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The articles and views expressed by our members, are not necessarily the views of the editor or committee and therefore we reserve the right to modify and or refuse an article if it is considered in the best interest of the club.

MARCH 2005

CLEAR



In this issue:
Trilander
3D Rebuild
Flying Props
Carburettors



CHICHESTER AND DISTRICT

Chichester and District Model Aero Club

Committee 2005

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Committee appointed positions

Junior Members Protection Co-ordinator:	
Bruce Smith	01243 531602

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Cover photograph: Equipped for all eventualities - Andy Gibbs makes up sets of matching RTP lines for multi-pole flying in the lovely new venue at Bosham Village Hall.

CONGRATULATIONS

To Peter Doe on passing his BMFA 'A' Test
Saturday 5th February Examiner - John Riall

COMING EVENTS

INDOOR FLYING

2nd April	Sleaford College (A 285 Duncton)	2pm to 6pm	£5.00
29th April	Bosham Village Hall	7.00 pm	

CLUB NIGHTS

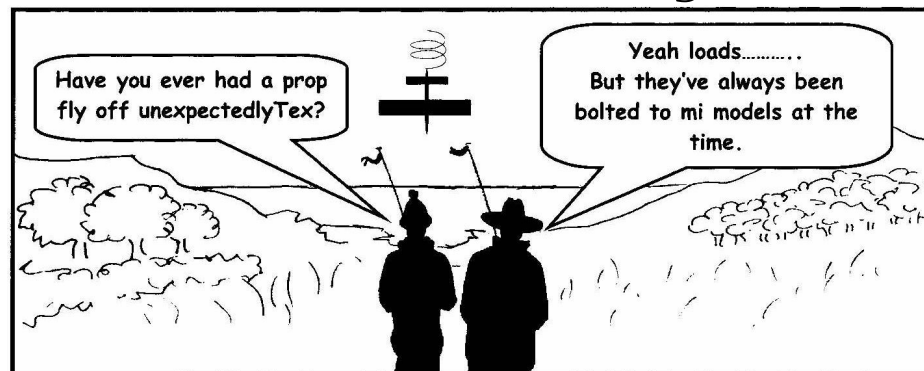
April. Indoor Flying Competition. .
May. The Club annual Skittles Night. £2.00 per head.
June. Make your own model night
July . Flying on Fishbourne playing field Free flight, R/C Park Flyers and C/L
August . Flying on Fishbourne playing field F/F, R/C Park Flyers and C/L
September. DVD and Video night.
October. 2nd Auction night.
November. Nothing arranged, see me with ideas
December. Annual General Meeting.

Club Gala Day 30th. May. (Whitsun Bank Holiday Monday)

ORGANISED TRIPS

		Spaces left
Sandown Symposium.	21st May	7
Wings and Wheels	25 th June	1
Hastings Show	30th July	4
Southern Model Air Show	17 th .September.	6

TeX & ReX *by Ecurb*



that you are using on the aircraft. If the carburettor is of the OS, ASP, IRVINE, THUNDER TIGER and probably all four-stroke types, the best way in my opinion to adjust is as follows. If it is at all practical, remove the carburettor from the engine taking care not to lose or damage the seating "O" ring seal. Attach a piece of fuel tubing approximately 150mm (6" in old money) to the fuel nipple. Close the main needle valve and then open it up 1.5 to 2 turns. Then close the throttle barrel until there is a 1 to 1.5mm gap showing between the barrel and the carburettor bore. Screw in the idle /mid range mixture screw lightly to it's seat. Do not overdo this; you will feel slight resistance when it is seated. Without disturbing any of the other settings, blow down the fuel pipe while unscrewing the idle/mid range mixture screw until you hear a faint hissing. This shows that the airway is now open. Stop unscrewing the adjustment screw. One final check is to carry on blowing down the fuel tubing then shut the throttle barrel completely. The air supply should be now be cut off. This method of adjustment gives a slightly rich main needle and idle needle setting, which can be fine-tuned later. Re-assemble the carburettor to the engine making sure that unit is sitting on the "O" correctly and it not damaged at all.

Now start the engine and let it reach operating temperature having adjusted the main needle screw for best running. Close the throttle to idle and wait for 2-3 seconds then go to full throttle instantly. Do this 2-3 times to see the result. If the engine

dies when the throttle is opened, the mid-range is "too lean" so, stop the motor and open (turn anti-clockwise) the idle/mid range needle a 1/4 turn. Small adjustments give the best results. Keep adjusting until you get an instant pick up and constant, smooth power at the top end. **Do not** adjust the mid needle with the engine running. If you have not fiddled with the factory settings, when changing propellers or fuel, the maximum adjustment needed should be 1/4 either way. If the carburettor is of the MDS type and the factory settings have been disturbed, for initial starting open the main needle 2.5-3 turns and the idle/mid needle 1.5-2 turns. To initially set the idle/mid needle, **CLOSE** the throttle barrel, and then gently screw the needle clockwise until the needle seats. Now unscrew the needle 1.5-2 turns.

