

QUEENSLAND ULTRALIGHT ASSOCIATION MAY 2010 NEWSLETTER

Watts Bridge Memorial Airfield, Silverleaves Road via Toogoolawah, Qld

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Gavin McGrath's 701 is back in the air. He had a problem with the heads on the Subaru EA81 motor, but now everything is running OK. This Subaru motor is no ordinary auto conversion. It has a balanced crankshaft, a specially-made billet steel cam, specially-made (to drag car standards) billet steel connecting rods, a modified crankcase (to accommodate the big ends of the new connecting rods), a high compression ratio (10.5 to 1), and the heads are ported and polished, chambered and cc'd, with large stainless steel valves in hardened seats with double heavy springs. It sports two Zenith Stromberg carburetors, a Hirth G20 gearbox and a magnificent looking DUC Windspoon propeller, all optimized for operation at 4800 engine rpm. Jim Gollagher, eat your heart out!



Gavin is just as proud of his plane as he is of his magnificent moustache.



This plane is a serious STOL performer. A very impressive flying machine indeed.



Both Gavin and Jim have shown a lot of initiative with engine development. Jim's report is on page 4, by the way. We are lucky to be able to share their stories.

Oils aren't oils, Sol....or are they?

From: Arthur Marcel [mailto:a.marcel@qut.edu.au]

Sent: Tuesday, May 18, 2010 5:18 PM

To: penrite@penriteoil.com

Subject: Hi-Per 2 Stroke Oil

Dear Penrite technical person,

I would like to know the exact reason you recommend against using Hi-Per 2 stroke oil in Rotax engines. Is it to do with the rotary valves on some Rotaxes or is simply a legal disclaimer.

Arthur Marcel

Dear Arthur,

Thank you for your enquiry. Penrite Oil does not make any recommendations for aviation purposes, as our insurance does not cover this application. If you wish to use a two stroke oil in a Rotax engine which is in an aircraft, we recommend that you go to one of the other oil companies (such as Shell) who do have aviation products. I trust this answers your query.

Regards,

Alan Jeffery, Technical Department, Penrite Oil Company

Many thanks, Alan, for your prompt reply. I take it that you are saying that Penrite recommends against the use of Hi-Per in aircraft due to its insurance arrangements.

Can I ask you just one other question, please? Does Penrite recommend against the use of Hi-Per in land-based Rotax engines such as those used in snowmobiles and water craft?

Arthur Marcel

Dear Arthur,

Thank you for your email. For Rotax engines in land-based or water craft (e.g. Seadoo jet skis), we recommend the use of Hi-Per Two Stroke Oil or our SIN Two Stroke Oil. Under no circumstances are the Hi-Per Two Stroke Oil, the SIN Two Stroke Oil or any Penrite Oil products to be used in aviation applications.

Regards, **Alan Jeffery**, Technical Department, Penrite Oil Company

Editor: I just bought 20 litres of Penrite Hi-Per. I intend to use it in my Rotax 503 Sapphire. The tin cost me \$148.26. That's 7.40 per litre. I got it from Almagamated Pest Control. That's John McCarron's business. Graham O'Connor is the production manager there. He's a good guy to deal with - knows all about ultralights. Bob Burns from the Flying Tigers gave me Graham's name. Bob has been using Hi-Per in his Rotax 582 Lightwing since new and the motor now has 560 hours on it. It has never been pulled down. He recently tested the bearings with a through-the-plug hole bearing tester and they are fine. With the exhaust off, he can still see the cylinder honing marks.

The argument for hybrid oils is that they combine the high lubricity and wear protection of synthetics with the corrosion protection of mineral oils. I investigated both Penrite Hi-Per and Valvoline Racing. Even though the Valvoline has a higher wear protection rating (ISO-EGD compared to ISO-EGC), the Valvoline company recommends against using their oil in any Rotax motor, airborne or land-based, because of the rotary and RAVE (exhaust) valves used in some motors. However, as you can see from the emails above, Penrite recommends their oil for use in any land-based Rotax. So, add this advice to Bob's first-hand account, and Hi-Per looks like a pretty good choice. However, it's up to you. Read those emails carefully before deciding to change oils. Some people advise against ever changing oils.

Now, let's catch up with Jimbo and his final report on engine development:

Hi Guys. This weekend has seen the last of my dyno testing done. All the relevant data has been retrieved and the decisions have been made as to how I'll be setting up my Subaru EA81 converted auto engine. I have used the last two weeks to make the final changes. The engine is back together in a form I hope will be very close to what I'll fly behind.

