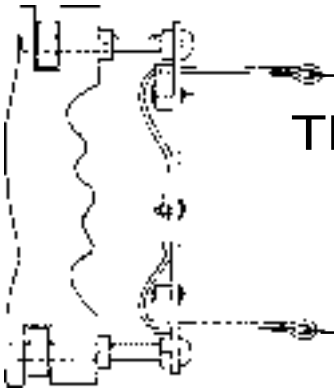


$2.00

THE VOICE OF CONTROL LINE AEROMODELLERS FROM AROUND AUSTRALIA

Number 64

Produced by the Victorian Control Line Advisory Committee

March 2003

INSIDE THIS ISSUE

Copy Deadline for next issue is: Wednesday 19th March 2003

PRODUCTION SPECIFICATIONS

Please remember when submitting copy that if you have access to a PC, or suitable typewriter you can save me retyping by giving me your items pretyped, and please use a good black ribbon for best reproduction.

Best of all is to send it on a 3.5" disk as a Windows Write, Word for Windows, or as an ASCII TEXT FILE or use Email

Contest results should be tab delimited, ie use a single tab between each column of results, if submitted by disk. This makes formatting much easier on the editor.

Harry Bailey. 37 Thompson Street. Clayton VIC. 3168.
Telephone (03) 9543 2259.

Email address:- acln@ozemail.com.au

COMING EVENTS

CONTROL LINE CONTEST CALENDAR 2002

MAR 16	**FAI Team race, Goodyear,** Simple Rat race.	CLAMF
MAR 23	FAI, Novice & Jnr Aerobatics, Vintage "A" Team race, Classic "B" Team race.	KMAC
MAR 30	CLAC Fly/Try Open Day	KMAC
APR 6	Simple Combat.	SMAC
APR 6	CLAG Country Flying Day	MAFFRA
APRIL 18 - 21	**VMAA CONTROL LINE STATE CHAMPIONSHIPS**	
Sat 19th	FAI Speed,Jnr Combat,FAI T/R, Combined Speed,1/2A Combat.	CLAMF
Sun 20th	Jnr, FAI& Novice Aerobatics,Combined Speed, FAI Combat, Vintage "A" T/R, Vintage Stunt, Classic "B" T/R, Jnr 2.5cc Rat Race	KMAC
Mon 21st	Midge Speed, Goodyear, Mini Goodyear,1/2A T/R, Simple Rat Race.	CLAMF
APRIL 27	Classic Stunt, Bendix.	KMAC
MAY 4	Vintage "A" Team race, Aust " A" Team race.	SMAC
MAY 4	CLAG Country Flying Day	KNOX
MAY 18	**FAI & Combined Speed,** Triathlon (Artmil Trophy), **1/2 A Team race.**	CLAMF
MAY 18	Vintage Stunt	Brimbank Falcons
MAY 25	FAI (Yeoman),Novice & Jnr Aerobatics, Simple Rat race.	KMAC
JUN 1	CLAG Country Flying Day	MOE
JUNE 8	Balloon Burst, Limbo.	SMAC
JUNE 15	FAI Team race, **Goodyear,** 1/2 A Combat, FAI & Modified Combat.	CLAMF
JUNE 22	Vintage Stunt, Combined Speed, Vintage "A" Team race.	KMAC
JULY 6	Simple Rat race (whipping permitted).	SMAC

NOTE - All SMAC events to be held at KMAC flying field. All events at KMAC except Aerobatic events to be run by CLAMF, DAC & SMAC members.

Events will be flown in order of printing. Events in **Bold type** will be flown over hard surface

CLAMF Frankston Flying Field, Wells Rd, Seaford (Melway 97J10), 10.30am start

Contact :- G. Wilson (03) 9786 8153,

Events conducted by CLAMF at the KMAC Field (Melway 72 K9) 10.00am start.

Contact :- H. Bailey (03) 9543 2259

KMAC Stud Rd . Knoxfield (opposite Caribbean Gardens) (Melway 72 K9) 10.00am start

Contact :- T. Matthews (03) 9560 0668.

SMAC Contact :- Reeve Marsh (03)9776 5949

WMAA Horsham. Contact :- V. Cresp (03) 5382 4065

BRCAC Bendigo-Newbridge Rd . Marong

Contact :- S. Power 03 54 424 925

CLAG Contact :- Graham Keene (03) 51924485

Details of venues can be found on web site www.clagonline.org.au

COMING EVENTS

CLAS 2003 CONTEST CALENDAR

DATE	CLUB:	EVENT:
Sun 9th Mar	Doonside (at Kelso Park)	F2B Aerobatics
Sun 16th Mar	Werrington	F2B Aerobatics and Classic Stunt
Sun 30th Mar	SSME	Phantom,Vintage 1/2A, Vintage A, Bendix T/R
Sun 6th Apr	KMFC	1.6cc Combat and Slow Combat
12th/13th Apr	MDMAS (Lake Lidell State Rec. Area)	Splashdown Weekend (Seaplanes,Floatplanes)
18th/21st Apr	CLAC (Victoria)	VMAA C/L STATE CHAMPIONSHIPS
27th Apr	SSME	F2B Aerobatics
3rd/4th/5th May	CLASIIFields,Ipswich,QLD" QUEENSLAND C/L STATE CHAMPIONSHIPS	
17th/18th May	MDMAS (Muswellbrook)	Veteran's Gathering
25th May	SAT (at Dapto High School)	F2B Aerobatics
1st Jun	KMFC	Palmer / Aldrich Classic Stunt
7th/8th/9th Jun	Venue to be confirmed N.S.W. STATE C/L CHAMPIONSHIPS	
15th Jun	IMAC TBA.	F2B Aerobatics
13th Jul	KMFC "AGM,	2.5 Stunt, F2CN & Slow Combat"
19th Jul	REMAC (incorporating award for best All American)	Vintage Stunt
26th Jul	SSME	"Vintage 1/2A, Vintage B, Goodyear, Combined Speed"
27th Jul	SSME	"Phantom, Vintage A, Bendix T/R"
3rd Aug	IMAC (contact Owen Pearcey)	FUN FLY
10th Aug	KMFC	F2B Aerobatics
31st Aug	SSME	Slow Combat (Bonus points for WW2 style model).
14th Sept	KMFC	"Classic Stunt, Vintage Stunt, Simple Rat, Slow Combat, SWAP MEET"
11th Oct	REMAC	Vintage Stunt (including special award for best Fox powered model)
19th Oct	IMAC (Berkeley)	F2B Aerobatics
9th Nov	SAT (Kelso Park)	F2B Aerobatics
16th Nov	NACA (Gateshead High School)	Classic Stunt

16th Nov	KMFC	Vintage A&B, Vintage 1/2A,
3oth Nov	SSME	F2B Aerobatics
7th Dec	Doonside (at Kelso Park)	F2B Aerobatics
14th Dec	KMFC	Christmas Party and Fun Fly

"IMAC (Illawarra Model Flying Club) - Flying site @Hooka Ck Road, Berkeley. NSW"

"KMFC (Ku-ring-gai Model Flying Club) - St. Ives Showground, Mona Vale Rd, St. Ives. NSW"

"NACA (Northern Area Contest Aeromodellers)-Gateshead H.S.,Pacific Hwy, Gateshead. NSW."

"REMAC (Ryde Epping Model Aero Club) - Peter Board H.S., Wicks rd, North Ryde. NSW."