Next week we'll look at setting up the 'Air Bleed' type carb and the Perry carb. Till then -
Keep your fingers out the prop!

*—
I never.*

Editorial

Dear Bruce,

I feel compelled to write to you re last months letter to the editor. Firstly I wasn't aware that we'd had any trouble at Thorney. We had a letter reminding us that the area to the east of the runway was a no fly zone, incorporating a moan from an eager bird watcher, who may be pointed in the direction of, amongst other publications, a leaflet published by the BMFA about birds and the effect models have on them - which would appear to be nought.

My main reason for writing to you was the case of the fly away plane sighted in the letter, (I was there, as they say) an elderly gentleman arrived at the patch with a largish well built yellow parasol winged plane. Rudder/elevator only, built on of a vintage free flight design. Could some body help him as this was his first Radio controlled flight after a long lay off from modelling (free flight only).

The model was duly checked out and off it went more or less flying itself. The box was handed to the new old pilot who seemed to grasp an understanding very quickly. So much so that to everybody's amazement he lit up a cigarette. After some minutes he casually said the plane did not want to turn. The box was grabbed but to no avail and as described the model flew into the stables, which I would point out were empty of horse or CO's daughter. I'm not sure the Army even knew about it until the search party found it.

We have had other instances of over zealous horsemen being shown up by falling off a London based horse on R & R in front of two horsewomen.

There was only one plane flying at the time, an Ultimate biplane, being flown well and a long way from the horse. The behaviour of the officer was far from gentlemanly, literally running some way and nearly grabbing the transmitter whilst the plane was in the air and shouting and balling. This all was a face saving act because he the great horseman had been thrown in front of two attractive women and he had the temerity to report to the CO.

We have the case of the full size landing on a model,..... one could go on. My main point is - we must be aware at all times of people and animals about us and I do not feel that any off us on the committee are or ever have been complacent. We are always on our guard for possible problems and danger areas and I feel along with the rest of the members that we are all Safety reps.

The whole club that is!

Ken Knox

Ken Knox

J.M.D.

Many members will have their own personal memories of Jerry Devenish. For me the most important event occurred in 1977 when as competition secretary he introduced a 'non-radio' event into the 'Victor Ludorum' contest calendar. The previous ten years had seen a marked decline as Radio Control became the dominant discipline.

This introduced me and a good many others to the 'delights' of free flight and control line where we'd only known R/C and it reminded others of the skills no longer employed.

The events in 1977 were 'Rubber' and 'Chuck Glider.' The rubber event being the choice of three (available at the time) kits under 24" wingspan. Members liked it so much that there was a repeat of the formula in 1978 and this was followed by 'Open Glider' in 1979.

The most memorable event was the 1980 control line contest - even in 2005, reading Jerry's report of the contest brings a smile to one's face. Never in the history of CADMAC has so much carnage been seen in one afternoon! All in the name of a fun competition!

The end result of all this was that a group of members became known as the '3F Club' - though it depends

who you ask as to what '3F' translates into.

When we were banned from walking on the grass in the early 90s a hand-full of members went off to fly Free Flight elsewhere, and I, for one, have not flown 'radio' since.

So for that decision in 1977, Thank You Jerry.

I detail below a list off Jerry's 'Official' contributions and commitment to the club.

1961 - 1962
Secretary & Clear Dope Editor

1977 - 1983
Competition Secretary

1987 - 89
Club Chairman

1990 - 1993
Safety Officer

Competition Honours

1st	Open Rubber	1959
1st	Andrews' Sailplane	1961
	Flying Scale Trophy	1967
	Thorney Trophy	1978 1984 1985
	Victor Ludorum	1978 1982 1983
		1988 1989

Done E. Hunter

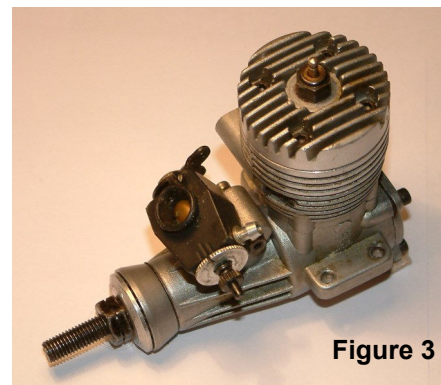


Figure 3

and transfer chamber with slip ports. Single needle control of main mixture. Knurled disc adjustment of idling mixture. These carburettors were standard fitment to HB/ Graupner, Veco and some K&B engines. They are still available as after market units. See figure 3.