As I told you in last month's newsletter, the decision was made to give up on the idea of running regular unleaded petrol. The motor will run only premium unleaded because the compression is back up to 9.3:1. I've also gone back to the original cam grind (like an LPG towing grind) with the big change being the larger exhaust pipes. While the heads were off, I decided to ceramic coat the chambers and exhaust port. A very light spray will provide a slight power gain from thermal insulation of those surfaces and therefore help the cooling system.

I only needed to do a couple of runs. The first one was at full power. I tweaked the mixture and timing at 5000, 5200, 5400, 5600 rpm to find maximum power at 5200 (96.2 hp) with only slightly less at 5600 (94.1 hp). This is pretty much what I want and I can see from this a nice broad torque curve which means the motor won't lay down if the prop pitch isn't quite right. I'm feeling pretty confident about the cooling system also because the prop blast over the ducting outlet will drag heaps more air through the radiator than what my fans can on the ground, especially around the dyno when all the ambient air is being heated up.

The final run was at a cruise power of 60 hp at 4600 rpm, mainly to gauge economy and then to do a final fuel cut plug chop to have a last look at plug colours, etc. Here's where things are now looking real good. To maintain that power setting the throttle opening is only 14.0mm which is much less than needed with the bigger cams and 0.6mm lower than the best of the previous tests. During this run, I switched the fuel supply over to a gravity supply bottle suspended a foot or so above the TBI. It had 100cc graduations on it and I measured the time to burn 100 cc of fuel. This was followed by a fuel cut (flat nose pliers) plug chop.

As closely as I could time it, it took 19.6 seconds to burn 100 cc of fuel at the cruise setting (60 hp @ 4600 rpm), which equates to 18.357 litres/hour. I think this is a very realistic figure and if my aircraft can cruise at around 85 knots with this, I'll be very satisfied. The plug colours were all good (after the earlier inlet manifold mods) and I can now say that my dyno testing is complete. I have all the information I need to build myself a good reliable little aero engine....well, fingers crossed anyway!

Shortly, I'll put together a full summary of what I've found and a full spec list of my Subaru EA81 aero engine. Now time to get back to building the plane. I about to turn all my wood into an aeroplane wing – wish me luck!

Cheers, Jimbo

QUA Membership Fees: Due to the cost of building the clubhouse, the annual membership fee has been increased ten-fold to \$500.00 plus GST per member. Holy Smoke! No, only joking. It has stayed the same! Yes, that's right, you get the clubhouse for free. Now, isn't that a bargain? You lucky people! So give (or send) your hard-earned cash to your hard-working treasurer, Ian Ratcliffe. Actually, I think Ian is going to send you a bill so check your letterbox regularly.

For Sale:

I saw Mal demonstrating the Himax on Saturday, but as far as I know, that beautiful little plane has still not been sold. It's a really well-made aircraft and is very clean inside and out. It's just the plane for anyone who wants to get aloft without much expense.

Sapphire Airworthiness Notice

Forrest Hill Airfield



The Sapphire aircraft design has been with us for about twenty-five years, and fifty or more of the type have been manufactured. It has a reputation for being a reliable little aircraft with currently no airworthiness bulletins issued in relation to any of its systems.

That is what I was told when I asked knowledgeable people, including RAAus Technical Manager, Steve Bell, about the Sapphire before buying one. The only negative remark I ever heard was that it needed to be flown all the time because it had a tendency to deviate from straight and level if disturbed. I took that to mean that the plane was neutrally stable. Coming from a GA/gliding background, it never occurred to me that there would exist a popular design with an undocumented dynamic instability on one of its flight control axes. However, as it turns out, the Sapphire is indeed dynamically unstable in pitch.

A notable difference between the Sapphire and most other small aircraft is that it does not use conventional stabiliser/elevator surfaces for pitch control. Sapphires are fitted with stabilators, a kind of horizontal tail in which the whole surface changes angle of attack in response to control inputs. Normally, stabilators are hinged at their centre of aerodynamic lift. This may also be the case with the Sapphire's stabilator, but the axis is far enough forward to make it clearly apparent that there would be a weather-cocking moment around the hinge. In addition, the stabilator's centre of gravity is well behind its rotational axis (i.e., it hangs down). Both these facts mean that, unlike conventional tails which tend to dampen pitch change caused by turbulence, there is a tendency for the Sapphire tail to exacerbate pitch change. Firstly, the stabilator tends to align itself with changes in airflow (weather-cocking) and, secondly, it responds inertially to vertical movements of the tail because of its aft c of g.