"SAT (Sydney Aeromodelling Team) - Kelso Park North, Henry Lawson dr. Panania. NSW"

"SSME (Sydney Society of Model Engineers) - Model Park, Luddenham Rd, Luddenham. NSW "

"WMFC (Werrington)-Entrance to flying site @cnr. Landers & Walker Sts, Werrington. NSW."

CLASII CONTROL LINE EVENTS CALENDAR 2003

Flying field at Leichardt Park just past One Mile Bridge Ipswich

Members fly most Sundays between 9am and 1pm. Club competition days are held on the second Sunday of the month. Visitors are most welcome but please bring your F.A.I .card to prove current MAAQ membership. This is a Council Park with permission given to fly only control line planes, no radio and only between the hours of 9am to 5pm. Further information on club activities can be obtained from President Mark McDermott 07 32889263 or Secretary. John Taylor 07 33927679 email johndt@iprimus.com.au

Mar 9th	F4B Scale, S/Off Scale, Fun Scale, Vintage & Classic Stunt/ F2B
Apr 13th	Vintage A & B T/R, Classic B T/R, Bendix, Class 2 G/Year
May 3,4,5,	Qld C/L State Championships (except Scale events) N.B At CLASII FIELDS IPSWICH
May 17th, 18th	**Qld C/L Scale State Championships. N.B. At CLASII FIELDS IPSWICH**
Jun 8th	Fun Fly In.

Events later in year will be advised at a later date, but as usual Clasii events will be held on second Sunday of each month

FOOD AND DRINKS ARE AVAILABLE AT THE FIELD ON CLUB DAYS. Visitors are requested to make a gold coin donation to club funds for fun flyins. Competition events commence 9.30am. Separate entry to apply to each event. Clasii (simple) Rat rules available from Secty.

2003 QUEENSLAND CONTROL LINE CHAMPIONSHIPS

BULLETIN NO 2

MAY 3rd 4th 5th at IVOR MARSDEN MEMORIAL PARK complex IPSWICH

(Ref. UBD Map 232 E2) 4kms from Ipswich P.O. (2.5 kms past usual Clasii fields)

All usual C/L events will be offered **(except F2C)** Queensland events inc. Mouse and Clasii (simple) rat will be held on Monday 5th (Qld public holiday) Evening social activities are planned throughout both weekends so competitors can meet under congenial conditions and enjoy a nice meal and a few quiet drinks.

SCALE ONLY

MAY 17th 18th at LEICHARDT PARK IPSWICH

(Ref UBD Map 232 R1) 1.5 kms from Ipswich P.O. F4B Stand Off and Fun Scale will be offered, commencing at 12pm Saturday 17th with a FREE sausage sizzle prior to Static judging.

NB All EVENTS OVER FIVE DAYS WILL BE CONDUCTED ON GRASS.

PR-ENTRY CLOSE DATE IS 12PM 13th APRIL although late entries will be accepted up to 8am on competition day **(Penalty fee will apply)** subject to approval of C/D and Registrar. **A minimum of 3 fully paid entries Snr. (2 jnr) must be received by entry close date for an event to be scheduled.** All competitors registered will be advised which events are to be conducted and in what order 7days after Pre-entry close date All refunds needed will be returned at this time.

Hot and cold food and drinks will be available from the on site canteen. Plenty of trees, seats, shade and shelters available. Ample parking on site with sewered toilets and showers etc. Official entry forms should be available from your C/L Club Secretary first week in March. If you are unable to obtain an entry form please contact Registrar direct.

For information concerning entries, events, rules, accommodation, caravan parks etc please advise email/fax/ phone /address to

REGISTRAR 2003 QLD. C/L CHAMPIONSHIPS
John D. Taylor, 274 Toohey Road Tarragindi Qld.4121
Email johndt@iprimus.com.au Phone 07 33927679 Mob 0407150791 Fax 07 33927529
NB Not available after 7pm Sundays

CLAC will be having another of its Fly/Try open days at the model flying field on **Sunday March 30th.** John Harrow has offered to organise the publicity aspect of the event in the local media and we are hoping for a better public response than our November attempt.

The programme will be the same as last time so bring along your static and active display models and assist in any way you can to promote our hobby.

The display that the Control Line team gave at the Avalon Airshow was well received and many of the spectators took the opportunity to have a joy flight with the "TOO UP" trainer models.

HEARNS - 55 YEARS STRONG

What started in 1947 is still a hit in 2003. Well, that was the case when 8 fliers met for KMAC's annual Hearn's Trophy at Knox in late January.

This aerobatics championship goes back over half a century and during that time everyone who is anyone (both local and interstate) has won it. The hardware is still the original with all the winners individually recognised on the very impressive trophy.

This year was a three-way shoot-out between Doug Grinham, PJ Rowland and Doug Harlow with only a handful of points separating them. But that was the order they finished after two rounds in breezy conditions.

It was good to watch Mark Ellins leave the field after round one:..."because the wind's good enough for decent wind surfing." Only to return in time to fly on the tail of the second round when Melbourne's winds dropped for mid-day.

Ken Taylor's plane used his favourite motor - the MVVS 49 which he now has with a simple rear exhaust (a plain pipe squashed down at the end) and full Euro-style compression. Despite using nitro, the powerful motor still managed a 4 stroke run and Ken is determined to continue its development.

This January's KMAC meeting also featured what will be standard at all F2B aerobatic competitions from now on - a Classic pattern class. This is for fliers who do not want to go through the full F2B pattern but can enjoy a competitive flight in the reasonable Classic class (even though they may not use a fully Classic-legal plane).

And for this new category, David Nobes showed how good a plane designer/builder/flier is really is. His first competitive flight saw his own design go effortlessly through the manoeuvres as the stock standard OS40FP revved and revved and revved.

Hearns Trophy 2003: Grinham, Rowlands and Harlow were the best.

Results:
(Judged by Peter Roberts)

Doug Grinham	(Reactive/Jett60)	1545
PJ Rowlands	(Vortex/Moki 51)	1513
Doug Harlow	(Vectra/Moki 51)	1499
Mark Ellins	(Manito/ST46)	1426
Derek Pickard	(Jazzer/Stalker 61)	1293
Ken Taylor	(Krystal/MVVS49)	1005

Classic pattern:

David Nobes	(OD/OS40)	139
Frank McPherson	(Magnum/Fox 40)	84

BRIMBANK FALCONS
CONTROL LINE MODEL AIRCRAFT CLUB
INVITES YOU TO OUR
VINTAGE STUNT COMPETITION

JUNIORS OR ADULTS,
NOVICE OR EXPERIENCED
$ 5.00 ENTRY FEE
TROPHIES AWARDED

WHEN: 18th MAY 2003

TIME: 10.00 am TO FINISH

WHERE: BRIMBANK PARK, KEILOR EAST
ENTER OFF KEILOR PARK DRIVE.

The flying Site is 300 metres inside the main entrance gate, on the left. For further information please contact the following ;

Club Secretary: Alan Matthieson-Harrison 9337 4193
Or
P.R. Officer : David Gregory 9337 9836

Please note that the Club has special permission to fly at Brimbank Park on designated days. Casual flying is NOT PERMITTED.

A STOOGE FOR TRICYCLE UNDERCARRIAGE MODELS

1. **INTRODUCTION**

The standard ground level stooge is easy to use with " taildragger" models, but very difficult to use to restrain a tricycle undercarriage model with the tailplane well above the ground

This is a description of a stooge that restrains the model via vertical arms in front of the stabilisers.