The final type of carburettor is the type that is used in K&B pylon and ducted fan motors. These have NO external needle valve and a small adjustment disc. It is only fitted with a servo connection arm, all mixture settings being controlled by the position of the lever! This carburettor must be the twiddlers worst nightmare. See figure 4.

We will now look at the external adjustment facilities of modern twin needle carburettors. See figure 5. **A**

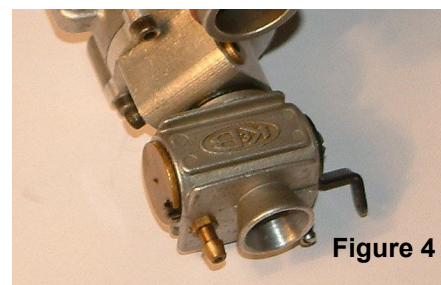


Figure 4

is the main mixture control needle. This controls the high- speed mixture requirements of the engine. **B** is the slow running needle. This controls the idle and part throttle requirements of the engine. **C** is the throttle stop screw that determines the end stop for the throttle barrel. When the engine is installed in the aircraft, it is usual to unscrew this screw to allow the engine to be stopped.

There are two ways of adjusting these carburettors dependent upon

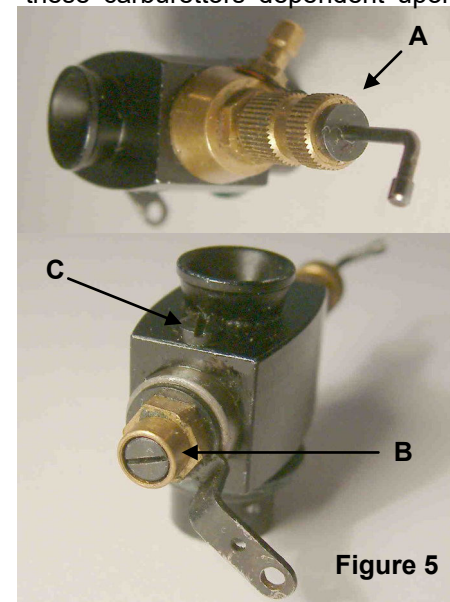


Figure 5

the make. Before we start adjusting, it should be pointed out that carburettors only need adjustment to cater for temperature/humidity changes, fuel changes and propeller changes and any changes must be small. Before adjusting, make sure you have fresh fuel; a new plug or little used one (remember previous article on plugs) and the propeller

MOTOR TORQUE

with
trevor
bowry



This month we are going to discuss that much maligned and fiddled with piece of equipment on the engine.

The R/C Carburettors. If the manufacturer does not get it right it can destroy the reputation of an engine. If the manufacturer has got it right, then just wait until the modeller gets his/her hands on it! The manufacturer has spent many hundreds of hours getting the design and performance characteristics of the carburettor right, it is not a case of "lets stick this one on and see what happens". Carburettors must take into consideration things like engine suction and timing etc. In this article I am not going to go into carburettor design but just look at the different types of carburettors that are used and their care and adjustment plus a brief look at some that are not seen very much on the general flying scene.

The most common carburettor these days is the twin needle type, which is a Sideways-moving, barrel with two needle valves controlling high speed running and idle to half throttle running. Typical example shown in figure 1.

The other common type of carburettor is the Air bleed variety. The main needle valve still controls the high speed running but an air bleed screw controls the slow speed/idle. Typical example shown in figure 2.



Figure 1

Two other types of carburettor crop up every now and again although one is basically an aftermarket item these days while the other is a special ducted fan/pylon-racing item. The first one of these is the Perry carburettor. This is a barrel-type throttle with special mixture control

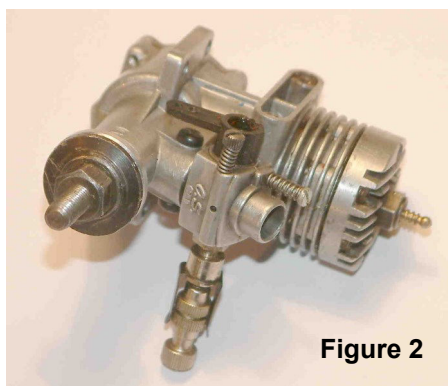


Figure 2



Jerry - pipe in mouth, getting the windings on - contentment.