Normally, stabilator-equipped aircraft have systems which provide a centering force on their stabilators. For instance, the Piper PA-28 series of aircraft has an anti-servo tab along the trailing edge of their stabilator. This tab moves in the same direction as the stabilator, increasing the centering moment in proportion to the deflection of the stabilator from its trimmed centre point (see photo). It is, actually, the adjustment of the anti-servo tab's centre which trims the aircraft. The other type of centering system that can be employed is a mechanical one working on the stabilator push rod.

Anti-servo trim tab on PA-28 type aircraft (taken at Watts Bridge on Saturday)



The original Sapphire design had no such centering system, aerodynamic or mechanical. The only warning of the aircraft's pitch instability was in the flight manual which instructed pilots to always fly the aircraft hands-on. However, in the 1990s, a stabilator centering system was added by the then owner of the business, Don Bowd. This system is located under the pilot's seat, a very inaccessible (and therefore difficult to inspect) position in the Sapphire. It employs shock cord (bungee strap) to provide centering forces to the stabilator via the push rod. The system is functional, though perhaps insubstantial, relying on the use of hose clips to secure the shock cord to the push rod (see photo).



After buying my plane in Adaminaby NSW, I flew it north to Forrest Hill and quite a bit of the flight was done hands-off, trying to fold maps, etc, without any unusual occurrence. I had been told about the system under the seat, but only in the context that it was a trimming system which had very little adjustment. I don't believe the previous owner had any idea of the system's critical importance to the safe operation of the aircraft. I suggest that this ignorance might be very common among Sapphire operators.

Recently, I had a moment of psychological discomfort when I discovered the consequences of a malfunction in this system. Basically, the deterioration or detachment of either or both of the two shock cords of this system has the potential to cause a sudden and rapidly accelerating change of pitch downwards in response to turbulence (even minor turbulence) when the aircraft is being flown hands-off. Such pitch change puts the aircraft immediately into a negative g condition causing disarray in the cockpit and without prompt hands-on recovery could quickly cause structural damage. Simply the array of objects that come loose in such a situation can cause catastrophe. In my case, the control stick cut-out to the control tunnel had not been properly booted (covered) and several items disappeared down the hole, requiring some extreme manoeuvres to slide them forward again. I actually landed the plane with a small padlock wedged between the pushrod and the bottom of the fuselage, a realisation which, actually, gives me a lot of confidence in the potential of the Sapphire's control setup to survive invasion by loose foreign objects.

I was destined to have this rattling experience twice with the plane, not being quite sure exactly what had happened the first time. I thought perhaps I had accidentally bumped the stick. The second experience was supposed to be a "controlled" experiment but turned out to be more mentally stimulating than the first inadvertent loss of control. Needless to say, though, I was at a considerable height and wearing a parachute. After that flight I started some serious thinking and, on pulling the cockpit apart, the problem revealed itself. One of shock cords had come loose, somehow sliding through the hose clip attachment point on the pushrod. I have since started to build a more substantial and accessible (and therefore more easily inspectable), alternative system for centering my aircraft's stabilator.

I have tried to contact other Sapphire operators to make sure that they are aware of the critical importance of this system to the safe operation of their aircraft but have had no luck with RAAus. Steve Bell initially suggested that I write an airworthiness notice but now he seems too busy writing about aircraft safety to even answer my emails. So, working on the theory of six degrees of separation, if any of you know of any Sapphire operators, or of other people who know of them, please spread the word. Send them a copy of this notice.

Details of Sapphire-related incidents are hard to come by, but there have been at least two unexplained fatal accidents involving Sapphires that I know about. There was one aircraft which dived into the ground from low altitude in turbulent conditions near Holbrook, NSW. The pilot had probably been flying at high speed because he was apparently trying to get back to his home field before a thunderstorm arrived. I believe that particular accident was attributed to wind shear at the time, but by no means proven. End of notice.

An interesting shot taken at Watts Bridge on Saturday



Rotax Discover the North Burnett Rally and Monto Forums

During the weekend of the Queen's Birthday Monto Fly-In, Recreational Aviation Australia will be holding the "Rotax Discover North Burnett Rally" on Saturday 12th June. This event, being a poker rally, will involve flying to five airfields in North Burnett Regional Council's area and picking up a playing card at each location, with a prize going to the winning hand. The airfields are Biggenden, Gayndah, Mundubbera, Eidsvold and ending up at Monto, with local community service clubs and organisations dealing out the cards at each location. Tea, coffee and soft drinks will also be available along the way from Lions Clubs and the SES.

The monthly Biggenden Markets are on this day and, also, the Gayndah Jockey Club, which operates from the oldest course still in use in Queensland, will be running their main annual event. For those interested in dropping in at a country race meeting on the way to Monto, the Jockey Club have kindly offered to provide a free pick up and return service from the airport to the meet. The dress standards are relaxed and for contact details and further information visit this website:

www.queenslandracing.com.au/raceclubs/show.asp?id=51532 .

