THE BRIAN WINCH COLLECTION

Issue 1 - 9

HE OF THE OILY HAND

THE BRIAN WINCH STORY

BY ALISTAIR WELCH

Brian Winch is a name that should be familiar to anyone that has read a hobby magazine over the past 30 plus years. Not only is he a major contributor to this magazine but has written for magazines around the globe.

Arguably the world's most knowledgeable model engine expert, Brian has been an active aeromodellers for most of his life. I had the opportunity to interview my fine friend to uncover the man behind the articles.

FRC: How did it all begin for you?

Well, it goes back a long way - 81 years at this stage when I was born in 1937. As you would know, WWII began in 1939 and ended in 1945 so my young days were spent under the shadow of that conflict.

My early days at school were slightly clouded by the threats of bombings and invasion but that was not a realisation that caused panic at such a tender age. What did come of it was the little booklet I received that was for identifying overhead flying aircraft - all the types of foreign and friendly so you could consider evasive action if you saw enemy aircraft.

We had a large air raid shelter in the backyard so, in the event of an impending attack or the warning of the sirens, the family could be down the shelter like startled rabbits but…not for me, to the horror of my mother. For me the interest was the aircraft flying overhead which were 'Hurricanes' 'Spitfires' or, if multi engined, 'Bombers' as they were the only aircraft I could identify correctly or fancifully - more the latter really.

I had a deep interest and liking for aircraft and I drew many (pencil and back pages of school books) that were absolutely perfect scale in every detail and replicas of the aircraft I saw in my imagination or newspapers. It was my young lad's imagination that they were drawn true and correct even if I drew most in a Farnborough Pass attitude to show the wings as I never figured out how to draw a wing from the tip view.

FRC: What was your first model?

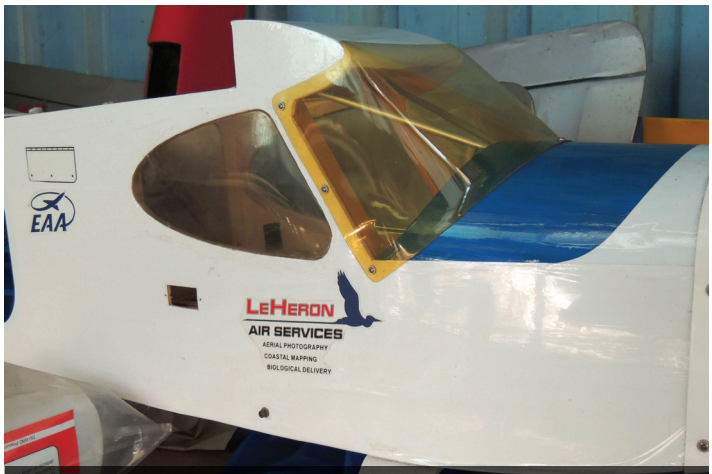
An absolute disaster.

My father was in the CMF (Citizen Military Forces) on weekends mainly as he was employed as a tradesman fitter and turner at a company where a lot of armament was produced. He spent a lot of time machining very large gun barrels (anti-aircraft) and the like so he was in a 'protected industry' but, as with many, he was inducted into the CMF for homeland defence.

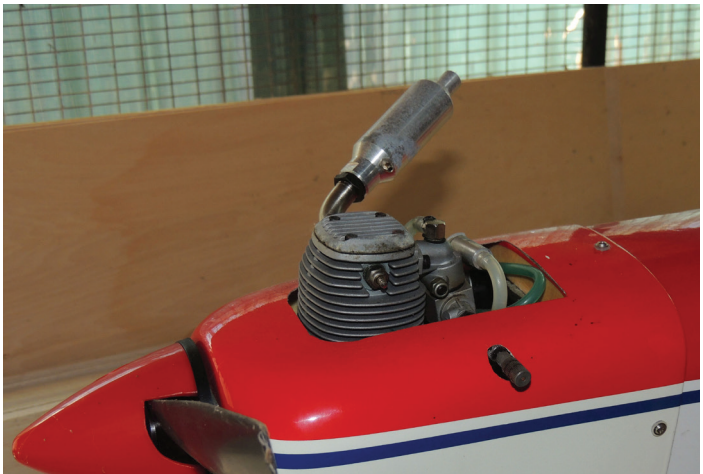
As things heated up on the battle fronts worldwide and Australia was under a real and impending threat, the manufacturing companies geared up for massive increases in production so almost every day was a working day and men were retrieved for this work from the CMF - my father being one of them.

He had the odd day off (rest day) but I cannot remember the frequency. However, in some way he got his hands on a kit for a rubber powered model - a

A rare moment in my workshop where I was recently fitting a Mills 1.3 diesel to a nice radio assist free flight model - a nostalgic moment.



At 3.2m span, this very nice Rascal will be a pleasure to fly when I fit the radio and a multi engine. I am considering a Saito Ti200 twin for power.



The RCV rotary valve .90 that has an odd sound when it is running due to the internal gears. Very reliable and good power.

One corner of my model workshop showing just a few of the models in flying condition.

monster of 16" (40cms) wingspan (well… it was big to me as I was not more than a tadpole at that time) which he built and covered in blue and black tissue - a magnificent aircraft which we were going to fly the next time he was on leave.

Never did he get to fly it - my mother lifted it off the lounge chair in order to replace the cover and she put in on the floor for a moment. My little - just walking - sister saw her opportunity and promptly sat on it.

To this day, some 70 odd years later I never let her anywhere near any of my models just in case she remembers how she did it.

That was the one and only interest my father had in model aircraft so I was then on my own and I gravitated to carving solid models. A simple kit with a small balsa block, a section of 1.6mm sheet for wings and empennage, a three view and a piece of carbon paper.

I never figured out how to use the carbon paper for the 2 dimensional fuselage (okay for wing and tail pieces) so I did the old sculptors trick - a block of material, a model and you carve all the material from the block that did not look like the model. I really did learn a lot from those great little solid kits such as cutting and sanding balsa, gluing (Tarzan's Grip was the only glue to use) and aligning the various surfaces.

When I graduated to my first flying model kit - a KeilKraft Zephyr Glider, I was able to build and finish the model correctly and, to my absolute joy, it flew.

After that success I built many gliders and rubber powered models and moved onto designing and building my own from scratch which was incredibly rewarding when a model flew 'right off the board' as is said.

FRC: What about your first engine?

It was actually a donkey engine - a simple vertical boiler, firebox underneath and a plate with the cylinder pivot mounted on it. The piston and connecting rod connected to a bent wire crank supported by two brass tab bearings and a flywheel was secured to the extreme end of the crank. I fired it up with bits of candle, little pots of methylated spirit and even a real fire of small chips of wood. I really enjoyed watching that piston and crank operating and it was an absolute turning point in my life as I learnt many things that stay with me still with three guides that I still use and refer to.

First was to 'always read the instructions or information'.

I first saw a photograph of a model engine (Frog 175 petrol) on a cereal packet that you could obtain with so many cereal box tops. The cereal was dreadful stuff from England (the Poms wouldn't eat it so it was sent to Australia) but I persevered stuffing the glug down my throat until it was pointed out to me (by an adult) that the offer applied only to UK residents.

Still, I was now aware of an engine for

I have a number of storage facilities for engines according to type and value. A varied range here with a mixed pedigree.


Various types of models in this section - some flyable - some waiting for some service but all part of the pleasure of modelling.

powering model aircraft so the second lesson came into play - 'you cannot get something for nothing - there is always a bottom line' so I set about obtaining money to purchase an engine but… money grew even less on trees in those days so came another valuable lesson, 'there are always ways of earning an honest quid' (quid - previous currency - 1 pound…about 2 dollars) and, added to that was 'determination and effort will eventually pay off.'

I collected rags, bones and bottles to sell to the 'bottle-o' merchant when he came around in his horse driven cart. He purchased any glass containers, rags and bones and paid well for them. I kept soft drink bottles separate as you were paid more for them when they were returned to a shop but you had to fight hard as the shopkeeper would try to pay you with lollies (which was a better deal for him).

I also collected newspapers as these were purchased by the pulp mill but that was hard work as the mill was about 3 miles away and I had to pull a dreadfully heavy billy cart (that had steel wheels) with the papers. A few sundry jobs - polishing shoes, running errands for neighbours, delivering fruit and vegetables for the green grocer bought in pennies but then I struck the jackpot.

On the edge of the township was a very nice, large historic homestead owned by a nice gentleman who had a penchant for collecting cats. I like cats and I was looking at some of the cats in his yard one day when he came out and spoke to me (a bit of a surprise I suppose). He asked me if I would like to earn some money mowing his lawns and trimming the gardens. This work was not new to me as I mowed the grass at home (we had grass - not lawns) and often dug the measly garden for all it was worth. Mowing in those days was by hand - a pushmower that was a tremendous effort if the grass was allowed to grow high. Looking at the neat lawns in this property indicated that the mowing would not be a backbreaking labour and the owner wanted them done every week. Then he almost knocked me flat - he said he would pay me 7/6 (seven shillings and sixpence - 75 cents) which was an absolute fortune in those days.

I mowed, trimmed, assisted at times with the cats and my cash register was clanking away merrily until I checked and calculated I had enough money (and a bit left over) to purchase the magnificent Frog 100 diesel I drooled over almost every day as I pored over the Hobbyco catalogue. It was then 1948 and life was slowly but surely stabilising after the war which meant my father was home more often on weekends and he came with me - and paid my sixpence (5 cents) train fare to Sydney to visit Hobbyco at 561 George Street - the name and address burned into my brain.

I had enough money for the engine and a bottle of fuel but I never figured on having to have a propeller so my father 'loaned' me the small amount for the yellow nylon propeller suitable for the engine.

My father insisted on being the person to start the engine as it could be dangerous with the powerful(?) whirling propeller but his attempts were in vain - not even a phart from the engine and that cast a grey cloud over my life as it would have to be returned 'sometime' when the opportunity arose to go back into the city (1 hour - 15 minutes train ride and two fares to be paid.)

Sitting on my bed in my very small (add on) room that night my first lesson came to me so I read and re-read the instructions and something twigged. I read the fuel requirements - castor oil, kerosene and ether and the warning that it should be used in the open due to the possible effects of ether

I knew the smell of ether as an aunt had used it to 'put down' a sick cat and that smell stayed with me. That's strange, I didn't smell ether in the fuel so…read the fuel bottle and there it was - 'add one part ether to two parts of the fuel mix' - 'somebody' hadn't read the instructions but I wasn't going to point the finger at my father - he could be a bit 'short' at times.

The following Monday, after school, I went to our friendly dispensary (chemist these days) and purchased a shilling's (10 cents) worth of ether after convincing Mr Simpson (the pharmacist - chemist) of my need for it. At home I carefully measured the fuel mixture, re-read the instructions for the initial compression lever and needle valve settings, primed the engine as per the starting instructions, gave the propeller a couple of flicks and…the dear old Frog burst into life.

What a great sound, great smell and a great vision of that propeller whizzing around - I was ecstatic but only for a moment as my father had just come home from work, heard and saw the engine running and, when he found out I did it on my own, he growled and snarled, fumed a bit and that was the absolute last time he ever had anything to do with my modelling hobby. I think, these days, we would call it a 'dummy spit'.

FRC: How did you progress from those early days and develop the interest in engines.

I never got over the first time I had the engine running and engines became a great fascination for me. I certainly built and flew many models and, while I enjoyed control line flying, I think there is nothing to beat the majesty of an elegant free flight model taking to the skies completely unaided so many of my early models were of this nature with a range of engines for power. I enjoyed gliders

- large and not so large, experimental models, speed models (control line) and getting into a team race had a lot going for it especially with one favourite model, Lazy Daisy Mk 2 with a 3.5cc DC diesel.

My first encounter with a glowplug engine was a Frog 100 mounted on a board which I held for the modeller (at our flying field) while he started it. Boy, that was some power but the noise was ear splitting. I preferred diesels, but the capacity was limited to about 5 cc and a diesel of this capacity was way beyond my budget as well as being rather difficult to obtain.

When I was offered a gummed up (castor oil) Frog 500 by an English modeller (immigrant) who had run it in England then packed it away until he came, with his parents, to live in Australia, I made a suitable swap (as was common in those days) and set about 'fixing' this great engine. I carefully (with considerable effort) disassembled the engine, marked the bits so they would be back in the same place then put the lot in an aluminium pot ('borrowed' from the kitchen) and covered the lot with the cleaning solution my mother used to degrease the gas frets on the stove.

Yep, cleaned everything well and truly. The aluminium bits - including the pot - were gone but the steel and brass bits were clean as a whisker. The cleaner was sodium hydroxide - aka caustic soda and it converted all the aluminium to a grey sludge. My engine was lost and my mother was not at all pleased about the loss of one of her 'favourite' pots. Another lesson learned and still used - caustic soda dissolves aluminium and aluminium alloys - and I use it at times to clean aluminium fusion welded onto crankshafts and the like of engines sent to me for repair after a seizure so - an expensive but good lesson.

Encouraged by the fact that I had been able to strip the engine down, I decided to try a few others and found engine work was very satisfying and incredibly interesting.

My final years at school was at a boy's technical college and there I 'encountered' the gymnastics teacher, Ivor Stowe - later to be Ivor F - who was an absolute fanatic when it came to model aircraft and engines. He had a club at Doonside (where he lived) name Doonside Aeromodellers Club - we had meetings and model building sessions in his model shed and studied his engine collection - piled in a heap in a second-hand glass showcase from some shop that went out of business.
When I was doing my apprenticeship in Fitting, Machining and Advanced Practices I was able to make a few engine parts and then a couple of engines that sort of ran but the life expectancy was not really great as I used scrap materials of an unknown quality but…it was excellent experience.

This was quite unexpected when I was notified in 1993 that I had been awarded a position in the Hall of Fame for my journalistic contribution to aeromodelling. Somebody must have liked my work so I keep going as best I can to continually justify the great award.

In those early days I had a brief fling with radio control with my close mate, Barry Lee (mate from school days, modelling and still a close mate 'down the road a bit'). Not greatly impressed with the push button control and that models seemed to be a total write off when they crashed (frequently) so I kept on with the control line and free flight aspect of modelling.

When Bob Young produced his very successful digital proportional radio control sets I could see a bright future with this control system. Fields suitable for free flight were becoming a rarity so, being able to control a model within a flying range had a great appeal for me. It was Barry who arranged for my first set - a 6 channel Silvertone radio in magnificent livery.

Barry worked spare hours at a toy and hobby shop owned by a woman who had little if any knowledge of model aircraft so he was a valuable asset. One day he saw the radio set (in its box with all trappings) in a secured cabinet in the store room so he asked the owner about it. She was frightened to put it on display as it was so expensive, and somebody might 'shoplift' (steal from retail store) it and she wished she had not purchased it to sell as it caused her so much worry. Barry mentioned it to me and quoted the price she was prepared to 'let if go for' which suited me nicely as I was also working spare hours at a camera shop to 'support my hobby' as is said.

Well, I became the owner of this magnificent radio but found the battery was not holding a charge so my next contact - that ended up as another good friendship - was Bob Young who analysed the problem as a 'buggered' battery - a NiCad left for some time without being charged - fatal to those batteries. New battery fitted, I was into radio control flying and that was the first of many radios over the years.

I have been the Safety Officer at Model Park (SSME) for about 40 years ensuring safe practices for all aspects of modelling as well as the occasional assistance for engine problems.

FRC: How did you get into writing magazine articles and engine reviews?

I gave a lecture/demonstration at the Sydney Society of Model Engineers about soldering any metal to any metal including aluminium and, as is the method of ensuring your audience remembers your information, I handed out a set of notes with the pertinent information to all the audience.

Somehow Merv Buckmaster - then owner/editor of Airborne magazine got hold of a copy and contacted me to ask if he could use it in the magazine and that he would pay me. Why not? It apparently went over well with readers who asked for more so Merv offered me a position as contributor and sub editor (dealing with reader's letters) so, the Airborne Engin-ear came into being. The Engine-ear was my consideration as I would be listening (ear) to readers problems about model engines.

Engine reviews came later and that was a bit of an event. I purchased the first O.S. 60 four stroke (open rocker style) and decided to write about it in one of my articles. I had disassembled the engine and photographed the parts but there was a little problem. As was good engineering practice (in early days), when I removed the 'C' type collets from the valves, I threw them away as (full size practice) they were not suitable for re-use (actually, they are for model engines as I found out over a few years).

I went to a model shop close to where I was working at the time and was told that the collets were not sold separately- I would have to purchase valves, springs, collet cups and collets at a cost of 22 pounds ($44) each - an incredible amount of money for those days (1976). I made my own collets and reported on this in my article when I got to talk about the engine. Well, talk about letting the cat amongst the pigeons, this also let the dogs out among the cats.

Tony Farnan, owner of Model Engines Australia got his knickers in a real twist and complained to the editor along the lines of, "what is the use of me paying large amounts for advertising when Brian Winch reports as such?".

I didn't know Tony at the time, but I rang him and really copped an earful about how he had every part for every engine and so on. He said he had packets of the collets ready at any time and you purchased two only as required. I replied that it might be worthwhile letting his retailers (model shops) know about this and then the bomb really dropped. He asked who the retailer was and, when I told him there was a loud silence from his end of the phone line until, in a 'caught him out voice', he said, that person is not a seller of products from us and, if he has O.S. engines they are illegally obtained and sold.

Wowie - that really pushed the button as Tony had the O.S. name registered to his business (Model Engines) which meant that nobody could sell them unless they purchased them from him. To do so is commonly known as 'back-dooring' - not a very nice practice at all (for many reasons). As to what transpired with those two gentlemen I have no idea other than O.S. engines were not sold in the shop after a couple of days.

As for me, I received a packet of the collets direct from O.S. (Japan), another packet from Tony Farnan and, for some strange reason, a packet from the Silvertone Model shop (Bob Young) - I now have, let's say, a lot of O.S. 60 collets but my home-made ones are still on my engine.

Anyway, a little while later Tony Farnan rang me and asked if I would like to carry out a full engine review which, as I considered, was a tester to see how I conducted the test and what I wrote. He sent me a nice little 25 two stroke which I enjoyed testing, pulling apart, photographing and reviewing. Apparently, Tony was pleased with the report as was the CEO of O.S. who reported that 'first engine (production) to Farnan san and second engine to Winch

A very nice Extra with a petrol two stroke that fly's extremely well and looks nice as a bonus. That unpainted wing beside it is 3.5m span for a large, slow flying model.

san' (san in Japanese is our Mr, Mrs etc.). Tony Farnan held several records of sales per capita for O.S. which pleased them extremely and, apparently, also pleased with my reports so, every new O.S. engine that was produced, I received number 2 off the assembly line. Different engine brands followed and, for a while, a sample of almost every engine that was sold in Australia ended up on my test bench for testing and review.

Some time later, I received an offer from Nexus, the UK company that produced, inter alia, the RCM&E magazine - a very high quality production - and the offer was for the use of my engine reviews and a monthly column under the logo of 'The Wizard Of Oz' which was the work of the then editor. I had suggested, 'Modelling Down Under' or similar but the editor insisted on WOO.

I also wrote for about 10 years for RC REPORT in the USA which was quite enjoyable, a couple of articles for a quality Italian magazine and, at the request of the UK company, I wrote two complete books on engines and the engine section for David Boddington's large scale book.

FRC: What engines and models do you have?

I have a very good supply of engines many of which I often bring out of hiding to examine (admire) again and, if the mood takes me, to give it a run for no other reason other than to enjoy the experience. I have a large hangar of models of many types and sizes - some have a few hours on the clock, some are yet to be test flown but the moment is always to be proposed when time permits. I also have a large selection of kits dating from the late 70's which I purchased, many from model shops closing down, and some are now classics which might be built when I retire but, in the meantime, I enjoy looking at the boxes and reminiscing on when they were current and popular and I had a lot more time for flying.

I wasn't a great one for crashing models - couldn't see much sense in it so my models tended to last a long time and I still have some in good flying condition from the days when servos had 4 wires and there were only NiCad batteries.

The reason why a crash was a rarity was due to not pushing the envelope, as is said. I knew and understood the capabilities of both the models and myself so I never ventured into the 'wonder if the model will (whatever)' realm which is, to my consideration, the reason for many crashes apart from poor preparation, checking and noting a problem before it becomes terminal.

FRC: When will you retire?

Well, I have tried it several times and found it rather boring but I have considered that, some time in the future, I will retire …again… and then build/fly more models, finish off a few workshop projects and manufacture a few more engines that I have had in my mind storage for quite some time. I also have a number of drafts for articles and books of non-modelling topics that I will tidy up and see about publication. Should be interesting as life is and always should be in bad times and the good times which we should all strive to have in the majority. After all, the journey of life is a one-way track so see it all now - you don't know what might be ahead.

To finish off as I have to go - (there are engines to be repaired on my bench) - from my very first years of understanding I have asked questions, respected people who were able to explain so many topics and answered my many queries. To those people I am eternally grateful for it is from those experiences I have shaped my life so far and will continue to do so. To so many I say, thank you - you provided me with valuable assistance and knowledge.

THE WINCH REPORT

BY BRIAN WINCH

This is a very rare bird - a Fokker DR1 at ¼ scale and scale colours. Some modellers whine about building one wing but Alex O'Connor was quite happy building three and doing a fine job overall. Power is a reliable DLE 30.

Before I start my usual shenanigans, as those who have followed me throughout the years know, I have great pleasure in contributing to a worthwhile modelling magazine, particularly this new publication as it offers a fresh, new approach to an Australian based hobby magazine.

Over the years, I have had contact with the editor of this fine presentation and we have shared our thoughts about the magazine landscape, the hobby plus everything in between. I have always found Andrew to be open to suggestions, passionate about the hobby and building a great publication of which we can all be proud readers.

Andrew's thinking about the vision of the hobby is new, fresh and dedicated. His intention of overseeing this publication is very clear - it's all about helping the hobby stay vibrant. From a commercial perspective, I know he could make more money elsewhere than in this niche field but the fact that he has made the jump after years of planning is testament to a man who is willing to back his convictions. He has a full understanding of the many challenges ahead but true entrepreneurs back themselves in and then work to deliver.

As a contributor to magazines around the globe for many a year, I have seen numerous publications come and go so I am hoping all of you modellers, whatever your discipline, get behind

Simon Harvey is more than pleased with his 107" Citabria powered by an RCGF 20cc petrol engine. It looks very pleasing in the air as well.

this new magazine that is, really, put together for us.

The hobby industry is a tough game and many who try say there are better ways to make money than get involved in the business side of aeromodelling. So, when a youngish, passionate fellow puts his money where his mouth for the sake of the hobby then I for one will stand by his efforts.

One fact for sure - **FLAT OUT RC** could not have come at a better time to assist and boost our hobby.

As hobby businesses struggle to survive and global competition is strong, the only way to stay relevant is to promote it and keep those involved motivated to keep on going.

The industry that supports us needs to get behind the push to maintain relevance for their own sake and get back to investing in improving their lot rather than retracting into a hole where the death knell sounds.

Our hobby needs to grow up and from one sometimes grumpy old man to those that have been driving our industry for many years, please take note and understand we are in 2017 not 1982 so it is about time we got with the times and drag our wonderful hobby into a new more modern era. Our old ways are not competitive in today's world.

The good ol' Aussie way of having a go needs to be supported. If you have been around the hobby a while and already speculating the demise of this new publication understand one thing. It will not fail due to of lack of effort but on the back of you the reader and the industry not forking out a little of your pocket money to help keep it going.

If all our hobby media dies in this country then it will become a distant memory, lost forever and another nail is driven in the hobby's coffin. While we have the choice, I urge you to give this magazine a go and help it become something we can all hold in high regard.

I for one am excited about the future and will support anyone giving it a go to

keep this hobby driving ahead – I hope you will be with me

See you in the pages,
Brian ('Oily') Winch.

HAPPY NEW LOO

Maybe a slightly indelicate topic for some readers but it is a fact of life - we all have the need to visit at least some part of our day but…some visits can be, let us say, less than enjoyable? pleasant? hygienic? scary?

I know there have been times in my life so far when I made a necessary visit for, fortunately, a stand up dispatch and wondered hopefully that the bacteria, germs, bugs and general nasties could not jump high enough or maybe they were sleeping.

It's when 'something' growls at you in the solitude of a tin shed dunny that you need to move quickly out. Well, if there is ever a time to spend more time than necessary in the 'comfort station', it might just be at the Wagga Wagga flying field where the club has just laid out $22,000 for a super beaut, all bells and whistles toilet and shower block.

In this new 'chez convenience' are relieving cubicles for both genders, a hot water shower and a gentlemen's trough (okay - a urinal) which I found

Airshow

Bring the family for a great day out!

Food and Drinks available

Wagga Model Aero Club
Presents

The 45th Annual

World War II & Military Scale competition

Scale radio controlled models on display & flying throughout the 3 day event

Friday, Saturday & Sunday
20th 21st & 22nd April 2018

Models Flying from 9.00am – 5.00pm
15kms South of Wagga on the Olympic Hwy
For directions or more information check out our website at www.waggamac.org

quite interesting as I could look out the large window (above waist level obviously) and view the scenery while I was 'watering my horse' as is said in polite circles.

So…it's not such a big thing that a model club has a loo - it is the fact that this club has pulled together to constantly improve their lot with facilities for both themselves and visitors and the nice new elevated 'comfort station' is their latest achievement.

'Tiggies ' will always be popular and modelled many times over but you have to spend time to have one as good looking as this fine example.

I just caught this one when I had been distracted for a moment and noticed the wheels are up - hope it is taking off.

As they run a large clubhouse and kitchen, electric power is a necessity as well as for various power outlets and they hire a very large diesel power generator for the job. However, their next project is to purchase one - probably an 'as new' reconditioned unit and that will add even more comfort and stability to the club.

I mention this as a pat on the back for the club and organisational committee as an example of what can be done when people with a common interest can pull and work together rather than whining about losing a flying field and similar tales of woe.

Some modellers can be mean as buggery - wouldn't put their hand into their pocket in case they get bitten by the spiders that live there. No chance would they throw a few dollars on the table or get off their behinds and put a bit of effort into helping or improving their club. All their efforts are put into whinging and whining about how the sky is falling on them.

Look around - there are a number of clubs that have their own field and great facilities and the benefits of those have come from members getting in, 'doing their share' and throwing a few dollars into the hat.

Now, it would be obvious to readers that I have had a recent visit to the Wagga Wagga club and they would be right on the mark as I was there for the annual Anzac weekend - World War 2 and Military Scale competition and what an enjoyable time it was.

This event (2017) is the 44th year and, already, plans are being drafted for the 45th in 2018.

You are cordially invited to compete or to visit and enjoy a great lot of flying,


It's amazing what you can make fly.

looking or photographing some absolute top models, talk 'Aeromodelese' with the competitors.

As a bonus you can spend some time in the new and large Albury RC Models & Hobbies marquee where you will see, on sale, more model equipment than your local model shop (if you have one, that is). Ken and Rob, the business partners of this hobby outlet really provide a great opportunity to browse and/or buy an incredible range of model products. It is good to have a first hand actual look and feel at items and even 'sniff' the atmosphere (I like smelling and feeling the engines HoHo).

THE EVENT

Even though the club has had a big change of personnel for the organisation of all events, it still ran quite smoothly and, virtually without a hitch.

One thing that was overlooked was advertising the event and this is very important not only for possible attending modellers but members of the public who come for a visit…and to buy from the canteen and model shop.

Guaranteed it won't be left off the list next year as the organisers will be well versed by then and…I am sure they will get a tap on the shoulder well before hand just in case.

As is usual, two flight lines were operating and judges were on the ball with some very good objective judging from that which I could see and by the allocation of prizes at the conclusion of the event. There certainly was some grinning winners and I did not hear anything untoward about the final scores (at most events there are a few whiners). Somebody dialled in the perfect weather so flying was without a loss or gain with unfriendly conditions. All in all - a great weekend and there is a spot for you next year - either flying or watching.

Sift through my photos for a sampling of what to expect.

Phil Poole holding his modified 48" span 'Scram' originally designed by Danny M to Z (aka Maslowicz) and the engine is an MP Jet 0.061 - lovely combination.

THE VETERANS EVENT

The Muswellbrook Gathering (aka The Veterans) event is held each year in May and, from the beginning (just on 30 years ago) it was held on the first weekend after Mother's Day.

Due to work and other commitments, the then president 6 years ago changed the date back to the first weekend in May but, the gods of weather (or who/whatever controls these events) were not happy and they poured rain down upon us - great bucket loads of rain…water up to your eyeballs (or so it seemed).

The weekend was washed away and this was not an occurrence to make modellers happy. The visiting modellers either stayed in motels or camped/caravanned on the field all at some considerable expense.

As it was a total washout for the previous 3 years, modellers were losing interest and the call was for it to return to the original date allocation of the third week in May.

I emailed as many modellers for whom I could obtain addresses to suggest we put this to the club and the response was overwhelmingly in favour so, I put it to the club and, thankfully, they agreed.

Now, like a lot of clubs (any type of club) it is difficult in these times to roust out a few volunteers to lend a hand.

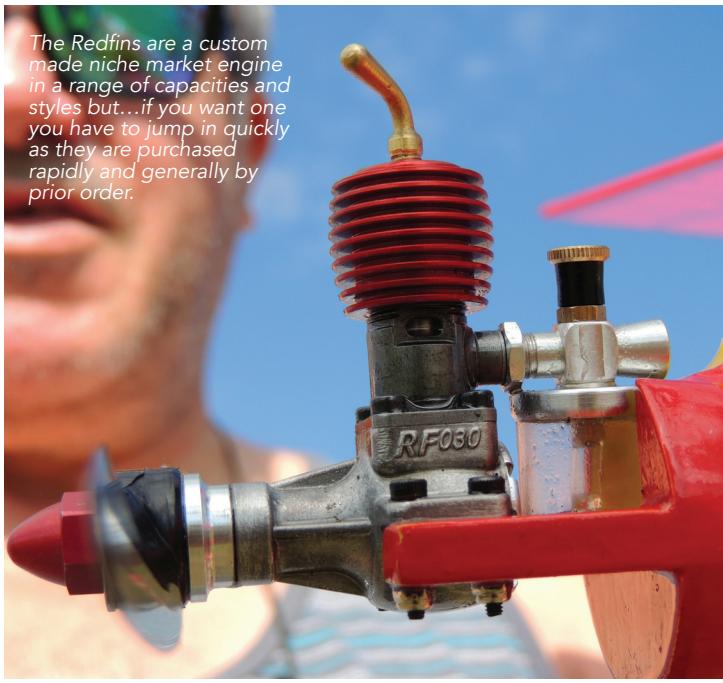
Generally it is left to a willing (scant) few (sound familiar?) but, those who did turn out deserve a lot of credit as all was well organised and the event went smoothly beyond the date allocation (more on this soon).

As is now a tradition of sorts, I organised a Chinese banquet on the Friday night which always goes down well. The restaurant is close by the most used motels, clean and comfortable and the owner and his wife are well known for the quality of the food they prepare. I have to tell you - I am a bit of a trencherman (look that up) when it comes to a Chinese banquet and for the measly $22.50 cost per head, I have a bit of a struggle to walk the few hundred metres back to the motel at which I reside. No…I am not a boozer - it is the load of food and the strain on my muscles refilling my plate so many times when everybody else has finished. (Maybe I am getting old???)

Now here's the shaky bit. On the way to Muswellbrook on the Friday morning it rained cats, dogs and maybe even dinosaurs…the rain pelted down all the way so hard I was down to crawl speed at times on the road as vision was quite impeded by the water lashing the windscreen. I was not able to contact all those who usually come to the dinner but we still had a reasonable number and it was certainly brollies to the fore on the way to the restaurant.

One of the young fellows who was there with his father and grandfather made a courteous comment about the rain and maybe the weather gods were against me personally. I assured him that The Oily Hand would rise up, make a command and all would be well (and I was hoping against all hope the weather would pass over by the next day).

Next morning, at first light, I saw foggy weather descending over as far as I could see - a good omen as this weather generally heralds a good day following. By the time I had finished my breakfast (not a big breakfast mind you - I had dined rather well the night before) the clouds were almost gone and blue sky was giving promise of a nice day.
There was a good turn up of modellers of all disciplines with some really classy free flight models, expertly crafted control line models, a super



The Redfins are a custom made niche market engine in a range of capacities and styles but…if you want one you have to jump in quickly as they are purchased rapidly and generally by prior order.


You've got to love the lightweight free flight models. Crash them one day - fly them the next (after patching). The flexible propeller will also take a lot of punishment without damage.


This is how it started and remains for many - a free flight model, diesel engine, a bottle of fuel and a rag for oily hands - how great the memories. Andrew Linwood designed and built this 1 metre span model with a carbon fuselage. Adequate power with a Doonside Mk1 Mills .75 diesel.


This O.S. LA 40 was successfully converted to diesel quite a few years back, was used and hung later in storage. It was 'found' again and bought to the Gathering where, after a good prime, it started first flick.

demonstration of speed flying over many laps with pit stops by Grant Potter and his very capable mechanic controlling a super hot diesel powered speed model and a variety of R/C models that included some big stuff, some different stuff and some weird and wonderful stuff.