Committee Meeting 1st February 2005

Present: - Tony Chant, Trevor Bowry, Alan Misslebrook, John Riall, Andrew Gibbs, Ron Hemblade, Mick Blundell, Ken Knox, Gavin Bidwell and Bruce Smith.

Apologies for absence: - Morris Campbell, Lee Hackett

Matters arising from previous minutes None

Correspondence Letter from BMFA Southern Area asking for CADMAC to enter a team in the Balsa Brain Competition organised by PADMAC at Cosham. **Action, Ken Knox**

Letter from BMFA Southern Area asking if CADMAC could host a Scale Day at Thorney. **Action Tony Chant**

An obituary will be sent to the BMFA news reference Jerry Devenish's sudden death. It is understood that the show at RVCP in July is going ahead and CADMAC will attend as per usual. Hopefully John R. will compare again. **Action, RCVP, Trevor Bowry**
Club Membership issues Pilot Handbook put on hold. Bruce S has agreed to produce the updated issue and will take note of Committee member's comments. Feedback should be available next meeting. Club membership criteria as discussed at last meeting were formally put to the Committee. Proposed by Bruce S and seconded by Trevor B. Motion carried, and it was agreed to call an EGM at the April meeting. An amendment to this proposal by Alan M and seconded by Ken K that it be raised at the next AGM, was not accepted.

There was one new application to join the club and this was accepted. The two temporary memberships issued last club night, have been withdrawn (these were issued to out of

catchments area persons)

Monthly meetings/Social Events Programme

All events and meeting activities as per last month. The Gala Day preparations are well in hand. John Doe will be asked if he can supply projection equipment for the video/DVD night in September and John Riall and Trevor Bowry have agreed to split the evening with a talk on covering and engines.

Competitions Programme Nothing was arranged due to absence of Competitions Secretary.

Training Nothing to report. Everything seems to be progressing well with several members getting near to there "A" test.

Safety The safety articles were well received and will continue. There will be experiments with the placements of cones at Thorney. There was an accident involving a member at Thorney, and it appears that it might have been equipment failure. Andy G to take over the Noise meter & frequency monitor from Tony C and carry out frequency checks. It was agreed that a windsock is installed at Thorney and much tighter safety at Indoor meetings needs to be observed. Finally, guest flyers. Guest flyers to fill in a notification form when flying within the club. Of course the club rules would have to be observed. This was proposed by Tony C and seconded by Trevor B. Motion was carried. Notification form to be drafted by next meeting. **Action Bruce S and Andrew G.**

Communications No problems with Clear Dope. Nothing to report on the Web site due to Web master being absent.

Thorney Island Nothing to report due to absence of Thorney Rep. Tony C to liaise with Army and Micro light flyers over proposals of siting of control line and helicopter activities.

Trundle Everything okay and the new sign has been put in place.

Porthole Farm No problem at Porthole and Raiff has given permission for the Gala to be held there. Rubble is still required for the approach track and it was suggested that Mick Pearse is approached.

Indoor Flying The first meeting was held at Bosham Village Hall on 28th Jan. and it was a great success, being well attended. John R has drafted a letter to be sent to Southbourne School reference flying there. Mick B is still waiting on a reply from Seaford College reference indoor flying.

BMFA This item of the agenda was covered under Correspondence.

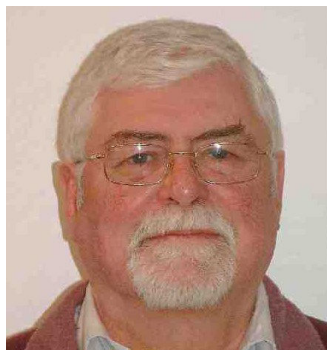
AOB Alan M said that membership stands at 98. This is very good for this time of the year. Andrew G asked if his proposal for a probationary period was now ready for discussion. This continued to be kept on hold. Ken K to get more input from BMFA on what is going on plus input from other club committee activities.

DATE OF NEXT MEETING

Tuesday 1st March

Trevor Bowry - Hon. Secretary

Trevor



curve..

I found a drawing of a Trilander which was beyond my capability as it was difficult to understand, too large a scale and not a very good likeness. On the assumption that the full size Trilander was from the same drawing board as the Islander I set forth and started by building an Islander which was made longer and reconfigured to take the third engine.

There are no proper drawings just a few of my own red lines on the Islander drawing. So far so good. What I have not yet solved is to where I should mount the wings and where should the C of G be? Anyone any ideas? At present the plan is to scale the position from photographs but I cannot find the C of G anywhere. I understand in life, the Pilot has a load calculator, judging passengers weight and

baggage, to determine where they should sit to provide easy flying.