To release the model, the arms rapidly fold forward to a horizontal position

The stooge can also be used as a rough release for taildragger models.

2. **GENERAL DESCRIPTION**

The picture below shows the general arrangement of the stooge, restraining a tricycle undercarriage model, (Ken Taylor "Centaur").

The stooge has a low profile so as to minimise damage to a model in the event of the model accidentally overunning the stooge.

(a) **Basic Construction**

The stooge is built up on a laminated chipboard base, with circular foam covered restraining arms that can be locked in a vertical position.

The locking and release mechanism is mounted to the chipboard base and is housed within a lightweight, low profile, aluminium cover.

The release mechanism is activated by a horizontal rod protruding from the side of the stooge, and attached to a length of builder's twine or sash cord, etc.

The stooge is attached to terra firma by two large camping - type steel pegs, pushed into the ground.

The two pegs prevent the stooge sliding forward, or rotating out of alignment with the model.

(b) **Setting Up**

The stooge can be set up by first placing the model in the desired position for takeoff

The stooge is slid under the rear of the model, and the restraining arms raised to the vertical locked position in front of the stabilisers.

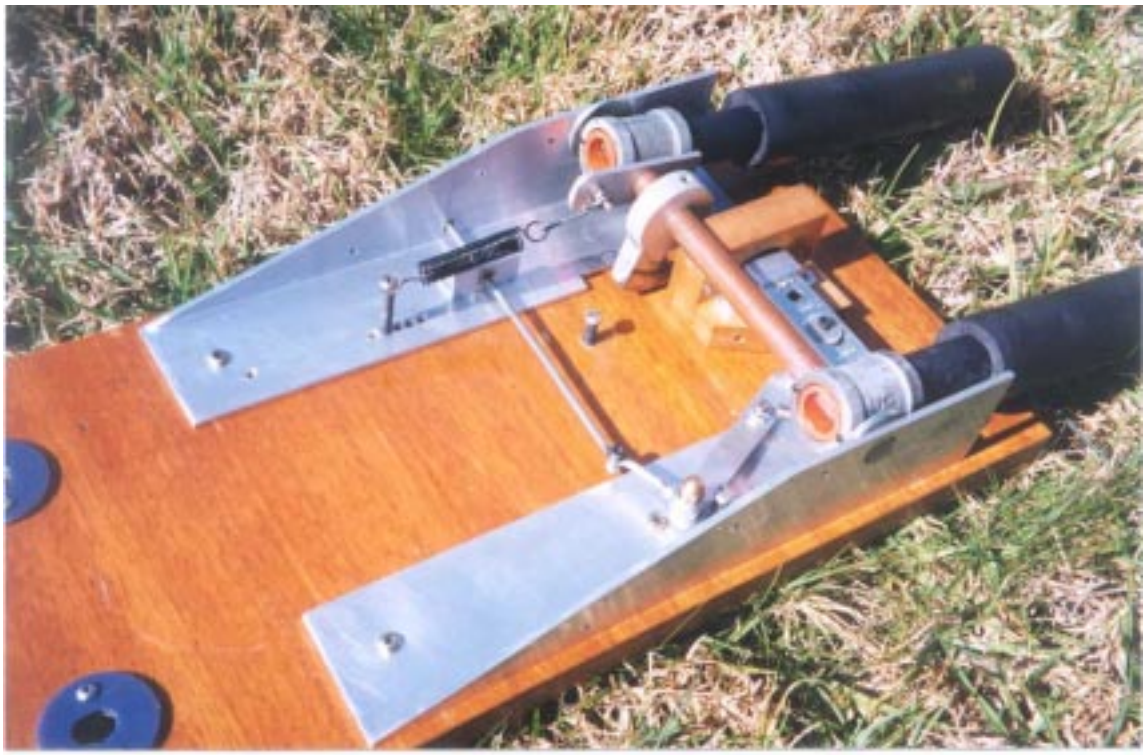
The two pegs can then be pressed into terra firma, and the release cord run out to the control handle position.

Double check the arms are fully locked.

The model can then be started and released in the normal way.

2. **CONSTRUCTION DETAILS**

The picture below shows the stooge with the cover removed, and the arms in the released position.



(a) **The base** of the stooge is made from 19.5mm scrap laminated chipboard, with a protective coating of clear lacquer, (Estapol)

The base measures 600mm x 195mm and is rounded at both ends.

(b) **The side mounting rails** are made from 50mm x 50mm X 3mm architectural aluminium angle.

The rails support the cover, and the mechanicals of the stooge.

(c) The release mechanism, is made from a standard internal door mortice lock

The brass tongue of the lock engages with a circular aluminium cam fixed to the restraint arms shaft.

When the lock tongue is out, and engaged with the shaft, it will hold the restraint shaft and arms in the vertical locked position.

The mortice lock is held in position via a craftwood block screwed to the base.

(d) **The release rod and lever,** the rod is made from 3mm low alloy steel wire, and is supported by the side rail, and a small aluminium angle, the rod slides in brass eyelets.

The release lever is made from 12mm x 3mm architectural aluminium flat and is 100mm long,

The release lever is fixed to the mortice lock shaft, and moves the mortice lock tongue in and out.

The release lever is held in the locked position via a return spring to the front of the rail, (mortice lock tongue in the out position).

(e) **The restraint arms** are cut from 20mm orange electrical plastic conduit, 230mm long overall, the last 140mm are covered with 30mm diam' black foam rubber tubing, (from Clark Rubber)

The plastic conduit arms, are fitted to metal sockets made from galvanised iron water pipe couplings, the couplings are drilled at right angles to receive the shaft, and held in position on the shaft via 3mm grub screws.

(f) **The restraint arms shaft** is 12mm diam', cut from a scrap electrical copper clad earth stake, the shaft could be made from any suitable metal in a similar diameter, the shaft length was cut to suit the width of the side rails.

A spring and bracket is fitted to the inside restraint arm socket, to pull the restraint arms into the horizontal position, on release.

(g) **The circular aluminium cam**, was cut from 10mm plate, the cam is fixed to the shaft by two 4mm grub screws, initially the brass mortice lock tongue would bind on the aluminium cam, (the angled side of the cam would not slide over the brass tongue, and push it back into the mortice lock to reset the restraint arms to the vertical position)

The solution was to clad the angled section of the cam in tinplate. Tinplate and brass slide well!

(h) **The aluminium cover,** keeps out some of the muck, and gives the top of the unit a smooth profile.
The picture below shows the stooge with the cover removed, and the arms in the locked position.

The stooge is elaborate, and some parts are oversize, but it works, and it was fun making it. I like making gadgets.

Frank McPherson KMAC / CLAG MAAA 58427

For those of you that have an internet connection comes the news that your ACLN can be viewed on David Kidds webpage dkd.net.clmodels Look under "current newsletters" All the pictures are in glorious colour. This will be an ongoing thing and my thanks go to David for his services.

Another new C/L modelling website is that provided by Ken Dowell at

members.optushome.com.au/knoxmac

RULE BOOKS

Printed A4 size copies of the Control Line FAI & Australian rules are available in a spiral bound folder from CLAC,
PO BOX 298,
SEAFORD, 3198.
The cost is $8.00 for Book plus $2.50 postage.
Please make cheques payable to "Control Line Advisory Committee"

Control Line Aeromodellers of Gippsland Inc.