Some clouds hovered around once or twice and we did get the edge of a deluge for a short period - not a problem, plenty of cover for sitting and talking and then, on Sunday, dial a day as far as the weather. Sunny, blue skies and just gentle wind ideal for the free flighters. On both days there was a constant supply of food and drink available and a gathering on the Saturday night at the local RSL club for a good nosh and natter.

On the Monday morning, on my way home, I again pass the field and, as I slowed down I saw some caravans still residing and half a dozen modellers 'free flighting' on the field. Some blokes just never want to leave.

Reg Towell never fails to come up with a superb model and this scratch built Sea Fury powered by a Saito 72 is a fine example.

VERY PLEASING OBSERVANCE

My previous career as a Police Officer gave me a great amount of insight into the behaviours of young people - a duty of which I was extremely interested, studied and wrote about as well as giving many public talks on the subject.

One simple factor that stayed with me over the many years was (and still does) is that there is no such thing as a bad child but there are plenty of bad parents or unqualified parents - people who should never be allowed to bring up children.

We are all born neutral - devoid of everything except the basic and automatic will to live. After that, adults, teachers and peers teach us about life and educate us in the knowledge to grow into an adult. It is here we find so many failures in all those contacts with the teaching adults and peers and these are manifested on the child who, simply, becomes a bad person - a person who has, in literary terms, wandered off the path of good and taken up a life of evil.

It has been my experience that a young person who is given attention and time by the parents (quality time and attention) will greatly benefit and find the path to growing into adulthood much straighter - no kinks or forks in the road.

Dealing now (specific examples) with young fellows who are linked closely with their father and aeromodelling I have seen some really pleasant outcomes over many years.

Young fellows who have gone on to a successful career, are still close to their parents and living a no nonsense lifestyle.

If you've followed my work over time, I have spoken about the Tennant (the 'Tennos') family from the Wagga Wagga area with John and Hazel the parents (and now grandparents) and all the offspring being part of a close knit family and…all involved in same manner with aeromodelling.

I met up with Dave Tennant again at The Gathering and, off course, his constant mate and son Ben, now 17 years old. While I say 'mate' - for certain they are mates but there is no mistaking that Dave is the father and the 'leader of the pack', so to speak. Talking to Ben, he was telling me he was doing a lot of flying both full size and model (he has had his flying licence for a few years now) and that he has purchased two full size aircraft - one without an engine and in need of a bit of refurbishment (new engine is on the list to be purchased soon) and one in New Zealand which he will have brought over unassembled in a container as soon as he has saved the required money for the costs. Now that is quite an achievement for a young fellow - certainly much better than sticking the 'money' in his arm, sniffing it off a table or drinking it in frenzied orgies.

The PCB and the spark plug have some function - maybe the instant disassembly of the electric 'thing' on the front.

Just for comparison, Bill Mansell gave me an A4 photo of the full size aircraft and... I could not pick any difference. At 2 metres span, 6.75 kg, powered by a Saito 150 this PT19 Fairchild in Norwegian colours is an outstanding scratch built model.

Another fine example is the Harvey family with 'RV' (Alan Harvey) as the 'Old Phart' (well…he IS the same age as me), Simon his son and Adam the son of Simon at 15 years old. All three have a long history or aeromodelling from chuck gliders to large R/C models plus RV has a collection of 'weird' flying objects such as a Cox .049 rotor copter thingy and a half yard of oily rag attached to a Coz 0.49 that fly's vertically and frightens the daylights out of any bird flying nearby.

Simon is more inclined to large scale models and Adam will take on flying anything that even resembles an aircraft.

In his younger days (going back a few years) he was at The Gathering with his father and grandfather and he was, at that stage, flying chuck gliders and, under instruction, stirring the sticks of his father's R/C transmitter. He had a rather well flying 'chucky' and was instructed to fly it over the grass area beyond the pits and to not let it fly into the pit area.

Not a prob' - over the grassy area he went and had the model flying in grand style until --- - in a rather rapid vertical descent, it 'landed' nose through the covering of Kevin Borer's parked model on the grass verge. Kevin is a rather laid back character, was not overly concerned and reassured Adam that the repair was not much more than a bit of covering stuck over the hole which went down rather well as Adam was concerned about the damage and possible repercussions. RV jumped in with a lesson on trimming chuck gliders so they

Simon Harvey's super large white Fokker.

Ray Clark's monster Fiat dropping in for a visit and it's not in any hurry, just lazing around the sky.

Many of the Fox engines just keep running and they are now quite a desirable acquisition for collectors and users.

landed in a horizontal manner rather than nose straight in and also that the grass was greener quite some distance from the models in the camp area.

Adam is a very pleasant young fellow - keen as mustard on model aircraft pursuits but does not neglect other sporting activities and has a keen mind for his studies, particularly mathematics. Again, like Dave Tenno and Ben, Adam and his father are great mates but Simon rings the changes and RV puts in a helpful word as needed.

RV told me that, when Adam was a little tot his Mum and Dad were trying to get his first words out and the repeated Mum, Mum, Mum or Dad, Dad, Dad was not striking a chord. After some exasperating time the little bloke look up at his Dad and said, clear as a bell, "Coolpower". Maybe RV was pulling a long bow at the time but, one thing for sure, Adam certainly knows and uses Coolpower oil in his fuels - a lad on the correct track.

Good job all you caring fathers.

The radial engine in Anthony Ogle's Neiuport 28 never failed during this event and it commanded a lot of attention in the pits and in the air. Great sound.

THE WINCH REPORT

BY BRIAN WINCH

A rare old petrol engine I picked up recently that I will run, eventually and I will use synthetic oil as this engine is one of the better quality ones and it was not recommend that you use a 70 weight oil in it.

Okay - which oil is best?

Maybe it all depends on who is telling the story or who is the most menacing of the two involved in the discussion. Fortunately, we don't have to resort to semantics or even violence as there is plenty to guide us down this slippery path (Oh, how apt… 'slippery path'…moan, he's at it again - phraseology to suit the topic).

Okay, let's slip back a few years - probably about 80 or so when the first model engines started becoming available for model aircraft, boats and cars.

Of interest to younger readers, the first 'engines'(apart from rubber motors) were compressed air powered. A various range of shim metal cylinders were used (some purchased, most crafted by the modeller) and these were pumped up (often with disastrous results) and a valve opened to send the air burst to a reciprocating engine almost identical to our modern engines but so much lighter and…not incredibly powerful.

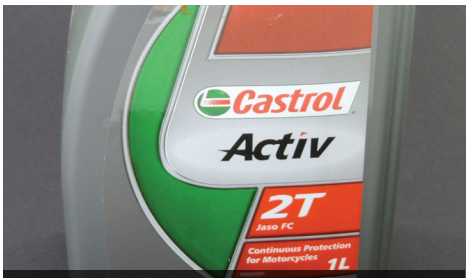
Modern versions still popular with many modellers are Co2 engines - similar engines powered by carbon dioxide capsules - aka soda water capsules - a small cylinder with the Co2 compressed within under a considerable pressure.

As a side note, these and similar capsules are used to power firearms - actually 'air' guns and some of these are incredibly powerful, accurate and available as repeaters firing many projectiles off the one cartridge.

The Co2 engines range from single cylinder to magnificent little radials but for ultra-light models only and this was one of the big problems in the very early days of our great hobby - what was available as far as lightweight materials for building models? Stripped bamboo was popular and even some plant stems such as the Nile Papyrus plants.

With little to offer to modellers (all red-blooded modellers in those days - no ARF's - you did the LOT yourself) as far as super light materials, it is easy to understand how popular the first internal combustion engines were in the modelling community. Obviously, they were all petrol powered, big capacity as the engines were very substantial in construction and not overly powerful. The RPM range rarely exceeded a few thousand. Engines were long stroke and had a considerable torque and very large propellers were used - plus…all propellers were wood - commonly home-made.

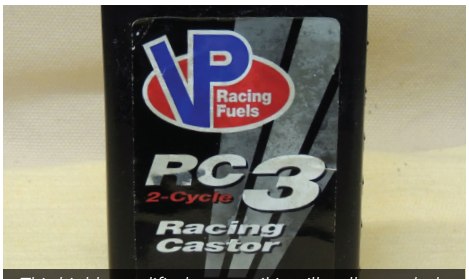
Now we have two considerations - the petrol and the oil. Maybe you are not aware of the fact that petrol has had many changes over the years. During the years, before and during WWII, the manufacturers of engines for aircraft use were on a constant battle to extract power from engines and many exotic formulae were tried. At one time petrol had an octane of 87 to the day to day consumer as the common low octane (aka 'standard') and the least expensive. Aircraft engine manufacturers used methanol, ether, acetone and Triptane



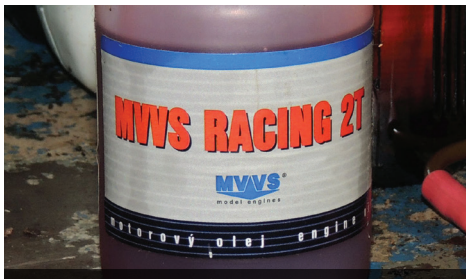
The Shell Activ 2T is a petroleum based oil that ticks all the boxes as far as engine requirement specifications. I've heard good reports from modellers.

This was the mainstay when castor was a big item in fuel mixes. The 'M' classification - Modified - indicated that is was de-gummed, low acidity and of a quality suitable for some lubrication purposes.

Neo oil was pretty popular quite some years back with Big Red being the oil for methanol use.



This highly modified castor oil is still well regarded by those who like this lubricant. It does not cause as many problems as straight castor but it still has a few undesirable side effects.



Supplied with and to be used (to maintain warranty) with MVVS oils.

The purity of castor oil is indicated by the BP classification indicating it is safe for human consumption as it is first pressing quality.

(which is trimehylbutane - an anti-knock additive) amongst many other weird and wonderful fuel experiments in the bid for power and mastery of the sky.

No doubt a few variations were tried by modellers to gain a few more horses from the engines of the day but the biggest downfall, and problem, was the lubrication. Some of the old engines in my (to use some day) cabinet had to be fed a 'good quality 70 weight oil' - something like a gearbox oil - syrupy decayed dinosaur sauce…mineral oil. Two reasons for this with the first being the fit tolerances in the engines. Most engines of the day and right up to later than you think were 'selectively hand fitted' - which was, in my apprentice days known as a thistle fit….'thistle fit this or that.

Model engine production was not a big-time project and of, generally, little importance. Sales potential was not so promising so what big company would even consider manufacturing 'toy' engines? Most were manufactured in small or backyard workshops on machines that had probably seen better days - maybe worn out from wartime production and semi-skilled workers. When you consider the top line engines of today are manufactured (often CNC) to micrometre tolerances - thousand parts of a millimetre (one micron is one thousandth of a millimetre…a millionth of a metre) and engines of days past were kept to tolerances of thousandth parts of an inch, we are looking at a tolerance in the range of 25.4 times, shall we say, rougher or courser.

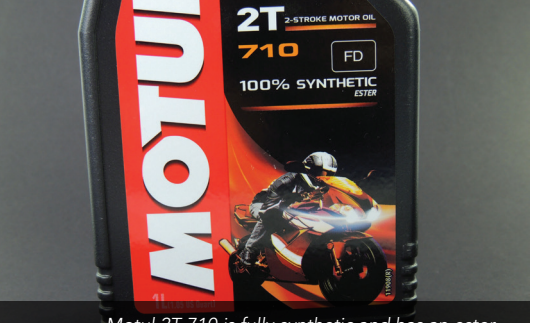
Pistons were machined in small batches with an overage (more than needed) as some would not be usable and the same for cylinders or liners. When it came to assembly, pistons were tested in liners and the 'thistle' approach was used - this piston will fit this liner. Now, even though this was the general mode of manufacturing, the fits were still not all that good so how to make up the difference? A good dose of thick, gluggy oil did the trick at ratios up to 38% for one particular engine at least. Mind you, the large helping of oil was not required or lubrication, it was simply to 'fill the gaps'.

In my final school days (college) I was keen on anything aeroplane with particular attention to 'anything engine'. A screaming hot engine of the day (I still have one in top condition) was the Eta 29 - a bit of a rarity as it had piston rings fitted. However, the ring fit, particularly when hot, left a bit to be desired when it came to starting a hot engine. These were great team race engines IF you could start them after a pit stop. The secret was a squirt of neat castor oil into the exhaust (no mufflers in those days) would provide enough gap filling goop and the engine would fire up quick as a wink but they sure painted a good layer of oil over your model after a number of laps.

Back to the earlier engines and the poor petrol, I must remind you that as far as fuel, all our engines are classified as two strokes be they two or four stroke as the fuel is a 'petroil' mixture - oil mixed in with the petrol. Two stroke engines were not a big item in the early days and, along with petrol, lubrication technology was in its infancy - there was no such thing as 'two stroke oil'. The oil you used was the same oil as used in a full size wet sump engine - an oil never subjected to or designed for combustion. As such the burnt oil caused ash deposits and this hit where it hurt most in a two stroke - the spark plug. It became a well-known and hated problem, particularly with riders of two stroke motorcycles, the dreaded 'plug whisker'. You would be riding along enjoying the day (or whatever) when the engine would suddenly stop.

It was soon apparent to two strokers what the problem was as a general engine problem was generally heralded by a few fits, pharts and coughs (or rattles), running out of fuel was similar with the engine going on and off song but a spark plug problem was a sudden cessation of engine noise - the wick in the engine went out. The problem was an ash deposit from the oil on the plug that was known as a 'plug whisker' - a fine carbon type thread from the centre electrode to the outer casing causing a dead short - no spark. The spark plug is the hottest item in the combustion chamber and this heat fused the oil ash into a hard deposit that carried the high tension electrical current from the centre to the side and, in so doing, eliminating the all-important spark of life. Reiterating - the spark plug is the hottest item and it had to be removed to either remove the whisker or, much easier and most common, change the plug. A fair bit of juggling with the plug spanner to avoid flesh contact with the cylinder head then a juggle act to remove the plug with a cloth and put it in the toolbox or saddle bag for later attention.

The spare plug that any astute rider carried was fitted, engine started and off to continue your journey…until the



Motul 2T 710 is fully synthetic and has an ester base (hydrocarbon mix only). It comes highly recommended by a number of modellers.

High performance 2-stroke oil from Japan that was the recommended (and supplied) oil for the first Enya 180 petrol/glow engine. Certainly a good drop but not available in Australia.

I used this oil for years in super high performance two stroke motorcycles that were oil injected (it is also used for premix). A great oil and still available and still suitable for many 2-stoke engines.

Coolpower has been my oil of preference for a lot of years. The Blue is my usual oil, the Red is a lower viscosity for heli and high RPM use (at higher ratios) and the Purple is inbetween both.

DeLuxe Power Model 2T-S is for petrol and diesel use only and is now recommended by the majority of engine manufacturers worldwide.

next whiskering. To further indicate the poor quality of the mineral oils available, again with two stroke motorcycles, you very soon learnt to get into the practice of 'throttle blipping'. If you were riding down a reasonably long hill (not too long, mind you), you gave the throttle a blip every so often. To the unaware this was more an annoying habit rather than a very necessary practice. I remember one of the tradesmen from where I was apprenticed whining to me one day about throttle blipping as the factory was at the base of a very long winding hill. "You young blokes can't help yourselves," he droned on, "If you're not blipping your (err…male appendage) you're blipping the bloody throttle of your motorcycle all the way down the bloody hill (well over a mile - 1.6km). What this whining …err…person did not know was that the oil of the day was so poor in maintaining lubrication, the engine needed constant doses to prevent seizing. As the oil was mixed with the petrol - 'petroil' mixture around 16 to 25:1- it provide lubrication only when the petrol was flowing through the engine. If you closed the throttle off going down the hill, there was a good chance the engine would suffer from lack of lubrication and nip up (seize). Even when, some years later, special two stroke oil became available, the problem was only eased - not cured as the oil was still dead dinosaur stew - mineral oil - and lubrication technology was still in its infancy.

A light on the horizon.

Around 1946 we saw the first of many changes with the first of the better grade model designated engines developed in Scotland - a petrol and a 5cc diesel engine. Right on the heels were the smaller diesels such as Mills and the petrol Frog 175 which late became the Frog 100 diesel much loved by many even today. About this time, Ray Arden was experimenting with an insert glow plug (of the style we currently use) for converted petrol engines. Contrary to some popular stories, he didn't 'invent' the glow plug as it had been in use many years before in petrol engines during the war. What he did was modify the idea from a platinum metal coil attached to the inside of the cylinder head to a separate insert plug using platinum wire and methanol fuel as a catalyst to help keep the plug heated. As we are well aware of these days, the plug requires preheating and the running engine retains the heat.

There is some conjecture as to whether the methanol actually keeps the plug hot by catalytic action or whether it is the residual heat of combustion that does the job. Certainly, heated platinum wire will retain heat if exposed to methanol but that might be just a nice laboratory experiment. I became doubtful of the methanol/platinum constant heat process when we first saw methanol fuelled engines fitted with a throttle. The earliest of them had a butterfly of various types coupled to the throttle arm to gradually cover the exhaust manifold to retain engine heat for reliable idle. If you idled the engine down without this gradual closure of the manifold, you could not expect a reliable idle or, for that matter, any idle at all. This consideration is borne out by the glow plug ignited petrol engines now on the market such as the OS GGT series that run and idle perfectly with no methanol and a platinum alloy (composite alloy) glow plug. A great assistance to the reliable running of these and similar engines is the quality of the oil used - more about that further on.

Going back to the development of the glow plug engine, here was found the need for a different oil as mineral oil will not readily mix with methanol so…enter the good old castor…well, only good in those days for my way of thinking.

Certainly the castor was much better than mineral oil and it was used, sometimes with some modification, for quite a few internal combustion engines, such as speedway racers, where we picked up that heady smell of 'racing fuel' which, actually, was the smell of castor under combustion.

Now castor was good but it was gluggy - around 50 weight and that causes a considerable lubricity drag - extra drag on the moving parts of the engine due to the viscosity of the oil. Whilst this was a small problem with two stroke engines it certainly was a problem that needed addressing for four stroke engines as a sump full of cold castor needed a lot of stirring when the engine was being started.

Castrol bought out Castrol R30 which alleviated the problem to a considerable extent as it was 30 weight oil (SAE.30 viscosity) but it was (is) a 'one meeting oil' - you had to drain and replace it after running your vehicle in a competition (example).

Some few years back, the Kavan company produced a scale appearance horizontal engine for model use and it had a wet sump that required castor oil for the lubricant. You had to (instructions form the manufacturer) drain and flush the engine after you had finished running it at the end of the day and replace the castor for the next use. If you left it without flushing - it was a complete dismantle later to free it up from the internal gumming. An expensive and not very

popular engine.

With our model engines, we were really limited to standard castor oil or, later Castrol M (and other brands) all of which had the claim 'first pressing' and here is where we stumbled a few years later. First pressing of any of the vegetable oils (including olive oil) is the higher-grade product. The fruit - beans - are cold pressed until the pressing table reaches the seed and there it stops. The oil extracted to this point is collected and taken for nay further processing. The pressing process is continued crushing the seed and squeezing right down to the juice out of the skins and the final product of this is used for either a lower grade oil or for other uses where the contamination from the seeds and skin are of no consequence.

The first requirement of the absolute best and purest first pressing castor oil is for the medicinal grade and this is set as 'BP' grade - British Pharmacopoeia - a very high standard indicating it is safe for human consumption - if you really want to drink the horrid stuff. ('Have another drop of castor." 'No thank you - I have to run… fast.") For readers who have not had the debatable benefit of ingesting castor oil - it is an incredibly strong cathartic, strong purgative, stimulates the evacuation of the bowels…rapidly. So now we open another picture and squash a myth from days long gone.

The aircraft of WWI (1914 - 1918) were generally 'rag and wood' - timber construction with canvas (typical) covering. Due to the incredible problems of developing different aircraft engines, the rotary was found to be the least likely to explode, breakdown or just fail in other ways. The motion of these engines was to have the crankshaft fixed to the airframe and the cylinders - to which the propeller was attached - spinning around the fixed shaft. The engines had no carburettor (as we know them today) so the engine speed was fixed with the only option of speed variation was to switch the ignition on and off. The problems of reliable engine construction were coupled with suitable lubricants - oils that would stand up to the heavy operational loads and heat of the reasonably crude engines (by today's standards). The oil that did the job was castor and the distribution of it through the engine was by the 'total loss' system - no pumps for recirculating the oil from the sump and no covers to prevent its escape from the open rocker assemblies and the many leaking joints of the engine. The engine was loaded with enough oil to last the time it would run on the tank of fuel or the limitations set for the particular engine as to how long it could be run before it destroyed itself.

Now we come to the colourful glory scene painted by unknowing authors of the 'magnificent men in their flying machines' who wore a silk scarf as a gift from a loved one or the fact that is was fashionable by such dare devils to show their contempt for the dangers and the 'de rigeuer' of their station in life. Next line of the stories was the reason they ran from the aircraft when it landed was to get away from the dangerous propeller if the engine was still running or to quickly join their contemporaries to regale the events that befell them whilst they were battling the dreaded (enemy) in the skies. Well, I really don't like to pour hot water on the stories but the fact is, there were other reasons for their actions. First off - the silken scarves.

Those aircraft were rather loosely constructed and subjected to incredible vibration - vibration that set up multiple static electricity charges that would earth out on the pilot. The silk scarves were meant to dissipate or absorb the charges and flick them off into the ether (atmosphere).

Now for the glorious run after landing and here we follow one of the pilots. He lands his Sopwith (or whatever) - engine still running so the ground crew can taxi it to parking base or to check the running engine. He then heads of in a fast beeline to the field buildings and disappears around the rear of the building wherein he blasts (most possible it was a blast) into the first available comfort station (okay, dunny if you must - actually, they would have been dunnies or latrines as there was no sewage service in those days) to alleviate (if he was quick enough) the effects of ingesting the great load of castor that had been blowing onto (and into) him as he flew the aircraft. (Remember what I said about purgative action?)

Despite the few side effects, castor oil was the mainstay of model engine fuel and its nasty side hardly ever surfaced. Few modellers had more than one engine at a time - all two stroke - and, as there was no iPads, Xboxes, television and the like, as much spare time as possible was devoted to modelling. Modellers designed, discussed, built, repaired models and, on Saturdays, flew the models - their engines were run at least on one day each week. A note on the Saturday business. In those tender days, we had to abide by the Sunday Observance Act - an act of parliament that prohibited just about any outdoor activity that had a hint of organisation (or enjoyment). No sporting fixtures, firearms hunting (very popular for rabbits for the pot and fox pelts which were saleable), model aircraft flying and similar activities. So, your engine had several runs on Saturday or even through the week in the evenings and, as most were diesel, the kerosene in the fuel helped prevent the dreaded castor gumming and corrosion.

I did not encounter castor gumming until I laid my hands on a Frog 500 - a 5cc (large engine) glow engine. A modeller came to the field where I flew with several mates with the gummed up engine looking for a solution of some type. My solution was to swap him something (don't remember what but swapping was very popular) and I ended up with the stuck tight engine. He had recently come from England where he had purchased the engine, ran it several times then it was packed away until he arrived with his family in Oz by which time the castor had converted to gum and locked the engine solidly. One day I'll tell you how I 'fixed' that engine but for now, the experience that castor could be a problem was a valuable lesson.

We had a partly ready to use diesel fuel - Mills Diesel Fuel and it was very popular but not too easy to obtain for me at least. These days I am of the opinion that the mix was equal parts upper cylinder lubricant and kerosene to which you added one part ether. When it was not so easy to come by the word got around about 'jungle juice' a mixture of equal parts castor oil, kerosene and ether and this worked well in every diesel I ever ran but again, I think the kerosene had a lot to do with slowing down the gumming effect of castor oil. Anyway, we were stuck with the castor for quite a few years until its real problem surfaced with the first four stroke - the OS FS 60.

Around the same time, some modellers were having problems with castor based fuels in the incredibly popular Cox range of engines. Some never exhibited the problem, others were plagued by it and it was only recently I found the reason for the problem. The first problem was with four stroke engines in that the compression was raised a little by the viscosity of the fuel and this caused kickbacks on starting. This was exacerbated by the advice (from O.S.) to use wooden propellers which, as most of us should know, do not suit single cylinder four stroke engines as they are too light to cope with the acceleration-deceleration of the four strokes of the engine.

My first experience with the four stoke O.S. cost me a number of wooden propellers as they shed blades when the engine viciously backfired during the starting attempt. Again, this was not

helped by the instruction from O.S. to prime the engine via the exhaust pipe. When I ran out of propellers and all I could obtain from Bob Young's Silvertone shop, I fitted a composite propeller, reduced the oil content to 15% (previously 20%) and flicked the engine as I would a two stroke and…instant start…no backfiring and it ran magnificently.

As the popularity of the four strokes increased dramatically and…O.S. produced the 80 and 90 FS (rear pushrods), I started to see problems with engines sent to me for service. They were gummed up from being left with the castor in them and not flushed out after use. The series with the rear pushrods were a real problem as the small chamber for the camshaft and cam followers at the rear suffered badly and removing the small cam followers was quite a chore when they were seriously gummed up. Another small problem cropped up with the beautiful Gemini twin in that it would not run on SOME castor fuels with this inclination more so in cold weather and this was a problem that plagued me (and many others) until the introduction of synthetic oil. However, I must say that is was quite recently that I found the cause of the problem and the same cause affected some Cox engines.

Going back to what I said about first pressing castor, I now know that if a genuine first pressing castor was (is) used, the problem did not surface. In recent time, I found out that some oil processors were extracting the oil from the beans with chemicals - a lot easier and less expensive than the pressing machines and more oil was extracted as all the bean was affected by the chemical solution. The problem was (is) that this chemical extraction changes some properties of the castor so that, when cold, it produces a waxy substance and white flakes in the oil and, subsequently, in the fuel mix. The ultra small fuel jets of the little Cox engines could not cope with the flakes or the waxy substance so they went lean rather quickly after starting. The Gemini engines have long brass induction tubes from the carburettor manifold to the inlet manifold of the head and, when the engine is correctly tuned, these tubes get super cold - in cold or wet weather they can have ice form on them. These cold tubes bought out the waxy stuff in the castor fuel and this upset the mixture as it was almost impossible to obtain a correct tune. Only those modeller who purchased their castor from chemists (BP grade) or used one of the high quality modified castors such as Castrol M had good engine runs from the castor blend fuels. Others who used some of the commercially available castor or fuel mixes(chemically extracted) had the problems and this is now well known, particularly by fliers of control line and free flight models.

This engine was converted to petrol operation and run on a very cheap motor oil that was not suitable for two stroke operation. I had a lot of trouble cleaning the ash deposits from the combustion chamber, piston and the valves. Not recommended.

Light at the end of the tunnel.

In the early 80's I was approached by an industrial chemist and a mechanical engineer with a request to try a synthetic oil they had produced. I had already had a mild taste (so to speak) of a synthetic oil when I tried a mix of methanol and a synthetic fork oil for motorcycle telescopic forks (that contain the front wheel). This fork oil was rather good but a bit expensive. When I mentioned this to the two chaps with the new oil they told me their oil was of a very similar nature based on a well tried and tested synthetic oil base. The new oil was Synlube and it was a winner in every respect. As they offered to reimburse me if any test engines I used were damaged I had nothing to lose but a lot to gain - getting rid of the dreaded castor. About the same period, unbeknownst to me at the time, Model Technics in England had developed a synthetic oil blend that they recommended be used at 7.5% with a maximum of 10% and this caused a bit of a snort and cough from the 'Add More Oil Brigade' - bunch of general Luddites opposed to anything new or innovative.

In later years I found out, directly from Model Technics, that they had run a number of engines with a 2% oil content and never damaged one. I was keen to carry out a lot of testing with the Synlube and it came up trumps every time. No engine overheating, no accelerated wear, no corrosion and no after run gumming - just what the doctor ordered and my test period was over 6 months. The news spread quickly and one model shop owner who flew very high performance club pylon models wanted exclusive rights to the oil but the owners would not come at this but…they agreed to sell it to him in bulk and he could name it for his own business which he did and sold it under the name GloGlide. He had a red hot Super Tigre .40 pylon engine in his model and he was blasting the competitors at every race. He later told me he was using 2.5% Synlube oil in his fuel and the engine was still running better than ever.

There are many moving surfaces that rely on good lubrication. The oil used must suit rolling, sliding and pressure (gears) applications without breaking down.

Things were going well - Synlube was winning the day and four stroke engines weren't gumming (if the new oil was being used) but, a dark cloud was hovering - suddenly the source of Synlube dried up - the owners of the brand just walked off the edge of the world…or so it seemed as contact could not be made and nobody knew where they went. In later days, I found that the name Synlube was also used by a lubrication company in USA and it was an old, well established

company. Knowing how litigious some USA denizens can be I considered that a lawsuit had been filed and that was the end of the Australian use of the name. Anyway, I did have a good supply of the oil but I had it in my mind that all good things must pass and it would be back to the dreaded castor again until I received a phone call from Eddie Edwards - owner of RC World Hobbies in Geelong.

Eddie had been competing in a pattern contest in USA and due to some fuel problems, he was given some alternate fuel by a friendly modeller and his engine was away and singing better than it ever had. On inquiring he was told that it was Morgans fuel - a fuel mix that contained Morgans Coolpower oil. Next day Eddie had the fortune to meet Jim Morgan - the man behind the fuel company - and deals were on offer. A small order of the oil and some mixed fuel was sent to RC World Hobbies for wide testing with some of the oil sent to me. The rest is history - the oil was excellent and certainly lived up to its name as I found a four stroke on test was struggling to get up to full operating temperature with a 20% oil fuel. At 15 to 18% I found it was every bit as good as - maybe even better than Synlube and… best of all…supplies were guaranteed as a large market had been established in the USA with several other fuel companies using the oil in their pre-mixes. Apart from being a top grade lubricant, Coolpower mixes with methanol and hydrocarbons such as petrol and kerosene (for model diesels) and it is also an excellent after run oil that will not gum up over an extended period.

In later times I found a second choice (just in case) and it is Klotz KL200 Original Techniplate which has similar characteristics to Coolpower but, Coolpower served me first so it is still my preferred lubricant.

Current trends.

Now we come to the preferences.

As a general rule, should you mention the oil you use at a flying field or someplace where modellers gather, you will disrupt the harmony of the camaraderie. "That oil is no good - it blew up one of my engines"…Why would you use that goat p*ss - it's not even good enough for a lawn mower engine"… "is somebody paying you to use that crap?" and other friendly, encouraging banter to make your day. I get a fair bit of it when the topic of lubrication crops up but…I always go in with my muzzle loader primed (or my gun loaded if you are a modern type). The simple fact is that there is little if any difference (according to application) between the top-grade purpose blended two stroke oils for MOST of our engines - I say MOST but not ALL and here's my muzzle load of saltpetre or buckshot - whichever you prefer.

As I write for general readership I must consider the types of engines used and this varies considerably. Maybe I might recommend a particular oil but, will that oil suit all engines? Will it mix with methanol for the methanol fuelled engines? Will it suit both two and four stroke engines? Is it okay to use the oil in Saito engines and other engines that do not have suitable connecting rod bearings for that oil? All those considerations require me to be as careful as possible as I certainly don't want to be responsible for wrecking an engine that was run with an oil I recommended.

Actually, the best I can do is rely on my own experience of testing, servicing and generally repairing engines plus running my own engines for my own enjoyment. Initially the engines I ran with synthetic oil were the common two and four strokes of the day including methanol fuelled and diesels and, as I gained confidence in the oil I reduced the amounts as it has always been my contention that too much oil is recommended for modern engines when you consider the incredible quality of the metals used and the machining tolerances maintained during manufacture. This logic helped me when I thought about the required fuel mix for a 30 or 40cc engine being the same as that required for a 0.3cc diesel.

The large engines would literally drink fuel whereas the little diesels and tiny glows (Cox 010 for example) would run for ages on a teaspoon of fuel yet they still required the same oil content according to instructions. The turning point was when I contacted Super Tigre in Italy and spoke to Mr Garafoli's (the owner and developer of ST engines) senior son and he told me they recommend a maximum of 11% oil in the fuel of all engines over 20cc capacity. A little while later this was placed in front of me as a typical example.

A customer had returned a new 60cc twin Super Tigre engine for a warranty repair as it had seized solid after a short run. It was solid all right. I could not move the crankshaft the smallest rotation but, when I inspected the pistons through the exhaust manifold, I could see they were free in the liner - no sign of seizure.

Next step was to disassemble the engine and that's when I found the seizure - the crankshaft was seized solid in the front housing between the two bearings. The

The long induction tubes freeze when the mixture is correct and this causes the deposits to form if low grade castor is used. Certainly a contender for high grade synthetic oil.

Little engines as this Cox 010 must have the best fuel and it must be well filtered to go through the incredibly small fuel jet.