I can see now why the Designers went in for a cabin without facilities to walk up and down whilst the aircraft is in flight!.

Geofrey



Ashcroft

2005 Competition Calendar

Sat	16 April	12.30	Scramble	Thorney Island
Fri	22 April	18.30	Balloon Bursting	Porthole Farm
Sat	14 May	12.30	Fast and Slow	Thorney Island
Fri	20 May	18.30	Limbo	Porthole Farm
Sat	18 June	12.30	AULD (electric)	Thorney Island
Fri	24 June	18.30	Bomb Drop	Porthole Farm
Sat	16 July	12.30	Precision 'A' Flight	Thorney Island
Fri	22 July	18.30	Carrier Deck	Porthole Farm
Sat	06 Aug	12.30	Thermal Glider	Thorney Island
Sat	13 Aug	12.30	Thermal Glider	Thorney Island

For further detail contact Morris Campbell (Comp Sec) 02392 637728

Trilander

by geoffrey ashcroft

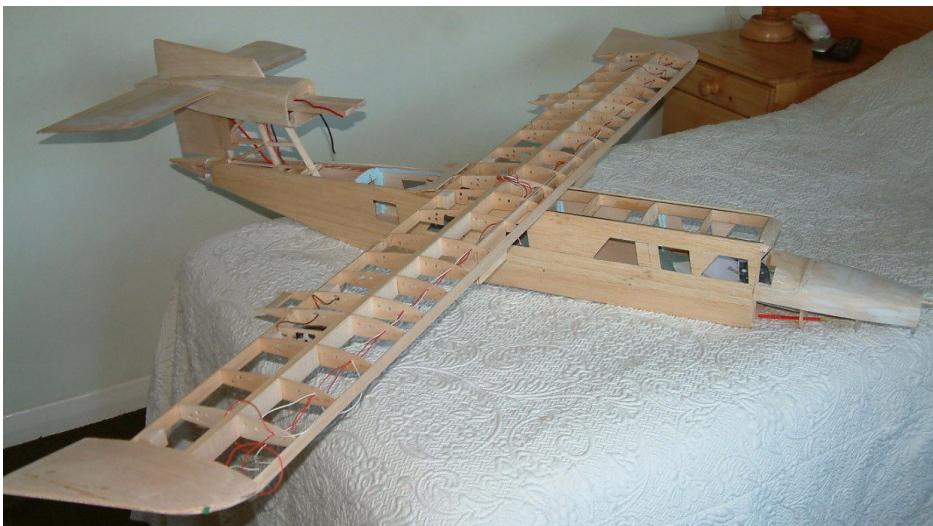
It is a year since I appeared in print and it is now time to let others know what is cooking in the Muddle room. Following copious help from others, some of which I shall choose to ignore! I have now jacked the learning curve up another degree or so. To recap, I have, so far, produced two rather poorly constructed representations of well known war birds neither of which has great flight potential. This winter I thought that a more peaceful project might be appropriate so I choose a Britten Norman Islander which needed two engines.

The two engines I have, had just been received back from the man-

ufactures where they were extensively modified and up dated to help them fly in unison in my Mosquito, it is for this reason why the Mossie has not progressed further this year.

A drawing by Duncan Hutson was acquired and at first sight it appeared to be a straight forward project. That was, until I started researching the net for further information; where upon I found that the main interest was in Trilanders. Simple says I, just add an electric pod to the tail; next I realised that the RCVs that I love were probably too powerful for the construction hence it seems that there will be three electric units.

There are many advantages, the main one being of cleanliness and the second that this would be another sector to add to my learning



BMFA

Southern Area Meeting 24th January 2005

A brief note of the evenings events. There was a well attended meeting with the full committee including the BMFA PRO Tony Barker, who had some explaining to do re sponsorship of Queen Victoria county park. (We only received £1000.00), which puts this years bash in jeopardy unless we get a better deal

Balsa Brain is to be held at Cosham in March - date to be published by Steve as soon as it is confirmed, and they would like attendance from more clubs as it was felt that this event was very good for the area. A sort of meet the relations.

There was £3279.00 held in the area funds

BMFA would like to run a "Master Class" for scale pilots to show how to get the best from scale planes. This is to be demonstrated by the top people in this field, Peter McDermott etc., and BMFA southern area have asked if we could host the event as we are accessible with ease and have a concrete runway. This would not be an event for maddening hordes, but a bit like the 'rained off' electric event of 2003. The committee would like an answer in principle ASAP.