Meeting held at Agnes Brereton Park Traralgon February 2nd 2003

Perfect weather, nicely mown grounds and many fliers, or should that be flies, they certainly were thick, however overall a great day.

All present managed at least several flights, pilots and models in no particular order were; John Goodge, (Ares Fox .35 / Nakke Stalker) .40RE, Robin Hiern, (All-Australian Sparey 5cc diesel), Frank McPherson, (Manito ST46 / Aldridge Magnum Fox .40), Rian Goodge, (Spitfire OS .15FP), Andrew Beevor, (Viper OS .46LA / Stunt Trainer OS .25FP), Graham Keene, (FM OS .46LA, Peacemaker OS .15FP), Paul Richardson, (Doctor OS .46LA), Geoff Ingram, (Freebird PAW .49)

It was pleasing to have the return of Paul Richardson who has lately been indulging his passion for large capacity American motorcycles.
Also good to have visitors Craig Hemsworth, (Pirouette OS .46FS / Bumstreak ST40) and Gary Odgers, (Midi Slow PAW .15) make the trip down and spend a day with us.

During the lunch break a meeting was held, noise levels again were the topic of discussion. Robbie Hiern had

brought along his sound level meter so it was decided to take some readings with the planes in the air. The readings were taken at the edge of the flight circle, the objective being to merely agree on what should be permissible noise at this site.

As a matter of interest some readings obtained were, (with full mufflers) OS .25FP (78), OS .15FP (80) with mute (73), Stalker .40RE (82), Fox .40 (87), Merco .35 tongue muffler (92), Sparey 5cc diesel (90). The Sparey being machined by talented engine man Robbie Hiern, certainly looked purposeful hauling the All-Australian around and the sound although loud was certainly not unpleasant.

A reminder that visitors are very welcome to join us, details of flying days can be found in the ACLN Events Calendar, or web site www.clagonline.org.au

Graham Keene Sec/Treas CLAG Inc

Ducted cooling for model airplane engines.

Advances in wing design, especially if F3D pylon race models, have reached the point where further performance gains may not be related to the surface configuration of the model. If there is one area where gains may be expected, it is in engine cooling.

On full-size aircraft, quite large gains in performance have been achieved by reworking the cooling system. I have in mind Roy LoPresti's work on the Mooney light aircraft. From my memory, I recall he turned a 160 MPH airplane to a 210 MPH airplane, largely by reducing cooling drag. This seems like an improbably large figure, so let us look more closely at another example, this time not from memory.

In the magazine "Aeroplane" for May 1999, there is an article by the late Lee Atwood, vice-president of North American Aviation in 1940, entitled "We can build you a better airplane than the P40". The aircraft alluded to is no less than the P51 Mustang , so we can expect some excitement!

Lee indicates that the propeller thrust at full power was about 1000lbs. However, the drag of the cooling radiator was of the order 400lbs! This is shocking, nearly half the available thrust was required just for cooling the engine. For you farmers out there, this is not unlike using horses to plough and harvest your wheat fields: for every 1000 bags of wheat, the horses eat 400! And that is a fact!

By careful design of the radiator and its ducted cooling system, it was possible to use the heat released by the radiator to generate 350lb of thrust, thereby reducing the net drag of the cooling system to just 50lbs. This was a rather special achievement, possible due to the work F.W.Meredith, in 1935, at the Royal Aircraft Establishment at Farnborough. This reduction in cooling drag was mainly responsible for making the Mustang some 30 MPH faster then the Mk IX Spitfire, despite the higher critical Mach number of the Spitfire wing.

Now here is food for thought. Perhaps our speeds are too slow to use the Meredith effect on our racing models, but just how bad is our cooling drag? Are our cowling designs giving rise to more drag than, say, the wing itself? Highly possible, based on those figures for the Spitfire and Mustang.

Recently I had the need to test my bar-stock double-exponential tuned pipe on an OPS 40 mounted on my stationary test stand. In characteristic Supercool fashion, things went wrong very quickly. With the motor completely uncowled, air rushing past it in all directions, I figured that cooling was not an issue. How wrong can you be!

From cold, the motor would burst up on pipe to 27000 RPM, then sag and sag down to 25700, and become impossible to tune. Opening the needle did nothing. Getting pipe data was impossible, so in set the Blues as my alter ego started jabbing me with a pin and making me feel despondent. Was my pipe at fault? I had heard of pipes burning holes in pistons: was my 3 months of development and coding all wasted?

Looking closely at the engine, I noticed that there was castor oil burnt onto the back of the cylinder, offset slightly to starboard. This seemed to indicate excess heating, or at least lack of cooling, at that point. Talking to the C/L speed guru Grant, he spun me a wonderful story. When dyno tuning his K&B 40 racing motor, he was able to determine the cooling pattern from coloration of the liner and piston. Cooling was fine in the front of the engine and in the vicinity of the transfer ports, but not at the rear of the cylinder in the region of the exhaust port. So air was doing the cooling in front, and the fuel also contributing to the cooling.

Cooling with the fuel mixture? This does not sound so good to me. After all, the Spitfire had an intercooler between the supercharger and the inlet manifolds, for the express purpose of cooling the fuel mixture. Just the opposite of what we are doing.

The MB40 pylon motor is well known for its heat stability, especially on the starting line. Previously I thought this may have been due to some wonderful metallurgy or the elimination of the cylinder liner, the latter giving better heat transfer to the cooling fins. But when I looked more closely, I noticed that this motor has rear transfer ports which can cool the rear of the cylinder, unlike the IR, Nelson or RPM.

To my way of seeing things, the MB40 has never performed up to my expectations. The front induction Nelson and RPM have been able to keep pace, despite inferior design specifications. Could it be that the MB40 has gained its temperature stability from using the fuel to induce more uniform cooling around the whole cylinder? If so, great for handling, lousy for power. Hot fuel bad, cold fuel good.

Now back to my sad, obsolete OPS. If I was going to test this darn pipe, I better cool the rear of the cylinder so that, at least, the motor would hold a setting. But how to do this? I didn't want to build a cowling for use on my test stand, what a pain in the butt that would be. Everything I do is conditioned by access to my CNC mill, and its enormous power in sculpting shapes. Could I machine up a metal cowl from bar stock, something that wouldn't flap around in the breeze like composite cowlings are wont to do?

Then it hit me. My gloplug was held in place by a clamp-ring, which also carried the head fins. What if I was to

machine up a new clamp ring, which retained the head cooling fins, but included a shroud that dropped down over the barrel cooling fins and forced the air round the back of the motor! Piece of cake! Have it done Friday!

Well, it was Friday a month later I had it done, and very racy it looked, too.

Photos of OPS duct

There are some principles involved in designing a cooling duct such as this. I don't really understand them, but I can regurgitate very well. We Australians are great regurgitators, it assists with our beer drinking. It goes like this. Blowing cold air at high speed over an engine is a lousy way to cool it. Never mind that that is standard practise, it is still lousy. The heat transfer is poor, and the drag is very high.

The correct way to cool is to blow low speed, high pressure air over the fins. This is standard practise in full size airplanes, and if you know where to look, you will find that this is true. But where do you get low speed, high pressure air from? Well, chances are, if you look in the front cowling holes on a Cessna or Piper, you won't see the cooling fins. That is because the intake air is directed by baffles into the top of the cowling, from where it moves downwards thru the cooling fins, then out.