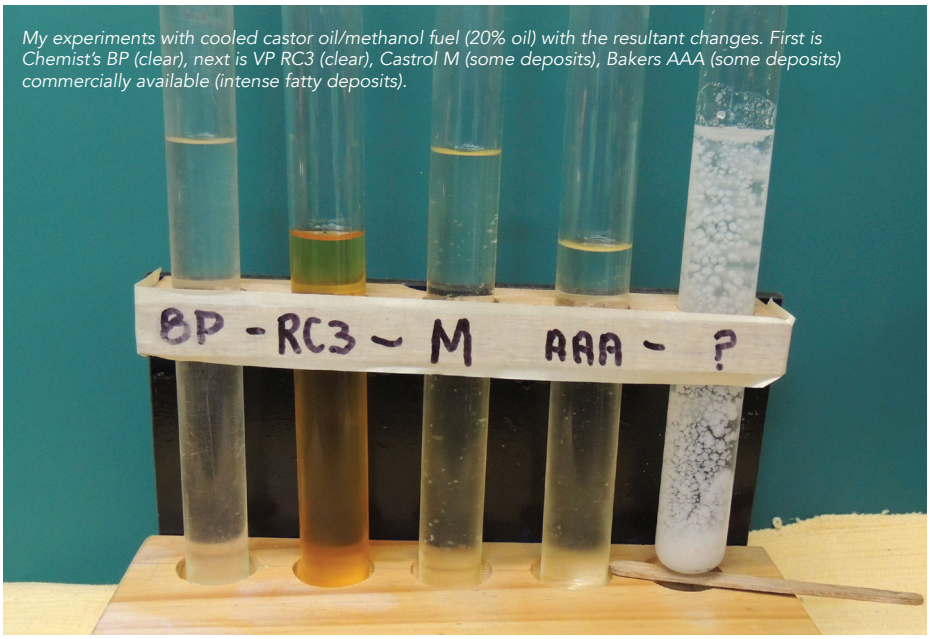
seizure was so bad I had to machine the housing off the shaft then soak the shaft in sodium hydroxide (aka caustic soda) to remove the 'welded' on aluminium.
I rang the owner and he jumped on me instantly saying he had 'loads' of Super Tigre engines that he ran on 20% castor in the fuel regardless of what I advocated in regards synthetic oil - he was a 'dyed in the wool' castor man. When he finished his rant (or slowed down a little) I suggested he consult the supplied instruction manual on page X. He started reading it over the phone with loads of confidence until he reached the specific fuel requirement for the engine - 'no more than 12% oil is to be used'. That shut him up well and truly.

I told him that the castor was his choice and, provided it was of a good grade I had no problem with HIM using it if he saw fit to do so but…at 20% in his fuel, the high viscosity could not pass through the carburettor jet when you took into account the volume of fuel required by the engine which, at 60cc capacity, was a considerable amount. The engine ran lean and the air tight fit of the shaft in the front housing (as required by two stroke engines) suffered from no lubrication and, hence, no oil film so it gave up the ghost and seized. The seizure would have been due to the expansion of the steel shaft and the very rapid pickup of the aluminium housing as the heat built up. Maybe it might not have happened had he been using synthetic oil but this I cannot say. What I can say is, sometimes, too much of a good thing can be a problem and so it is with oil in the fuel.

To add a little bit to further this, when it was reasoned that synthetic oil was the oil of choice worldwide for many modellers, some engine manufacturers had to modify the threads on the needle valve and, in some cases, change the angle of the needle point. The threads and needle point were suited to higher viscosity castor fuel (reasonably course threads used) but, if the engine was run on a synthetic oil fuel, it was difficult to tune it as one click of the needle was either too lean or too rich. Finer threads fixed the day as did different needle angles and we are going though similar now (although most have been modified by now) with methanol engines that have been converted (factory or home conversion) to petrol. The petrol fuel is of a so much lower viscosity and a petrol engine uses 2.5 times (approx.) less fuel so super fine threads and sharp needles are the order of the day.

So... what oil is best?

This is the closing chapter and it will be the briefest of all. I have my 'druthers' ('druther' have this than that) but I remain open minded (within reason). I read and hear the recommendations of many modellers and engine dealers and the best I can say is, if that which you choose or recommend works for you and does not prematurely wear your engine then that is the correct oil for you. It is a veritable minefield on the Internet when you look into high grade oils suitable for two stroke use but…these oils are for motorcycles, snowmobiles, jet skis and the like. Getting closer to the mark are the oils for chainsaws and other hand tool applications but, regardless of their intended use, there are none specifically for model engine use as we run our engines under full load (propeller, flywheel or water screw) and in first gear all the way hence the reference to chainsaws and the like. I know of one only oil specifically designed and blended for model engine use and, to my mind, it is the first of its kind…more in a moment.



My experiments with cooled castor oil/methanol fuel (20% oil) with the resultant changes. First is Chemist's BP (clear), next is VP RC3 (clear), Castrol M (some deposits), Bakers AAA (some deposits) commercially available (intense fatty deposits).

Oil producers will elaborate on the base product of their oils and which is best which, obviously, they would put forward. You couldn't expect them to say they use a lesser quality ingredient in the product they are trying to sell you so you, sometimes, have to make a choice as to which suits you best. Information available indicates that the main chemical bases used for the oils that suit our purpose are Ester and Poly Alpha Olefin (PAO). The ester base has a lot going for it in many ways but, as far as I can determine, it will mix only with hydrocarbons - of which petrol and kerosene are of most interest to use for fuels.

PAO based oils will mix with the hydrocarbons plus methanol, nitro methane, ether and so on. Where we must be careful is whether the oil is suitable for plain bearing engines - engines that do not have needle roller connecting rods which includes Saito, some O.S. (plain little end on the rod) and many methanol engines converted to petrol operation which is a big trend currently. In the last month I have converted two O.S. Gemini 300 twins (50 cc), an O.S. 160 single and a Saito 170 radial all of which have plain bearing connecting rods and, with special interest, the O.S. Geminis have two piece big ends on their rods and the fit is ultra-fine so selection of lubrication is especially important.

All these types of engines will generally suffer connecting rod failure if the lubrication is a problem and the failure stems from the engine running super lean from overheating (causing severe pre-ignition) and that the piston quite often nips up in the liner.

An engine with all needle roller bearings in the connecting rod - commonly forged steel - suffers from the piston grabbing in the bore when the film strength between the liner and the piston breaks down. Under ideal conditions the piston never makes metal to metal contact with the liner wall as the correct lubricant provides a buffer regardless of heat and pressure.

Testing times.

For this article - and for my own information - I purchased 4 different high performance two stroke oils from many that have been recommended to me by modellers or engine instruction manuals.

For testing I set up a common medium capacity two stroke engine that was fitted with needle roller bearings both ends of the forged steel connecting rod. Finding information on some of the oils proved to

be a bit of a minefield so I can report only what the company websites provide and that can take a lot of time in research.

The oils I purchased are:
Motul 710 2T
Synthetic ester base.
Red Line Racing oil 2T
Synthetic ester base.
Mobil 1 Racing 2t Fully synthetic base?
Castrol Activ 2T
Modified Mineral base.

I used the oils at 25:1 with 95 RON petrol and found almost identical results as far as RPM and engine operating heat. A little variation with the exhaust deposits with some being slightly drier but none were overbearing or objectionable in any way. At the end of each test I found adequate lubrication inside the engine - slippery liner surface and oily presence on the connecting rod bearings and the crankshaft big end. None of the oils produced any noticeable carbon or staining of painted surfaces (a problem with some oils of the past). While I am not recommending any of these oils for long term use as I have not the time for that type of testing, I am confident that their use, with correct tuning of the carburettor, will provide good engine protection and no adverse problems.

There are three other oils I have tested over long term and in many engines including the plain bearing connecting rods (Saito etc.) and found to be excellent in ever aspect of model engine use. The first, a long-time favourite that ticks ALL the boxes is Morgans Coolpower. This oil is suitable for vegetable, alcohol and hydrocarbon fuels such as methanol, nitro methane (any ratio), kerosene and petrol. I have used it at very low ratios (you don't want to know) for my own testing purposes and, all I can say is the engine used for the test (poor little bugger) is still in good running order and quite usable.

The next is Klotz Kl200 Original Techniplate and it closely matches the desirable characteristics of Coolpower. In early days (way back) the Klotz two stroke oils had a bad reputation as they had no after run protection - engines would rust up after the oil had been used in them. Morgans Coolpower came out right from the start with anti foamers, anti-corrosion and after run protection - an absolute top drop. Some time later the Klotz oils caught up and they are now a top line oil in all respects.

The next is a new kid on the block and this is the oil to which I referred earlier on - to my knowledge, the only oil specifically formulated for use in model engines and it is DeLuxe PowerModel 2T-S.

John Bristow, the industrial chemist behind it has lubrication technology as a background so he has a damned good idea of where to dot the I's and cross the T's. This oil is ester based so it will mix only with hydrocarbon fuels and it has been taken up by almost all of the leading petrol and diesel engine manufacturers worldwide as the 'recommended oil' for their particular engines and this includes Saito and O.S. with endorsements from the respective company presidents. If you look up this oil in the Internet you can read the various brands of engines that have fully tested and recommended it for their products. I have carried out long an arduous testing in a range of petrol and diesel engines and it gets my tick of approval in every respect.

Slipping off a slippery slope.

Well, after all of this my eyes are tired and my hands are slippery with oil (so to speak) so I am off to my workshop as I have a couple of engines to run and I will, for sure, be using the GOOD OIL.

Any Questions or discussions? Contact me at oilyhand@bigpond.net.au.

THE WINCH REPORT

BY BRIAN WINCH

Imagine that - four cylinders to feed from one carburettor and not a pressure nipple in sight yet, the engine runs flawlessly.

Andrew, our Editor requested that I write an article on engine problems and my reply was, "how much room have you got - there's gonna be a lot of material."

We decided on no limit on my material but it will be presented as a series of articles over how many magazines it takes to complete the information I intend to provide. During these articles, feel free to jump in if you have a particular problem you would like discussed and, provided it is of a reasonably general nature, I will explore and discuss the problem as best I can.

Now here I just have to say it but, as I am not pointing the finger at any one individual, the method that came to mind when Andrew suggested the topic was to use a cable tie (aka Zip tie) to secure the thumbs together of SOME modellers in order to prevent them fiddling with 'things' that should not or do not need to be fiddled, adjusted, removed, poked or hit in any way. While you will consider this in light vein, the fact is that some modellers do these things and I will recount various incidents as we go along such as the screwdriver up the carby (very uncomfortable). Okay, the best place to begin is an accessory to the engine - the fuel supply and the fuel tank - both a source of many problems.

Fuels and mixes

Beginning with methanol fuel, a couple of small points of annoyance (to me, at least).

Firstly, we can no longer refer to a 'glow engine' as we knew them in days past as there are engines ignited by a glow plug that run on 'petroil' fuel (mixture of petrol and oil). Two prime examples are the Enya 180 and the two O.S. engines - GGT 10 and 15. As well as the commercial examples, I know there are many other two stroke engine that have been simply converted to run on petrol with nothing more than the change from a spark plug to a glow plug or simply changing the existing glow plug for one suitable for petrol with the main one being the OS G5 and, equally successful in my many experiments, the O.S. F plug. I have had good success with single cylinder four stroke engines by using one of the two mentioned plugs and even great success using a carburettor designed for petrol operation due to the finer tuning available.

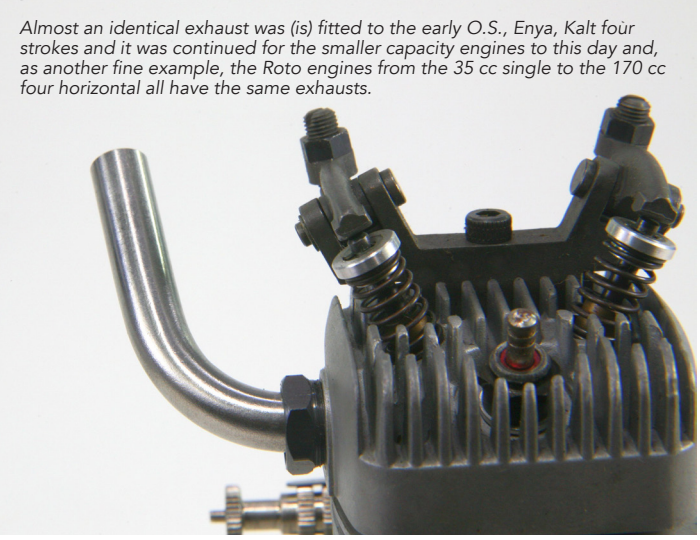
The next bee in my bonnet is the reference to 'nitro engines' and this is creeping in like a smelly dog sneaking in the back door after it has rolled in something rotten. Fact is that some engines are run with nitro methane added to the fuel but you certainly cannot use nitro methane neat as there is a good chance it will really explode and, at the very least, destroy an engine. For your interest, nitro methane will explode when subjected to a compression ratio of 6:1 - rather low. Now…most of our engines in which nitro methane can be used have a compression ratio of higher than 10:1 and up to about 16:1 so why doesn't the nitro charge fuel explode when used in

these engines? Easy reason - we dilute the nitro methane with methanol and oil and this effectively reduces its sensitivity to exploding when compressed. Rather a simplified answer but it tells the story sufficiently for this article.

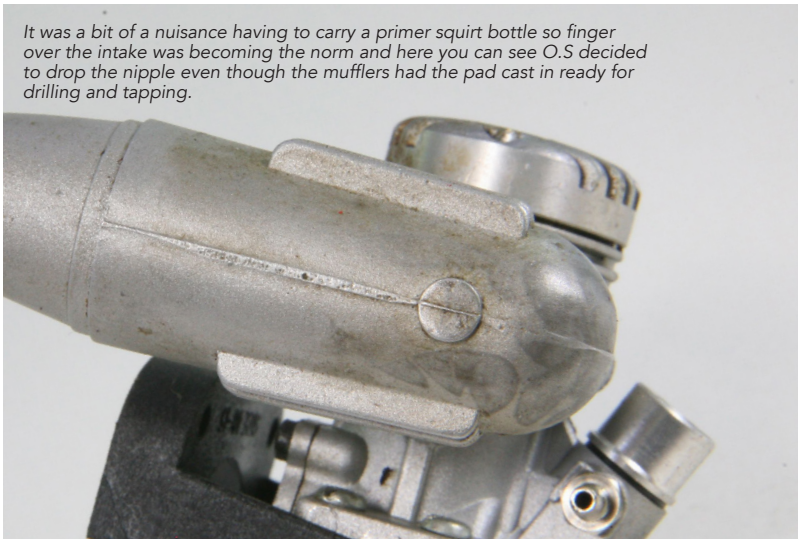
For a little example of this compression of nitro methane, some years back I was given an Enya 40 two stroke engine to examine for warranty purposes by a hobby dealer. The head had been bent up out of shape and the top rim of the brass liner had deep furrows - rough grooves spaced around it. I had not seen anything like this before and I pondered on it for some time but could not come up with an answer so I contacted the owner to get an explanation of what had happened when he started the engine.

He was a beginner - no previous model engine experience, and had purchased the Enya on good advice but did not read or understand the instructions supplied as far as the fuel. Actually, he told me the instruction sheet was folded and he read that the engine fuel was 20% castor oil and, under that, nitro methane so…. he purchased the castor, a litre of nitro methane and mixed up the fuel. Using an electric starter he gave the engine a spin for a couple of seconds then it exploded. The nitro would have been subjected to a very high compression ratio and, even though tamed slightly by the castor, it still exploded and the pressure of the explosion blew the grooves in the rim of the liner and warped the head. One thing that did come out of it was the integrity of the head retaining screws used in the engine - certainly of high quality as they remained secure so the head just twisted somewhat.

Now I don't want you making claims of outer world happenings or other inexplicable occurrences as I had a call from a modelling friend 2 weeks later to ask if I had any idea where he might obtain a head for a vintage engine (Dooling 60) that was very popular for control line speed events and red hot free flight models (they are still competitive) in days past. These engines are real screamers - high compression, high RPM but little use for other model uses as they are just super high performance on small diameter propellers. When I asked why he needed the head he said, ashamedly, "it blew off the engine". Now here I pause



Almost an identical exhaust was (is) fitted to the early O.S., Enya, Kalt four strokes and it was continued for the smaller capacity engines to this day and, as another fine example, the Roto engines from the 35 cc single to the 170 cc four horizontal all have the same exhausts.



It was a bit of a nuisance having to carry a primer squirt bottle so finger over the intake was becoming the norm and here you can see O.S decided to drop the nipple even though the mufflers had the pad cast in ready for drilling and tapping.

for a moment as the following admission will be injurious to my reputation of not liking castor oil but preferring synthetic oil.

Okay, continuing with the story. As this modeller had been converted to the use of synthetic oil, he mixed up a drop of 4:1 to give the engine a bit of a blast. Pressing buttons on our calculator indicates that a 4:1 fuel contains 80% fuel ingredient (in this case, methanol) and 20% oil ingredient. Now…in a slip of the correct method (as we are all prone to at times), the modeller mixed 80% nitro methane with 20% synthetic oil… he had picked up the wrong bottle - nitro methane instead of methanol. When he applied the electric finger to the engine (he was using an 8" diameter x 10" pitch toothpick propeller of the kind that tears flesh off flicking fingers), the engine fired once then the head hit the roof - not literally - it actually hit the underside of this workshop roof with a loud clatter and…it took the head retaining screws with it (these engines did not have the structural integrity of our modern day engines - the aluminium alloys were nowhere near as tough as modern alloys).

Same as the previous Enya, the nitro methane exploded and the poor old engine could not cope so it let go at the seams, so to speak. Now (here I cringe a little), this happened due to his use of the synthetic oil. Nothing wrong with a good synthetic in older engines - it is just that there is no limit to the ratio of nitro methane to oil - the 4:1 mixed perfectly. However, had he been using castor oil the fuel would not have mixed up as nitro methane will not mix with ratios exceeding 40% with castor oil so there is just shows to go you. What did we learn from that, that is in line with this article? The lesson (which will be explored a bit more later) is to keep your wits about you and suffer no distractions when you are mixing fuel as an incorrect mix (of several types that can be done) is a first line of consideration when you are having engine problems.

What fuel to use?

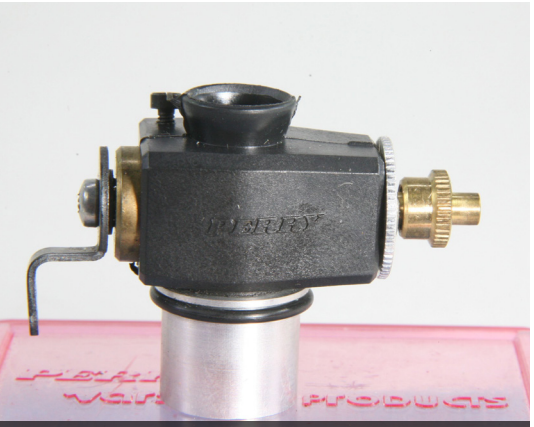
Before we jump into this tumescent pool of fuel discussion, I need you to have a full understanding of the word 'fuel'. As far as everyday consumers are concerned, be they modellers or not, more than likely the only time you will use fuel in an engine will be when you fill up the tank of your family chariot at a service station - a number of litres of petrol - the fuel for the engine and, similarly, diesel fuel if your chariot has a diesel engine.

Having filled up you snortle off to the flying field and fill your model aircraft tank with a 'fuel mix' - a mixture of methanol or petrol and oil or, in the case of a diesel dodger, oil, kerosene and ether. For the first one the fuel ingredient is the methanol, the next is the petrol and the next is the kerosene but the mix is not really the fuel - it is a mixture of ingredients that make up the 'fuel mix' and this is important at times when you are analysing an engine problem and maybe asking a question of a helper.

Robart jumped in on the act in early days and produced their version of a fuel pump using the same principle - engine pressure on an internal bladder.

Also a current pump unit but this one is for four stroke engines and is activated by the oscillation (natural rocking motion) of the engine.

The original Perry pump replaced the rear cover of your engine and, if set correctly they were extremely effective. The failing was the modeller who did not read the instructions but, then again, what's new?



Perry carburettors were(are) a very good after market item that came in a range of sizes. They smoothed out the rough running of some OEM carburettors and they are still available - and good - to this day.

I know from times way past that the simple term of 'glow fuel' is the accepted norm as is 'diesel fuel' or in some circles, diesel mix and this latter naming is more correct and very acceptable.

Much the same with glow fuel - better to say 'glow mix' and this covers both methanol and petrol fuels for glow plug ignited engines.

Due to the greater use of petrol fuels in two stroke engines (hand tools, motorcycles, outboard motors and the like including our great range of model engines, the reference to 'petrol' as the fuel for these engines is rarely used or accepted. We use petrol in out motor cars and a 'mix' in our two stroke motorcycles (etc) and the older term, not so well used these days, is 'petroil' - a mixture of petrol and oil suitable for a two stroke engine and even here we now have a little problem.

Older common knowledge was, as I said, petrol for four strokes (cars, motorcycles and some outboards) and petroil for two strokes. Not that it is going to be of concern for model engine users that some two stroke motorcycle engines use petrol - not petroil - for their fuel. The fuel is straight petrol and the oil is delivered to the engine by direct injection - a super fine spray of oil (almost a mist) into the crankcase where it mixes with the petrol that is waiting (nano seconds) to be blasted up to the combustion chamber for combustion.

This is the reason why even the oil injected two strokes still puffed a little exhaust smoke - particularly when subjected to hard a fast acceleration. Now we look at another variation to the norm and it concerns four stroke engines that use a 'petroil' mixture. This was bought to my notice a few years back when Honda was pre-advertising a four-stroke hand tool engine - whipper snippers, leaf blowers, chainsaws and the like.

As these engines are, in some cases, prone to being operated in less than vertical positions, there were a number of rumours that they must have a sophisticated wet sump lubrication system akin to a full size aircraft engine that, obviously, is prone to various manoeuvres including inverted flying but the oil in the sump is controlled so it does not leave the crankshaft out in the open, so to speak.

I had a number of modellers contact me to suggest that this new Honda four stroke range (various capacities) might be contender for conversion to model aircraft use (the current petrol four strokes were just starting to dribble onto the market) as it must have some sophisticated oil sump incorporated. My general reply was that, if this was the case, the price of the engines would be rather similar to the Rotax engines used in many ultra light aircraft and that would make hand tools a trifle (well - a helluva a lot) more expensive.

Having seen a detailed exploded view of one of the Honda engines I could see that it was not up to full size aircraft standard but of suitable design and integrity for its designed use. I also made a calculated guess that the lubrication would be supplied by a 'petroil' mixture, much the same as the common two stroke mixtures and this turned out to be on the correct track but it still causes problems to some users and the same for some modellers evidenced by the inquiries I receive and reports of damaged model engines.

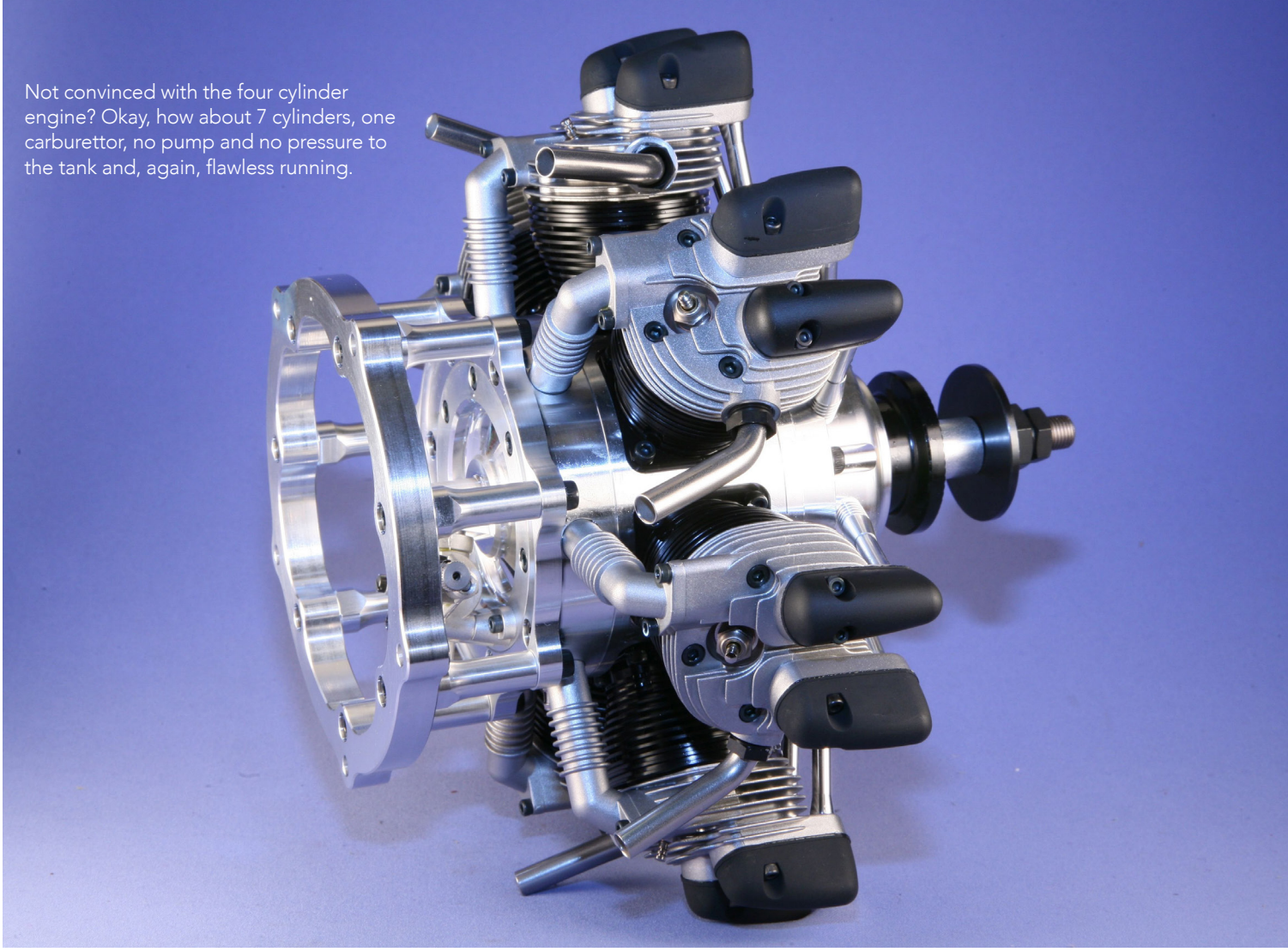
Our son is the head honcho of matters arboreal (trees if you must know) for a very large city council and he reported to me, early in the peace, that he had problems with some of his workers putting straight petrol in the new hand tools because they were 'four strokes and, of course, this led to a number of blown engines. Rather than supplying straight petrol and the oil to mix, my suggestion was a moderate size storage tank that contained the correct petroil mixture and that it be controlled (mixed etc) by one only person who had a full understanding of the requirements for the correct fuel. This was implemented and…no more 'cooked' engines.

Okay then, filter this down to our model engines with a simple instruction - for the purpose of the correct fuel to use, ALL our engines are two strokes. All the methanol engines, diesel engines, petrol engines be they two or four stroke are to be classified as 'two stroke' when you consider the fuel and the fuel that MUST be used is a mix of the main fuel ingredient and a suitable oil - glow mix, diesel mix and petrol.

Fuel problems

So many so-called engine problems can be traced to a fuel problem but, quite often a modeller will totally discount the fuel as 'it worked before' so it must be something wrong with the engine. It is the 'worked before' that always gets me and one of my little philosophies in life is, 'nothing happens until it does'.

Okay, apply that analogy to your model engine fuel and we will deal with a methanol mix first and, for a moment, I will deliver a small speech from my soapbox about water in methanol fuel.



Not convinced with the four cylinder engine? Okay, how about 7 cylinders, one carburettor, no pump and no pressure to the tank and, again, flawless running.

It is a fact that methanol will absorb water and it does it up to 60% of its volume. This has been a well-known fact for many years as I have read so many times in other model magazines about means to remove the water with freezing your contaminated fuel being the most popular but…this can be classified as an urban myth as it definitely does not work - the fuel goes milky in a form of emulsion but there is no clear evidence of fuel separating from the thin custard. Chemical laboratories do have water absorbing crystals that definitely will absorb and retain any water but the cost of the crystals is greater than the cost of methanol. This method would only be of use in a laboratory experiment or procedure where 100% dry methanol is called for.

If your fuel has water in it, the engine is not going to run at all well and some 'pit experts' are going to suggest the incorrect cam angle, over long induction tube or, the most popular, "all those particular engines have that problem" which, as an astute person, you know is a load of cock and bull.

Over many years I have bought this problem up for modellers and advised modellers who contacted me to consider this as the problem by trying some other modeller's fuel which is not giving him problems with his engine. As many times as I have mentioned it, I have had the 'arm chair' pedants pontificate that I was incorrect (most of the time not as politely as that) as the absorption of water from the atmosphere would not be enough to damage the fuel. Even an industrial chemist from a large fuel blending company in the UK disputed this by referring to the company receiving methanol in the thousands of litres delivered much the same as a petrol tanker delivers petrol to a service station. His claim was that their fuel did not have a water content and, if it was true that methanol absorbed water it would be evident in their fuels. Well, fact is, their methanol definitely would have a water content but the likelihood of the amount being sufficient to cause problems was almost zero and a very small percentage is tolerated by the engine as, indeed, it does take in moisture when it is running if the weather is a bit humid or close to rain.

So…what ammunition do I use to fire my gun so positively? You can see the answer yourself and I wager you have seen it many times in the past but paid no heed to it. In the morning when you start your car - particularly if it is garaged - there will be a small puddle of water on the floor under the exhaust outlet - water that is a by-product of combustion. It is always being produced when the engine is running but, as the engine and exhaust warms up and the car starts moving, the water is an almost invisible vapour except on very cold days or if you are in an area where it snows. The 'vapour trail' is quite evident just the same as the contrail we sometime see being formed by an aircraft at a high altitude where the temperature is a lot lower than that at sea level.

A methanol fuel, by its nature, produces a little more water than petrol when it is subjected to combustion in an engine and a percentage of this water so produced ends up in the fuel tank of your model. Now that's a surprise and I wager it has set a few readers wondering how in Hell can that happen? Is it the air entering the tank by the breather picking up some of the moisture or some other inexplicable method or magic?

Really, it is quite simple, many modellers PUMP it in when they use the dreaded muffler pressure to the tank.

To my way of thinking, I liken muffler pressure to a baby's dummy. Well, it is about time we (being grown up) discarded the dummy - stopped using muffler pressure as it is not required for our engines to run efficiently.

The very first O.S muffler for R/C application had just a counterbored hole for the starting injection prime but no thought of a pressure nipple as it had not then reared its ugly head.

"Why is it used - how did it start being used", you might ask. Well, going back in the dim, dark past when digital radio control was first introduced (radios with 4 or 6 channels and servos), it was obvious that there was provision for throttle control from the transmitter but… the engines used were all single speed - no variable throttles. Manufacturers jumped on this like a cat on a mouse and began supplying engines with a variable throttle and there were even a number of aftermarket throttles produced to fit a range of engines (Perry, Kavan come to mind).

Okay, the engine now had a throttle but idle was a bit unreliable as there were no mufflers fitted - straight out exhausts (imagine that today???) and it was realised that the glow plugs required a certain amount of residual heat when the engine was at low throttle in order for them to keep glowing. A range of exhaust flaps and louvres were fitted to the engines and these were mechanically connected to the throttle linkage so that they partially closed the exhaust outlet as the throttle was bought down to low RPM. Worked reasonably well but the engines still had an open exhaust at full RPM and the noise was beginning to upset some people (spoilsports, I say) so mufflers were the next addition to the engines.

One of the popular methods of starting an engine was to squirt a prime of fuel directly into the exhaust manifold then give the engine a flick. The new mufflers had a small tube or nipple incorporated in the body of the canister for this purpose so you could still inject the prime via the fitted tube or nipple. Now here I am digging deep into a world of maybe - maybe it is correct, maybe it is fiction but, there is some truth in the matter I am sure. At some time it was noticed that exhaust gas was blasting out in a fine stream from the priming nipple and this was coming out under pressure obviously. Now, control line fliers often used engine pressure to pump the fuel from the tanks in order to gain an increase in performance from their engines. Another popular method was (is) from a pacifier (a really good use for dummies or pacifiers) that is pumped up with fuel to several times its normal size and the delivery tube clamped off. The engine was primed, flicked to start and, as it fired, the clamp was released off the fuel tube, the pacifier had an urgent desire to return to is smaller dimension and, to do this, it had to squirt the fuel out at great pressure. To extract even more pressure, the dummy was set between two slices of ply which were bound with rubber bands to provide a lot more squeezing effort. If the timing of the release was coordinated precisely with the firing up of the engine, the engine then went into a screaming tizzy and the model was off and straining the lines. Incidentally, as it was beneath the dignity of many modellers to admit to using 'dummies' (aka pacifiers), they were called bladder tanks.

Well, here we can see the correlation between the bladder tanks supplying pressure and pressure (so much less) being available from these new-fangled mufflers so, if this pressure is used to force the fuel out of the tank, the engine must run harder (more RPM) which, during this period, was highly desirable to most modellers - particularly in the USA as more RPM meant the model flew faster… maybe. A bit like a modified muffler on a car or motorcycle - if it sounds louder it must be going faster.

Well, (still supposition) a modeller decided to fit a nipple to the muffler on his engine and connect it to the tank and, being as most humans are, then told great stories about how much better his engine ran so….everybody had to then have one and so it began. Manufacturers jumped in and fitted pressure nipples to mufflers yet, strangely, the primer nipple slipped into history and 'finger over the intake' became the method of priming. I never had of a liking for this pressure business - why on earth would you want to pump by-products of combustion into perfectly clean fuel? Soon problems manifested themselves when certain oils (after combustion), some castors for instance, slowly built up a slime coating on the bottom of the tank and this caused all manner of engine problems with many inexplicable engine stoppages often just after take-off.