Two events are planned for Old Warden, a garden party and a scale

day
March 27th at Middle Wallop a rubber free flight event is to be held contact no 01202511202

June 18th/19th? A scale aerotow is to be held at Middle Wallop this is an international event with part two to be held 10th and 11th September

If we decide to send an obituary for Jerry it must be sent direct to Eric Clark, the editor

Finally for our information BMFA have commissioned a "Study by BMFA on birds by aircraft" and is available from HQ.



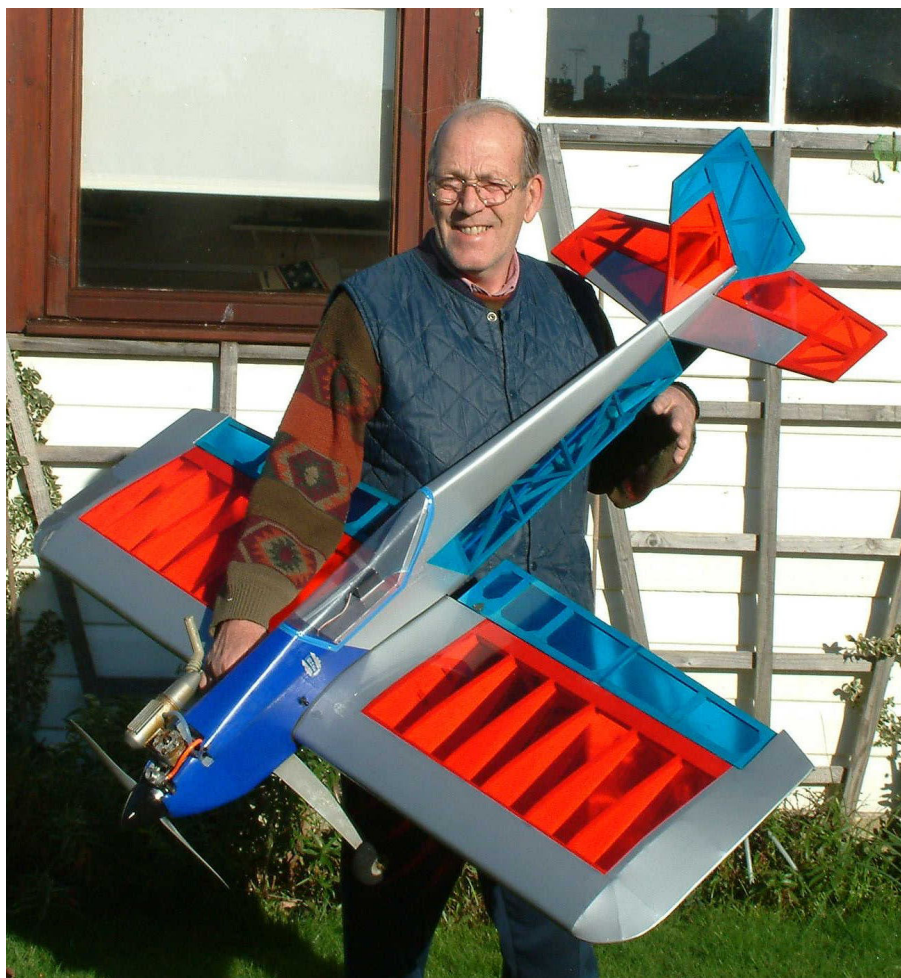
A handwritten signature in black ink, which appears to read 'Ken Knox'.

Ken Knox BMFA rep

3D REBUILD

Just recently I've had to repair two models and give my others a good check over. It's amazing what you find. Last autumn, demonstration flying my Samba c/l model at the Model World Show at Mountbatten

School, Romsey, (a very nice site) Halfway through the flight the engine cut suddenly while inverted. I managed to right the model but the lines went slack resulting in a belly flop landing during which the



were nutating, then the oblique angle it struck could have sent it anywhere, so ALL BETS ARE OFF. At every outing there is the need to run an engine at full power whilst adjusting it. When I do this, I always try to do it over grass, and with my tail-draggers, the inclination of the fuselage does not necessarily make a position behind the model safer.

We have to accept that there is NO SAFE PLACE to be when dealing with props running at high speed, apart from at distance. If it's on tarmac, then I am even more wary. I should point out that I'm just as wary of other people's models as my own in this situation, and prefer to walk away. As pointed-out in Clear Dope, it is best to try to confine maximum power running to when you, and others, are at a safe distance.

Sometimes events conspire to defeat this. Having examined what is likely to happen to a separated blade, it is up to the reader to devise and take responsibility for his own safety strategy, so any observations made here are personal to the writer.

I think I have exhausted my input to this subject, so I hope now that others will correct any misconceptions and errors, so that it can become a useful document. I have to thank Andrew Gibbs for his support in seeing this through, without whose encouragement I would have contributed much more to the housework.