That chamber formed by the upper cowling is called a plenum chamber: it has a wonderful property. Being of large volume, the air that rushes in through the intake holes is permitted to expand to fill the volume of the plenum chamber. Now the magic part is that when air expands in the fashion, its speed falls and its pressure increases! Wonderful, just what we wanted, low speed air at high pressure.

So my OPS duct had to have a small opening that expanded as much as possible to form a plenum in front of the cylinder. Not much room there, but I was able to expand it about 3 fold. Now that is a lot better than nothing, but nothing like the expansion in, say, the Rare Bear cowling, but I will return to that exotic later.

A baffle was incorporated in front of the boost port to reduce excess cooling of the front of the cylinder, as this would put the liner out of round just as much as overheating the rear of the cylinder does. The duct then closed again to force the low speed high pressure air around the cooling fins, exiting at the pipe manifold. Not so good, I didn't really want to heat the pipe manifold, but then these engines are not really all that cleverly designed, so you must live with it.

Now, where were we? Oh yes, the creaky old OPS now had a cooling duct, which carried my hopes for further glory. Yes folks, just in case you have missed the plot, this is all about Honour and Advancement!

Well I fired up the OPS, and sat back to see if the revs fell. No! Eureka! Over a period of thirty seconds, the revs even climbed slowly from 27000 to 27300, and the needle setting held! This was better than I dared dream. Pipe temperature analysis shows that the tuned point rises with the temperature, about 100 RPM per 10 degrees, and this was where we were at!

Overjoyed, I fired up again. This time, the motor burst into song and the head fell off! Yes, all 8 head-screws took off in the slipstream and hid in the grass. Supercool, you know that sorry follows joy, fall cometh from pride! I had torqued the screws lightly, as I always do, to allow for the expansion of the alloy head against the steel screws. But now the cooling was so great the screws were simply not tight enough.

Unfortunately to this date I have not been able to fly either the ducted head or the bar-stock pipe. But not to worry, where to next?

Well about this time a generous colleague in the UK supplied me with an IR40, as being a bit more realistic in performance compared to the 15 year-old OPS. The motor was in perfect condition, beautifully made and appeared to have been run very briefly, as it had light castor oil burn marks on the rear fins, just in the same location as the OPS.

Photo of IR

Right, I thought, now lets do this right this time. Rather than smoking up this fine engine on my test stand, I would fit it with a cooling duct before I ever ran it.
Not only that, I was finding the cost of plugs a bit more than my poverty-level income could sustain. I do enjoy food, it gives me energy: I prefer Testosterone pills, they give me lust: but it was Honour and Advancement I was after, not aching nether-regions.

So I drew up a new list of Specs for the IR shroud:

1. Cool the cylinder fins with a deep shroud
2. Make the intake lips round to avoid poor airflow at the intake
3. Provide the cylinder head with its own separate duct
4. Provide the gloplug with its own cooling duct
5. Improve the aerodynamics of the head cooling fins to reduce drag

It is hard to imagine a worse design than the head cooling fins on our racing motors. One would like to think that the air would rush between those lovely head fins, carrying away the heat and cooling the plug so it won't burn out so easily. Well Mr Manufacturer, I suggest you stop spending our money on Testosterone and start using your brains instead.

There is no way the air rushes between those head fins. They have square ends, they are chopped into short lengths for the head bolts, the head bolts stick up into the fins and they have square exits. Aerodynamically, they are hopeless. High speed, low pressure air rushes over the top of the fins, producing high drag and poor heat transfer. Absolutely woeful. Give me those pills, I use them for brain food!

The IR head duct has the following features, which I hope you can see in the photos.

IR head photos  

1. The inlet end of the fins are rounded, and the exit section tapers to a fine edge, simulating an airfoil section.
2. The fins are curved, so that they pass around the head bolts without interruption
3. The fins lie in a duct, which provides for expansion to yield low speed, high- pressure air. This in turn produces high heat transfer and low aerodynamic drag by the fins.
4. The gloplug has its own duct, with its own plenum and finning to cool the plug effectively.

Admittedly, the whole assembly has the appearance of a steam engine, but this is a developmental prototype. There is much more that can be done to increase its efficiency. For example, the slotted air- intake is quite the wrong design. LoPresti, in his work on the Mooney, showed that the air intake should be circular, with rounded lips. Not to kiss you with, you Testosterone addled turkey's!

Now on the subject of lips, I promised to return to Rare Bear. There is a lesson to be learnt from this mighty Bearcat, just from standing on the ground and looking in the cowling. Remember, this is a 530 MPH 3000+ horsepower monster. The heat generated in one flight would warm my house all winter. So just what does one see of the cooling system?

Firstly, the air-intake is an annular slot around the back of the spinner. It looks to be about 4" wide, which isn't very much. The outer lip of the annulus is highly rounded, to permit smooth flow of the air into the cowling of the air-cooled radial engine. The air then enters a very large plenum chamber, formed between the front row of cylinders and the forward section of the cowling. The expansion must be very large, I would guess a factor of 50, maybe more. So you see, this engine is only going to see very slow moving, high-pressure air at the cooling fins.
The flow of this air after it leaves the fins was not apparent from the ground, but I would not be surprised if the Meredith effect described earlier was in action. One of the key requirements for the Meredith effect to work is control of the back-pressure of the exiting air. This can be provided by the variable cowling gills at the rear of the motor. There is certainly plenty of heat available for generating thrust!

There is yet more to say about the intake flow. If the high speed air were not correctly ducted, it would not expand smoothly to generate the high pressure air. It is important that the fast moving air does not become turbulent. That is also the reason that the P51 intake duct is stuck out so far into the airstream: that prevents turbulent air from the fuselage from entering the duct.

On the Bear, the smooth ducting continues from the lip right up into the plenum chamber. Not only that, but the crankshaft on the reverse side of the spinner is also heavily faired, just as though there was a reversed spinner backed up against the true spinner.

I have often wondered how aircraft like the Bearcat, FW190, Thunderbolt, La-7, Lagg-3 etc, with radial engines, were able to compete so effectively against aircraft with liquid cooled engines, such as the Mustang, Me-109, and Spitfire. These latter slender aircraft had in appearance much lower frontal area. But appearances can be deceiving!

The aircraft that brought understanding to me was the Fw190-D9. In appearance, this is a radial-engined fighter. At least, it has a radial cowl, hardly what you would expect to see on a liquid-cooled in-line engined fighter. But the D-9 is exactly that! The engine is a Junkers Jumo 213A, a 12-cylinder in-line liquid cooled unit.

The radiators are mounted in the radial duct in front of the engine, with the cowling gills immediately behind the radiator duct. This is an even better set-up than in Rare Bear. All the elements are there for a Meredith effect, or at the very least for efficient low drag cooling…..low-speed, high pressure air.

So if you have read those accounts of Kurt Tank, the Fw designer, being bounced by Mustangs and simply flying away from them, then perhaps the story is not so apocryphal as it sounds. Which brings us back to the conundrum. How can a big fat radial engined fighter compete on equal terms with a slender liquid-cooled in-line engine?

The answer lies in the cooling drag. The physical flat-plate area of the airframe comes a bad second to the drag of the cooling system.

Well that just about wraps it up on ducted cooling. All I have left to say is some more bad words to the manufacturers. You are dragging your heels, you are out of date.