The sudden acceleration would loosen some of the slime (after it had built up a bit) which would block the clunk or

At full throttle (max, RPM) the restrictor was fully open and at full noise.

Again, this O.S. standard muffler for one of the smaller capacity engines has the primer but no pressure nipple. I think the pressure nipple fitting was aimed more for the USA market and smaller engines were more popular in Europe where it was not so popular.

the carburettor and it required physical efforts to remove. I cleaned out many carburettors for customers and found, as I called it, cholesterol in the spraybar - a waxy coating reducing the diameter and partially (or totally) blocking the jet. Even though I spoke up about this many times, because the nipple was fitted, the use of it must have been correct according to many armchair modellers.

Well, as I have said many times, I always have a load of ammunition to fire back and this came in the form of the four stoke engines - NO PRESSURE NIPPLES. Now, you would think that the distance fuel has to travel up the induction tube of a four stroke and that there is a greater lag on demand time (every second stroke for a two stoke - every fourth stroke for a four stroke) that muffler pressure would be required for a four stroke engine but…none was supplied or needed - the engine ran perfectly. Eventually the whiners won, "sniff, sob, whine…my engine does not have a pressure nipple on the muffler", so some of the manufacturers played the market and fitted the blasted nipples…it's all business.

Some manufacturers stayed their hand and this is evident in the O.S. multi cylinder engines - the radials and the horizontal engines - no muffler pressure yet, strangely, those engine run perfectly. Another manufacturer who stood his ground was Neil Tidey, the manufacturer of the beautiful Laser engines (in the UK). From 1984 and still current, Laser engines feature right at the forefront of competition modelling - mainly scale in Europe and the range up to the magnificent 360 Vee twin at 60cc capacity. From my own experience and that of many other modellers, these are incredibly reliable engines and they run inverted just as well as upright or side mounted, all with no pressure to the tank and the carburettors are mounted directly onto the head - way up high or way down low when inverted.

Watered down

To close this first part of a series, here is the watering process, which, maybe some readers have picked up on already and… my ammunition. When you use muffler pressure to the fuel tank, apart from all the burnt gunk and carbon, the engine is pumping water in - remember (?) a by-product of combustion as we discussed earlier on. At the end of the flying day, there is, in almost all cases (many modellers used a tank too large for their needs) fuel left in the tank and that fuel is pumped back into the fuel caddy. This goes on almost ad infinitum until the day when the engine does not want to play the game. Won't idle, won't transition and generally bucks and pharts at the traces.

What is the problem? Well, dear reader, there you have it - this is how water slowly but surely gets into methanol fuels and the fuel ceases to be suitable for use. Yes, repeating my initial statement, methanol (fuels) absorb water up to 60% of their volume.

Another method employed to retain the plug heat was to place it as far from the exhaust as possible and, to many modellers, this was incorrectly thought to be a 'high performance modification'.

Don't miss out

In the next article of this series I will bring to your notice the quality of some methanols - grades of petrol to use and how to cook up a stinking container of rotten dinosaur soup - believe me - a real stinker it is.

Contact Brian Winch with your input or questions on beewun@bigpond.net.au or oilyhand@bigpond.net.au.

THE WINCH REPORT

BY BRIAN WINCH

Almost as good as new and it now runs extremely well with nice clean internals and external finish.

Damn, blast and bother!

Just thought I'd let off a bit of steam with some moderately strong language (good for the soul), however, the 'blast' brings me to some information of interest to engine type modellers (modellers who use/collect/ accumulate internal combustion engines).

For many reasons model engines can become grotty - dirty, caked with baked on oil, carbon and, if the dreaded castor has been used, castor varnish which should be removed for better running operation and for appearance.

Over many years, there has been thousands of words written about the 'perfect' method to clean engines and some of them have been, shall we say, less than desirable for a number of reasons.

Without getting into that topic too deeply, just one consideration is the use of a particular automotive product that is used by immersing the engine and boiling it for some time. From my research I found the fumes of that particular chemical when it is boiled is very dangerous to humans - not at all recommended.

I must just mention one other and that is the use of a very popular brand of cola drink - again the engine is boiled in it. One of the ingredients is phosphoric acid which is a good rust remover but not so good on many aluminium alloys and another ingredient is sugar - quite a lot and I don't want my engines boiled in this.

For a lot of years, I have used a cold chemical cleaner sold under the name of Turco Transpo - a cold dip developed for aircraft carburettors - you immerse the carburettor in this liquid then wash it with cold water. Does a great job but…it is a very strong alkali that will attack aluminium and its alloys (destroys magnesium which is present in some engine castings) so time of immersion was very critical if aluminium is involved.

If I wanted to bring an engine back to new appearance (often requested by owners) I use the Turco to clean the inner parts and bead blasted the external parts but there were shortcomings in this process. The beads I used were 'Glass Ballons'(sic) which are microscopic glass spheres that really do a fine job, but all stopped holes had to be plugged with a screw or otherwise. For example, the threaded holes in the rear of the crankcase are stopped holes - they go in for a certain depth. Now, if these and any like it are not plugged off, the mashed glass spheres would pack in super tight and their removal was a nightmare. As well, even though I used a breathing mask, the thought of that glass powder being ingested was of fair concern. Then, one day, a light at the end of the tunnel.

I was contacted by a company who carried out soda blasting - blasting surfaces with bicarbonate of soda - a safe product to be ingested as it is a common food product and, as a great bonus, it is water soluble - wash it off with water when the job is

done. To test the waters, so to speak, I sent a very grubby (horrible looking) Wankel engine that I had disassembled for them to clean as an example. The engine came back as absolutely new - a great job but…the cost (mine was a sample job) would have put most modellers off as it was quite high. I know some modellers did have engines done but these were rare and expensive collectables, so the cost was just bearable. I looked into the process for myself and, eventually, I converted to soda blasting (I have my own home-made blasting cabinet) and that changed engine clean-up work for me. As an example, I can blast a completely clogged (oil and varnish grot) ball bearing and bring it back to new in both use and appearance. Blasting engine cases is extremely successful as the soda does not cause any damage and will penetrate the smallest cavities inside and out and the engine comes out as new. The only small problem I found was that bicarbonate of soda (aka bi-carb) is hygroscopic - it absorbs moisture from the air and goes lumpy or, in extreme case, a solid block so care must be taken to prevent this problem which is quite a nuisance.

The tunnel light

Well, here is the light at the end of the tunnel. I was recently contacted by one of the business partners who told me they had gone their separate ways quite some time back and the business had been dissolved. However, with a new and qualified Operations Manager, Annie Fredriksz, the Excel Soda Group company carries out this type of operation on a much larger scale with greatly improved methods of operation and, the costs are much more favourable for model engine cleaning. As well as the new business, they have developed a special blasting soda that does not draw in moisture - does not clump or set like concrete and this soda is being sold at many common outlets such as SUPERCHEAP AUTO and it is sold under the name of Safe Soda - Soda Blasting.

The contact Email address is to Dean Kersarlal at safesoda@gmail.com Dean will be submitting an article in our magazine covering soda blasting as done by the company and at home to do-it-yourself.

What's wrong with my engine?

I have heard and read this question so many times over about 40 years of magazine writing. It sometimes comes up as a dream (or should that be a nightmare?). In the majority of cases the answer is quite simple - the problem is with the operator as our beautiful model engines are a jewel of perfection (generally speaking) and, if they had a thinking mind, all they would want to do is to run sweetly and efficiently without interference.

How many times is it seen at any flying field that a modeller fly's his model quite successfully and the engine is singing a happy song. He lands the model, has a cuppa or a chinwag with a mate then decides to have another flight. He fills the tank, starts the engine and then…adjusts the main needle valve and I ask…why? The engine ran perfectly less than an hour ago but does the modeller think that the needle fiddler leprechaun has snuck up and altered the adjustment? If you were to make note and watch carefully, as I have done on many occasions, the mixture needle is turned in and out but ends up in exactly the same position as it was prior to be upset. Even worse is the adjustment of the idle mixture control and this can really upset the applecart. That control, in almost all carburettors, influences the operation of the carburetor to around half full throttle until the main mixture setting takes over.

Okay, we started in issue #3 of this magazine so let us continue as I discuss as much as possible the vagaries of model engines and why you might have a problem and the topic to start this series is that which we all use - fuel in all fine detail.

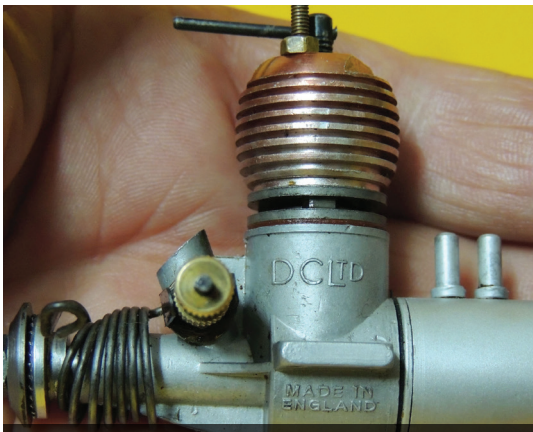
Briefly, the fuel is the main ingredient in the mixture we use to run an engine.

Basically we have three main ingredients - kerosene (diesel engines), methanol (methanol/glow engines) and petrol (petrol engines) and to these we add, most importantly, oil for lubrication and then other additives for various reasons such as ether and (maybe) booster chemicals for diesel engines, nitro methane for easier starting and smoother idling for methanol/glow engines (or greater percentages for performance boosting) and generally no additives for petrol engines though there are some but not recommended usually due to possible carburettor problems and that fact that we are mostly satisfied with the given performance of an 'off the shelf' model petrol engine.

To really muddy the waters, before somebody asks, some of us do have a tendency to 'experiment' with fuels and manufacturers have also changed oars mid-stream so to say.

Model diesel engines are very tolerant of various fuel mixes and I have been one

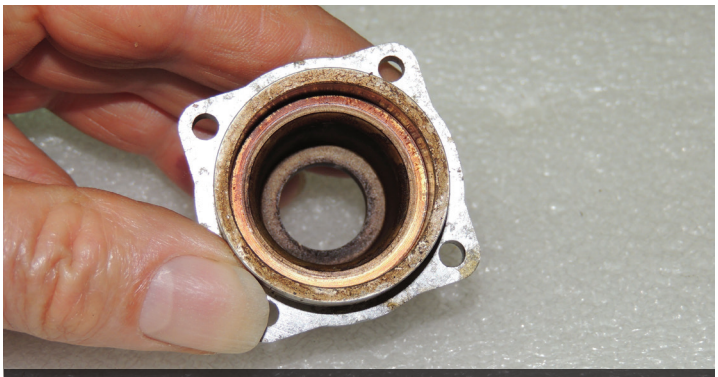
A little English made diesel from some years back that was run on castor then left without any care or attention.



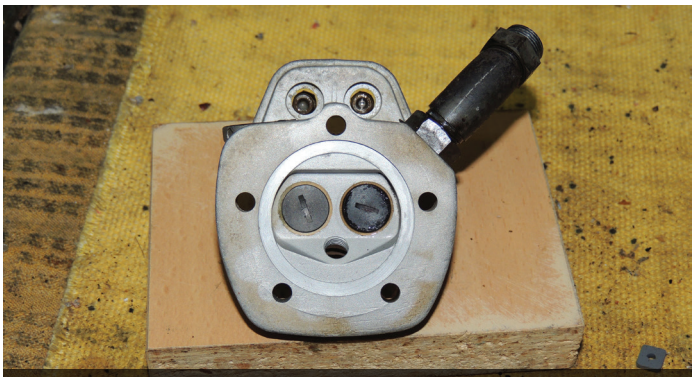
To have this in your hand as a young lad you counted yourself very lucky but they were out of my league due to the cost and availability.

A fine example of a rare gem that has many years of castor gunk. A soda blast will bring it back to NIB (New In Box) condition.

The front housing was returned to new condition ready for an easy fit of new bearings and a new life.



Rusted bearings were well locked in and they weren't coming out without a fight so I 'blasted' them and they gave in when I gained the upper hand.



A good blast inside the exhaust chamber and over the combustion area bought it back to new condition and the engine then ran very nicely.

A very heavy carbon deposit was preventing the exhaust valve from closing with subsequent engine running problems - it wouldn't run.

You could hardly recognise this engine when I had it sent to me due to the castor varnish and carbon. A visit to my soda blasting cabinet made a lot of difference.

I blanked off one side of this rusted bearing to provide you with a comparison of before and after soda blasting.

Sullivan PROFLUX tubing is available in two bore sizes, several lengths and as made up replacement clunk tubes. Certainly flexible and impervious to any of our fuels. This lot came from Albury RC Models & Hobbies.

of the 'guilty' experimenters by trying out a range of various hydrocarbon liquids, napthemes, aromatics and alcohol derivatives as a substitute for ether which is reasonably difficult to obtain these days. I have also used distillate as is used in some full-size diesel engines, Jet A kerosene and petrol in place of the kerosene with mixed results.
Methanol/glow engines as I now refer to them (we now have petrol/glow engines and spark ignition methanol fuelled engines) are the same old 'glow' engines (sometimes now erroneously called 'nitro' engines) that we run with a methanol, oil and, sometimes, nitro methane fuel.

Provided you use a suitable oil, good quality methanol and 'real' nitro methane (as opposed to some 'near nitro' chemicals which are, often, bearing destroying acetone blends), you won't find any problems with this basic fuel. Problems that can arise is water in the methanol (or fuel mix) and this comes from low grade methanol or using muffler pressure to the fuel tank (more on this later on). Methanol on its own or mixed with oil and nitro has an infinite life (lasts forever) as it does not degrade in any way but…I cannot guarantee that if some types of castor oil are used as I mentioned in my previous lubrication article. Just one quick example, a little while back a modeller friend gave me a bottle of mixed glow fuel he found in the back of his shed that was blended in 1965. I used it in an engine and the RPM was identical to that I had obtained with freshly mixed fuel.

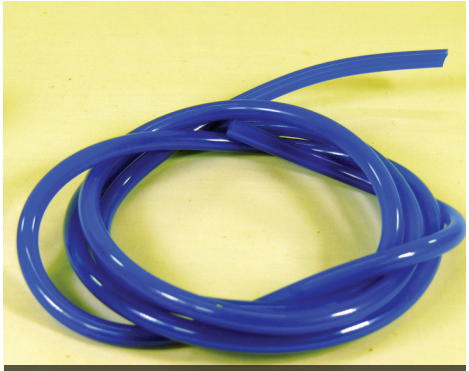
Petrol fueled engines generally run on a simple mixture of a ratio of a recommended oil to petrol. Rather straight forward but there are some traps for the unwary. First off is the petrol grade and this is where we must be circumspect to avoid engine running problems.

Unless otherwise advised, the grade of petrol to use is 95 RON (Research Octane Number) - the middle of the range generally on offer.

The use of the 90 and 91 RON petrols can be a problem as these generally have additives that might be injurious to parts in the carburettor and/or cause the engine to run hot. One positive additive is ethanol (alcohol) which is definitely a problem for some brands of engines as it will degrade the materials used in the pumps and regulators of the carburettor. As well, it will increase the

Neoprene tubing will last for years in any fuel and is on top of my list even though you cannot see through it which upsets some modellers.

Exelon 4080 tubing is the one that does not harden in petrol - you actually leave a few drops of fuel in the tank to maintain its pliability.



An excellent all round tubing that is really tight when fitted on a nipple or metal tube. This came from RCGF Australia.

running temperature a little. Another ingredient sometimes added is toluene which is a plant derivative from the tolu tree and also a by-product of the process of producing gasoline from crude oil and the manufacturing of styrene. It is also known as methylbenzene, toluol, anisen and phenyl methane having many uses with corrective fluid as a simple and common example. Added to petrol it can cause overheating and poor running if the amount is not carefully controlled but I do not recommend it for our engines as, again, the effect on carburettor parts is to be considered.

Regarding the oil used in the petrol, as I showed you in the last article, there are many very good lubricants on offer with a recommendation that you use a synthetic oil unless you want dinosaur soup - a foul smelling brew that will snap you head back when you open the can. I am going on past experience here, but I have read that the problem still exists and that is the use (some types?) of mineral oils for a petroil (two stroke fuel) mixture. In a rather short storage time it will go bad, rotten, smelly and not at all nice - in fact it really stinks and your engine will kick up quite a fuss. I cannot vouch for all synthetic oils but I have never had this problem with any that I have used over the years and some I have left for over 12 months as a test.

The problem is well documented in the UK (don't know about the quality of their petrol either) and many modellers, hand tool users (professional gardeners and the like) outboard motor users and even many moped (motor scooters to us) riders use a very high grade petrol substitute that is sold (generally) ready mixed for engines requiring two stroke pre-mixed fuel under the name of Aspen 2T and it is very highly recommended by all who use it even though it costs more than regular petrol. The fuel ingredient is an alkylate synthetic petrol product that has an outstanding longevity when mixed (as the Aspen mix), extremely clean burning with a very low carbon monoxide exhaust gas. All reports I have read praise it to the heavens but there is one downside, to my knowledge. It is not available in Australia but it can be sent to here at (moan) lots of dollars. Anyway, if you are interested, look it up on the Internet as there is a lot of information available.

To close off, for all our model engines, the fuel requirement is two stroke mixture regardless of whether they are two stroke, four stroke or rotary (such as a Wankel). We do not have any wet sump engines (as your car engine is) where the lubricating oil is contained within the engine - all our engines require oil mixed with the fuel ingredient (yes, yes, I know - the Kavan horizontally opposed model engine had a wet sump - it was filled with castor oil that had to be completely drained at the end of EVERY flying day. Still a few around but they are collector's items these days and I doubt that there are many if any used for powering models).

As a passing note, in common with our model engines, I think all the four-stroke engine powered hand tools (whipper snippers, chainsaws and the like) also us a petroil mixture for simplicity of engine design.

Last note here just in case you have worrying moments when you mix up a batch of petrol fuel where the manufacturer recommends a petrol to oil ratio rather than the percentage we have used for so many years with methanol and diesel engines. With a ratio mix the required amount of oil is added to a full measure of petrol - that is X amount of oil added to 1 full litre of petrol. To calculate the amount of oil in millilitres (or cc's - both the same measurement), divide the given ratio number into 1,000 (the millilitres in 1 litre of petrol). The resultant answer is the millilitre amount of oil you add to the litre of petrol. As an example, recommend oil ratio for X brand engine is 20:1 so, 1,000 divided by 20 = 50 - you add 50 ml of oil to the litre of petrol. Try another - 40:1 and the answer is 25 so, 25 ml of oil is added to the litre of petrol. Obviously, if you are mixing up more than one litre (say 5 litres) you multiply your ratio answer by 5. When measuring the oil, read the amount (top of the oil in the measuring flask) at eye level to avoid parallax error and be aware of the meniscus of the oil - the top of the oil is concave - it curves down from the edge and this is very important with all fuel measurements particularly if you are measuring small amounts.

Next problem - location

Well, we have sorted the fuel problem so now we need a fuel tank for a supply of it to 'feed' the engine and here we can encounter so many problems if you are a bit careless or simply lazy in the selection and setting up of the tank. Looking first at fuel tubing - a definite weak link in the chain. For diesel and petrol engines we must use a fuel tubing that is impervious to hydrocarbon fuels - kerosene and petrol being the main considerations.

For methanol engines the choice is considerable as alcohol (methanol) and nitro methane is not a problem with most types of tubing other than hardening some. The tube of choice is silicone which, as far as I can deduct, came about by the use of some tubing scavenged from a medical application - kilometres of it is used for all types of medical procedures and, apparently, many years back some astute modeller kept his (medial procedure tubing) and found it was ideal for methanol engine fuel use. Now it is manufactured by the thousands of kilometres for a myriad of uses. While it is ideal for methanol fuel, that is its limit as any hydrocarbon fuel will cause it to soften and swell.

For diesel engines, you can use Neoprene fuel tubing (black or clear), nitrile rubber, several types of petrol proof plastic tubing and Tygon, the popular tubing for petrol engines as a few examples.

If you really must know, this is what is inside and the system works and works very well.

Looking now at those types we have some problems when they are used for the clunk tube in a fuel tank as clear Neoprene is not very flexible, many of the petrol tubings will stiffen with age or swell slightly when immersed for some time in some fuels. Tygon will stiffen and shrink in diameter and the recommendation from the manufacturer of true Tygon (4040 grade) is that it be changed after six months use and we will discuss this further when we get into the fuel tanks. There is one brand of fuel tubing that will tolerate all fuels and not deteriorate but it does have one small problem. This tubing it the Sullivan ProFlex and it certainly does work well but it is a bit thin in the wall thickness and it will crimp if bent too tightly which is a bit of a shame. However, I will give you details of an excellent use for it when we get to clunks in tanks.

Another tubing that is excellent for petrol use is Exelon - a vinyl compound - it actually softens slightly (without swelling) in petrol and it is advised that you always leave a dribble or two of petrol in the tank to keep it soft. Okay, there is a problem - it is not (to my knowledge) available in Australia and it costs an arm and leg for postage and money transfer fees from USA but…the actual tubing cost is quite low at around $US16 for a 25' coil. (. Again, we will look at this when we get further into fuel tanks.
There are several other plastic (generic classification) - rubber type tubes that are very suitable such as the Viton fluoroelastomer range that crop up every so often but supplies are a bit patchy unless you do a bit of digging yourself.

Moving on to fuel tanks

From my long experience, I have no doubt that the majority of supposed engine problems stem from the fuel system - the tank/clunk/ fuel lines/ overflow line and the filter. If an engine has been running as it should and then develops a problem I would check the ignition (glow plug or spark plug), the ignition battery and switch. Finding no faults, I would examine the fuel system. In this part of your engine installation there is a tremendous potential for problems - problems from the start or problems that develop.

Modellers who have a history of setting up their models (scratch building/kit building) know that the setting up of the fuel system is very important and not a simple (push it into place and connect the tubes) operation. Selection of a quality tank is the first consideration as, with many other products these days, some are made to a price - a low price and quality is out the window. I have seen tanks with a screw on lid that leaked instantly or after a little use. Some tanks split open (a real bugger as the fuel causes all manner of problems), some degrade with age and some split open in the neck where the bung is squeezed tight. Always select a time proven tank brand (Sullivan, DuBro are examples) or one from a reputable supplier and, I must say this, price is a guide as a 'super cheap, bargain price tank' is about as useful as warts on your nose. For large capacity tanks you might consider looking at the RCGF website. I have severely tested the tanks on offer and found them to be of excellent quality with some outstanding fittings and fluoroelastomer clunk tubing. They come ready to use and, really, there is no necessity for you to interfere with the inside or the fittings as they do an excellent job as they are supplied.

For a real set and forget fuel tank you might consider the RotoFlow tanks from Albury RC Models in a range from 10 to 50 fluid ounce capacity (295 c to 1,478 cc) and these tanks are an install and forget item. They come ready to install in a model and you have no input whatsoever to the inside as the tanks are assembled and sealed in the factory. There is an inside mechanical clunk (all metal assembly) and all fuels can be used - an outstanding fuel tank that takes the worry of problems away - one less to be concerned about.
Okay, you want to set up your own fuel tank so you might consider a DuBro tank as these have a long and excellent record for the quality of manufacture and the fact they last - often longer than the model in which they are fitted.

Tank problems

Looking now at as many potential tank problems I can think of and then we will look at preventing those problems.

An extended range of capacities and a long record of trouble free use. Set up correctly they will provide excellent service for many hours without the need to constantly check them. Modelflight supply these.

An absolute premium grade fuel tubing but…also a premium price.

These are a very high quality tank ready to use with a super long life clunk tube and leak proof metal fittings factory installed. This one from RCGF Australia.

- Split/ fractured metal tubes.
- Split or pin holes in fuel tubing.
- Tubing falling off metal tubes.
- Clunk or clunk tube falling off.
- Clunk doubled back
- Clunk against rear wall of tank
- Clunk not following fuel
- Overflow/breather blocked or too long
- Muffler pressure problem.
- Capacity of tank
- Split tank/leaking cap/bung.
- Position of tank in model.

Well, that should just about cover the problems that beset us so let us now look at the fix for them.

Before we go further, I want you to remember that we are looking to prevent problems and have as near as possible an entirely trouble free fuel system.

Now we look at the problems I have examined over a lot of years with do-it-yourself fuel tanks and the first is the metal tubing used in the stopper or bung for the fitting of delivery, clunk and overflow tubing. If the tubing is brass there is a likelihood that it will be attacked by the nitro methane in glow fuel and also some ingredients in petrol and this shows up with the brass tube actually breaking up or disintegrating into splintery fragments. Mind you, it is not common, but it does happen, and I consider it might have something to do with the grade of brass tubing or the grade of nitro methane. It is a fact that nitro methane attacks (rather viciously) copper and has a mild reaction with zinc. What is the composition of brass? Copper and zinc in varying amounts plus, at times, traces of aluminium, lead and arsenic so my thoughts are that some brass alloys are more resistant than others to the attack but the fact is, brass is attacked and this is a consideration. Of note, I have seen rare attacks by petrols but I do not have details of the cause.

Okay, we go to aluminium tubing but… methanol attacks aluminium and forms a grey sludgy slime on it. This formation is slowed somewhat by the oil content of the fuel but it will still happen. Drop a bit of aluminium (old broken carby or engine bit) in methanol or methylated spirit and, quite often, overnight the sludge will form. Another little problem is that aluminium does not stand up to vibration or bending forces very well and is likely to fracture from too much movement (you shaping it) or the vibration transmitted by the fuel tube to the engine. Sometimes petrol will cause a bit of surface growth on aluminium - like an etching and anything like this weakens the metal.

What have we got left? Well, you could go for steel if you can obtain it in suitable tubing sizes but…steel has a bad habit of corroding from moisture, so it is not going to like glow fuels. Certainly, okay for petrol fuels - it is used for fuel delivery in most cars but obtaining it in small tube sizes is difficult and, again, left without a little care, it will still rust when used for petrol installation.

Things look a bit grim by now but I do have an ace up my sleeve and it is stainless steel - the perfect answer for all fuels but now you ask where can it be obtained in small sizes. You probably have some in your pocket right now…inside a ball point pen. Being a card-carrying hoarder…err…collector of useful things I have quite a supply of stainless steel refills in a range of diameters. It always grated on me when a pen ran out of ink to throw it in the WPB when it had a nice short length of stainless steel inside so…I collect the stainless-steel tubes. These can be cleaned with a solvent such as methylated spirit as one example and all traces of ink can be removed.

Another benefit is that these tubes can be soldered and, in our tank construction this is necessary.

In our next article I will show you how to use the refill tubes and continue with the setting up of a trouble-free tank.

Contact Brian Winch with your input or questions on beewun@bigpond.net.au or oilyhand@bigpond.net.au.

THE WINCH REPORT

BY BRIAN WINCH

What's wrong with my engine?

Continuing from the previous episode of exploring all engine related problems, I discussed with you fuels, mixtures and fuel tanks covering the various problems that beset us.

I suggested using stainless steel for the metal plumbing in the tank as it is impervious to all the fuels ingredients we use so let us look at setting up the absolute trouble free fuel tank to eliminate one more of the little problems that are generally covered under 'engine problems'.

The security of fittings in the tanks is of paramount importance as, in common with many modellers and ARF models, the tank is, many times, a major drama to remove and, in many cases, almost impossible to visually examine.

So many times I have been told by modellers asking for assistance that they cannot remove or even see into the tank when I suggest there could be a problem in that area. Really, no matter how good your tank or tank setup is, there is always that rare occasion that it is the source of the problem.

A little while back, at a popular competition, a modeller (well known to me) asked my opinion of the large radial engine fitted to his scale model. The engine would start slightly reluctantly but not run faster than about 4,000 RPM - way below its maximum. I could not see into the tank area of the model, but I suggested he should examine the fuel tank as the engine was, to me, obviously starving for fuel. While I was talking the problem over, a couple of 'helpful' souls came over to the area and the qualified answer to the problem was that the fuel tubing fitted from the tank to the engine was of a diameter too small for the engine - it was 5/32" petrol grade tubing. When I carefully suggested that the tubing was more than adequate, the reply was that it was way too small for an engine of 70 cc capacity and 'everyone who had the same engine had the same problem'.

Now this is a well-worn cliché in all facets of aeromodelling regardless of the problem. If the wings fell off a model you can be certain some wise spark will assure you that it happens to ALL of those models. Doesn't matter what the problem is - it is a well known problem and the person was told by the butcher who heard it from his third cousin removed who heard it from (his dog or cat etc.) The fact that there were 3 other models flying very nicely with the exact same engine had no bearing on the case, the fuel tubing was too small and that was that. When these knowledgeable persons put their two cents worth in, I retire - I don't argue and I don't want to be part of a controversy that is of incorrect advice.

When the happy helpers moved on to annoy some other modeller, I told the modeller with the problem that the fuel tubing was quite adequate as it had

to supply fuel sufficient for one 10 cc capacity engine as only one cylinder fired at a time in the radial sequence. Even if all cylinders were firing at once (can't happen - just an example), the tubing would be adequate when you consider the diameter of the fuel tubing used in a full size car which is generally around 4mm ID (Inside Diameter). I suggested a blockage of some type was preventing the fuel getting to the engine and the only way to find this was to visually check the tank. Fortunately, the modeller lived in the area (of the field where the competition was being held) so he was able to check the model at home that night.

Early next morning, I saw him setting up his model and he had a beaming smile which indicated to me that he had found the problem. "You were spot on, Brian - the tank had come adrift, slid forward and was choking the breather tube… air could not get into the tank." On the test flight after attending to the problem the engine was singing a sweet song at full noise and continued to do so for the rest of the weekend. I was rather pleased that he had not resorted to the usual 'fix' when the problem arose - he did not attempt to 're-tune' the engine as it had run quite well the day before and, being an experienced modeller he knew that the tuning would not change as he was using the same fuel and propeller.

Reducing the problems

Okay, I have said my piece about accessibility of the tank so it up to you how you deal with it as long as you remember, sometime (if your model lasts a good time) you definitely will have to access the tank to make some adjustment/ repair/clean/ re-plumb or other necessary procedure so prepare for this when first setting the model up for use.

Now, here is my method for plumbing a tank for long, trouble free use and reliability. As I first mentioned, I am going to use stainless steel tubing from ball point pen refills but that is only for the delivery system and you will need two refills - the ones I am using are 4.8mm diameter. Without some very specialised equipment or materials, bending this type of tube is not to be considered so we also have to resort to copper or brass tubing but we protect it against corrosion - more further on.

Using a Dremel or similar, cut the ends off the refills to end up with a parallel tube but…don't cut them to length just yet. I found a pipe cleaner soaked in methylated spirit or isopropyl alcohol did a good job of cleaning the inside of the tube of residual ink and leaving it soak in metho for a while completed the job perfectly.

While they are soaking, wind yourself some circlips using plated copper wire around 0.5mm (24 gauge) like a spring around another refill or rod the same diameter (the blank end of a drill is a good choice) then cut along the spring form with fine snips or scissors to end up with a nice supply of 'C' shaped circlips which will serve as the tube retainers (aka barbs) on the metal tubing.

Now we are going to cut the refill tubes to length as required - one for the clunk tube and the other for the delivery tube through the tank bung.

A small tube cutter works best here and, using my 'patented' method, the ends will not curl in to reduce the tube internal diameter on the ends.

Slide the refill over a metal rod for a very snug fit - a just slide on is what we want - then cut to the lengths required with the tube cutter. Again, the blank end of a drill bit is ideal for this. This provides a very neat cut with just enough curl in to prevent a sharp edge on the ends of the tube.

Scrub the tubes with a Scotchbrite pad (or similar) to a clean and shiny surface, wipe the end sections with methylated spirit or alcohol then tin the ends with solder for about 6mm along both ends.

Slip a circlip on both ends of the clunk tube and one end of the delivery tube then set them about 3mm from the ends. Push the delivery tube through the tank bung and fit the other circlip. A touch with a small soldering iron and a drop of solder will secure the circlips and coat the wire with solder to build up a very neat barbed end.

The clunk weight is very important in any fuel tank and the most recommended is the Walbro type (also sold under the O.S. label) which has a neutral metal (not affected by any fuels) weight with straps that clamp a superfine felt filter.

The two main benefits of this type of clunk is the excellent filtering - nothing other than fuel passes through them and that they do not generate air bubbles in the fuel. Contrary to some thinking, it is not an ingress of air that causes air bubbles - it is movement of the liquid.

A slight pause here to cover a topic that has been bandied around since we first ran model engines - air in the fuel line of which there are countless reasons but, really, the cause is quite simple.

My 'supply of materials' - ball point pens I have loved, used but not forgotten - they are now material for projects.

Atmospheric pressure at work. Containers are subjected to sunlight so the air inside expands with the heat. Now winter's cold weather is with us, the air inside reduces in volume and old 'AT' squashes them.

A good shake and a quick photo to indicate the induced froth in the water, methylated spirit and oil. Air bubbles form within the liquid.

Soft, very inexpensive stainless steel tie wire as is used in apiary work to hold wax frames for bees to store honey. Lots of uses in model jobs.

Sullivan Prolux fuel tubing is impervious to all the fuels we would use and it has an extremely long life but will kink if bent back on itself.