To those of you who have stuck with me to the end, I thank you for your tenacity and hope that you have found this attempt at analysis interesting.

To those who have found it over-complicated and have skipped straight to the end, I would say that should you be unfortunate enough to be struck in the face by a flying blade, then it will be a memorable day. But you don't need pages of analysis and the short life history of a flying blade to know that it's going to hurt.

Colin



But there's something even more interesting. Before separation, both blades complete one revolution of their own in space per revolution of the whole prop, centred on a circular path of half the prop diameter. If one is suddenly detached, its centripetal acceleration is removed, but there are no new forces applied to change the blade's rotation in any way, and so by Newton's laws it revolves at the same RPM as the complete prop as it follows a tangential path out of the prop disc, until aerodynamic forces take effect. That WAS a surprise

Another way of looking at this is to note that before separation its tip is travelling at the full prop tip velocity, whereas its root is at zero velocity. At separation therefore, this blade must revolve in the same direction as the prop as it exits the disc. Since the blade exit velocity is half the tip velocity, the tip velocity relative to the blade centre (new hub) is halved, but the new disc diameter formed is half the prop diameter, so the exiting blade is at the same RPM as the prop.

OK, now let's make it a real blade. The first thing we note is that this blade extends only from a fracture line placed most likely in the region of the hub periphery, to the tip. This means that the radius of gyration of its CG is larger than the hypothetical blade, so its separation velocity is slightly greater. Looking at an 11 x 5 Graupner Grey prop and eyeballing its mass distribution, one could estimate that the velocity now becomes 204 mph.

After separation, we also have a spinning blade with positive incidence at the tip, but a very heavy negative incidence at its root. The result is presumably an enormous nutation, most likely initially throwing the blade into a spiral about the exit line, from which it is bound to diverge in some way - hence my bell-shaped volume analogy. Better minds than mine can decide exactly what happens.

Next, the separation is unlikely to be instantaneous. If the detachment progresses across the angled root of the blade, the blade mass will be attached asymmetrically relative to the blade CG for a very short time, and will be moving. In addition, there will be a radial angular deflection. These must impart a twisting motion and further nutation to the blade, and the sudden pitch-change will cause the blade to diverge prematurely from the plane of the prop disc.

So with a blade initially exiting at about 200 mph and spinning at 12,000 rpm, possessing a sharp tip and jagged break-line - that's some weapon, and no wonder that it removes teeth!

One other thing should be mentioned: What happens to the engine and remaining blade while all of this is going on? While we are try to avoid the flying blade, the engine now suffers massive vibration and tries (sometimes successfully) to shake itself out of the airframe. In either of these scenarios, we need to be sure that we can shut down the engine instantly and reliably. It is a Club rule well worth emphasising.

Returning to the accident I witnessed, this happened because the exiting blade was not in free flight, but immediately struck tarmac. You could imagine that if it

shock broke off the tailplane. Having repaired the model I then noticed a split in the fuel tubing near the carb nipple also the tank clunk was off. Still its nice to find a positive fault at times.

In November I managed to break another model. Also flying inverted. Only an inch too low down on Thorney strip. It took off the rudder and two inches off the prop diameter but I managed to right the model and land safely. My excuse was 'wearing bi-focals.' My faithful 3D hack, now six years old has worn one engine and half of another out. It was starting to look shabby and even the clear yellow was fading. I decided to re-furbish and construct new tail feathers instead of a new replacement.

After stripping out all the equipment, with a sharp knife cut through the covering - centre of the wing and fuselage length-wise. Heat the bonding area with a heat gun and pull off the covering as you go. The residue left on the wood is removed with cellulose thinners.

A good inspection of the airframe was called for in this case. Minor wingtip repair (I wonder why?) one diagonal fuselage brace and a couple of fuel soaked areas to deal with around the balsa nose and at the rear end where the control snake exited. Then with new tail feathers all was very sound.

What was surprising was the very rusty metal pin hinges. The wheel axels showed signs of wear and there were score mark on all four sides of the square tank - made by the clunk. These had to be seen to

be believed. The old 148 servos seemed good though, despite the high airframe time use - in excess of 80 hours.

The fuel soaked areas were dealt with by laying toilet tissue over the affected area then heating with the covering iron set to hot. Repeated several times this draws out the oil. Next the areas are soaked with cellulose thinners and the drawing process repeated. Finally smear the area with talcum powder, wipe away any surplus then give a coat of sanding sealer (or your own dope/talc mixture). Once dry give a light sanding and you will find that covering film will now adhere to was was once fuel soaked. A warning though. If engine bulkheads or undercart fixings are badly soaked it could be terminal without drastic surgery.