Future racing engines will be built with ducted cooling systems, not the primitive stick-it-in-the-slipstream rubbish we have now. Cooling fins will be aerodynamically shaped and placed in plenum chamber ducts. Most likely, the air intakes will be annular, like Rare Bear, and the fins placed vertically on the crankcase to provide up-draft cooling which exits above the pipe, not onto the pipe. The head and plug will have their own ducts, with circular inlets. In this way, fuel will no longer be used as a working fluid for the cooling system. Power will rise, as the ducted cooling actually cools the fuel in the transfers. Engine handling will improve, as the uniform radial cooling of the cylinder maintains the perfect circular shape of the cylinder. Plug

life will increase. Compression ratios can then be increased, and pipe stinger exit diameters reduced, without risk of burning holes in the piston.

And all this will be sourced back to Supercool! Supercool, the father of the modern racing engine. Weep your hearts out Nelson, Metkemyer and Phelan! If you are real nice to me, I will even let you give me some engines and money to develop your obsolete engines for you! Hurrah!

Supercool

TARMAC Notes for January and February

This month I received news of the passing of Ugo Rossi and Bill Brown, two big names in the history of model engine design and manufacture.

Ugo Rossi was an Italian modeller and engine builder about whom I know only a little, although his name appeared often in the model press of the early 1960s and was associated with several controversies. There were stories of running in a speed engine at one world championships by shearing the (wooden) blades off the prop and allowing the engine to run in on a shaft run. I don't know if that was true, but it is the sort of thing that you remember. (As was the photo of him in the pylon with the lines going back over his shoulder.) Originally a dedicated speed flier and world speed champion several times over flying his 'Devil' and 'New Devil' designs. I believe he began his engine building activities by modifying ST .15 engines for FAI speed and marketing wooden speed propellers (under his name, but manufactured in England). Dicky Morrow still has a Rossi Super Tigre .15 and I have some of those wooden props. He then formed the Rossi company in 1966 and has proceeded to consistently produce a range of very high performance engines. The Rossi factory remains in operation and is now being run by his family.

Secondly, we have a very comprehensive profile of the American Bill Brown written by Motor Boy Ron Chernich that I have taken (with permission) in it's entirety from his web page. Ron writes:

With the start of 2003 comes sad news from the USA in the passing, at age 91, of Bill Brown—a man called, with some justification, the Father of the Gas Model Engine. William Likens Brown IV was born on May 11, 1911. He rose to national fame in the US modelling scene during 1933 when a model called *Miss Philadelphia III*, powered by a spark ignition engine that he had designed and built swept every major category at the National Model Airplane Championship meet. At this time, there were no categories for "gas" powered models because there were no commercial engine manufacturers. This enabled Bill's friend Maxwell Bassett (the builder and flier of Miss Philly) to enter in events traditionally flown with rubber power. If this seems unfair, you need to consider that gas models needed to be huge to carry the weight of coil, battery and engine. Add to this the facts that engines had to be hand-built and that there was no extant body of knowledge on how they operated, nor how a gas powered model should be designed and rigged, while rubber powered models were well understood and developed.

In 1934, Bill and his father (Bill Brown III) founded *The Junior Motors Corporation of Philadelphia* which they managed and ran until 1940, selling out to Hurlemann. Their engine, called the *Brown Junior*, was an enlarged (.60 cu in) and refined version of Bill's original that led to the introduction of gas powered models as a national competition class and spawned an industry. Now you can argue that it could have been anybody; the time and technology were right; Ohlsson and others were doing the same thing in the USA and ET Westbury, CE Bowden and Frank Whittle (yes, THAT Frank Whittle) were doing similar things in the UK. But it was Bill and his father who thought through the problems and made it possible for modellers to buy not only a reliable engine at an affordable price, but also all of the required paraphernalia needed to make it a practical power plant for model aircraft.

Following the sale of the Brown Junior Corp, Bill went on to design the first CO2 powered miniature reciprocating engines. A Master Machinist, he worked at Leeds and Northrup, the Franklin Institute in Philadelphia and the Ordinance Research Laboratory. In later years, he received National and International recognition for his very significant contributions to aeromodelling. It's a sad fact of life that we've all got to go sometime; Bill leaves us having given far more than most. Ron Chernich.

One of a number of images from the recent Nationals that has been provided by Jim Stivey. A scene showing three busy pilots and a Vintage A racer. The question for you is: Who is flying the plane?

Since the Nationals, Jim Stivey has been busy editing and recording the video that he took there on to a series of six CDs. So even though I wasn't there in person, I have seen some of the action and been suitably impressed. Not the least by the enormous amount of effort that he has put in.

I am in need of some help for a little project to preserve some WA Control Line history. Are you the one that will provide it? Here is a list of names of guys that were active in control line flying in Western Australia in the 1940s to the 1970s. I know that there are many more names to add. Dicky Gibbs tells me that he can think of another 26 – and that is just a start. If you knew one or more of the guys on this list, I want you to write a few words of text about their main areas of C/L interest. Assume that I don't know anything about them - that should be a fairly accurate assumption in most cases. A few anecdotes wouldn't go astray either and if required, your anonymity will be guaranteed. Send them to me with (if possible) a recognizable photo of the guy(s) concerned. I need something that I can extract a head and shoulders shot from. Black and white is fine. If possible use email to send a scan (.jpg) of the face (front or profile) of any of them. If you don't have scanning facilities, but would trust me with the photo for a couple of days, I can scan them and I promise to return any photos ASAP (make sure that your address is with them). If your name is on the list or you think it should be, please write to me yourself with a brief personal profile and photo. The names are:

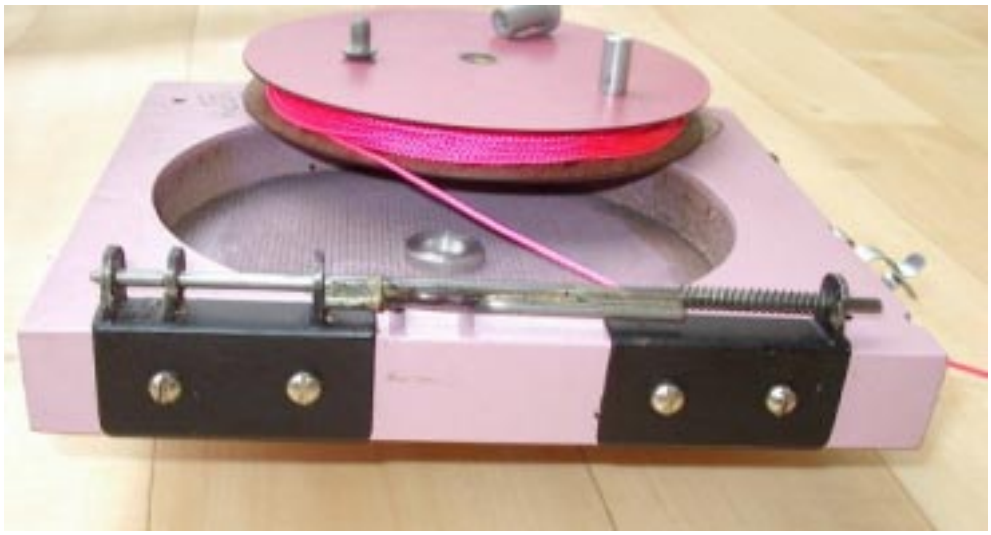
Fred Adler, Rod Ashton, Geoff Barnes, Harry Barclay ,Bruce Bellis, Richard Bellis ,Mike Beilby ,John Bowles ,Dave Campbell ,Viv Chappell ,Alex Cunningham ,John Collins ,Dick Gibbs ,Brian Greeve ,Don Hall ,Ron Hoogenkamp ,Ross Jenkins ,Colin Leknys ,Dave Moignard ,Theo Merrifield ,Ron McPhee ,Noel Mitchell ,Dick Morrow ,Doug Murray ,Tony Ostle ,Gary Ryan , Brian Sadler ,Pete Somers ,Bob Spackman ,Geoff Spehar ,Bernie Sparks ,Jim Stivey ,Bob Taylor ,Fred Tower ,Jim Trevaskis ,Phil Trueman, Doug Tunstall ,Garry Turna ,Ross Tolchard ,Steve Walton

