

In the Air Tonight

Aerobatics for Everyone
(why every RC pilot should try
aerobic flying)

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Great Britain RC Aerobatic
Association



Why Aerobatics?

Becoming a skilled aerobatic pilot will:

- Give you the satisfaction of being able to fly your plane with precision and confidence
- Give you the best chance of flying your way out of trouble
- Help you to avoid trouble in the first place!
- Make you a safer pilot
- Require you to go flying a lot (you do enjoy flying don't you?)



Before we go any further...

- You don't need a plane that costs thousands of £££
- You don't need a fancy radio that costs thousands of £££
- You don't need a big 4 stroke engine / fancy electric motor with contra rotating props / enough batteries to power a Tesla



First Steps

What you need:

Essential

- Know how to programme your radio

Very Useful

- A low or mid-wing design plane (high wing is OK but harder to fly well)
- Be prepared to write down a few notes before, during and after a flying session
- A friend to watch your flying



Setup

- Spend some time in the workshop to set your plane up right.
- A rough check – is everything lined up straight? You can just do this by sight – after all this is what you do when you fly it...
- But – do measure the CG. Make the effort to do this. It should be where the designer / manufacturer says or mid range if they give a range.



Control Linkages

- Slop free
- No binding
- Z bends are fine!
- Use a servo arm that is 90 degrees to the servo centre line
- Don't use sub trim on your radio – adjust the linkages. Don't be lazy.



Control Throws

- Most people (nearly everybody actually) have too much control surface movement – except on rudder.
- For precision aerobatics:
- Ailerons – 10 degrees up and down max
- Elevator – 10 degrees up, 11 degrees down max
- Rudder – 30 degrees MIN
- Use exponential to soften around neutral
- Ailerons & Elevator 30% expo (Futaba – minus 30%, JR, Jeti, Spektrum – plus 30%)
- Rudder 40% expo



Control Throws

- Yes – that is enough elevator throw!



Control Throws

- Set 1 degree more down than up elevator.
- This will give you a similar response to upright flight as you will need to hold about 1 degree down for level inverted.



Control Throws

- Make sure throws on elevator are equal if using twin servos – this is very important – measure it.
- No fancy settings for landing!
- For spins, use 15-20 degrees elevator throw with 40% expo.
- No more rates – you won't remember!