The model was given a light sanding all over and then dusted off before re-covering was commenced using odds and ends from other projects. I mixed solid silver and transparent reb and blue colours and the model soon looked as good as new - in fact better than the original.

Now I could bolt back all the original gear without any of the fiddling about and I had a lovely new model at very little cost - except time of course!



THE DYNAMICS OF FLYING DETACHED

Following on from Trevor Bowry's 'Motor Torque' article on props, and sparked off by Andrew Gibbs' Safety Article, Colin Stevens rolls up his sleeves and grapples with the theory and the mathematics.

Pondering the concerns expressed by Andrew Gibbs in Clear Dope on the hazards of being in close proximity to propeller blades, I thought it would be interesting to attempt to analyse the dynamics of the flight of a separated blade, that is, to try to define the probabilities of its different possible trajectories. An initial survey soon shows that this is a virtually impossible task to perform with any precision, since we don't have enough data. For example -

1/ When the blade detaches, how do we predict its path when it represents a heavily twisted unstable aerofoil, and it is most unlikely to experience consistent chordal airflow?

2/ We don't know the dynamic behaviour of the blade in respect of its orientation at the instant of separation, because we don't know how the break in the blade root or hub propagates. This will define to a large degree the path that it will take due to aerodynamic forces.

What we can do however, is to look at the mechanisms involved, and to try to evolve some general principles. It seems that an adequate understanding is just as likely to come from imagination and experience, as from academics alone. Since I can make no claims to academic prowess, this suits me well.

I have observed many blade separations over the years, and they were particularly prevalent in the late 40's/early 50's, with the introduction of hard plastic props. One thing became apparent, and that is that there seem to be two somewhat conical volumes in air which can usually be considered "relatively" safer, and these are in front of, and to the rear of the model. There is a major caveat, though! The perceived safety of these volumes applies only if there is no other intervention with the flying blade, i.e. the ground, or model structure. I have witnessed the penetration of a blade through someone's cheek, and the dislodging of teeth, when the victim was stooping behind his model, setting his dethermaliser. Even from this position, because of the obstruction presented by his model, he could not position himself satisfactorily within such a supposed "safe" cone. Additionally, the ground presents itself to a major proportion of the arc of the prop, so a ground-strike carries a high probability,

and is as great a threat to bystanders.

A second caveat is that we are dealing here only with the detachment of a single blade, and not with the shedding of the whole propeller, which would entirely negate the concept of a "safer" zone in front of the engine.

Have described the relatively safer zones as cones, it would be more accurate to describe these more as bell-shaped volumes since, as the blade kinetic energy is dissipated by drag forces, one would imagine that the blade will come increasingly under the influence of aerodynamic forces, and will diverge increasingly from the plane of the prop disc. I see them aligned with their apexes centred on each end of the crankshaft, i.e. normal to the disc of the prop, regions where it is difficult to imagine that a blade could be projected into by mechanical and/or aerodynamic forces.

I for one have been transfixed for years by the notion of enormous centrifugal forces on the attached blades, and therefore the likely implications of the sudden release of such forces should a blade fly-off. Thinking about this, the penny eventually dropped, and this is very important - the centrifugal force only acts while the blade is attached, and things are quite different after separation. This is where it gets interesting.

STATEMENT: If you believe in Newton's Laws of Motion, and temporarily ignoring aerodynamic effects, then after separation the blade must progress at a velocity and in a direction that it possessed at the instant of separation. It doesn't sound right, but there are no forces acting on the blade once separated. This about-face in my preconceptions surprised me at first, so let's try to see what goes on in more detail. I always find it helpful in these cases to strip a problem down to basics, and then build it up again.

First, let's take a hypothetical untwisted blade of zero pitch, to diminish the aerodynamic arguments. Let's also say that it has an even mass distribution from root to tip, with its CG in the middle of the blade. In the case of its exit path from the prop disc, all dynamic effects can be assumed act on this CG. If it separates instantaneously, then according to Newton it will proceed at a tangent to the circle described in the prop

disc by the path of the blade CG. For simplicity, if the root extends hypothetically to the centre of the crankshaft, then its exit velocity will be half the tip velocity. I do hope I've got that right.

What are the numbers? Let's take a prop of 11" diameter, revolving at 12,000 rpm.

Tip Velocity = rpm x pi x prop diameter = 12,000 x pi x 11/12 ft/min. = 34,558 ft/min = 393 mph.

So the blade exit velocity is about 197 mph.

Not quite what we had envisaged perhaps, but still fast enough to be alarming.