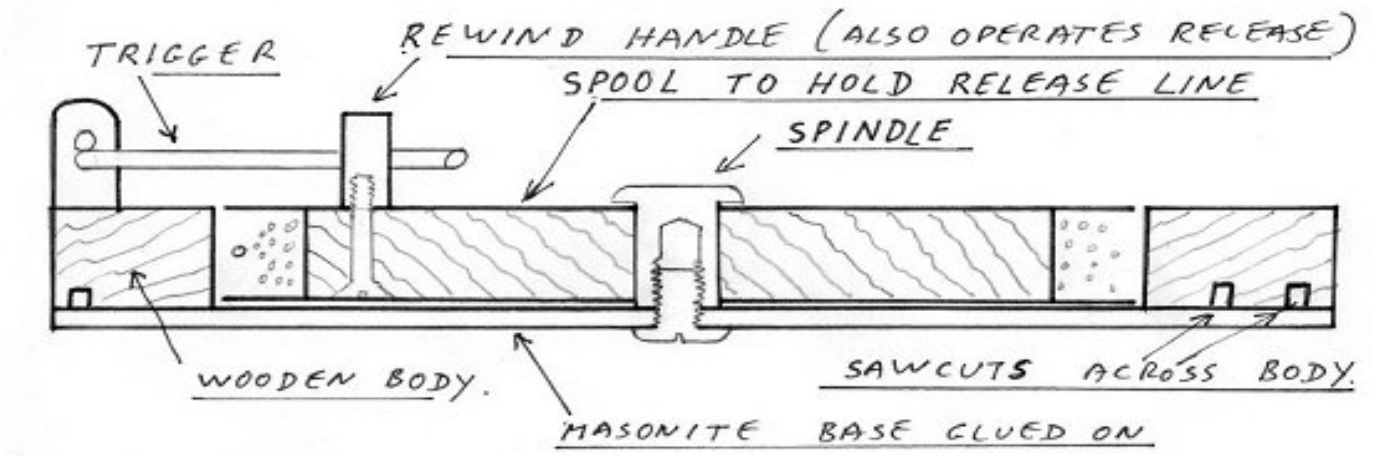
I have never made a secret of the fact that I have a weakness for gadgets. One gadget that can be very handy to a Control Line aeromodeller is a 'Stooge' or remote release for those perfect flying days that you rock up to the field and find that you are the only one there. In those circumstances it is indispensable. Over the years I have seen a variety of devices and methods used by (sometimes desperate) modelers to self launch C/L models. Most of them were quite adequately safe and reliable, but I have seen a few that were distinctly risky. Such as restraining the plane by standing the glow plug battery in front of the tail unit and using the handle to jerk the model sideways for release. That can work, but there is also the risk that the plane will be on it's way before you reach the handle. It is much better to make a purpose built reliable stooge.

Here are a few details of mine, which I have just discovered was a lot simpler to conceive, make and use than it is to describe. I am mainly going to rely on the fact that a picture is worth a thousand words and that you, like all aeromodellers, will need only a general idea. I have a couple of photos of the machine and a pencil sketch of remarkable crudity to show a cross section as if the thing had been sawn in half. You can just ad lib the rest using whatever bits you have laying around

This is a top view of the stooge with the trigger loop dropped over the line rewind handle. At the bottom left you can see the alloy tubing release handle which is clipped to the side for storage and on the bottom right the U shaped tops of two of the three fixing stakes slid into their storage holes in the body. Those stakes are put through the three skewed fixing holes in the body and pushed into the grass to secure the release for use. To use once the release is firmly fixed to the ground behind your plane, the trigger loop is swung off the rewind handle, the release handle is unclipped so that the spool can rotate and the line taken out to lay next to your control handle. The trigger loop is then dropped back over the rewind handle. When the release line is pulled it tries to turn the spool anticlockwise, and the rewind handle actually operates the release by using the trigger loop to slide the spring loaded release rod out of engagement with the fixing to the model.

Here you can see the stooge dismantled. The spool is sitting on top and the release line can be seen. I used pink builder's line even though it is a bit stretchier than I would like, it was chosen for it's high visibility. There is no trouble finding it against the grass. At the front can be seen the 1/8 inch piano wire release rod with the trigger loop silver soldered underneath it. The trigger loop is not only used to actuate the release, but it also serves as a stop for the release rod and for the spring to push against. When the release is operated, the release rod is fully withdrawn from the two support plates on the left hand side where the aircraft attachment loop is held. This guarantees a certain release.





This is the 'sawn through the middle' cross section. The saw cuts made across the bottom of the body before the base is glued on provide a storage space for the piano wire hold down stakes. . The dimensions are not critical. I used a 4 1/2 inch disc of wood with a 5 1/2 inch disc of laminex on either side to make the spool which is set into the wooden body.

Another of the photos from the Nats. This time showing Jim Stivey himself in command of the Bendix model that he shared with Richard Bellis. I don't know if the control lines will be visible in the printed photograph, but there doesn't seem to be very much line tension at this stage of the flight.

I think that it is right when they say that there is a very fine line between "hobby" and "mental illness."

Charlie Stone VH4706 Email cestone@bigpond.com

More Nationals reports from Albury

Class 2 Team Race

8 Entrants were processed; Hallowell/Braddock failed line check and withdrew. 3 Rounds of heats were flown. Results of Round 1 saw Ray/Ray (Vic) leading with 3:14.00 followed by McDermott/Taylor (Qld) 3:19.94, and Wilson/Lumson (Vic) 3:24.56.

Justic/Owen withdrew from the competition with a broken model.

Round 2 provided the first Sub three minute time of the competition. Bailey/Ellins at 2:89.78, lead the competition. In round 3 Wilson/Lumsden were able to overcome their problems of the first 2 rounds with 2:56.99

The final was an all Vic affair with Wilson/Lumsom, Bailey/Ellins and Ray/Ray pushing to gain the title. The first pit stop saw disqualification for Ray/Ray at 36 laps and Bailey/Ellins at 46 laps due to their model running into the circle This left Wilson/Lumson to continue on to win in 8:09.5

Thanks to all the people assisting with the running of the event.

F2C Team Race

Nine team entries for this International class event. All but one team flew in the three rounds from which these teams with the fastest times proceeded to the Final. Competitors came from all around Australia to make this a truly National event.

Control Line Combined Speed.

Combined speed was run at the airport in overcast and humid conditions. Two separate events were run in a relaxed atmosphere.
The winner in piston driven combined speed saw Robin Hearn place first and second, Noel Wake placed third similar to the placing's at last years nationals.

Jet speed saw two categories. These being sport jet and open jet. Sport jet motors using standard fuel where open is unrestricted fuel. Jet speed contestants decided the placing's would be universal.

