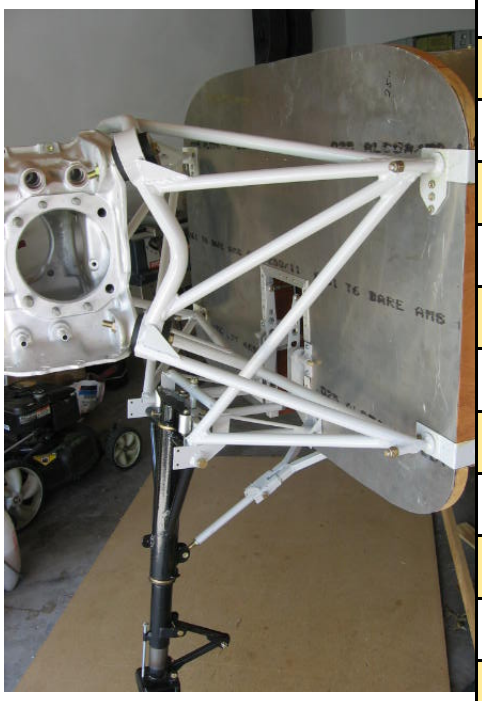
BUILDING THE ENGINE MOUNT

If anyone would like the engine block and jigs to make their own mount please contact me at bundysax@hotmail.com.

Happy Building and God Bless !

Doug Turner

The plans say not to weld the nose gear retraction points until you have retracted the nose gear, I have manually retraced my nose gear and have found that every thing is perfect but now I have to remove the engine mount to finish welding these points. I suggest that if every thing is perfect according to the plans to weld these points permanently while you have the chance !



So……..

Two cannibals are eating a clown, and one turns to the other one and says…. ”Does this taste funny to you”?

COMPLETED AND FLYING GP-4s

PLANS NUMBER	NAME
0	George Pereira
1	Darry Capps
2	Jake Jackson
8	Steve Baum
31	Pat Salomonde
49	Thomas Evans
134	Ernie Holmes
193	Mike Traud
233	John Reinhart
260	Phillip Foshee
292	Paul Guglielmi
360	Lynn Sheets
366	Jim Simmons
396	John Evans
?	Bernie Griffin
502	Mike Mahar
283	Tony van den Heuvel

Send updates to gp-4@woh.rr.com

FAIRINGS FOR HORIZONTAL AND VERTICAL STABILIZERS

.by Adrian McClelland, Australia

This is my method for fairing in the horizontal and vertical stabilizers to the fuselage skin.

I originally tried doing this with high density blue styrene foam, but I found that since it was pretty thin, it crumbled and broke up when I tried to sand it.

I found an easy method was to mix up a slurry of West Systems #410 filler.. I made a trowel from scrap ply, with one end radiused to suit size of the fairing I wanted. I spread the filler with the trowel, and if done carefully, it only requires minimal sanding. (The 410 filler is easy to sand, just like the blue Styrene).

I then applied about 2 to 3 layers of cloth, then the deckcloth, lightly sanding each time.

I have added my fitment of the tailcone, just for interest. By using the angle, it allows the tailcone to butt up to the fuselage, with the skins level.

Plywood fairing spatula, cut from scrap ply and radiused to suit.

Spread filler into Gap

With filler applied and sanded.

After glassing

Leading edge of horiz stab to fuse fairing after glassing

The finished product

Just is case you were wondering about the aluminum angle, it's for fitting the tailcone. Fairings

It will eventually be faired in with horizontal and vertical stabilizer fairings.

WWW.OSPREYAIRCRAFT.COM

WWW.SPRINGFIELDAVIATION.COM

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CLASSIFIEDS

For Sale:

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

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

For current pricing, please call or send me an e-mail.

Bob Ringer

Halifax, Canada

Ph: 902-876-2871

Cell: 902-483-4611

E-mail: bobringer@eastlink.ca

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.

Raymond Beazley

Dartmouth, Canada

Ph: 902-465-6141

Cell: 902-497-4187

E-mail: raymondbeazley@hotmail.com

- order by the piece, sub assy or pkg
- Parts tagged for identification
- All parts are cleaned and primed
- Small items within a week, complete packages up to six weeks

For Sale:

LIO-360-C1E6 engine **case**, was used to make Engine Mount. Contact Doug at:

Bundysax@hotmail.com

For Sale:

Fuel Tanks made by one of our builders, Ray Call. Current price as of October 2008, $900 per set. 4 weeks lead time. For more info contact Ray direct.

Ph: 812-934-3260

E-mail: rtcall@gmail.com