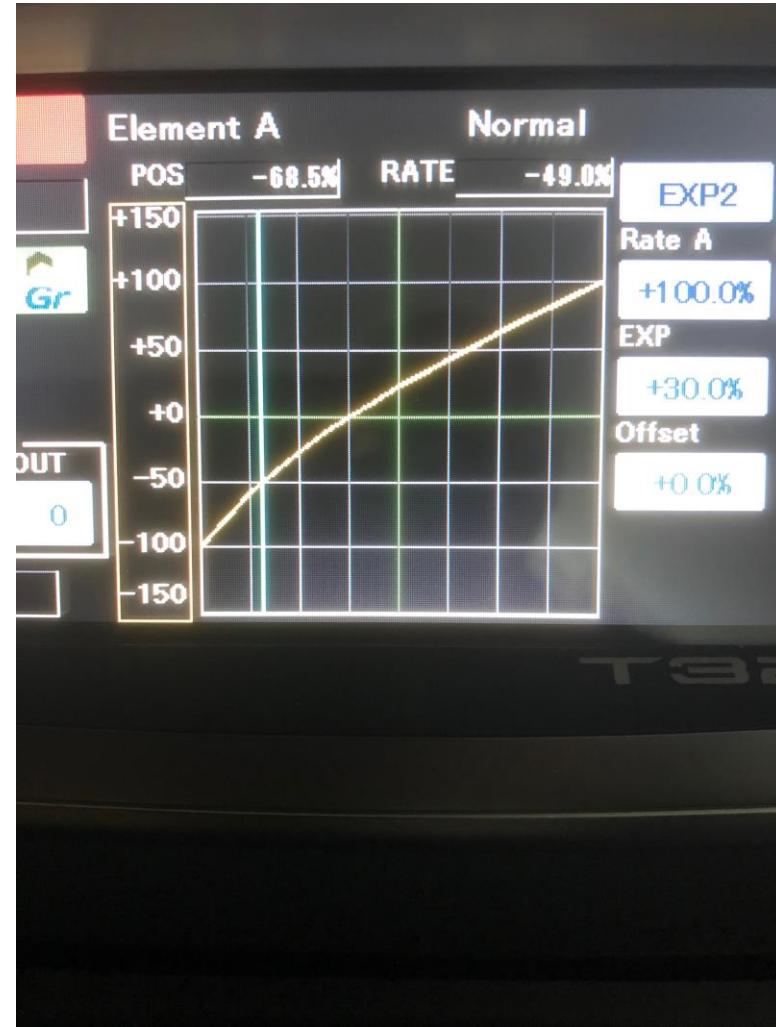
Rates / Conditions

- Try to use just two rates – one for normal flying and one for spins.
- If you have multiple rates on different switches you won't remember what does what!
- Use one switch that you can reach easily without letting go of the sticks or looking down.



Throttle Curve

- IC engine – use a linear function
- Electric motor – use a curve with more response at lower power (EXP2)
- Multi point curves are too complicated when you are learning



Eyesight

- This may seem obvious, but...
- You need decent distance vision (corrected if required)
- Use sunglasses
- Don't fly in front of the sun – try to face the other way if your site allows it



Train your Eyes!

- Focus hard on the attitude of the plane (one wing low, diving, climbing, yawing etc.)
- AND at the same time use your peripheral vision to look at the plane's direction of travel
- THESE TWO POINTS TOGETHER ARE THE KEY TO GOOD FLYING
- The plane will generally fly in the direction the nose is pointing – unless there is a wind – which there is 99% of the time!
- Look at where the nose is pointing and estimate the wind drift to keep it flying in the right direction.



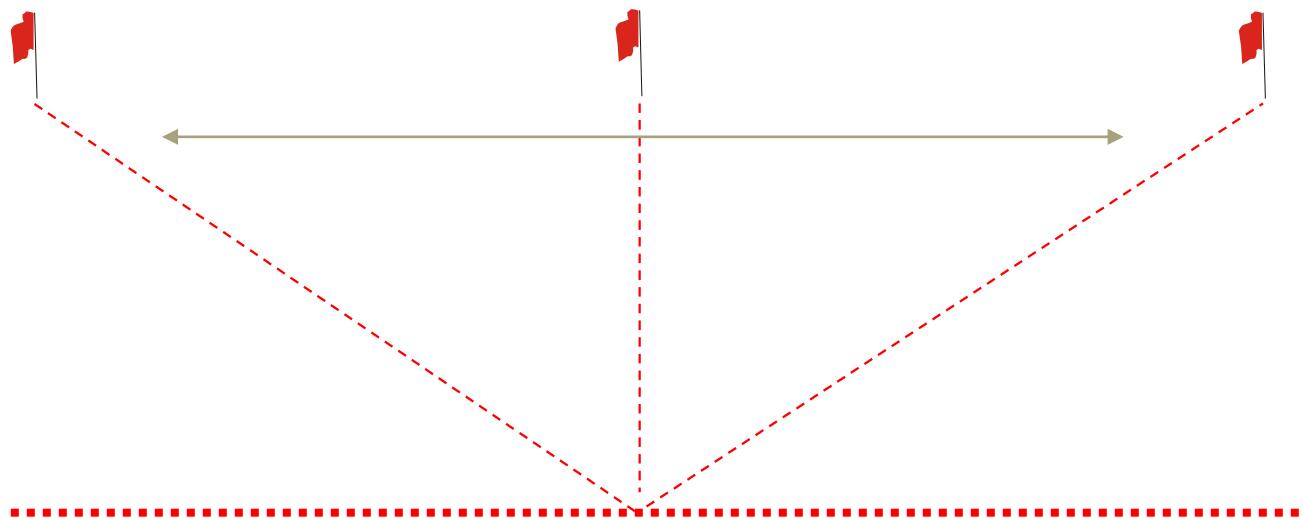
Let's Fly!