I fit the blank end of a drill bit into tubing and then cut it with a tubing cutter.

These clunk filters are an excellent choice for model use as they have a good weight and the felt block filters all foreign material before the fuel enters the delivery tube.

Not quite as heavy as the felt clunks but still a good option as the filtering is very good and it prevents bubbles travelling up the clunk tube.

For this example I used a 200ml plastic bottle (an empty vanilla bottle I had on hand) that I cleaned internally. Using the lowest (common) viscosity fluid - clean water, I filled the bottle to about .75 of its capacity. Good clean water has a very high surface tension (72.8 millinewtons per metre at 20°C) so, when I shook it, I could see bubbles form while it was moving but they quickly dissipated when the bottle was still.

The next lowest viscosity fluid easily on hand was methylated spirit which, added to the water in a very small quantity, slightly changed the surface tension and the fine bubbles remained for a short time when the bottle was still. Next addition was one drop of olive oil, another good shake and the bubbles increased and remained for a much longer time.

Okay, we are not using water in our fuel but petrol and oil or methanol and oil has a much lower surface tension and…a big and here….it is subjected to very high frequency transmitted from the running engine so … there are many bubbles in the fuel tank (aka 'froth') and some of them, according to the type of fuel delivery, are transmitted along the fuel lines. Most oils these days have an anti-foaming ingredient to prevent the fuel foaming like shaving cream but it does not stop the layer of superfine bubbles that form when the fuel is subjected to high frequency vibration. Maybe you don't see bubbles but they are often there and very fine - almost invisible but, allow a bend or tight change in the fuel line direction or add a reservoir such as a pump (O.S. for example) and the micro mesh bubbles gather together and form large bubbles which are generally not much of a problem for methanol fuelled engines but could be a problem with petrol engines due to the much lower fuel consumption (2.5 times less that a methanol engine) and the type of carburettor.

So, now we have a good reason for using a clunk weight that prevents bubble problems. O.S. also produce a bubble preventing clunk in the form of a sintered ball with an O ring around it (to prevent tank wall damage) and this first became necessary with the super charged O.S. engine which was very sensitive to air bubbles in the fuel. These are also very good filtering clunks but you would need to change to a Viton O ring if you are going to use one in petrol fuel.

Plumbing the tank

Okay, we have our clunk bits and the delivery outlet tube so let's plumb them into the tank and … consider the overflow/air inlet tube which we need to address before we can assemble the internal system.

As I said previously, without special equipment or bending metal alloy it is not easy to bend thin walled tubing. There are two methods for future reference if you have the need - one is expensive but reusable - the other is virtually free.

The first is to use an alloy sold as Cerrobend which will melt a bit below the boiling point of water. It is melted in a bain-marie (one container sitting in hot water in another container), poured into the tube, allowed to cool, the bend is carried out (perfect job), the tube is put into the bain-marie again and the metal melted out to be used again…and again and so on.

The other method is to block one end of the tube, fill it with soapy water (kitchen detergent is good), plug the other end with a tissue (reasonably tight) and freeze the tube overnight. The tissue is to stop the water running out but allows the ice to move it out a bit as the water expands as it freezes. Without a lot of mucking about, take the tube from the freezer and bend it as required. This is how musical instruments - trombones, trumpets, French horns and the like are bent to shape and also the exhaust pipes for Honda motorcycles but they have a

tube in a tube so the outer tube does not discolour from the exhaust heat.

Okay, let's do it the very easy way and use copper or brass tube for the breather/overflow but, to prevent any chance of corrosion and breaking down, the inside tank section with the bend toward the top of the tank is shrouded with tight fitting fuel tubing to suit the fuel to be used. Wet the tube with kitchen detergent and push the fuel tubing on making it a little longer than the metal tube then cut the end on a bias so it just touches the inside top of the tank.

Right, let's assemble the bits and here I recommend the use of Sullivan Proflex tubing, Fluororubber tubing or Neoprene tubing as I showed you in Flat Out RC #3.

You can use silicon tubing if the tank is for methanol but do not use Tygon tubing for a petrol tank as it has a limited life span of about 6 months before it starts to harden and shrink. We need a long lasting tubing that is going to be used for a hinge - it will allow the clunk assembly to trace around the rear of the tank to pick up fuel without interruption regardless of the attitude of the model.

One more item to find, and this will come in handy for other applications as well, is stainless steel tie wire available from many sources on the Internet. One I find very good is Brookfield Beehives and the wire they have is top quality for a very reasonable price.

Our first move is to introduce the outlet tube into the tank bung after having soldered a circlip on one end. If you need to enlarge the hole in the bung, one safe way is to run a red hot rod through the main outlet hole. I used a long nail - 3.7mm diameter - and it did a fine job. The stainless tube was then a firm push in fit aided with a drop of soapy water.

Okay, push the tube through the bung right up to the soldered on circlip, wrap a narrow strip of aluminium foil around the protruding tube end and solder the other circlip on.

The reason for the aluminium foil is that it acts as a heat sink and the heat from the soldering does not transfer back to the bung.

Slide the tube back through the bung to set the lengths inside and outside as required then slip a short length of fuel tubing over the inside section. You need only around 25mm of tube as this is our first hinge. Slide the clunk tube into that 'hinge' and ensure there is a little clearance between the ends of each metal tube. Using the stainless wire, wind two loops around each end of the hinge piece just behind the circlips then twist the wire ends to tie them off.

Rather much the same process for the clunk weight - a hinge piece plus wire ties and that completes the clunk assembly.

Regarding the length of this assembly, check the end wall of the tank to see if it is flat or slightly concave (bowing in) as some are. This is a problem area for the unwary as the clunk assembly length is generally set with about 10 - 12mm clearance from the rear of the tank but…this is often viewed with the clunk weight resting on the tank inner bottom. If the end wall is concave the provided clearance might not be enough and the clunk can jam on the apex of the convex (inner side) surface.

To check all is as it should be, hold the tank vertically and rock it to move the clunk weight in all directions over the rear wall to ensure it has adequate clearance over the entire surface. I suggest 12mm to be the ideal clearance as, according to Sir Newton's laws, the body (clunk weight) will remain at rest (stay where it is) while the tank moves forward under acceleration of the model. If the clunk tube can stretch under this acceleration, the clunk will jam against the rear wall just as your model is taking off and…you know what happens - the blasted engine stops. As we have very short lengths of flexible tubing in this assembly, the stretch factor is minimal but… not if you have the clunk close to the rear wall. A reminder here again - we are setting up a trouble-free fuel system as well as is reasonably possible - every little point matters.

Next is the breather/overflow tube which, as I said, needs to be copper or brass unless you want to experiment with curving/bending the stainless tubing. Both copper and brass are subject to breakdown when immersed in the fuels we use so we protect the tubing by fitting a tight fit fuel tubing sleeve over the section inside the tank as I explained earlier on.

Where?

That just about covers the assembly of a trouble-free tank so now we have to place it in the model and here we have a bit of a grey area - particularly with methanol engines that do not have a fuel pump for the carburettor supply.

The very first consideration is your mode of flying the model - sedate scale flying, easy weekend flying, old timer type flying, a bit of manoeuvring or 3D type sky blasting.

On my test bench the tank is generally lower than the needle valve of the engine (reference point) and all engines run on that test bench run as they should.

As an experiment, I have held a fuel tank and lowered it as the engine was running until it was 300mm below the engine and the engine continued to run but… the engine was static - not being thrown about as it would be in a model.

I have said this many times over the years and I will repeat it for those who are unaware of the fact that engines do not suck fuel into the carburettor. Obviously this is not entirely correct as there is a very small amount of suction as the piston moves but it is a very small amount with many factors of consideration such as tapered liners, Dykes rings, ringed and non-ringed engines for starters.

The fuel is driven in by atmospheric pressure which is a pressure in all directions around us at 101.325 kpa (kilopascals) or, in old money, 14.7 pounds per square inch at sea level. Not getting too deep into the topic, AP (Atmospheric Pressure) is equal in all directions with main variation being elevation which, for example, shows at the peak of Mt Everest at 4.89 psi.

Now, the matter of concern is our fuel tank, which, under normal circumstances, has equal pressure on all sides so it balances out and doesn't get squashed in (unless you block off the breather). The fuel inside is a different matter as it is also subject to AP but only on the top surface as the tanks sides are at an equal pressure. That surface pressure does not push the fuel out if the tank outlet is left open to atmosphere as the AP is equal on the opening of the tube so all remains static but, it the outlet tube is hanging below the tank, the fuel will start to run out in a siphoning action as the surface pressure of the fuel area is greater than the cross sectional area of the tube and the weight of the fuel is added to the flow action.

Right then, the tank is connected to the engine (no fuel pump at this moment) and all remains static - there is no flow of fuel. We rotate the crankshaft and moved the piston up (two stroke) and the area below the piston increases, the port in the crankshaft or rear disc opens

This is the secured and safe 'hinge' section for the clunk tube. The SS wire does not need to be super tight.

Complete assembly ready to be fed into the fuel tank. Note the breather/overflow tube is protected with fuel proof tubing.

The way it must be, a very flexible clunk tube feed that will follow the fuel around the rear of the tank regardless of the model's attitude.

and atmospheric pressure rushes in to fill the void. As the air flows through the carburettor it is met by the spirit of Giovanni Battista Venturi, an Italian physicist of the period 1746-1822, the man who expounded the principle of Mass Continuity in which, extremely basically here, a fluid's velocity increases when it passes through a constriction.

A parallel tube reduced in diameter somewhere along its length will cause an increase in the flow speed of a fluid (with air being also classified as a fluid flow) as it passes through the narrow section. Now, this all brings in high and low-pressure troughs (suction) and any impediment along the tube such as a projection or a break in the surface will cause such an effect.

What does all this mean to us when we are discussing fuel and carburettors? Well, the intake of our carbies is commonly known as the Venturi with the basic design being a trumpet (or bell) type main opening that reduces down in diameter over part of its length the opens out again to almost the same diameter as the top inlet.

In the reduced diameter section is a spraybar (many types) into which fuel is introduced and controlled by a needle valve. Now, back into the above 'heavy section', I wrote that the velocity of the air (fluid) increased in the small section and this is a high-pressure trough - maximum speed of the air in that place.

As it contacts the spraybar (or fuel jet) part of that flow is stopped by the solid object or interference in the smooth flow - hole in the side - so it has to flow around it and, in doing so, the flow rate decreases and becomes a low pressure trough and this, very basically again, causes a suction - it draws fuel from the fuel jet which mixes with the airflow that goes into the crankcase.

In the case of a four stroke, very similar but the opening is the inlet valve and the vacant area is the cylinder as the piston goes down and the same air/fuel action occurs. Now I hear somebody at the back of the field say, "Hey, 'old on a minute, mate - what abart when ya puts yer finger over the venturi and turns yer engine over to suck in fuel - how abart that then?" Okay, I won't use the terrible cliché that 'that's a good question' because, to me, all questions are good - some better than others but, the fact is it would seem a bit hazy after all I have expounded in the last few paragraphs as it would seem to shoot my postulation well and truly in the foot, so to say.

Well, this is how it works. When you block off the carburettor intake, the air cannot flow in as it normally does but, as you turn the crankshaft, the piston is still creating the void (void of air) in the crankcase and this low pressure area is an invite to AP to push fuel from the tank into the void. At the same time a small amount of air still enters (AP is very persistent) through the exhaust port and fuel passageways in the two stroke or exhaust valve in the four stroke and continuing to turn the crankshaft pushes out some of the air bought in, the void is re-created and more fuel is pushed in from the tank by AP.

To see a fine example of this, try suction priming (finger over the carby) an engine fitted with an air bleed carburettor - no fuel will flow if the throttle rotor is anywhere but fully open as the air to fill the created void is introduced via the air hole in the carburettor body and this does not pass by the spraybar. If you open the throttle rotor fully (maximum RPM position), the rotor blanks off the air bleed hole and the fuel is drawn in by the interchange of positive/negative pressure (voiding and filling of air) as the piston moves up and down.

Well, there you have it, pressure of atmosphere pushes the fuel into your engine and now we see how tank position can have an effect on the smooth flow. I know that here, I am going to upset some readers when I advise that you leave space to change the position of the fuel tank if you have a problem. If you have problems with an inverted engine - not reliable due to flooding - then you should consider lowering the tank position and of course, do not use muffler pressure. In fact, I advise you never use muffler pressure as you pump contaminants and water into your tank and, really, it is not necessary. If you have muffler pressure

fitted and decide to try without it, you need to adjust the main needle a bit richer - simply retune the engine and it will still run as it should and be more reliable throughout the tank of fuel.

As general advice, for a non-pumped engine, the tank is set up with the centre line 10mm below the alignment of the main needle valve but…this is a general rule and starting point. If you have fuel feed problems due to the tank position, there is a really easy way of finding the ultimate tank position and for this you need another tank of the same capacity. A bit fiddly here but, believe me, you can really sort out tank problems with this method.

You will need some rubber bands or cable ties and some scraps of soft leather or felt as you are going to install the tank on the OUTSIDE of the model secured with rubber bands or ties and the leather or felt is to prevent damage to your model from the securing ties.

As an extra reference, consider wrapping the section of the fuselage with white paper in order to felt pen mark the tank positions for later reference. Easy process now, fly the model to check the tank level and adjust this if necessary to obtain satisfactory results.

The simple truth is, other modeller's aircraft you see with inverted or side mount engines that do not have problems have a special feature - the fuel tank is set at a level and plumbed to suit the engine whichever way it is fitted and, we've all seen them and, maybe, asked the modeller how come he doesn't have problems with his inverted four stroke (etc.)

Petrol engines - a different story

While the following advice is aimed at engines fitted with a Walbro (or Walbro style) carburettor, it can, with a little experimenting, apply to any engine fitted with a pump fed carburettor. The Walbro (and types) carburettors have a failing that is common to many petrol pumps even in full size cars - they are not at all efficient at pumping air.

My mind boggles (whatever that means) when I read the instructions for a petrol engine and note the advice 'rotate the propeller 25 to 50 times to obtain a fuel draw to the carburettor'. You've got to be joking, mate.

Just think if you had a motorcycle (as they were) with a kick starter and the same advice applied…..you would end up with muscles on your kick starting leg the size of beer barrels. So…why did I refer to motorcycles? Well, we can take a page out of their book about fuel delivery.

Motorcycle engines rely on gravity feed to get fuel from the tank to the carburettor - the tank is high so the fuel flows down (pushed by AT which is why it is important to have a small breather hole in the tank cap or elsewhere)- an excellent system.

The motorcycle carbies are a lot different to the Walbro (and types) as they have a float chamber which lets the fuel flow until the chamber is full. The Walbro has a diaphragm and valve system that prevents the flow of fuel until it is activated by a pulse from the engine - if the engine is not running, the fuel will not flow and that is a little problem we must overcome.

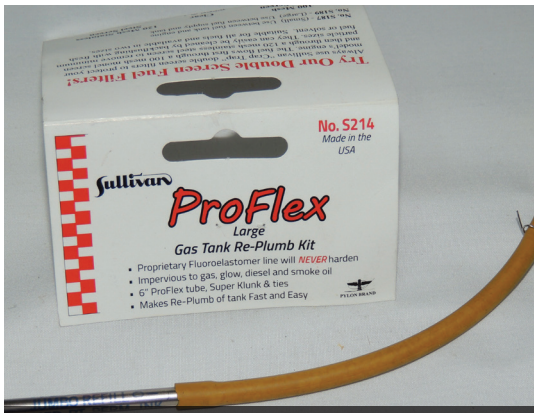
First, we must have the fuel tank as high as possible to provide the gravity feed and then we need a substitute for the float chamber and this is in the form of a Tee piece and fuel button. Ideally the Tee piece is in the fuel line, as close to the carburettor inlet as possible and the fuel button is connected to the leg of the Tee set up to suit your application for your model.

In use you fill the tank until it is indicated by the overflow from the breather (keep this at a maximum of 100mm long), remove the fuel button and introduce a drop more fuel into the tank until it flows out the fuel button line (squeeze the tank overflow but do not block it in case you forget to unblock it) then replace the button. You now have fuel knocking on the door of the carburettor and, if all else is well, you will have an almost instant engine start.

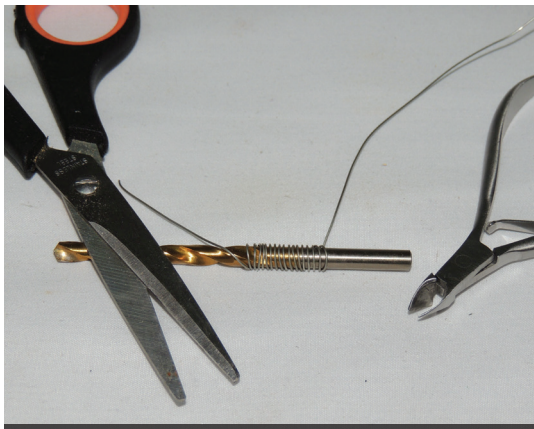
As the fuel flows

Next issue we will discuss, briefly, the fuel line to the carburettor and then look at why you are having carburettor problems and how to fix them.

Any Questions or discussions?
Contact me at *beewun@bigpond.net.au* or *oilyhand@bigpond.net.au*



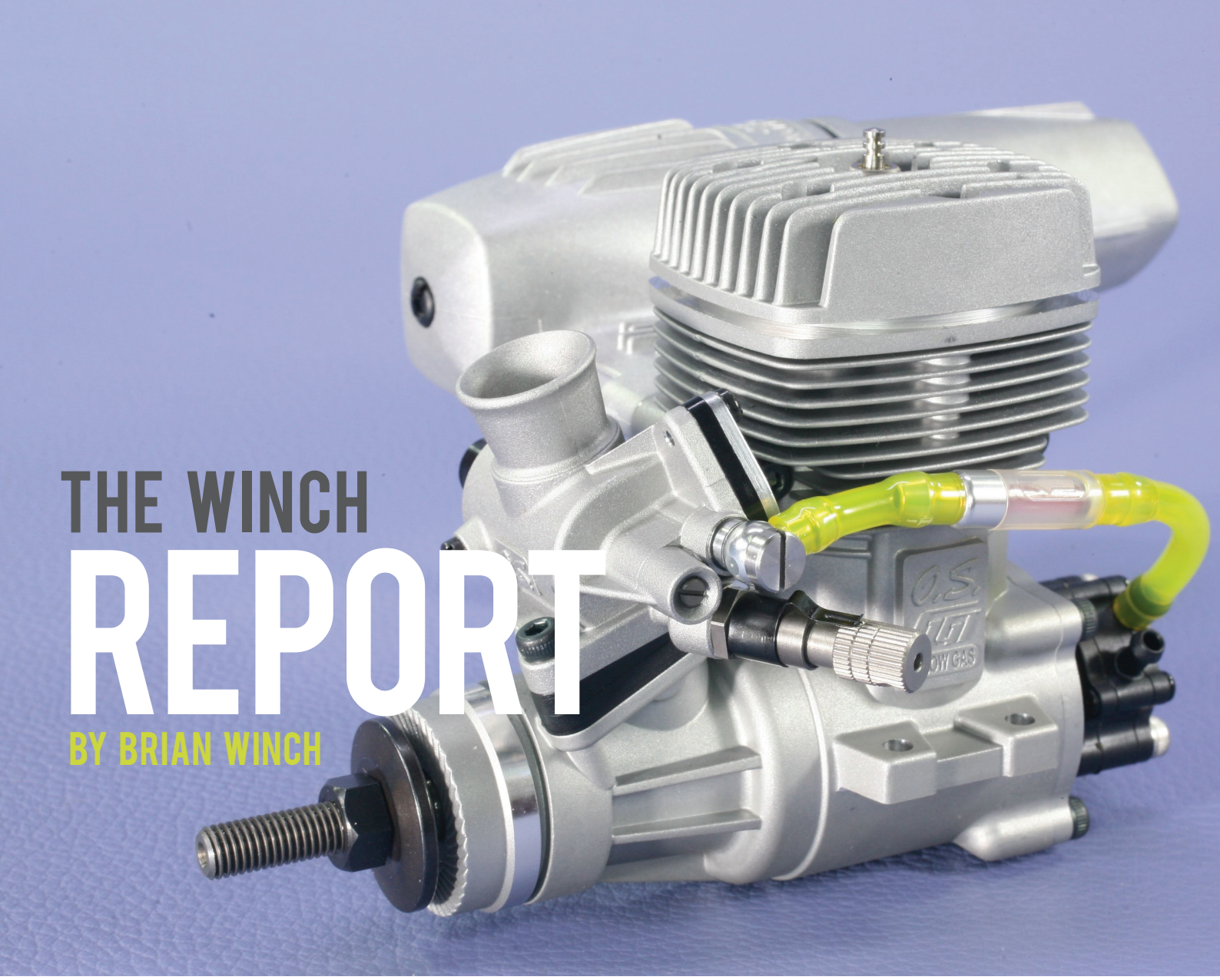
Another consideration is to introduce the SS tubing into the Prolux tube to prevent it kinking but you will need some soapy water to help slide it in.



Use tinned copper wire to wind around an arbor for the purpose of making your little circlips to act as fuel tubing barbs.

Cut along the coil with fine scissors or snips and the end product is a perfect soft wire circlip you can squeeze in slightly for a slide on fit.

Pipe cleaners and methylated spirit is the way to clean the inside of the pen refills but…wear disposable gloves as the job gets messy.



THE WINCH REPORT

BY BRIAN WINCH

Slipping back

I've been continuing down the path of trouble shooting engines but I seemed to have forgotten to mention this in my earlier fuel article, but I was reminded when a reader (modeller) contacted me about fuel colour.

Some oils that use a vegetable dye for colouring can be subject to fading when exposed to Ultra Violet light - light from the sun - and that can pose a serious problem.

I am sure you know the sensation that occurs at times, the sensation of thinking you know you carried out a certain task and convincing yourself, but not fully - that you really did. A bit like the age old 'doubt' problem when you are a few hundred kilometres along the road to your holiday destination and the 'doubt' pops into your mind or your partner's that, maybe, the gas was left on, the door wasn't locked, the stove was still on, the iron was still on where you left it on the ironing board. Here you have to look at the logic of the situation and your attention to detail. For a lucky few, the doubt can be dismissed totally due to the surety that the gas, etc. etc, was attended to correctly before you closed the front door…and locked it…err…did you lock it?

We can apply that analogy to mixing fuel and, maybe, you did or didn't add the oil. This situation generally arises when you are mixing up a batch of fuel, you have poured the requisite amount of petrol (in this example) into a container and you are called away for some other task, maybe a phone call or the washing machine stops working etc. Now we consider a few 'ifs' - If the oil you use is a strong colour or your oil has faded to clear. If your fuel container is clear walled or if you use an opaque or metal container. Your container not filled to a known level or cannot remember just how much oil was in the oil container. You might have a problem when you get back to the fuel mixing project and you are not really sure you added the oil. With a clear wall container and an oil that has a strong colour, a visual check is enough but…many times we are not that lucky.

Methanol fuel is a little different in this department if you still used a high oil ratio and one particular oil but, as many modellers now realise, you don't need so much oil and even down to 5% suits some and this brings the problem of the amount in the bottle - it is not easy to see the difference in level of, say, 4 litres of methanol on its own or four litres of methanol with 200 cc of oil added if you have to look down inside the container. If you use Klotz oil you might see a pink colour but most other oils - including the dreaded castor - can show up clear. If I had these doubts I would dip a strip of paper kitchen towel into the fuel and let it rest for a while. Petrol and methanol will evaporate from the paper and, if you did include the oil, an oil stain will remain but….not always reliable with some petrols as the petrol dyes used can leave a stain so you cannot rely on this for petrol fuel.

The only reliable and accurate method is to carefully decant the fuel into accurate measuring containers and note the liquid measure. If you were careful measuring the petrol this will indicate yes or no. I know, I know - You always put the oil in first (as I do) and use the fuel ingredient (petrol or methanol) to wash out the measuring container that was used for the oil but a distraction can still cause an upset if your fuel container is opaque or metal. You come back to the job annoyed by the phone call from some foreign person telling you your computer has a serious virus - your bank account is going to be frozen as it has been compromised - you can have a free weekend listening to a lecture on 'Self Immortalisation' or "Life After McDonald's' and you continuing cursing as you pour the petrol in but…did you put the oil in before the phone call?

A visual indicator would be very handy if it was strong and not affected by time, heat or sunlight. John Bristow (DeLuxe Material) was well aware of this when he formulated his PowerModel 2T-s oil for hydrocarbon fuels (petrol/kerosene). He used a synthetic ester base and a very powerful dye that leaves you in no doubt if there is oil in your fuel. Other oil manufacturers use a vegetable dye in their oil and it is this that, in the main, is the problem as it will certainly fade or completely disappear leaving the oil as clear as water. I think the dyes they use are available only on a commercial basis or they can access the actual dye base as food dyes nowadays are water based except for lemon essence (the bush cooks friend) and this is quite strong alcohol but…not enough colour to be of use for our purposes).

Really, regardless of what you think, know or practice, the fact is modellers are still wrecking engines due to mistakes mixing fuel. In the mainly methanol fuel days this was not such a big problem as many modellers purchased ready mixed fuel from hobby shops but…not on with petrol - the laws about storing and selling petrol or petrol based fuels are extremely powerful - no hobby dealer would risk a big fine if he/she sold ready mixed petrol fuel. It is purely the domain of the modeller and that poses a problem in the first instance when the amount of oil is in question as it is stated in the instructions as a ratio - 40:1 etc and this can confuse some if they do not understand how to work out the amount of oil. (I'll tell you further on). Drawing on some of the phone calls or Emails I receive - the mixing of fuel is a grey area to some and, to some, not a task that requires careful consideration. Examples: "My petrol engine is blowing loads of smoke and it is down on power???" Answer: "It is my consideration you have way too much oil in the fuel." This is generally verified when I ask about the fuel mix and I am told they were very careful measuring precisely a 20% mix. Err…sorry - that should be a 20:1 mix which is 4.76%.

Much worse: "My engine started right away and was running much better than it ever did (higher RPM) then it stopped suddenly and it was so hot there was smoke coming off it."

"How much oil did you put in your fuel?"

" The same amount I always use…err…I am positive I put the oil in the fuel…I think."

"I think you cooked your engine due to no oil in the fuel and it is probably terminal."

Rather oddly, to my way of thinking, I have had a few modellers have a similar problem with their glow (methanol) engines and it could only come about when using faded oil or one oil I have seen that is clear from the start. The Email tells the story:

" My glow engine started easily and when I advanced the throttle it revved like crazy and, while I was wondering what it was doing, I heard a loud clunk sound and the engine stopped so quickly the propeller flew off, I refitted the propeller but, when I tried to turn it over it moved a little then stopped and it will not make a complete turn."

"Sad story to tell you, the connecting rod is broken - probably the big end is snapped off or split open…there might be other damage as well. Check your fuel - it might not have oil in it."

Security and peace of mind

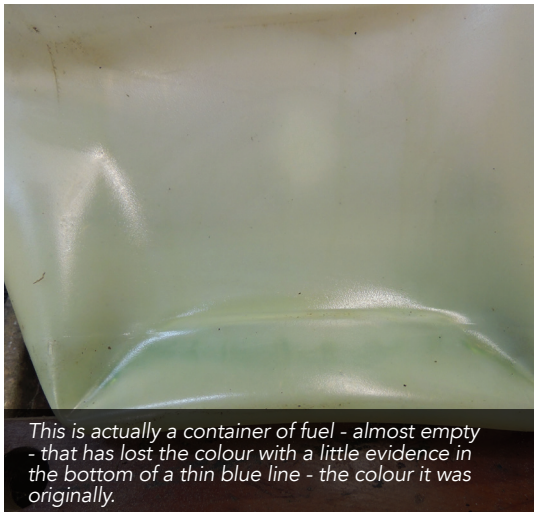
At great expense to provide you with a solution (well…I did spend a few dollars anyway) I purchased a number of colour dyes to mix with petrol and methanol. Adding a dye to oil is an option but the dye to do the job was not on my low-cost list; besides, adding a dye to the fuel ingredient is so much easier due to the ease of mixing - a couple of shakes and the job is done.

Vegetable dyes (that are generally available) are not an option as, these days as I said, are water based and we need an alcohol base in order to mix readily in petrol and methanol. Dye powder such as clothing dye was a consideration but some I looked at were rather course grained and designed to be mixed with water plus, some

My 18 Volt drill with a home made spinner adaptor will wind over, probably, any model engine you try it on.

Incredibly intense blue colour from the felt pen in both petrol and methanol. You can see the dye reservoirs I pulled from the marker pen still in the liquid. I also use the methanol mix as marking blue for engineering marking out.

PowerModel 2T-s is intensely coloured and, so far, I have not had any evidence of it fading in sunlight.



This is actually a container of fuel - almost empty - that has lost the colour with a little evidence in the bottom of a thin blue line - the colour it was originally.

I made this twin QuikFire filter arrangement when I test ran the Roto horizontal four engine as I wanted the absolute cleanest of fuel feeding the carburettors.

The ideal trouble free fuel delivery assembly. Fill the tank though the Tee piece, remove fuel button - pump in more fuel until it comes out of the button tube, replace the button and you have fuel knocking on the carbie door.

You are advised to not disassemble these filters as the rubber seal needs to be squeezed to a particular degree so…I have done it for you - no need for you to repeat this exercise as you now know what's inside.

An example of the cigarette filter used as a fuel filter. This is a mock up for this article but is close to how I constructed them.

are a bit on the dangerous side as the common ingredient is aniline which is well documented in the medical journals as to the problems that can ensue from exposure.

Now…when I see a warning like this I wonder about the result of it being combusted, burnt and blown out as exhaust smoke so, scrub that off the list. After a lot of head scratching to come up with a commonly used strong dye colour I made a few notes on my little white board and then, smacko, it hit me like a bolt from the blue…I had the blasted answer in my hand…a felt marker and I had also messed up my white board as I used a permanent marker (mistake) instead of a white board marker. Okay, what about using the colouring from a felt marker for the job?

I researched the dyes used and the carrier (liquid in which the dye it dissolved) and found, in the main, the colours are pigments that will only dissolve in one of the many alcohols. Xylene was the most popular but it has a few nasty properties so the better quality markers use ethanol (alcohol) or isopropanol which are much safer and…will mix with hydrocarbons (petrol for us) and methyl alcohol aka methanol.

I purchased a random sampling of brands and began testing with rather mixed results; also, I had to consider a time factor - how permanent was the colour and was it affected by ultra violet (sunlight). Eventually I settled on Schachitata markers sold under the name of Artline 100 and, to utilise these, I removed the front screw on plastic 'nib' (felt writing bit) holder and withdrew the fibreglass or felt (typical) core that held the colour material - blue in this case. I suspended a core in both a bottle of petrol and methanol and saw the instant colour of both liquids.

After a good shake and leaving the bottles overnight, the fuels had coloured a very deep blue so…now the light test. The bottles were placed in a position where they were subjected to both dim and bright sunlight - same place where some of my oil had gone clear. After 8 months there has been no change in the colour intensity and actual testing resulted in a small amount added to the oil for the petrol and methanol fuels (as part of the required fuel amount) and then the oil added to provide a very well coloured fuel that would leave you in no doubt that you had added the lubricant.

A small amount of the dissolved colour in your petrol or methanol oil with a consideration of around 20mm added to 1 litre of oil would be a good start. Really, I would not even consider varying your fuel measure as the small amount added would make no discernible difference to the final mix ratio. You try it out for yourself and vary the amount according to how much colour you want.

Back to reliability

Continuing our series on ensuring the reliability of the engine in your model, I will now deal a little more into the fuel delivery from the tank to the engine just to clear up a few points from the previous series.

I have discussed fuel tubing with you - the types and uses but I want to talk briefly again regarding the fuel tube diameters as I have had a few readers comment on this and ask a question or two.

Let's look at a large capacity, multi cylinder engine…the Roto 4 as an example as this has a capacity of 170cc. This engine is fitted with twin carburettors - each one feeding a bank of two cylinders.

I used standard (or 'small') fuel tubing when I test ran that engine, it ran perfectly and, actually, I had to 'stay my hand' as is said as I was recording RPM in the 6K+ range on a very slightly rich mix.

Peter Cita - the owner of the company, designer and builder (in part) of the engine recommended an RPM range

close to 5.5K. One thing for sure - the fuel tubing was certainly delivering adequate fuel and here I refer again to a car or motorcycle engine. From memory (of many years and 76 odd motorcycles I had), the fuel tubing feeding the carburettors from the lowest to the highest capacity engine was pretty close to that which we use for our model engines - commonly neoprene or similar and a push on fit to the fuel nipple.

The pressure assisting the flow of fuel for a motorcycle engine varies as the level in the tank decreases. A full tank would have the fuel flowing very freely if you removed the tubing from the carburettor nipple but this noticeably decreased as the tank volume was reduced and, an almost empty tank provided not much more than a slow dribble yet…the engine was still capable of reaching maximum RPM. Now we look at a car engine and disregard the capacity. The steel tubing in my dear old 'yellow terror - my Bedford 250 van) was 6mm outer diameter and it fed a 6 cylinder Holden orange engine with a capacity exceeding 2 litres. The bore of that tube was around 4mm and it was a long tube from the tank to the carbie but…that good old engine never missed a beat. Here I add a proviso when considering the length of the fuel delivery tube.