If you'd like to take advantage of this service, please contact Peter Strohfeldt (details on the website) sooner rather than later, as this will assist the Jockey Club with organising this service. By the way, if you are going to have a flutter, don't forget about last light.

Forums at Monto will be held on the Sunday, with subjects including *Human Factors From A Medical Perspective - Dr Petar Novakovic*, *Operations At Non-Towered Aerodromes - CASA AvSafety*, *Operations - Lee Ungermann*, *Flight Instruction - Steve Tizzard*, and *Insurance Matters - Peter Bugg*.

Nick Sigley

This is rather picturesque, isn't it? Another shot from the All-in Fly-in on Saturday



Formation practice with Kev Walters (photo taken by Jim Gollagher)



Coming events:

There are 11 Aviation Events scheduled across Australia during the next 30 days. The full events calendar has 62 events in the next 365 days.

Details at: <http://www.aeroclub.com.au/events/>

- May 23-29 Yarrowonga, VIC, Megafauna Flyers Fly-Away
- Jun 5 Luskintyre, NSW, LAFM Lunch with the Tiger Moths
- Jun 6 Wollongong, NSW, Annual RV Fly-in Brekkie-Show & Shine
- Jun 6 Wagga Wagga, NSW, BBQ Lunch
- Jun 6 Gatton Airpark, QLD, Breakfast Fly-In
- Jun 11-13 Betoota, QLD, Betoota Gymkhana and Motorbike Event
- Jun 12-13 Wentworth Y-WTO, NSW, SSAC Annual Queens Birthday Fly-in
- Jun 12-14 Watts Bridge, QLD, AAC QLD State Aerobatic Titles
- Jun 12-14 Atkinson Dam, QLD, Dam Buster's 2010
- Jun 12-14 Toogoolawah, Skydive Ramblers Drop Zone, QLD, Queens & Ramblers Birthday Boogie Bash
- Jun 19 Dunwich, North Stradbroke Island, QLD, Straddie Breakfast Fly-In

The next QUA meeting is on Saturday June 5th at 11am at the Watts Bridge clubhouse. Be there or be square!

PRESIDENT: Peter Ratcliffe 0418159429 **TREASURER:** Ian Ratcliffe 0418728238

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QUA Inc TECHNICAL DIRECTOR: George Perez 0423536

MINUTES OF APRIL 2010 GENERAL MEETING

MEETING OPENED	08.00 pm on 10 th May, 2010.
APOLOGIES	Richard & Glenda Faint, Bryan Schollum Richard Sweetapple, Vern Grayson
VISITORS	Neil Bowden, Olaf Weedbrook
ATTENDENCE	Fourteen.
PRESIDENT'S REPORT	QUA Inc membership fees are due now. Renewal forms / invoices to be sent out by Ian. Letter received from the Isis Flying Club with an invitation to the fly in at Childers Airfield. All In Fly In at WBMA is on Saturday May 22 nd 2010. Drinks and QUA stickers will be available for sale. New refrigerator has been purchased for the clubhouse. More wall sheets will be purchased for the toilet area. Work will be done to finish the tiling and shower.
TREASURERS REPORT	No report due to being on holidays. Previous Closing Balance \$ 6,582.89 Peter McCormick has made contact again. He plans to pay outstanding rent up to July 2010. Michael Brooks still needs to be contacted regarding rent.. Investment account is to be set up when convenient
SECRETARIES REPORT	Request received from the Queensland Air Museum for the QUA Inc to hold a display at the Open Cockpit Weekend on 3 rd & 4 th of July 2010. QUA Inc Logo stickers are available at \$2.50 each. One hundred were printed for members to use.
WBMA REPORT	Bruce Clark is now the nominal president as well as the airfield caretaker. Black snakes have been seen recently Shale is being used to resurface the roadways including in the clubhouse section. Liz Cook is applying for a grant for a marble monument for the memorial area. Grant still ongoing for the new toilet / shower block. Caboolture Gliding Club had a good weekend recently. The tug was working hard. The petrol bowser also had good sales.
GENERAL BUSINESS	Mud wasp nests have been found in hangars and engine cowls. Need to check thoroughly when doing your preflights Amberley air space boundaries will be revised after June 3 rd 2010. The zone is being reduced in size from the north. New VTC charts are available showing the updates. The Inglewood Fly In went well with good attendance. Next QUA meeting is on Saturday, 5 th June at Watts Bridge.
THANKS	To Robin for providing the supper once again.
MEETING CLOSED	09.00 pm.