John Taylor, Alisdair Taylor, David Axon, Peter Morandini and Bob Fry

FAI Combat

Even though there was a small entry of six flyers the quality of those flying was of very high standard, with a lot of skill and a little bit of luck giving both spectators and flyers a most enjoyable day.
Congratulation to the place getters for a job well done with Robert Owen getting the points on the day.. It was a close bout for second place with Graeme Wilson beating Keith Baddock.

Jnr 2.5cc Combat

Every junior flew very well with little or no damage to models. The experience of Michael Comiskey (2nd) and Murray Wilson (1st) showed out in the final. Ryan Comiskey (3rd) is flying very well considering the experience he has and Lachlan Hines (4th) hung in there with two good flights.

2.5cc Rat Race

Seven teams presented to do battle for the title of best 2.5 Rat team in the country. Although it was a bit windy, the stiff breeze did not worry these speedy machines.

After the usual practice, the 10 minute heats were soon underway. Owen/Justic were the stand out team in the first round with their F2Cstyle flying wing. They managed 263 laps, just ahead of the consistent Hunting/Hunting on 260 laps and Ray/Ray on 200 laps.

The second round started with an excellent 3 up heat. Mark Ellins, Danny Rich and Colin Ray showed superb piloting skills as they treated spectators to an exciting display of Rat Race flying. Sharp reflexes and lots of experience in the middle are essential for surviving this event.

Ellins/Lumdsen got their act together in the second round, recording 275 laps to give first segment choice for the final. The Hunting brothers and Owen/Justic were the other qualifiers.

It was 20 minutes of sheer hard work for both pitmen and pilots. In the end it was a clear victory for the Ellins/Lumdsen team

Junior Rat Race

Flown in the morning, in ideal weather conditions, three teams participated, each team was given two heats to gain experience, all young fliers handled their racing very competently and enjoyed themselves. Young Murray Wilson being the most experienced won the final with the other two boys coming a close second and third.

Mini Goodyear

Nine teams entered this event with five coming from Victoria, Three teams consisted of pilots & mechanics from different states flying together just for this event. One team from Queensland withdrew leaving eight teams to contest the last two rounds of the heats.

All teams recorded times in the first round. Wilson/Ellins were one minute faster than the next closest team, and elected not to fly a second round. The other seven teams were all trying to improve their times to gain a place in the final.

Baddock/Hallowell and Ray/Ray set the fastest times in this round to join Wilson/Ellins in the final, all three teams coming from Victoria.

The final was a very fast and cleanly flown race. The result reflected the heat times with Wilson/Ellins the winners followed by Baddock/Hallowell second and Ray/Ray third.

Noel Wake CD.

Goodyear

The Goodyear racing class had 9 official starters with one of the best Goodyear contests in recent years. All competitors posted times in the first round this year a stark contrast from last year!

The first round resulted in 2 sub 4 minute heats, with only 3 seconds separating the next 3 competitors.

The second round saw the remaining teams going for broke with sub 4:06 time required to squeeze Wilson/Ellins out.

The 2nd heat saw Hallowell/McDermott put in a 4:02, with Ray/Ray posting a 4:07. Wilson/Ellins now had to better 4:02, but it all unraveled for them with the quick fill valve blowing out during the race.

The final started quickly with all teams away smartly. Justic/Owen had a very rich tune requiring several stops to get it right. Hallowell/McDermott had a good clean race with fast stops but lacked the airspeed of the eventual winners from S.A Fitzgerald/Petty for whom even a blow plug wasn't enough to deny victory.

Keith Baddock. CD

Open Combat

Open combat had 7 entries to do battle and after many exciting bouts Richard Bellis came out on top to beat Michael Comisky (Jnr) with Robert Owen in third place 13 bouts were required to find the winner. With pit crews helping different flyers and carnage after most bouts, some delays occurred but the competition on the whole was good.

A note from the Control Line Contest Director

On behalf of the VMAA and myself I would like to thank all of the people that assisted and contributed in many ways to make the Control Line events the success that they were. Every event was completed on schedule.

Special thanks go to all the contest directors, judges, timekeepers and lap-counters. Your help was invaluable.

The lack of any protests made my job relatively plain sailing and I now have a better understanding of the workload involved for all the Nationals organisers.

Jim Ray

WANTED

Plan or kit of Aeroflyte "Hurricane" 1.5cc stunter.

I also want a NIB O.S.Max 3. 35 engine and could trade a NIB A.H. Amco 3.5cc BB diesel.

Phone Bob Allan **(03)5145 5548** (This number was printed incorrectly in the last two editions of ACLN sorry!Ed)

Diesel head to suit 1984 Nelson team race engine - Allen head comp screw (10-32 thread)
Ring Alan Lumsden 03 9 874 2824

1.5cc (0.09 cu in) reasonable sport glow motor in running condition, preferably with muffler. Such as OS, Enya, etc.
Derek Pickard 03 9889 1149

For Sale

Nova Rossi .21 Speed. "Brand New" in box.

Set up by Model Racing Services.

Cost $450	Sell	$340
Nelson PA51 Stunt		
Ex. cond. In box		$260
(2) 1/2A Russians (combat models)		
Ready to fly		$45

Phone Ron (03)85003633

LOST AND FOUND

Lost or mislaid at the Albury Nationals at the Airport on the 30th December.

1 speed control line handle. Square metal FAI with yolk pegs. Wooden handle grip. Plaited white nylon safety thong. If you can assist with returning this item to it's owner please contact:-

David Axon

Tel (03) 9337 4853

A.C.L.N. ADVERTISING

For the newer readers, we point out that "private" (personal) ads are free to subscribers, and "commercial" ads are $20 per quarter page, or $5 for business card size. Commercial Advertisers can receive a free business card size ad for submitting original articles of interest to A.C.L.N. readers.

Copy or artwork for ads should be sent to the editor, cheques to the treasurer (G Wilson P.O. Box 298 Seaford, Vic 3198). If you want to save a stamp, I can forward on any cheques sent with ads but please make them payable to "Control Line Advisory Committee"

AUSTRALIAN CONTROL LINE NEWS
If undeliverable return to:-
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P. O. BOX 298
SEAFORD VIC 3198

SURFACE MAIL

CONTEST RESULTS

Combined speed Frankston 16-02-2003

Pos	Name	Class	Engine	Flight 1	Flight 2	Flight 3	Fastest	Km/h	%
1	N Wake	Class 5	Novarossi 21	14.93	15.03	14.61	14.61	246.41	95.96%
2	N Wake	Class 1	OS CZ11 PS	16.05	15.78	15.65	15.65	230.11	93.58%
3	R Hiern	Vintage 2.5cc	ED Racer glo.	10.22	9.37		9.37	154.66	90.02%
4	C Agnew	Class 1	OS CZ11 PS	16.59	16.93		16.59	217.00	88.25%
5	R Hiern	FAI	Rossi 15 FI.	14.50	14.66	14.33	14.33	251.22	87.44%
6	K Hunting	Midge	PAW 10.49	10.22			10.22	141.72	86.59%
7	V Marquet	Vintage	Proto Enya29	54.57			54.57	106.17	65.97%
8	J Hunting	Midge	Super Tigre G33	13.70			13.70	105.72	64.60%
9	C Agnew	FAI	Profi	DNF					0.00%
9	R Hiern	1/2A	AME .049	loop					0.00%