On my Bedford the carburettor was higher than and about 2 metres from the tank outlet. Similarly, in our old VW (1956 model - had it for 40 years) the tank was at the front of the vehicle with the outlet at the bottom and it fed the higher placed carburettor that was probably about 4 metres distant.

Obviously, the petrol flow needed assistance which was provided by a rather simple mechanical pump in both cases and the simplicity of these pumps was the reason for their reliability - possibly more reliable than some modern electric petrol pumps of which two are often used - one in the tank and the other near the engine fuel system. Exactly the same as the pumps on our model engine carburettors - they were not at all efficient at pumping air so…if you ran out of petrol, it was quite a job to get the fresh supply from the tank to the carburettor…unless you knew a simple trick.

First off, the problem comes about due to the lack of RPM at which the engine is rotating. While it might sound like your car engine is whizzing over when you initiate a start, the whizzing noise is the starter motor pinion (small gear) connecting with the ring gear - a large gear on the rear of the engine that turns the engine when the starter motor spins it. The gear ratio is huge - a very small gear connecting with a very large gear to obtain a mechanical advantage so the final RPM of the engine being started is around 50 - that's correct - 50 RPM. At that speed it takes an incredibly long time to pump petrol from the tank the carburettor and, more often than not, as the cranking progresses the sound is reducing which indicates the battery is on its last legs so…you've got yourself a pocket full of problems.

Much the same with our model engines when you crank the engine (rotate the propeller) to draw fuel to a pump type carburettor. Turning the prop by hand is a waste of (human) energy as it is going to take more time than your poor old arm muscles can operate without pain. Flicking with a chicken stick is almost a dead loss as it does not flick the propeller as fast as a hand flick so you now wear out your wrist energy.

An electric starter can be useful if it is of a fair size and if you have a large battery rather than those piddley little 7 Amp one so common on model fields. Those batteries are designed for a backup power supply for alarms and the like - certainly not for a heavy current draw you could expect from an electric starter which, checking even the most common style, I found a current draw in excess of 50 Amps for a .40 size engine.

Quickly here, going back a bit, I described my use of a tradesman type 18Volt drill that has a powerful battery supply designed for heavy duty use and this is assisted by the gearing on the drive system.

Okay then, how do we obtain the fast start when the fuel line is devoid of petrol? Well, as far as a car engine I let the engine do the work at reasonably high RPM. A good glug of petrol 'right down the frote' (into the intake of the carburettor), hit the button (key or whatever) and start the engine. At the speed it will run and for the brief time it will have drawn the petrol up and, in most cases, after a cough or two, it will continue running….problem solved.

Much the same for our model engines and here I use a syringe to squirt a good dose of petrol (fuel) into the fully open carburettor. As soon as you squirt it in, close the throttle down to idle as the reed valve (fitted to most engines) will prevent the fuel from entering the crankcase until you spin the propeller.

Much like the car engine, this is, quite often, enough to get the engine running as it will run up at high speed (even at idle it will be much faster than you could flick it) and the pump in the carburettor will operate fast enough to purge the air from the line and draw in fuel to keep the engine running.

Another method which I really favour is a 'purge point' and I have discussed this with you in the past but…once again for new readers and those who can't remember. In the fuel line, from the tank to the carburettor inlet nipple, as close to the inlet as possible, fit a Tee piece in the line. Add a length of tubing to the spare outlet (leg of the Tee) and a fuel button or simple plug if you are too mean to buy a button. Fill the tank as you usually do and when it is full, remove the button and fill some more until fuel runs out the unplugged line then replace the button or stopper. You now have fuel right up to the carburettor for an easy start.

Regarding the fuel line from the tank to the carburettor, as we have discussed, you don't need big bore tube because you have a big engine but…the length of the tube needs to be considered. There is an hydraulic drag as liquid flows through tubing and this is surprisingly noticeable. When the first of the rear needle glow engines came on the market, I had several for testing and I noticed a slight lag affect when I altered the main needle on the rear of the engine. Maybe a second or even a fraction of a second but it was noticeable, and it was explained to me by a qualified hydraulic engineer that the drag of the liquid in the tubing was the reason - it was a delay as the re-measured (tuned) fuel travelled through the tube to the inlet nipple of the carburettor.

If your tank is some distance from the inlet nipple of the carburettor it will influence the flow a small amount until the flow is established. You can overcome this by having a high position fuel tank (to a pumped petrol carburettor) to allow for gravity feed or by using a slightly larger diameter fuel tube if you are really fussy and…you notice the effect (and not imagine it). Keep the fuel line as straight as possible and ensure it does not kink or become squeezed by movement of the tank. Keep the overflow line at a maximum of 100 mm long and have it going straight down out the bottom of the cowl or fuselage and…don't reduce its diameter with a metal tube for some neat or otherwise idea.

Filter, filter, filter

Are you getting the point I am trying to impress? To many modellers, 'filter' is little more than a word and a 'thing' to be fitted in the fuel line. Many don't bother as their answer is that they filter the fuel when it is blended or they have a filter in

Different sizes and grades that are available. My preference is the 'regular' as indicated but you will need to spend a bit more time making up a filter as these are the larger size and the flow is very good.

Not enough colour in the lemon essence which is alcohol based and the strawberry flavour is glycol based. The actual strong coloured food colourings are water based.

Many years use and still doing a great job. The hardened glass bowl of the Saito filter is removable for cleaning it and the mesh filter, Shame they stopped making them.

A common petrol fuel line filter from auto accessory shops that does an excellent job and, as indicated, I soaked this one in methanol fuel for 12 months to check the plastic. It survived with flying colours.

the fuel caddy but, let me tell you, this is not adequate.

Regarding methanol engines, there are many modellers who still insist on using muffler pressure to the fuel tank even though there is compelling evidence to indicate it is not needed.

The muffler sucks and blows (normal) exhaust pulses and it sucks in dust and other debris which will find its way to the carburettor eventually and all Hell breaks loose when the engine stops (on takeoff) or won't start or has lost its tune.

Another culprit is the fuel delivery tube from your fuel caddy which is often dropped on the ground or left to open atmosphere where it has the potential to gather dust and other nasties which are then transferred into the tank during the next fill.

Moving on to petrol engines we are now looking at super fine jets in the carburettor - tiny holes or slits that are so small the eyelash from a mouse will block them. In some complex carburettors (to be discussed in article #7) a blockage is close to impossible to clear unless you are prepared to have the carbie serviced by a professional (mower/chainsaw etc. repairs) and even then, the blockage might not be able to be removed so...a replacement carburettor is in order.

Again, I remind you that this current series of articles is the best advice I can provide about trouble free modelling - taking your model to the flying field, setting up, starting the engine without dramas and continuing in that manner until the sun starts to wane. No engine problems is the objective and, with care and consideration, it can be done.

Right then, filters is the topic and selection of a filter that REALLY does the job is imperative. Considering a very nice homily from a lot of years back that was advice from St. Jerome - 347 - 420AD, if you apply it to the filters you use (and other aspects of life obviously), you will find it an excellent guide. "Good, better, best. Never let it rest - until your good is better and your better best." I am sure St Jerome was not considering fuel filters but the advice can be applied to any endeavour and, for this article, it applies to filters. Let's tear it down a bit. You heed the advice and your intention is then to fit a filter to the fuel line from the fuel tank to the carburettor so…that is 'good'. Because you just ordered 'a fuel filter' from the hobby shop or dropped in and purchased one, when you examine it (as should be done always) you find the internal mesh is probably okay for filtering out blue metal or course gravel but not suitable for petrol fuel so you then look for something 'better'. You then try another filter which is, possibly, 'better' but you don't 'rest' as you are now in the flow and want the 'best'. A bit of research and you find there are very high quality filters specifically designed for 100% filtration of petrol fuels so you then go for 'the best' and, all things being equal, the clean fuel supply is another item you can guarantee and another possible problem you have eliminated.

My early projects

Even before the current trend for petrol engines was fired up, I had early petrol engines and many super small capacity engines which, as you can imagine, have extremely fine fuel jets in the spraybars.

I had a few small petrol engines that had a complex carburettor approaching the style of the ones we see these days of the Walbro types and these had jets so fine that a glob of castor (the current oil for the times) would block them to the point where it was a major operation to clear them as it was difficult to find something fine enough to enter the jet tube without doing damage. I had some bronze mesh that was so fine it would not let water through if it had been subjected to fuel and it did a reasonably good job but, the body of the filter was a bit ungainly (read - 'plug ugly').

My maternal grandfather lived with us most of the time and he was a professional smoker. The best pipes and tobacco, top line cigars and hand rolled cigarettes which, really, were rolled in a special cigarette rolling machine, the end product was fitting for a gentleman and…it contained the best tobacco to suit individual tastes. I was privy to the operation of the 'machine' as the operation appealed to me so, many times I would roll up a super quality 'ciggie' for my grandfather that had no 'danglies' out the ends - sign of a 'master hand' at the job.

One particular day my grandfather showed me the latest 'must have' for cigarette rollers - cork tip papers and filter inserts. You set your cork tip paper in the roller, layed a filter insert in that end. Filled in the tobacco, closed the lid and out popped a super great cork tipped ciggie with a filter tip end. Those filters prevented a goodly amount or tar and nicotine coming back into your mouth

when you smoked the cigarette without impeding the suction of the smoke. When the ciggie was finished, on examination, the filter insert was yellow for most of its length - a very effective filter and…a light globe sat above my head - an idea was born. If these filters prevented nasties from travelling with the inhaled smoke - how would they go preventing nasties travelling with my model engine fuel?

It certainly set up a bit of head scratching and fiddling - not so many bits and pieces available then as today but… with the short bit of 'borrowed' clear petrol tube from my father's shed (a maze of stuff - a virtual Pandora's box) I was able to soften the tube, dilate it with a small file handle enough for me to gently push in a filter. When the tubes cooled it returned to its original diameter which was a neat fit internally for the neoprene fuel tubing I used. I had designed and constructed an incredibly effective fuel filter that had no challengers mainly due to fuel filters for model engines being, probably, non existent.

Eventually, fuel filters could be seen as something to sell (by manufacturers) and several came onto the market but…in some the mesh was so course it stopped nothing of importance with the big problem being a lint type fibre that came, as far as I could ascertain, from some methanols and this was a real bother. One of the better filters to come onto the market was from Saito and this was a magnificent piece of work with hardened glass filter bowl and a super fine mesh insert that was accessible for cleaning. I have a number of these and the first one I purchased is still on my inside test bench with, no doubt, hundreds of hours of use and it is still doing a fine job for methanol engines. With the rising popularity of petrol engines, better filters were a requirement. While we did have some superfine mesh filters (long tubular style) that certainly had a suitably fine mesh, they had a problem in that the seals on the ends were a rubber compound that petrol ate for breakfast and that caused a real problem with rubber grit finding its way into the carburettors.

I revisited my cigarette filter design and that did a fine job for me until I found some small sintered metal filters in an auto accessory outlet and these were quite a good bit of gear. O.S. realised there was a problem when they produced the first of the small petrol engines, the GT10 and 15 and then the GGT series with the petrol glow plug. These engines have the superfine jets I mentioned earlier and blockages became a well documented problem. The O.S. engineers came up with a solution for the 10cc engine by fitting super fine (really super fine) mesh filter incorporated in the line from the rear needle valve assembly to the front carburettor and that, if not fiddled with, is a perfect answer for those engines.

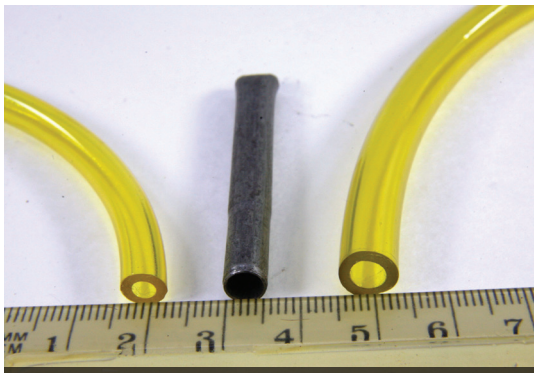
I have been reasonably satisfied with my cigarette filters, the sintered metal filters and my ever reliable Saito filters (which, unfortunately, are no longer available) but I felt, for a long time, I would like something just that little bit better and then, from the USA, a request to test and review a new filter aka the Quik Fire- a filter that suited any type of fuel and one that was as close to 100% efficient as could be done. Sounded too good to be true but…why not - let's give it a good old Aussie try.

This filter linked in with another idea I had experimented with over a long time - a hopper tank that was similar to a vacuum tank and a float bowl all in one. My ultimate goal was to have a ready fuel supply (small amount) right up to the carburettor inlet that retained a small amount of fuel for instant starting and a constant regular flow. Well, when the filter arrived from USA I was quite impressed as it looked like all the aspects I was after in the one package. It is a small aluminium canister (float bowl/hopper tank) and the filter element is a concertina shaped paper element that, if laid out flat, would have a surface area of 5,184 square millimetres (50.184 square centimetres) and the capacity of the canister is 10.7cc (minus the surface area of the filter…small amount) so we have a nice hopper tank and a massive filtering area that is not going to let anything whatsoever through to cause problems in the carburettor. It will filter any fuels used in model engines and the life of the filter element is beyond your memory ("How many years back did I buy that filter????") - that type of time range. I suggest you fit it vertically if possible and as close to the carburettor as is comfortable. Of course you fill your tank from BEHIND the filter - between the filter and the tank and it is your choice for this but I still recommend a Tee piece and fuel button AFTER the filter for priming carburettors fitted with a pump - particularly the Walbro (and its clones) as this will ensure you have fuel in the filter canister and right up to the carburettor inlet.

The next step

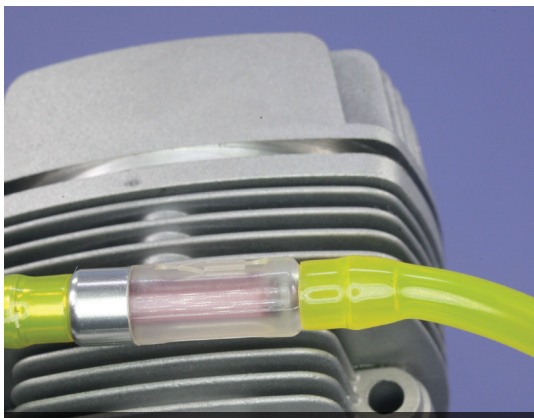
Okay, I have bought your fuel supply reliably to the carburettor eliminating all the nasty little problems that annoy us so, for the next step we will delve into carburettors - all types, how to test, tune and check them and all.

These filters might still be around in some model shops and I can recommend them 100% for a simple filter as the sintered filter element does an excellent job. The O ring (indicated) is petrol and methanol proof.



On the left is a standard size fuel tubing with a bore of 3mm. The metal tube with a bore of 4.5mm came from the fuel line of a large capacity V8 truck engine, the right side tube is classified as 'large bore tubing for model engines and it has a bore of 5mm. Not really needed if you think about it.

This size felt pen marker will provide a lot of intense dye for your fuel so you will need to 'try a little' - see how it goes then be satisfied or add a little more.



The factory fitted filter on the OS GG10 is a superfine mesh that will not let any foreign material through big enough to block the jet. Actually, It will not let anything other than fuel through.

THE WINCH REPORT

BY BRIAN WINCH

Master of the mix

I am taking you with me on an exploration of a marvel of mechanical wonder - in essence - a model engine carburettor…warts and all.

This requisite gem on which our engines depend for sustenance simply sits in its mounted position constantly (when the engine is running) mixing the correct ratio of air to liquid fuel according to the demands of the engine. It requires nothing in return other than a filtered supply of the two ingredients it so ingeniously blends and supplies. This quiet achiever will continue on its duty ad infinitum - never faltering unless doom befalls it - the doom of the 'dreaded fiddler'.

Before we jump into the deep end - a little understanding of some common terminology that helps at times when installing engines.

The direction of travel through a carburettor is called a draught and this is further classified by the mounted position of the carburettor on the engine. The first is 'natural' or, as it is more commonly known, 'side or cross draught' where the carburettor is mounted in a horizontal position on the engine - the air flows along a horizontal or straight path into the engine. Examples are some side or rear carburettors as seen on many petrol two strokes and on the Laser four stroke engines for example.

Next is 'updraught' where the carburettor is mounted on an induction tube - generally a fair bit lower than the cylinder head and the air/fuel mixture travels upwards to the intake valve chamber of a four stroke engine. Some two stroke engines, particularly model diesels, have an up draught position when the venturi tube (carburettor) is mounted under the front housing.

Last is a down draught and this is a bit common on model engines and common in cars. Our familiar two strokes of many years with the front induction system have (mostly) down draught carburettor systems - the air/fuel mixture flows down the venturi into the crankshaft rotating valve - a simple and reasonably efficient method of induction. Let us now consider 'CAUSE & EFFECT'.

The cause

If I was to list all the engine problems that beset us, the absolute maximum, most, supreme, highest, preponderance, majority, lion's share, bulk, largest (are you listening to me?) top number of the list would always be the finger and thumb on the hand of the obsessive-compulsive needle twiddler.

The type of modeller who has a good flight with his model, lands well, has a smoke, cup of coffee, a bit of a chin wag or however he takes a break, makes the decision to fly the model again, starts the engine and then….fiddles with the needle valve - re-tunes the engine…

the same engine that not more than ten minutes previously ran perfectly, never faltered during the flight, was ticking over like a clock before he stopped it in the pits yet, it needs another tune-up.

Well, really, it certainly doesn't but it is a force of habit with some modellers - they just do not trust the carburettor to work the same each time the engine is started.

Maybe they have a belief in 'carburettor gremlins' - nasty little trolls who sneak up when you are distracted and change the needle settings. These beasties hide in the grass, under models, behind field boxes, wherever they can in order to remain unseen. The odd thing is (if not 'gremlin attacked')…the carburettor will work exactly the same as it did previously…the same as it did on so many times in the past - nothing changes unless you fit a considerably different size propeller or change to a different mix of fuel. If nothing has been changed the carburettor will work just the same and it will continue to do so unless it becomes contaminated (foreign material enters) or it is attacked mercilessly by the dreaded curse of the needle fiddler.

The effect

The first effect of never-ending needle twiddling is unreliability of the engine, unless the modeller has a good ear for the tune or uses a tachometer, a totally unreliable engine due to, in many cases, the tuning becoming leaner each time it is changed. I don't really know why - maybe the modeller thinks he hears a different note or just goes that little bit further, but it is a common sight on take-off.

The engine is screaming (why take the model off as if its tail is on fire?), lifts off and…the engine stops. This is due to a lean tune on the ground as the load on the engine decreases, the model begins flying and, as the load is decreased, the engine will run faster and then becomes over lean and stops.

Quite often, the 'pit advice' (from watching modellers) is that the tank is too big and the excess load of fuel rushes to the rear of the tank forcing more up the fuel line to flood the engine. If this was correct, the engine would flood during the high-speed taxi before take-off and we can thank sir Isaac Newton for that (his theory that an object will remain at rest unless compelled to change its state by the action of an external force). The fuel sitting at rest in the tank will move to the rear of the tank as the tank (with the model) moves forward.

Going back a few years (heyday of engine work) I had a lot of Saito engines for warranty repairs (I am the Saito repairer) and these engines had broken conrods, dropped valves and some pistons seized. Having had many years of experience with Saito engines, I was rather perplexed as to the ongoing problems that were reasonably recent due to that I knew the background of Saito engines and that they were of extreme high quality and tough as a boarding house steak.

I had a range of the current engines for review and, even though I work them to the limit (and a little over), I was not experiencing any problems - all the test engines ran perfectly and, when disassembled for inspection and photographing they, as was usual, exhibited almost no signs they had been run.

It was just by chance I read the header specifications of the instruction sheet and noted the recommended RPM for the engine. The instructions sheets had been changed around slightly and the front panel listed the pertinent details of the engine - the information being supplied by Gen Saito - the original designer and manufacturer of the engines from day one.

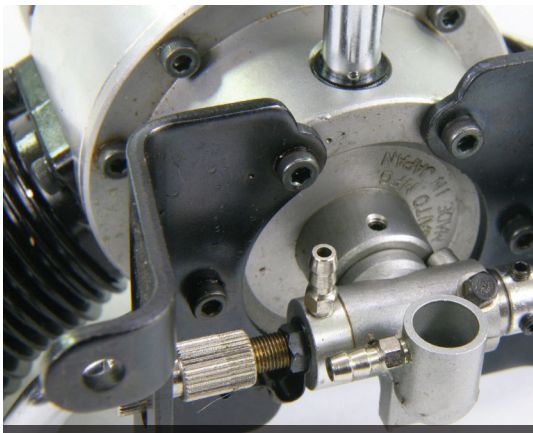
Gen Saito was a genuine gentleman and an extremely keen engine man but…he was a 'rev head' - loved hearing engines pumping out the RPM. When each new series of engines was developed, one or more from the production line was set up on the test bench and really wrung out - pedal to the metal stuff.

Ken Anderson of Hobby Headquarters told me that, on a visit some years back to the Saito factory, the then new 5 cylinder radials were ready for dispatch. While Ken was sitting with Gen Saito, Gen had his head engineer pull a radial off the assembly line, mount it on the test bench and run it…which he did… absolutely flat out - maximum RPM on the minimum size propeller. Ken said he waited with bated breath for the engine to disintegrate but…it kept running until the tank was dry. Gen Saito was quite pleased with the demonstration and remarked that the engine certainly did exceed expectations as far as RPM.

Well, with a keenness for high whine propeller speeds, the MAXIMUM bench tested RPM of each (different capacities) new engine was listed as the 'RPM for that engine' on the instruction sheet so…what did many modellers do with their new Saito? Tuned it in their model (on the ground - to that listed RPM - a

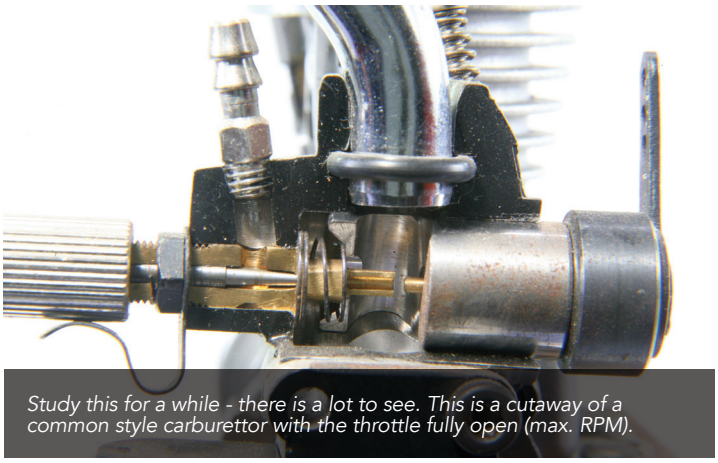
When an engine overheats, something is going to give. In this case, a common result - a valve dropped through the piston.

At times, the best you can do with a damaged engine is to…mix it into the concrete pad.

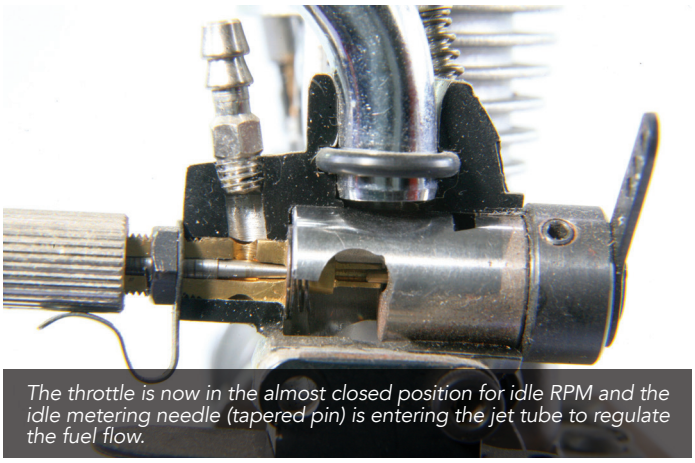


Part down draught - part side draught but, what about the 2 nipples? Well, one is a primer nipple to assist starting as there is no choke.

Most early engines (petrol engines) were side or straight draft induction but there was a variety of positions used by manufacturers.



Study this for a while - there is a lot to see. This is a cutaway of a common style carburettor with the throttle fully open (max. RPM).



The throttle is now in the almost closed position for idle RPM and the idle metering needle (tapered pin) is entering the jet tube to regulate the fuel flow.

loaded RPM of a static and restrained model. As soon as the model began flying after take-off, the load decreased and the engine unloaded but…it was already tuned to maximum RPM (and probably at maximum lean mix as is the bent of many modellers) so the unloaded RPM increased by, probably, 1,000 or more which had the engine running beyond its safe running speed and super lean.

The engine would be 'telling' the modeller that all was not correct but so many modellers are not in tune with their engines - never bother to listen to it in the air- so the engine gives up the fight and a part breaks down due to the extreme stress.

At the time I had a Saito 72 in a model and it ran perfectly (still does) so I checked the RPM of it as I had tuned it quite some time back (I rarely if ever retuned an engine in a model after I had proved it to run reliably) and the reading was 1,600 below the stated RPM in the engine instruction sheet and there I had the answer.

At the time of this, Gen Saito had flown off on the celestial omnibus and his grandson, an engineer, had taken over the company. I had several dealings with him (friendly) and, at his request, modified the engine instruction sheet. At my request the RPM of the engines as set out in the instructions was not the maximum for the engine but a suggested GROUND RPM which is about 1,500 below the engine's maximum capability. From the first production of the new instructions I rarely saw a new Saito on my bench for repair and, of the rare few, the majority were user abuse. Well, there you have the lead in to this article about carburettors, care and tuning so let's move on to ….

...Needle, noodle, nu

(Thanks to The Goon Show for that title) and, as with the nonsense of that great team in the show, we will explore some of the nonsense that is parleyed around concerning needles, spray bars and fuel jets.

First off is the simple and basic spraybar from engines of old and still used in single speed engines and, other than a slight refinement in the manufacturing process, in words of the prophet - nothing has changed.

The common style of spraybar is a brass rod, drilled through, threaded on one end, a nipple shape machined in the other end and a hole (sometimes two holes) drill across the diameter in a position to place it in the centre of the venturi passage. To complete this item a needle valve comprising an internally threaded barrel (or thimble) has a needle press fitted or soldered in place and, when wound onto the threaded end of the spraybar, the needle interferes with the ingress of the hole which is, in essence, the carburettor jet.

This simple assembly is the basic principle of operation for all the carburettors used for model engines and a knowledge of its simplicity and how it works will go a long way to assist in the understanding of the carburettors, how they work and how to tune them.

From that very simple design there are many variations according to the manufacturer's designs, but the basic tenet remains the same. For the optimum operational effect, we also need to bring in Giovanni Battista Venturi (1746 - 1822) the Italian physicist who proposed the Venturi Effect where a fluid (including air) reduces in pressure when it flows through a restricted section (choke) of a pipe or tube. We have, in effect, that which we now know as a high and low pressure trough.

Any ingress access such as a hole in the spraybar, end of a fuel jet or even holes around the inside of the Venturi area (peripheral intake porting) will be subject to the low pressure (slowing down of the air) and this will manifest itself as an action of partial suction and be subject to atmospheric pressure - both of which will introduce liquid fuel into the airflow and then, below that area, we have our fuel gas - air with atomised fuel which is the food for model engines - it gets them running.

It would have to be obvious to all that the free flow of fuel to the jet has to be regulated and here we look again at the needle valve in its many forms. With the simple spraybar the needle valve has to have a pointed end - generally a rather acute angle (narrow angle) to provide the correct amount of interference to the centre placed hole(s).

The design of the angle of the needle point takes into consideration the capacity of the engine and the viscosity of the intended fuel.

The next consideration is the thread used for the thimble or on the actual needle (if that style is used) and, again, the fuel is a consideration. With the old castor fuel (yes - I know - some are still using it) the viscosity was high - particularly with a fuel rich with oil (some were 30% oil - boy…how gummy they were) so the needle needed to be quite acute and the thread reasonably course. On many early UK diesels, the thread was one of the BA (British Association) sizes with 5BA being quite common. With this combination the final tuning was within about one turn with a half turn wind out for starting.

If you had an early Super Tigre engine you really knew what tuning was about as the needle itself was threaded - superfine metric and the point was very acute. The 'handle' end was a simple 90-degree bend and, if the tuning was

required (new engine - needle was supplied separately) you would wind for ages and, even when you reached the 'sweet point', you still had around about one turn latitude.

Another hole and needle

Well, by now I hope you have an understanding of the needle and spraybar as I am now going to explain the differences when a variable speed (Radio control) throttle is used. For starters, some of the very simple and small carburettors still utilise a form of spraybar with the needle adjusting the fuel flow from the jet (hole in the centre) but we are talking very basic throttle operation here and one that is more suited to small capacity engines and, in particular, model diesel engines.

When you move up in engine capacity there are different systems employed and these are controlled by the design of the carburettor and whether it is an air bleed system or a full fuel metering system.

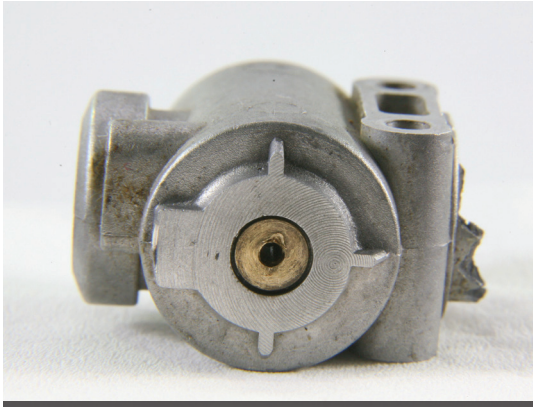
The first variation noted will be the throttle rotor - the part inside the carburettor that revolves to change the airflow and is controlled by your throttle servo.

When you move the throttle arm (piece to which you attach the link to the throttle servo), watch the movement of the rotor as the hole (bore) opens and closes. If the movement is a simple opening and closing - no side movement or angled movement, the carburettor is of the air bleed style - that is - there is no needle adjustment to alter the fuel flow at the idle position.

This type of carburettor works by allowing air to enter through a small hole in the body of the carburettor when the rotor is closed down to a very low RPM requirement. There is an adjustment available for this airflow in the form of a screw and a spring that, when turned, will move across the small intake hole. When you first set the control - and the engine idles reliably - forget all about further adjustment - it will never be needed unless you move to the south polar region, the north polar region or, perhaps, to the middle of the Sahara desert.

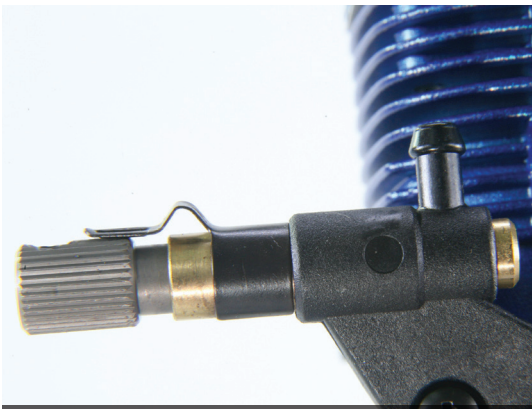
That to which I am alluding is the absolute lack of sensitivity of this air bleed setting to atmospheric conditions, propeller sizes and even moderate fuel type variations. Oh yes, if you experience and engine problem at the field, don't let the pit expert alter the carburettor settings if the engine was running okay before the problem.

An early O.S. carburettor with the rather prominent exposed idle adjustment screw. Modellers just had to fiddle with it to 'twiddle'.



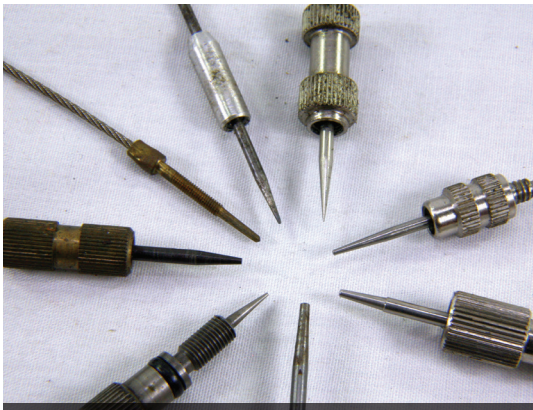
The edge of the jet tube is damaged due to a bang on the needle valve. I machined the end of the body for a clearer view.

Simple operation using an eccentric screw that, when turned, moved the disc to alter the jet position inside and change the idle mixture.



Remote needle valves are a great finger saver on the smaller capacity engines where fingers get close to the flesh tearing propeller.

A common slotted needle inside the throttle arm section. If you didn't have a small enough screwdriver you left it alone…which was good.



A few samples of the incredible range of needle sizes and shapes - some blunt - some sharp and various angles are used.

One example of an air bleed idle control. The air enters via the small hole and is adjusted with the spring loaded screw on the right.

Early Super Tigre needles. They did the job okay but they were very fragile being hard and small diameter.

Moving right along we now examine the fuel metering type of carburettor and these are identified by them having two fuel adjustments (rarely but occasionally three) - the main needle valve and an idle needle or similar. A warning here in that this second control can be in different forms - more further on.

Now, referring to the rotor in this type of carburettor, when you move the throttle arm the hole in the rotor closes in a helical action - it moves towards the main needle valve end of the carburettor as it rotates to the closed position. This movement is driven by an angled slot (sometimes with a very slight radius) in the rotor that is guided by a locating (or reference) screw in the body of the carburettor. This screw is removed if there is a need to remove the rotor.

As well, in the majority of cases, there is a fine tapered shape coil spring that bears on the high-speed needle end of the rotor to provide a little effort to assist the opening action and, mainly, to take up any side play which, if present, would continually alter the tuning. Now, the reason for this helical action (side movement) is to accommodate the idle mixture needle in the end of the rotor - in the centre of the throttle arm mounting. I say 'needle' but this is an overall term for this part as, in some carburettors, it is not a needle as such but a tube that slides over the main jet tube which, in this case, will have a slotted fuel jet. As the tube moves across and over the jet tube is gradually blanks off the jet slot to reduce the fuel flow for the idle mixture.

Carburettors that have an actual idle needle can vary in as much as some have a fine parallel needle and some have a tapered needle and, for the latter, care must be taken when making alterations. Dealing with the fine parallel needle, it is always entered into the jet tube but does not approach the jet slit until the throttle rotor is activated. These types generally have a crescent shaped slit for the fuel jet and the needle moves into the tube to interfere with the slit to control the fuel flow for idling.

Carburettors with a tapered needle type idle control have a straight tube that protrudes into the venturi area of the carburettor and the actual fuel jet is the open end of the tube.

For idle operation, as the rotor is closed down…and moves across…it brings the tapered needle into the jet tube and the taper shape varies the fuel supply for idling.

Now the warning. As I have seen so many times on various fields, a modeller is having an engine problem and a well-meaning pit expert (well - not an expert but a willing assistant) starts whaling into the carburettor controls winding in and out with gay abandon. If the tapered idle needle is wound in too far, it will bellmouth the fine brass tube fuel jet to the point where further idle adjustment will not be possible.

In many carburettors, especially many petrol versions, the idle needle controls up to 50% of the fuel mixture; this is particularly so with the Saito petrol carb's and it is why some modellers get into all types of trouble when they start adjusting that idle which, like the air bleed, once set never needs changing and, besides, it is extremely sensitive to alteration.

Looking now at another type of fuel control we come to the O.S. petrol carburettors - particularly those used on the 10cc and 15cc petrol engine (spark or glow version). As has been for so many years, the O.S. carburettors are a work of art and the epitome of the 'set and forget' operation. I know of modellers who fly year in and year out with O.S. powered models and they NEVER change the carburettor settings. The mixture controls are set on a very hot day (extreme conditions for carburation) and there they stay. In colder weather the engines run a tad rich but…so what…who gives a toss (unless you are a revhead).

Not being the fault of the 10/15 carburettors, I must say they give me more headaches than any other type but…to be fair, it is not the carburettors themselves but the engine owners who must fiddle and…not read the instructions.

These carbies are an excellent design with, really, only one needle to adjust, though they are a high grade fuel control system - control over the high speed and idle mixture but…the idle mixture is preset in the factory and should not be re-adjusted as is advised in the instruction sheet. This adjustment is with a small slotted screw in the body of the carburettor adjacent to the high-speed needle.

In the instruction sheet, this adjustment is referred to as the 'the mixture control valve'. It goes on…'Please note with this carburettor, needle valve adjustment does not affect the mixture control valve adjustment, but the mixture control valve adjustment affects the needle valve adjustment'. The reason for this is that the mixture control valve is really the spray bar (of sorts) - it is the tube that injects the fuel into the air inflow and it moves back or forward when you alter the slotted screw position.

If it is moved then the main needle mixture is altered as it moves further or closer to the main needle. At the same time it also moves further or closer to the idle needle fixed in the throttle arm end of the rotor. While this might seem a bit convoluted for a moment, if you read it and think about it you will be able to see quite clearly how it works and…why you should not adjust the mixture control valve willy nilly.

I saw a similar situation quite a few years back when the Perry pump was first introduced, and John Perry sent me some samples to test and try. He asked me to mention in my article the correct method of use to tune the pump as he was receiving questions from users about a conceived problem which, if you read and understood the instructions, was not a problem at all.

On the pump was a hexagon adjuster that varied the flow rate but…not for maximum RPM and not for idle RPM - it tuned the mid-range. You fitted the pump and forgot about it when you tuned your engine for both high and low RPM. When this was established, you throttled the engine to the mid-range RPM THEN you tuned it by a minute adjustment of the flow rate.

After that the pump needed no further interference and the engines ran right to the bottom of the tank.

As a footnote in line with my general advice, modellers who did not read the instruction sheet (the 'pit experts' who know all) would fit the pump (it was built into a replacement backplate), start the engine and, due to the fact that a special spanner was supplied, they had to use that damned spanner and adjust the idle. After some general stuffing around (as is the norm) it was decided that it was not the fault of the fool on the end of the spanner - it was the pump at fault so, a warranty claim and bad mouthing at the flying field.

There was also a special instruction that came with the excellent Perry carburettors that referred to a small pin in a cavity and inverted flying but… not reading instructions struck here so, eventually, after many advice inserts in model magazines, John solved the problem by removing the pin and slightly modifying the carburettor. Much the same these days and the

aforementioned O.S. carburettors with the 'Mixture Control Valve are a prime example and, my advice if you didn't read the instructions CAREFULLY is, again, don't fiddle with it - just carefully (with a tachometer in hand) tune the high speed needle and then forget all about the adjustable controls while you enjoy flying the model.

Cause of a problem

We have gone deeply into the design of spraybars and fuel jets so now I am moving onto the method of adjustment in a common design variable speed carburettor - aka an R/C carbie.

The main needle enters the body of the carburettor generally in a needle assembly unit - the needle carrier and the needle valve - when the assembly is screwed into the end of the carburettor body. Adjacent to this position is the fuel nipple - the part where the fuel line from the tank is connected to the carburettor and, inside and under the inlet nipple is a fuel chamber - a small cavity where the fuel 'sits' waiting for the demand to 'go forth and mix'.

Beyond the chamber is the metering hole - a hole bored into that section of the (generally) brass jet assembly and, commonly, this brass jet unit is a press in fit - that is, not replaceable and I want you to keep this in mind. It is here precisely where the liquid fuel is metered before it mixes with the incoming air through the venturi and the metering is done by the tapered needle valve - you know the one…it is hardened steel (an important reference).

Every so often I receive a call or Email from a modeller to ask why he cannot lean the mixture for his engine. Even with the needle closed right in the engine is still running rich for some inexplicable reason (probably an air leak according to 'experts' at the flying field).

Well, there is a reason and here I refer you back to the 'hard steel needle' I mentioned as this is the culprit or, rather, the tool of the culprit which is the modeller.

First cause is an untidy landing - one where the needle valve suffers a bump or a bend. Sometimes the impact will break the needle assembly away for the carburettor casting and this can be repaired with an application of JB Weld (typical) but you need to examine the hole in the brass inner section for damage before spending time repairing the breakage.

Unfortunately, in the majority of cases the hard steel needle tears or grooves the brass intake hole and this is terminal. If you have a lathe and the knowledge for the job, you might be able to do a repair job but, believe me, it is fiddley and requires considerable care and accuracy.

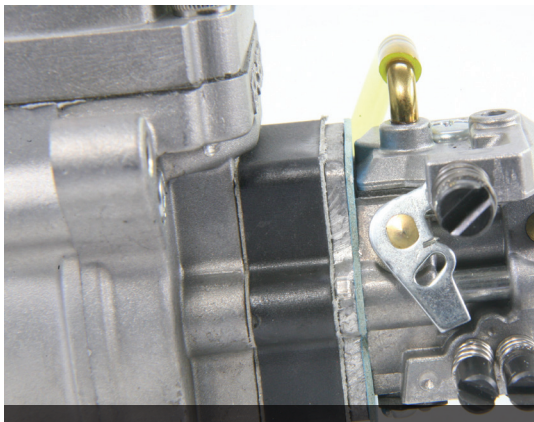
The other type of damage is incredibly common and the main one that leads to "I can't lean the engine even though the needle valve is screwed right in tight." Well, my friend, you are the cause of the problem with that long needle extension you fitted and, if there is a nice nob on the end of the extension, it is even worse. I refer to this as the 'wagging finger' - as the engine runs it 'wags' and, like a wagging finger it is a signal that you should not be doing it. Actually, the vibration of the running engine is causing the long extension to vibrate like a music teacher's tuning fork in the key of 'rub'. As it vibrates it transmits micro oscillations to the needle and that hard steel needle chatters away on the brass hole in which it is metering the fuel flow. Over time, as the hole is enlarged, you find you need to wind the needle in a bit every so often until you reach the point of no return - the hole is too large for the needle and tuning is no longer possible. Of course this is only a problem for needle twiddlers as the reason for fitting an extension is to be able to constantly twiddle the needle for no real reason - set it once and leave it set.

Next issue I will show you a nice safe extension for common methanol engine carbies, explain why the engine will not start when spun by the starter and start into petrol type carburettors - how they work, their operation and the correct method of tuning. Until then, resist the urge to 'twiddle'.

You are invited...

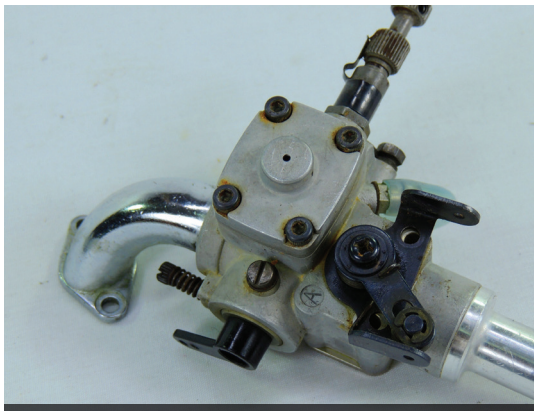
…to the best Military Scale event that is now coming up for the 46th year.

That to which I refer is the Wagga Wagga Anzac weekend where you can compete (easy flying - no pressures), sit and watch, photograph, examine the models and enjoy talking model matters with many fliers of varied experience. If you just desire to relax, there is adequate seating and weather protection, a great canteen on the go all weekend (hot and cold food), a model shop in which you can browse and, maybe, purchase and nobody will bother you if you nod off on the odd occasion due to the peaceful and relaxing atmosphere. I have been attending for over 30 years now and I still look forward to each next event meeting long-time friends, new attendees and members of the public.



Common, modern day engines fuel system - a Walbro (typical) carburettor set up in a cross draught configuration.

Adjustment on the Perry fuel pumps was a 'twiddler's' delight as a spanner was supplied with the pump so…let's adjust something!



O.S. fitted this fuel regulator carburettor to some of their engines years ago. It worked well provided you finely filtered the fuel.

In 'good old days' a filter was used on most carburettors to prevent grit and grot entering the carburettor with the incoming air.

THE WINCH REPORT

BY BRIAN WINCH

The urges that beset us

We are subjected to many urges from day to day and, being weak as we are, we almost always give in to the urge even though we want to resist for various reasons such as being seen by a stranger or even a close friend.

Okay, we can explain away some reactions to urges such as an irrepressible itch for example, but the one that stands out as pure habit - an unnecessary action - is one so common within the i.c. modeller fraternity is the need to twiddle - twiddle the needle valve.

I've gone well into this many times in the past so heed my advice - if there is a problem with an engine that ran well reasonably, previously, the current problem is not one of carburettor tuning unless…someone has changed the settings. Generally speaking, after tuning an engine correctly at the beginning of its use in a model - if you tune it on a very hot day it will not need retuning - the mixture remains correct and, even when the weather turns cold, it will still be reasonably correct - just a little richer but not enough to require a whole new tuning procedure.

If you must

Dealing with methanol fuelled, glow plug ignition models here. Okay, the engine will require initial tuning in a new model, if you change propellers (with a considerable difference), if you change fuel mixtures and, maybe, if you change to a different type of glow plug.

If the engine is 'out in the open' - no cowling - access to the mixture controls are not a problem but engines inside cowls are a different matter - you need access to the main needle. Now, I say 'main' needle as the idle mixture needle is almost a set and forget adjustment - it is extremely rare that it will need altering if you set it up correctly initially or the engine is new as the setting from the manufacturer will be spot on almost always. So…we need access to the main needle so we fit an extension - a long piece of wire (or a small Allen key in many instances) that will protrude out the side of the cowl to allow you to twiddle the needle. Well, if you read the previous magazine - #7- you would have seen the results of needle extensions that vibrated and caused the needle itself to destroy the jet hole in the spraybar.

If you look closely at modern engine needle valves you can see a similarity throughout most brands - the needle is as compact and short as is viable for operation. The reasoning behind this design is that the adjustable main needle is a cantilever fitting - it is supported by one end and the other end - the heaviest part - is hanging in the breeze so to say. If the one support is not well done - reasonable length and snug fit, the vibration of the engine will cause it to vibrate on its own axis and that is most undesirable.

Similarly, if you extend the unsupported

end with a form of extension, it will cause the same effect and internal damage as I previously described will be a result.

To overcome this, and provide a form of extension, in early days (of engine production) it was common to see spiral curtain rod (a super tightly wound spring effect) extension with a knob on the far end supplied with the engine. Problem was the needle valve had a ratchet detent of some form (spring clip for example - as is still used) and this was a resistance to the curtain rod extension.

You would wind the knob, no action at the needle valve end as the spring (curtain rod) was being loaded by the twisting then the built in (applied) energy in the spring would overcome the holding power of the detent clip and the needle would wind in almost instantly and, almost always, it went in too far and stopped the engine (cut off the fuel supply).

Some very old petrol engines and then, in later years, the beautiful O.S. Gemini twin came supplied with a Bowden cable extension. (Bowden cable is used for transmitting power from brake pedals and levers on push bikes, motorcycles and car handbrakes as an example. This is still used in some modelling applications for transmitting servo power to control surfaces). It was used on other glow and diesel engines as well later on and, generally, a small retaining bracket was used to take the cable to the rear of the engine so tuning was far out of propeller strike reach. This extension is still supplied with some O.S (and other) engines but few modellers understand how to set it up so that it is not 'flapping in the breeze'.

Considering the fact that tuning does need to be done under certain circumstances, and you need access for a cowled engine, I designed, many years back, a very simple and effective method with no extra load on the needle valve and nothing sticking out of the cowl so… here we go.

Simple job

You will need a ball end handle style Allen key (like a screwdriver) to suit 2.5mm socket head screws so it will be a 2mm driver. Obtain by fair means or foul a 2.5mm socket head screw about 10mm long and here you have to make a decision based on what equipment you have on hand or can borrow.

In the main, the hole in the end of many needle valves (for an extension) is the correct diameter (2mm) for tapping a 2.5mm thread. If not, modify it to do so if you go this way.

Remove the 3mm locking grubscrew in the needle valve and tap the hole with a 2.5mm tap.

Now, if you cannot access the thread tap, hold the head of the screw in your drill chuck (pedestal drill or hand drill) and carefully file it - while it is spinning - until the diameter is a neat and snug fit in the needle valve hole.

Fit the screw into the needle valve and securely tighten the grubscrew then, from your fuel tubing container, select a piece of tubing that is a good tight fit on the head of the screw you just fitted and slide it on up to the needle valve ferrule (the bit you grip to turn the needle).

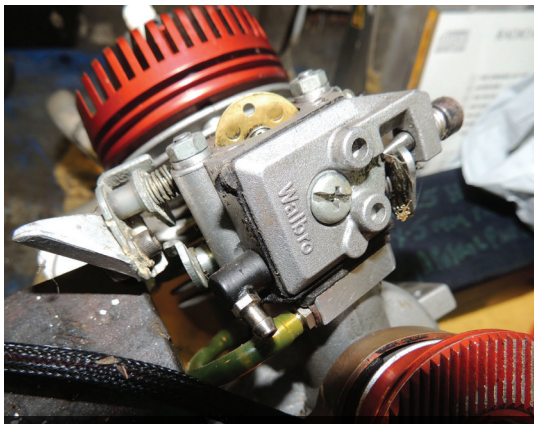
The length of the fuel tubing will be governed by the distance from your needle valve (in the tuned position) to the outside of the cowl with just a very small length proud of the outside (about 2 -3mm). By doing it this way you can remove the cowl when necessary without having to pull the needle assembly apart. For tuning or minor alterations (don't keep re-tuning your engine, for heaven's sake) to the tuning it is a simple matter to slip the Allen key inside the tube until it connects in the head of the screw and you can make the adjustments necessary. Set up in this manner, the extension of the needle will not vibrate and cause internal damage as I mentioned previously.

While I always recommend making tuning adjustments with the engine stopped, I know damned well that advice will fly over your head and you will do it with the engine screaming so…if you go this way…be ever mindful of that spinning propeller - a mistake could cost you dearly and the blood will make a mess on your model.

The wobbling Walbros

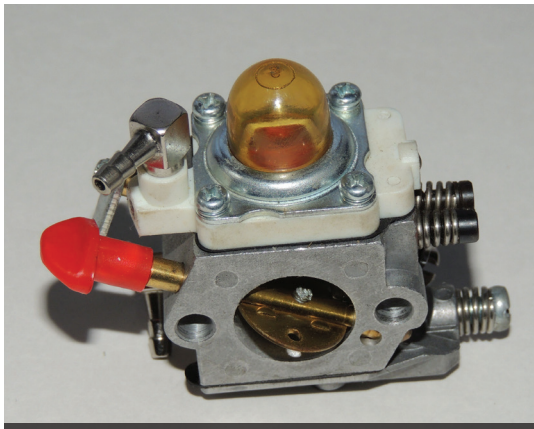
Again, I repeat, if the tuning has been set correctly it will not change and this is particularly so with the Walbro and similar carburettors, once set, they are a set and forget matter but…I know you will want to tune them so let us say this tuning is an initial tuning.

The access slots in the two tuning needles are not always easy to access and the screwdriver slips out. If you attempt to tune while the engine is running - I do not advise it - it is almost impossible to locate the slot with the blade screwdriver and, if you are lucky enough to slot it in - it is not going to stay there.

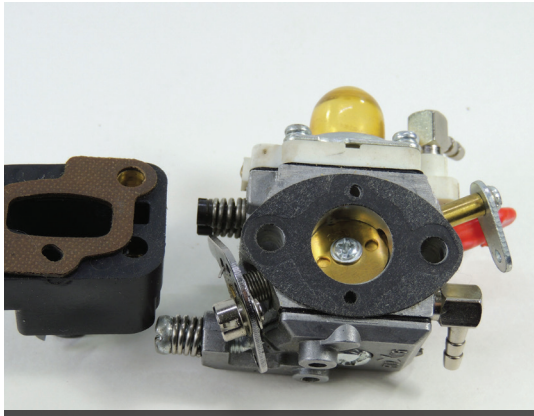


This is the cover for the 'fuel in' side wherein sits the incoming fuel chamber, the filter plus the fuel passage to the needle and seat.

You can't beat the use of a good filter such as this QuikFire for preventing anything getting into the carburettor chamber and blocking the filter screen.

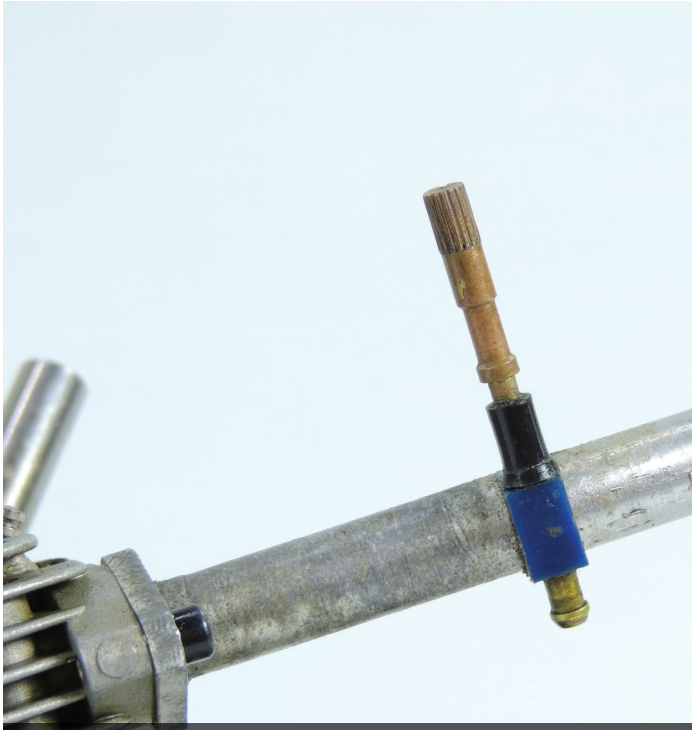


Some carburettors have a Vinyl (typical) flexible bulb for the purpose of priming the carbie prior to starting.



The rear face of the carburettor and the manifold block showing the pulse holes (bottom) the direct pulses from the engine crankcase to drive the carbie diaphragm.

On this engine, the pulse is delivered through the 'greenish' tube from a nipple in the crankcase. Note the simple repair where the plastic fuel nipple was broken off.



Some carburettors are as simple as possible for special purposes. This is a Thimbledrome fuel assembly adapted to a four stroke engine for free flight operation.

The simple answer is to borrow a little bit from my extension needle advice (above) and fit a short length of fuel tubing onto each needle. Obviously, you cannot use silicone tubing as it is not rigid enough but a snip of Tygon tube will do the job nicely particularly if it is a really tight fit and needs a bit of heat to get it on the needle's ends. Keep these pieces small - no more than 20mm overhang to prevent them from vibrating when the engine is running.

Tuning methanol/glow engines

This might sound basic but, believe me, over the years I have seen so many modellers embark on the wondrous journey of carburettor tuning and fall, dismally, by the wayside.

The engine is running, and the main needle is being rapidly wound in and out giving no time for the engine to settle into the new air/fuel mixture. It takes a moment for the engine to settle when the mixture has been altered and that moment varies according to the engine.

A common style two stroke - front intake - front mounted full carburettor has air and fuel flowing into the crankcase and this fuel gas mixture is then transported up the bypass ports (fuel passages inside the cylinder) to the combustion chamber where it is compressed and ignited.

Admittedly, this is a very rapid action but it is not an instant action, there is a small lag and this is quite pronounced if the tuning is being changed rapidly. If the needle valve is remotely mounted at the rear of the engine, the lag is more pronounced. It takes a little longer for the needle changes to affect the mixture in the carburettor body at the front of the engine.

Simply put, let the engine settle for a few seconds after you change the mixture.

If you really want to get down to brass tacks and carry out a very efficient and correct tuning, the first item you need is a tachometer. My method on the test bench starting out from new, after repairs, or that the main mixture is unknown is to wind the needle out about 3 - 4 turns - very safely rich in almost every methanol fuelled engine.

I start the engine, let it gurgle (rich mix) for a while until the cylinder temperature rises (close to operating temperature) then, at full open throttle, I begin winding the needle in a click at each finger movement and all the time I am watching the tachometer. As soon as the RPM stabilises (doesn't go high up or down as it will vary slightly) I give the needle another click.

I continue on in this manner until I see the RPM registered on the tachometer has stabilised - not going higher.

I let the engine run at this setting for a couple of minutes, watching the tacho' very closely to see if the RPM is going up and down, an indication that the mixture is a little on the lean side.

A couple of clicks out with the needle and eventually the RPM reading is reasonably consistent with no more than about 100 RPM variation which is normal. I then consider the high-end RPM mixture is correct for that fuel and propeller.

Now we move to the low end - commonly called the idle mixture control (it is really the 'low RPM mixture control' but who's being pedantic?). This adjustment is done only when you have the high RPM mixture set correctly as the total mixture control is a balance between the two needles - the low RPM needle, when set correctly, controls the first 50% of the total movement of the carburettor.

Just to upset the applecart, so to speak, the low-end mixture control is not at all sensitive in its lowest range. That is, even though the low-end mixture is not set at the premium setting, the engine will still idle quite well. However, if the setting is considerably out of correct adjustment, the engine will exhibit characteristics that are easy to recognise.

If, when the throttle is pulled back to the idle setting, the engine slows down as if bogged by too much fuel and that is precisely the problem, the mixture control is grossly rich.

On the other hand, if the engine speeds up, and stops, it is grossly lean.

There is a simple test for the correct mixture setting that I will discuss a little further on as we need to fine tune the setting which, at present, seems to be correct or close to it.

A caution here as I have witnessed this failing many times and often wonder about the thinking of the modeller. We are now going to test the transition, the movement of the throttle to advance the RPM from low idle to maximum RPM. The caution is, move the throttle at servo speed if you are considering manual operation.

Regardless of how well you have adjusted the tuning for both ends of the RPM range, an over fast manual 'flick' of the throttle lever can kill the engine… our relatively simple carburettors cannot cope with the super-fast operation and one simple reason is that they don't have, as your car has, an accelerator pump built into the carbie.

When you flick the throttle open at a very fast rate you choke the engine with an overabundance of air - a super lean mix and it just dies.

Okay, now, at servo speed (simple enough if you use a servo to operate the throttle as in a model), slowly advance the throttle up from idle. If the engine coughs and gags (or even stops during the gagging) the mixture is too rich so make a small adjustment (wind the needle in a very small amount) to gain even running.

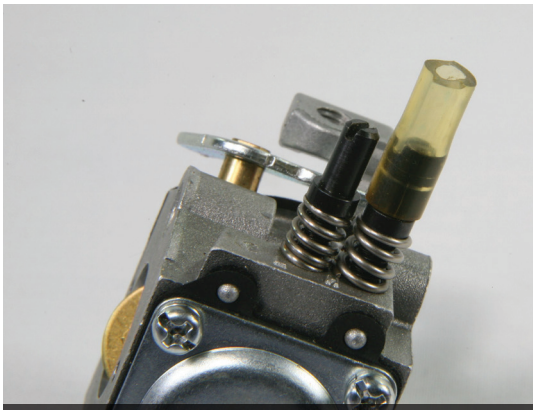
Move the throttle up to a bit above ¼ and check the mixture again then go almost to ½ throttle for the final check. Generally, on the style of carburettors we are dealing with here, the first adjustment you make for the initial advance movement (just up a bit from low idle) will do the job but it is worth your time to carry out the complete check up to ½ throttle.

Now, carrying out the same operation, if the engine just stops or increases RPM a little and stops, the mixture is too lean so carry out the same tuning procedure but this time we wind the needle out a little. Well now, you should be happy with your tuning exercise and the engine is running quite nicely but, if you want to make the final check, grasp the fuel line from the tank to the carburettor and give it a squeeze. If the engine RPM increases the mixture is still a bit on the rich side. If the engine simply stops you have done a fine job - the mixture is spot on so now… leave it alone - it will not change or alter in any way on its own so, if you did your tuning experiment on a good, hot day -

Looking inside the carburettor body to see the main jet with the opening in the centre of the Venturi.

In principle, all these pump type carbies are much the same and, in my experience, they all work quite well if you don't fiddle with them.

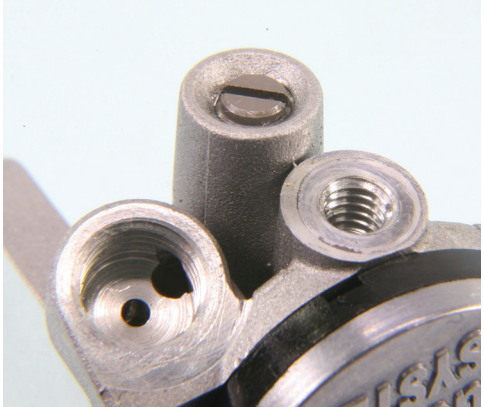
Inside the carburettor rotor you can see the idle mixture needle that 'interferes' with the main jet to reduce the fuel flow as the rotor closes.



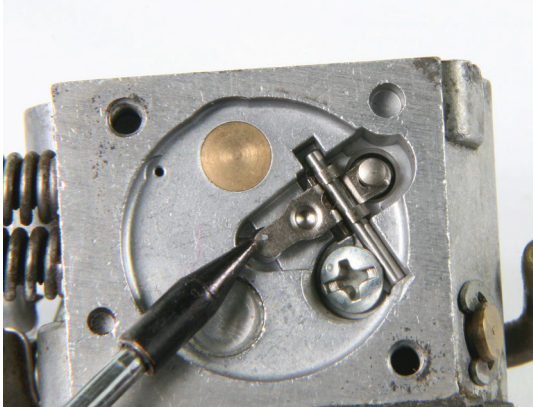
You might find a variation in the adjustment screws - mainly the slots but a piece of fuel tubing equals them out.

In operation I have a main jet piece with the idle needle entering to set the fuel flow for low RPM operation.

This is the air equalisation entry which, it can be extended by fitting a nipple or soldering a piece of copper tube and fitting a short length of fuel tubing.



On several of current O.S. carburettors they employ a 'fuel regulator valve' (slotted screw) which, in effect, moves the position of the main jet to alter idle and mid range mixtures.



This is the needle and seat assembly which I strongly advise you is NOT a fiddle and adjust area. It is very sensitive to adjustment.

that's it…it will not need changing. In the colder weather the engine will run just a little rich but that is a bonus - leave the needle alone.

How cold?

Before we begin reading the story about Walbro (and similar types) carburettors, as I said just now that you might have to change the mixture a little in really cold and wet weather for maximum performance but I am referring to average weather types - not extremes such as …flying in the snow or, if you are really keen, flying off extreme ice in the Antarctic which is just where one of our modelling fraternity enjoys his aspect of the hobby. More in my other article in this issue.

Walbro carburettors

Walbro is the name most familiar to modellers for a petrol carburettor but there are several other brands now commonly used and these are a clone, as is said, of the Walbro or, as I suspect, in some cases a badge engineered Walbro…a Walbro carbie with another name stamped on it.

There are stories on forums (as I am told but do not read) and flying field pit area banter that so-and-so brand carbie is not good or not as good as a Walbro and so on but, in my experience, I have tested all that I can find and I have not, to this time, found a dud - they all worked quite well and in the same manner as a Walbro.

Most of the problems stem from modellers constantly fiddling or not having a proper understanding of how to tune these pumped type carburettors we will look into the make up of the carbie and then get to my method of tuning.

Now, I'm not putting a big hat on but… if you want to see some examples of my tuning results, have a look at some of my You Tube engine tests with an emphasis on a few of the latest engines that I converted to petrol and spark ignition operation. www.youtube.com/user/BrianOilyEngines.

Okay, how's it work, mate? Well, the carburettor basically relies on two diaphragms. One to bring in fuel from the fuel tank and the other to supply the fuel to the engine.

One diaphragm is driven by both atmospheric pressure and pulses from the engine. The engine pulses are delivered either by an inline connection - series of matching holes - from the manifold of the carburettor mating to a hole in the intake manifold of the engine or a fuel tubing connection from a nipple in the crankcase. As the engine produces a positive pulse it pushes the diaphragm out and then the next engine pulse is negative which provides some suction aided by atmospheric pressure to even things up.

In this chamber there is a needle and seat assembly and here is my first warning…this is not adjustable regardless of what the 'specialist' at your club tells you.

Really, I am not being truly correct here as it is adjustable but it is so rare to be needed and you need a special gauge produced by Walbro to carry out the adjustment and…almost every carbie (series) is different so, first off you need the gauge, secondly you need to know what series your carbie is and thirdly, what part of the gauge (it is multi use) applies to your carbie.

Over many years I have never had the need to adjust the needle position in any carbies I have worked on but I have cleaned the needle and seat assembly and this is the next warning. The job is fiddly, a short screw has to be removed to get to the pivot bar and there are small items that will drop and never be seen again. The needle has a soft pointed tip (neoprene fused on?) that is delicate and easily damaged and the seat itself is a very delicate area - definitely no prodding and poking.

The only problem I have ever attended to over many years has been a stuck needle - the needle has been 'glued' in the seat by evaporated oil of dubious quality. A bit of a soak with petrol and some gentle disassembly for cleaning with methylated spirit has always worked for me.

Now, the area that might need your careful attention is the filter gauze and here you need a gentle touch and a watchful eye on how you handle it. This little screen is easily mishandled and it will drop quicker than the drop of a hat. When it drops you will have a problem finding it on the floor but…more often than not your shoe will find it when it treads on it and flattens it beyond use.

I find the safest method of removal is to use a fine sewing needle (pins are a bit thick), carefully move it up the side of its cavity until you can grip the edge with tweezers, or, for me, haemostats which I lock onto the filter. Cleaning is done in my work shop with spray pack carburettor (etc. etc.) cleaner available from auto accessory shops as they contain acetone, xylene and petrol hydrocarbons which do a great job and will dissolve the often found clear film on the screen. The film is from some oils (a waxy film) but I cannot say which ones as I don't have that problem with the oils I use. Obviously, as you have the filter out and firmly gripped, it is prudent to clean both sides then carefully replace it in its little nest.

Other parts and maintenance

I am going to refrain from a blow-by-blow description and instruction of what is inside and how to disassemble it as it is generally, really, unnecessary, beyond the skills of many modellers and can generally lead to a lot of hot and botherdness.

As to the replacement of diaphragms, I wonder when and why it is necessary.

Over many years I have had modellers tell me they changed the diaphragms (new kits are available for most), re-tuned the carbie and the engine then ran fine. While I am not saying there would be occasions when a diaphragm kit would be needed, what I do think is that the disassembly, cleaning and re-tuning might have done the job rather than the new kit. Maybe the type of oil used or even a low grade petrol such as 90 or 91 which could, in many instances, cause damage to some diaphragms and they go hard or soft or leak and a replacement would be in order in these cases.

My concern is that I have never had the problem with any of my own carburettors and, looking at the hardest use engines, I have some that are so old they are probably growing whiskers or going bald. I am referring to my chainsaw, leaf blower, whipper snipper and an old and small outboard motor. I recently donated the outboard to a better need but I still have the garden tools and they all run good as gold.

My chainsaw was purchased in 1972 (thereabouts) and it still runs perfectly after a lot of use and half a dozen or more replaced saw chains. I had need to use it recently after it had been 'in storage' (not being used) for a couple of years. I removed the carburettor filter cover then the filter pad, gave it a good squirt of 'Start Ya Bastard' and it fired up, coughed and pharted a bit then the carbie was taking in petrol and off it went as it has done every time I have used it. Much the same for my leaf blower and whipper snipper - a squirt

of 'SYB' and they burst into life and…I have never found the need to work on the carburettors in all the years I have had them. As a note, I used Coolpower oil (originally I used Synlube and Super petrol in the chainsaw) and 95 RON petrol which I filter before use.

Okey dokey, up to you if you want to fiddle and rebuild but, for those readers who would just want to tune the carbies - particularly for a new engine or one that has been bought second hand - let's get into tuning.

As I have said so many times in the past regarding petrol engines and their special carburettors, once tuned and all is well, leave them alone. They do not need re-tuning and, again as I have also said so many times, if your engine is acting up next time you start it, I can guarantee the problem is not the tuning of the carbie. It does not change and does not need to be changed. Look somewhere else for the problem.

In the tune of sweetness

I will now outline my method for tuning the Walbro so you will need a suitable screwdriver for the mixture needles and - most importantly, a tachometer.

A tachometer is really needed as ears are almost useless when it comes to tuning…and on many other occasions. Think about a strange noise in your car that you are sure is coming from the engine when it is, after all, a can of fizzy drink leaking in the glove box.

Right then, you have your tachometer, screwdriver and the engine mounted ready to run so start it up, let it warm up then take it to full throttle.

Take an RPM reading and record it (write it down on paper) then stop the engine and wind the main needle (marked as 'H') out ¼ turn, re-start the engine and take another reading.

Continue in this manner with the needle both rich and lean (needle wound anti clockwise (to the left for those with digital clocks) is the richer mix.

Eventually you will find 'the sweet spot' - the needle position where the engine runs evenly, does not lose RPM or stop suddenly. This is not hard to carry out as the high end tuning is rather easy for petrol engines. Too rich and they cough and gag, too lean and they simply stop.

Now we come to the fine tuning for idle and transition and this is where confusion reigns for many modellers.

Right down at idle, the engine is not so fussy about the tuning unless it is way out so, if needed, adjust the low ('L') to get a reasonable idle around 2,000 RPM.

With the engine warmed up, pull back on the throttle control, watching the tachometer, to the lowest sustainable RPM for the engine. Good chance you will record somewhere between 1,000 and 1,500 RPM.

Now, referring to the maximum RPM reading you recorded, advance the throttle, watching the tachometer, until the engine reaches ¼ of the maximum RPM then check the idle tune again but do not alter the main needle, it is set for good.

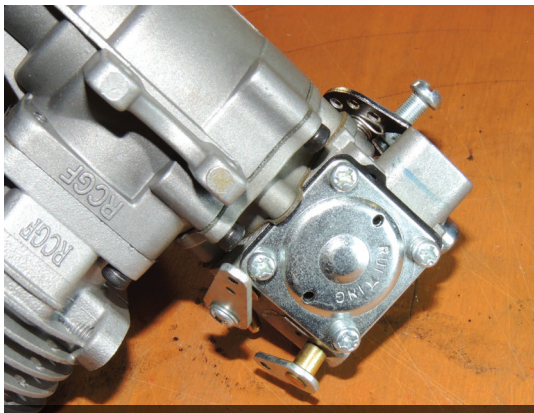
You might need to just touch the LOW needle a fraction to obtain even running then advance the throttle to 3/8 of the maximum RPM and repeat the procedure. Do this one more time at just a hundred or so RPM below ½ RPM and adjust if necessary.

The idle mixture control is operative up to half throttle then the main mixture kicks in so, all below ½ is the domain of the low end setting. Take the throttle back to your low idle, let the engine tick away at this for a few moments then advance the throttle AT SERVO SPEED. Do not yank it back if you are controlling the throttle with a hand operated connection. While these Walbro (and types) carburettors are very good for their intended purpose, they don't have all the refinements of a full size car or motorcycle throttle when you can 'floor it 'pedal to metal' and obtain an instant response.

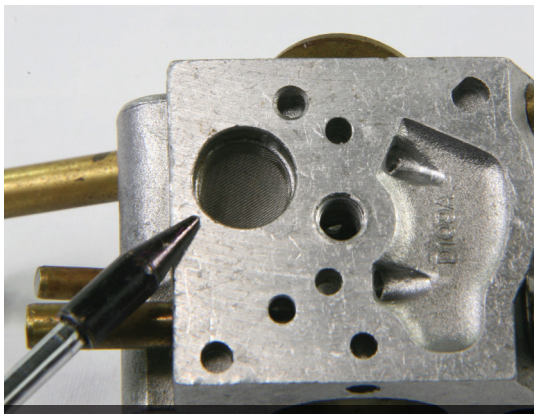
Remember, the engine has a considerable load in the form of a propeller that has to be taken up to the high RPM and prop's have considerable resistance.

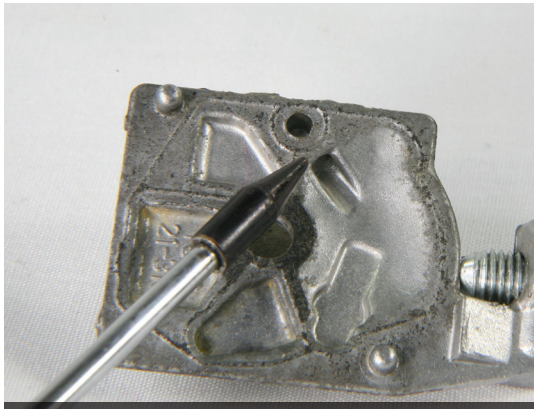
Well, after your tuning exercise you should feel satisfied and pleased with yourself - the engine idles reliably, transitions smoothly in a linear manner (¼ throttle is ¼ maximum RPM and so on) and the top end is as smooth as you could expect for our petrol engines. Now, feed it the same fuel, use the same or very similar propeller and keep your cotton picking fingers off the mixture needles - just start up, check and enjoy flying your model.

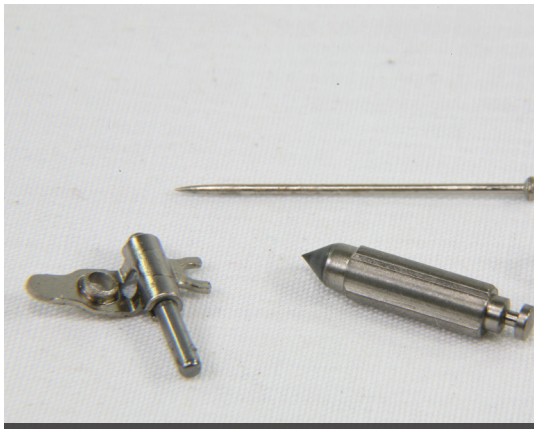
Next article we will delve into the spark department in our 'What's Wrong With My Engine?' series.



Another clone of the Walbro style made by RCGF. These carbies are very reliable and the adjustment needles are enclosed in that cowl pointing upwards.


This indication is the superfine mesh filter which can look clear but is actually glazed with a clear film if you do not use good oil and filter the fuel before it gets to the carbie.


Inside the cover section that has the fuel inlet nipple outside and the section where my pointer is indicating is the fuel flow passage.


These are the components of the needle and seat with a dressmaker's pin above for size comparison.

THE WINCH REPORT

BY BRIAN WINCH

The spark of life

Continuing on with my articles on resolving problem with model engines, I am now going to delve into the extremely murky depths of 'methods of ignition'. Speaking generally I would consider that most modellers would know of glow plug and spark ignition with a few more knowing of compression ignition but…knowing of them and understanding them is an entirely different kettle of fish so, let's look at some of the wonders and the problems that beset us at times.

There might be some modellers creeping up to the century mark who began the power aspect of modelling with spark ignition petrol engines but modellers a little younger, such as me, jumped in just as model diesel engines were introduced.

Actually, I began 'power' modelling right on the cusp of petrol/diesel engines as I was saving money, a long winded process in those days, for a Frog engine I had seen in a catalogue and it was the Frog 175 spark ignition petrol engine. Just as the rattle in my money box grew to a satisfying 'nuff', the 175 was modified to a diesel engine and, by the time I had the opportunity to go to the big city, and the engine started to arrive in Australia, the Frog company had introduced the next series. This was a considerable departure from the modified petrol engine design so I became the proud owner of a Frog 100 Diesel in all its (powerful?) glory.

Model diesel engines invoke a lot of unnecessary fuss and falderal for some modellers who proclaim to be 'purists' when, really, all they are being is pedantic about nothing. 'They are not really diesels - they are compression ignition engines' is an example of some of the arguments.

Fact is, they ARE diesel engines that are skilfully designed to operate with a simple carburettor (aka Venturi intake) rather than a high-pressure fuel injector (s) as you would find in, say, a diesel engine car.

To accommodate the simple fuel system, the fuel contains ether or some other hydro carbon to assist with the continuing ignition and to tolerate a lower compression ratio as is found in full size engines. Looking at the ignition, a diesel engine requires fuel (mixture of liquid and air), compression and heat to fire and run. In a full-size engine, the fuel is almost a vapour from the injector and a form of glow plug (like a solid rod) is used to heat the air inside the combustion chamber to initiate ignition. Our model engines are a varied lot as far as starting requirements but…one thing for sure…they need that small amount of heated air in the combustion chamber and, due to their small proportions (compared to a car or truck engine), the piston applying pressure on the air inside is enough to heat it up ready for ignition.

Most diesels have a contra piston, a rather short and tight-fitting piston either in the cylinder head or in the top of the cylinder and its position is adjustable by means of an eternal 'Tommy bar' or, for the elite purists - 'a vernier compression adjuster.'

Reasonably obvious that this contra piston is adjusted to vary the compression - part of the tuning process and this is where a lot of 'diesel dodgers' come unstuck.

You can always tell by the colour of the oil out the exhaust as an over compressed engine runs 'hard' and burns the oil so the exhaust efflux is black and smelly. A correctly tuned diesel has a light honey colour exhaust efflux and the smell is quite pleasant (to diesel dodgers).

Several reasons for adjusting the compression with the first being the heat of the day - on a hot day you would adjust it to compensate for the heat and the low oxygen content of the air. The other reason is one that makes the appeal

of a diesel so much greater for some modellers - by varying the compression ratio you are effectively changing the ignition timing and you would do this to accommodate larger (than usual) propellers.

According to the needs of the model type, if you had, say, a 6.5cc (0.40 cu in) engine fitted you could quite easily use a 14 or 15 inch diameter propeller which, even though the RPM would be lower than usual the thrust would be greatly increased and…almost no engine noise - even quieter than an electric model if a muffler was fitted.

Over the years I have conducted many experiments converting glow engines (2 and 4 strokes) to diesel operation without a contra piston. The simple fact of using a common glow plug to heat the combustion chamber allowed me to make instant starts. I also used a modified glow plug and a glow plug body with a small copper rod fitted - the rod was heated by a glow plug and the engines were quite easy to start and run - particularly when a variable throttle was fitted (for R/C operation) with an added benefit of an extremely low and reliable idle.

Summing up

Ignition problems with diesel engines generally relate to an incorrect fuel mixture - if you use ether in the fuel it has probably evaporated, or the ratio is incorrect or an incorrect compression setting. To find the setting on an unknown engine, it is common to wind the contra piston down - CAREFULLY - until it just touches the piston top (at TDC) then wind it back up by one half turn and go from there.

The other problem you will strike at times is the cold - diesels do not like extreme cold conditions so warm the cylinder (cigarette lighters have been used for this but…remember…there is flammable fuel present), give the engine a few good flicks before introducing the fuel then begin your usual starting procedure keeping in mind that too much fuel (flooding) cools the inside of the engine very quickly.

The world of the glow plug

There is a lot of 'waffle' over the years relating to glow plug ignition, the inventor and why it became so popular.

It is commonly written that a modeller and engine manufacturer by the name of Ray Arden (USA) invented the glow plug in late 1947. Fact is, he did not 'invent' the glow plug ignition as such as this had been used in varying forms for some years previous with mixed success in both large and small engines.

The original concept was a coil of platinum wire attached to an insulated centre post with the other end attached to the head of the engine and here we can see a problem. What is required to be done when the element fails?

A lot quicker to say than do and that is the removal of the engine head for a replacement element (or a new head).

To see a simple example of this we need only look at the 'glow heads' of Cox (and some similar engines) where this principle is employed. When the filament in a Cox head kicks the bucket, you have to replace the head.

Going back to Ray Arden, he was in the petrol engine era of modelling but could see the potential for a glow ignition - particularly for small engines. When you consider that in those early days the ignition for a petrol engine required (obviously) a spark plug, and they were a bit on the large size for many years, a set of ignition points, a condenser (aka capacitor), heavy ignition coil, switch, wiring and heavy batteries - the poor little engine had to lift all this weight before even considering getting the model off the ground.

While Ray Arden did produce a small diesel engine (converted from a petrol engine) he did produce a line of very fine petrol engines in the small capacities and then a number of glow ignition versions. Regarding his glow plug, it came about when a couple of his friends were running a spark ignition engine on methanol which became available as a fuel for model engines after World War 2 (more power - petrol was still of low octane generally).

The ignition power supply was switched off but the engine continued running due to, as was later found, a fault in the spark plug had caused an internal part to get red hot and the engine continued to run. This is now commonly known as 'running on' and was reasonably common in the days of lower quality lubricating oils that often formed an ash deposit on spark plugs.

For a two-stroke engine (motorcycle for example), this meant a dead stop - the engine died due to an ash whisker on the plug but for a four stroke, such as a car, the ash deposit was more likely to form on the earth electrode and glow red hot. Even though the fuel is petrol, this will keep the engine running after the ignition is switched off.

Diesels generally rely on the contra piston to vary the compression which, in effect, changes the ignition timing. Fitting a muffler to a diesel can make them super quiet.

Just a few of the power panels I have tested over the years. Some are good, some not so good and price is a fair indication.

I also have accumulated a fair collection of 'pocket boosters' and some of the oldest still perform quite well which is on account of steady charging - no more than 1C charge - often less.

I have had this Pilot brand charger for many years and it is still on the top ladder of performance for NiCads and now NiMH batteries.

I had an Austin Westminster and also a Nissan Cedric car many years back that were inclined to do this and the only way to stop the engine was to put the car in gear and stall it.

As many modellers would know these days, you can run a petrol fuelled engine with a glow plug for ignition with the OS GGT10 and 15 being prime examples.

Anyway, when the modellers saw this strange phenomenon, they notified Ray Arden (he was also a very successful inventor) and he saw the potential for a simple removable glow plug for model engines.

For the time being, petrol engines as they were in those days, became relics - dust collectors or, in many cases, converted to glow plug ignition. All went well for a number of years with model engines roaring at full RPM from open exhausts and the noise was not a great problem mainly, from my point of view, due to most people being a lot more tolerant that many are these days.

For sure my neighbour might have yelled over the fence when I was running a model engine and he was trying to listen to the evening news (radio entertainment in those days - no tele). Well…I was probably running a Dooling 61 speed model engine at 16,000 plus RPM watching the flame from the open exhaust at 6 0'clock in the evening. (I didn't hear him yelling at me until he threw a stick at me - maybe I was a bit deaf as a young fellow). There were no hard feelings as, next morning, he handed me a couple of fresh eggs over the fence from his hens for my breakfast. Still, people were different in those days.

Closing in

The times they were a'changing (as the song goes), more houses, less open space to fly models and…radio control was emerging as the newest toy on the block.

No more chasing models for miles, you would have complete control to fly just where you wanted the model to be. Yeah, maybe if you were really lucky but the advertising blurb was good.

Now we had a problem. Engines running full RPM in models over which we had a semblance of control (early R/C was a bit hit and miss) so, if the model was off course - heading to the ground for example - we could only watch it pitch in at full speed and that, very positively, controlled the engine - it stopped it dead in its tracks.

What was needed was a variable throttle and these jumped out of the woodwork, so to speak, as factory installed examples, generic examples and specialised examples but there was a small problem.

When the throttle was taken down to the idle position the engine would stop. The simple fact was that there was not enough residual heat retained in the engine cylinder to keep the glow plug glowing - it went cold as the remains of the slower exhaust exited the open exhausts of the engine.

Okay, fit a movable exhaust baffle, a baffle of some form that would reduce the exhaust aperture as the RPM was dropped and so we had butterfly forms, roller forms and flap forms that were connected to the throttle arm so that, as the throttle was moved down, the flap also closed the exhaust outlet and all was good….for a while.

Modellers (generally) being as they were (and still are), there was only one position for the throttle stick when the model was in the air - full forward…pedal to the metal…full song…flat strap and so the open exhausts blasted on but, as I said a little bit back, times were changing and the noise was becoming a problem.

Slowly but surely mufflers became popular on, mostly, R/C engines to ease a bit of the noise (in some cases) and to also provide a reliable idle and transition.

Control line fliers generally did not pick up on this (many still don't) as their engines ran flat strap all the time, the plug glows like a red hot poker and, besides, doesn't more noise indicate higher speed????

Okay then, we now have reliable glow plug engines (with mufflers) but…are they really reliable?

Many modellers still struggle to get their engine to run reliably so what is the problem?

First off, let's examine a typical glow plug. Externally there is a shaped steel shell (some early ones were brass) with a ¼" x 32 TPI threaded section - standard for all glow plugs and all ¼" spark plugs. For your interest, this thread is ¼" UNFEF (United National Fine - Extra Fine) although, there are old claims that it is a British Modeller Thread but I tend to go with the UNF claim.

Inside the shell are a number of insulators to protect the all important centre terminal post with one end that protrudes out the top of the plug body and the other end is hiding in the plug filament cavity.

As a complete electrical circuit is required for the plug to work, the centre post has to be insulated from the outer shell in order to prevent a short circuit. While it is quick to read an explain, the insulation is reasonably complex as it required to hold the post in its vertical position as well as preventing it from moving sideways whilst under the forces of an engine combustion up to, according to the engine, 50,000 RPM and that's a 'whole lot of shaking going on'.

Next consideration is the plug element and here there are many stories to be told. The original glow plug elements were wound from platinum wire and required 2Volts to heat them to glowing.

For those of you who vaguely remember science lessons at 'skool', you might have learnt that thin platinum wire will glow red in the vapour of methyl alcohol (aka methanol) but it is only thin wire, not the thickness used for glow plugs. However due to a catalytic action, the thicker wire will get warm, and, assisted by an external power source (2 Volt battery), the plug will remain hot but…this is not the entire answer as has been presented for so many years.

The fact is, once the wire has been heated by an external source, the internal combustion heat of the engine will keep it hot and this is proven by the engines running on petrol fuel - no alcohol at all - and the plug certainly remains hot even for a low idle. Err…isn't that what Ray Arden jumped on all those years ago…the engine that kept running due to a hot part of a spark plug?

These days, a number of alloys are used for plug elements in some brands - The mixture of alloys includes iridium, osmium, palladium, ruthenium and rhodium - all found with and the same group of metals as platinum but, most are a lot less expensive than pure platinum. You can buy platinum wire quite readily if you have some spare cash stashed. Look up www.BuyPlatinumWire.com but don't expect bargains.

Of interest, platinum was discovered in South America by Spanish scientist Antonio de Ulloa in 1735. He was the first person to give a scientific description of the metal and its properties. It actually dates back to 700BC and was used by native Americans to make jewellery, but it was not popular as their fires could not melt it like they could gold.

The Casket of Thebes, an Egyptian sarcophagus, was coated with engraved platinum and that pre-dates 700BC.

During the many early experiments by scientists (and others) it was listed as a 'noble metal' as it was reluctant to form a compound, did not rust or tarnish. It is a great catalyst with one example of blasting it with hydrogen as the hydrogen bursts into flames but the platinum is not consumed. This, dear readers, is part of experiments now being carried out in the interests of using hydrogen as an alternative fuel to petrol (full sized vehicles) and, (hopefully) damned battery power. Nothing new, it has been used in the past but modern science and technology is going to really advance it. Imagine - a platinum glow element in your car engine's cylinders, an injector blasting in hydrogen gas and off you go. No pollution whatsoever and the by-product of hydrogen combustion is water. Doesn't that just splash your boots happy?

So much for history and 'things to come', now back to our glow plugs.

A lot of the differences in glow plugs stem from the dollar value. It is definitely a case of 'you gets what you pay for' as they can be made very cheaply bringing forth the time worn adage, 'there is no such thing as a real bargain. The price you pay is the governing factor of the quality of the goods'.

I am prepared to say there are glow plugs that do have platinum elements and these are the high end as far as quality and price. Many have alloys using the other elements such as iridium (remember that name for when we get to spark plugs) and the like (as I wrote) and, from what I can gather, there are some that have fine iron wire elements that have a formed powder coating using some of the elements but I have no other information on this other than I know I have tested some very inexpensive plugs that were certainly wanting in quality.

Another factor of considerable importance are the dimensions of the element cavity in the plug, the little 'hidey hole' wherein the element is hiding. This has considerable influence on the heat and the heat retention of the plug and there are only a few manufacturers who pay strict attention to this factor. In earlier times, the 'idle bar' plugs were extremely popular - the plug had a steel bar across the element cavity to retain plug heat.

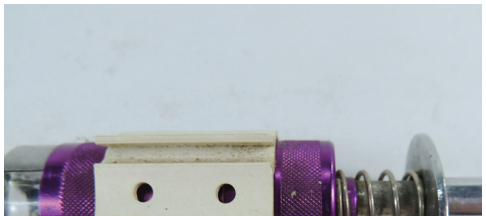
Going back a few years I was contacted by Model Technics in the UK with a view to carrying out some intensive testing of their range of glow plugs. They had advertised (as some people read) that to use their plugs could add 1,000, even 2,000 RPM to the speed of an engine and this was bringing considerable pressure on them

Although an automatic version, this power panel has a lot going for it as it is regulated to bring the plug to a nice glow without a searing first burst. You can also charge up your booster on this panel.

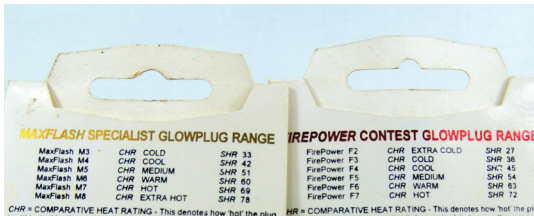
One of the best power panels that has lots of features and… an adjustable current for the plug. Only little problem is that the plug outlets (banana sockets) are the same as the starter outlets (12V) so you have to watch where you plug what.

The green LED's on the bar graph indicate the current draw of the plug to which it is connected and will also indicate a flooded engine by lighting up the green lights to the maximum.

Both of these are quite good glow drivers with straight 12V connection. The G-World has a variable power output so you can 'dial in a glow'. The Prolux is permanently plugged into my bench power supply for plug testing.



This pocket booster comes with a clip for the side of your field box and another bracket that clips onto your trouser belt so you can go out onto the field 'fully armed' for a quick draw.



The complete heat range and the uses of the range is well documented on the rear of each plug card.

Both O.S. and Saito produce a special long reach hot range plug for four stroke engines and these can also be used to good effect in many two strokes, particularly large capacity engines.

Along the lines of how glow ignition began in full size engines many years ago. These are Cox and Norvel heads that have the end of the element riveted onto the inner surface of the combustion chamber.

to prove such a claim. In fact, their claim was the use of the correct HEAT RANGE Model Technics plug could give up to 1000 RPM gain and they asked if I could substantiate that claim for publication. I knew exactly what they meant and what they wanted so I ended up with a box of several of each of their plug range to carry out the testing. At that time, they were the only company who had complete (useable) range of plug heats and a listing on each plug packet - very informative and handy.

The first test I carried out was a .20 cu in capacity engine (3.2 cc) with a standard (common use) fuel and I fitted the coldest plug in the range. RPM recorded and then I moved up the heat range until, at one plug heat I actually recorded slightly over a 1,000 RPM increase. Moving further up the heat range the RPM began to decrease - Bingo! - just what the doctor ordered.

I continued the testing with a range of 2 and 4 stroke engines, different fuels and then measured the internal capacities of the element cavities - all of which were recorded. I was able to write an article drawing certain conclusions from my tests and measurements which was published in the RCM&E magazine (UK) much to the gratitude of the Model Technics company.

For my own interest I made comparisons with many other plug brands and, from those tests and comparisons I was able to come to considerations why many model engines could not always be relied on to keep running for an extended flight of a model.

Now I know I am, for sure, going to offend some readers but a fact is a fact, modellers can be, quite often, overly cautious with a penny (to put it bluntly, they can be tight you know whats).

I have experienced this over so many years when I have advised a modeller or two (or more) to purchase a couple of different size propellers to obtain the best result with a particular model but I might as well as told a duck it had water coming off its back. Much the same with glow plugs. "Why would I need to try another plug - this one is working?" (me)Well, yes, it is in a sense, but the engine won't idle any less than about 4k RPM.

The heat range of a glowplug is determined by the engine capacity, its compression ratio, the fuel used and the RPM at which the engine is run.

The heat of the plug determines the ignition timing of a glow engine and the factors involved in this are the element heat, the capacity of the element chamber and the reach of the plug.

Try putting a hot, long reach plug in a small capacity engine and note how long the propeller remains on the shaft. The timing would be so far advanced it would buck the prop off on the first firing. It is surprising how little consideration is given to this factor by many modellers and… some model engineers - the people who design and manufacture the engines.

Going back a few years when the original Cox factory was in operation, I was approached by the CEO to be the Cox warranty and repair agent in the Oceania region as well as carrying out tests on their range of engines. They sent me a kit of tools for all Cox engine work and several of their latest engines, one of which was their first real R/C controlled model that was fitted with a standard type glow plug (as opposed to the usual Cox Glow Head) that they named The Queen Bee which had a capacity of 0.074 cu in - (1.2cc).

With the engine I received a note from the CEO to say the engines would not start at low idle but they ran very well and would idle down reasonably well when they were running. Seemed odd to me so I set the engine up and began my testing to find that, at the lower carburettor setting, the engine acted like a flooded diesel - the piston rocked up and down (oscillating) but would not complete a stroke.

Now, when this happens with a diesel engine you reduce the compression which, in effect, changes the ignition timing and the engine will then run. To me, this Cox was pre-igniting - the plug was either too hot or too long, so I changed for a very short reach colder plug and away it went sweet as a spoon of honey (honey? Queen Bee? well….).

I could start the engine on its lowest idle position, it transitioned smoothly and reached the quoted RPM - lovely little engine.

When I contacted the Cox CEO, he indicated that he was going to have some very serious words with the company engineer. As an offshoot of this, most readers will know I am not a fan of the confounded forums and, what I read did not change my views one iota. Out of interest, I clicked onto one popular forum to see what was said about these engines and the 'stuff' I read confirmed my opinion that there are some Richard Craniums writing stuff as the general opinion was that these Cox Queen Bee engines were a failure - junk, would only go with a modification to the carburettor and on a YouTube video of one running, the modeller never achieved a low and reliable idle yet there was not one mention of using a different glow plug - the solution to a small problem.

If you have an engine that does not seem to be running at its best, try two new plugs - one colder and one hotter and note the difference but…use a tachometer as human ears can be very deceptive as RPM guides. As a very general rule - very general mind you, an engine on high compression with no nitro in the fuel would use a hot plug and I have even been with pylon fliers who wicked the element out a little for a hotter (advanced timing) run. General purpose engines with nitro fuel use a medium to colder plug and four stroke engines need a long reach medium to hot plug but go for the quality brands.

If your engine is in good running condition (not worn internally) and it stops when you disconnect the plug power, it is an indication that the plug is dying or too cold. Running the engine to max RPM with the plug power on then switching it off, the engine should have a mild increase in RPM to indicate the plug suits that engine.

If an engine detonates you should try a cooler plug or fit another plug washer to make a small change in the timing. If your engine is not happy inverted, fit a longer plug such as an O.S. F and this works very well with the larger capacity engines such as the Super Tigre 2000, 2,500 and 3000 series.

I don't advice removing the plug for an inspection as the thread in the engine head has a limited life being aluminium and having a steel thread wound in and out.

If the engine runs and idles well, if ain't broke so don't fix it. However, if you do have the need to check the plug, the element tells all.

A plug in good condition will have a shiny or very clean element and the entire element will glow when power is applied. A faulty or dying plug will have a rough surface element, a distorted element or the element will be an ash grey colour. Obviously if the element is distorted or glows only for a small section it is an indication that is has become a missile -you throw it was far away as possible.

In very early days of free flight and control line flying, a poke around with a pin would often get a plug to work again for a while and this was necessary as pants pockets had holes and plugs were quite expensive.

If a plug is a problem today, it is not going

to cure in your toolbox tray with all the other grotty failed plugs. The don't get better, believe me so dispose of it 100%. How much is your complete model worth if the engine fails at a critical aspect of flight? As well, you will have to pick up the scattered bits on the field and come up with some time worn excuse - 'interference'- battery failure' - a bit of sky fell on it and so on.

The power is right

To close on this section, a few words about plug power.

In early days I had a modified motorcycle battery. One cell cut off and sealed up to give me 2 Volts and this worked very well for a very long time but, in those days, how would you charge a 2 Volt battery?

Over many years I have used many methods of powering a glowplug and found many downfalls.

When they were incredibly popular, and so many different ones on offer, power panels were the 'in thing' but…there were (and are) power panels…and power panels. Not all are equal. Some designed by USA companies had a pulsed 12 Volt power, a form of alternating current that pulsed micro seconds of 12 Volts to the plug. Not enough to kill it but enough to make it glow. Not a good system.

Most power panels emanated from castor oil days - that goopy stuff that gums up engines and…glow plugs. It was considered by the designers of some power panels that the plug would be gummed with castor the next time you started the engine (next flying day) so they programmed in a heavy pulse when the plug was first connected to the panel to really pump the heat up to burn away the castor.

The plug would be almost white hot (not at all good) and the other problem was, the program didn't take into account that you might start the engine more than once each flying day so…every time you connected to the plug it would get the white hot glow - one reason why glow plugs had a reasonably short life or, in some cases, no life at all as a lesser quality plug would die a miserable death on its first connection.

The better types of power panels have a rheostat control and an output gauge. You move the rheostat knob, the gauge indicates the current draw to suit the plug in use. Always best to set these with a plug outside the engine so you can obtain a reference for the type of plug in use. You need to look for a ripe orange skin orange glow of the element.
Not long after the big push of power panels (there were loads of them - a new one every week or so) the 'pocket booster' came on the market.

Again, in days past, most modellers had a super well-equipped field box with enough tools and equipment to rebuild a double decker bus and other items that were never (never ever) used so…the field box weighed more than the owner. If your engine quit on the flight line (takeoff area - we stood behind them in those days for taking off) you or a good mate would struggle out with the field box to provide power to restart the model and, soon, rules were setup at flying fields that field boxes must not be left on the field (as many were for other modellers to trip over of models to crash into on landing).

So…the pocket booster came into being - a NiCad C cell battery in a holder with a tubular plug connector on the end - some even had gauges built in. Over time the pocket booster became the Nistarter and the main source of plug power for many modellers. With the advent of the super large capacity NiMH batteries, this source of plug power has become almost standard on many flying fields.

Now we come to the Rolls Royce grade of plug driver - the RCats system. This is a complete unit with a built in lithium ion battery and a circuitry that reads the resistance of the plug to which it is applied.

The plug is heated to the nice orange glow every time - every plug and it is done slowly - no sudden jolt of power to shorten the plug life. A bar graph on the screen indicates the build-up of power and the green lights indicate the plug is at maximum power, ready to run.
I received one for a test many years back from Michael Luvara (USA) (the designer and manufacturer) well over 15 years back and took it down to the Albury Float Fly where it was handed around for anybody to use it and use it they did.

I also heated a glow plug to correct heat in a glass of water as a demonstration. It ran all weekend and started many engines with the result that many modellers 'had to have one' (many were purchased soon after). The unit comes with a charger and, for the average modeller, one charge would last about 18 months of average use. I have four now (multi cylinder engine use at times), they all work perfectly and all on the original batteries. The agent for these is now Albury RC Models and they keep selling them.

Out the door

Well, that's my lot for the moment so it's out the door and off to the editor.

Next article we will delve into the spark department in our 'What's Wrong With My Engine?' series.

Australia also got into the act with Aero-Flyte producing, along with their intense range of kits, accessories and very good model glue, the glow plug (range of) designed for Australian use.

This is quite a rare beast - the first glow plug produced by O.S. for their very first engines in the late 40's, early 50's.

Jaures Garafoli produced these high quality plugs in the early years for his Saturno range of engines known more familiarly later on as Super Tigre.