- You are going to fly the plane in front of yourself (most clubs / sites are set up for this anyway)
- Stand still!
- Don't fly too slowly with electric power - speed control is very rapid, but many people fly too slowly.
- Go big and fast at first
- Trim for straight and level upright flight at about 2/3 full power. Let go of the sticks to prove to yourself it is right.



- Fly 80 -100m in front of yourself – and not too low – there are no bonus points for low flying
- Get used to the new control responses – they may seem very soft at first

The flying area is 60 degrees each side of centre and about 100m in front of the pilot for a 1.5m span aeroplane



Finally – some aerobatics!

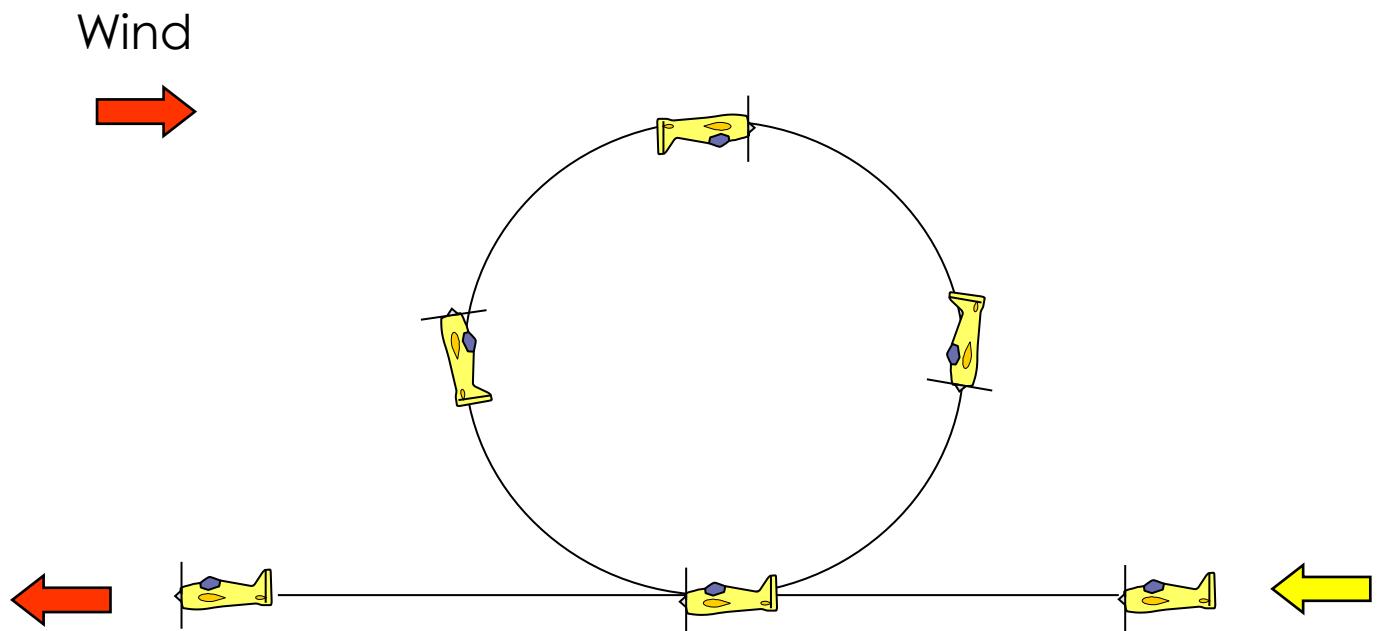
Four basic elements:

- Loop
- Roll
- Stall Turn
- Spin



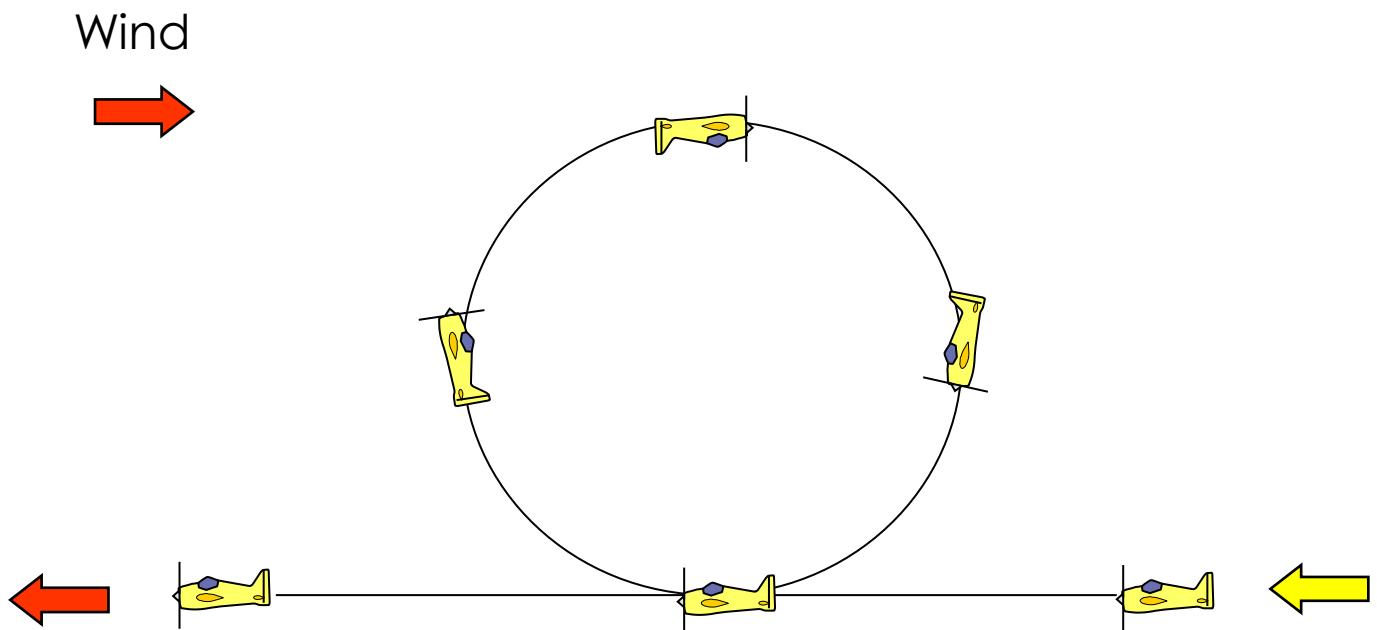
Loops

- Flown with up elevator (inside loops)
- ...or down elevator (outside loops)
- Round
- Square
- Triangular
- Learn how to fly these without screwing out left or right
- A crosswind will blow the plane in or out – watch for this
- Use your peripheral vision to aim for the right finish point



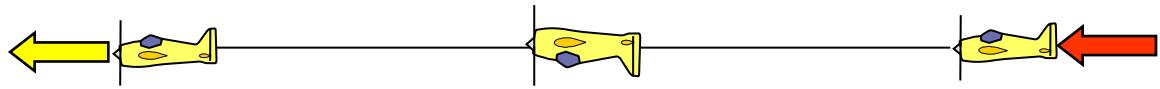
Loops cont...

- Speed control is important to keep shape – especially in a wind
- More speed and less elevator going into wind
- Less speed and more elevator going downwind
- Don't forget gravity is your friend at the top of a loop – you need very little elevator here



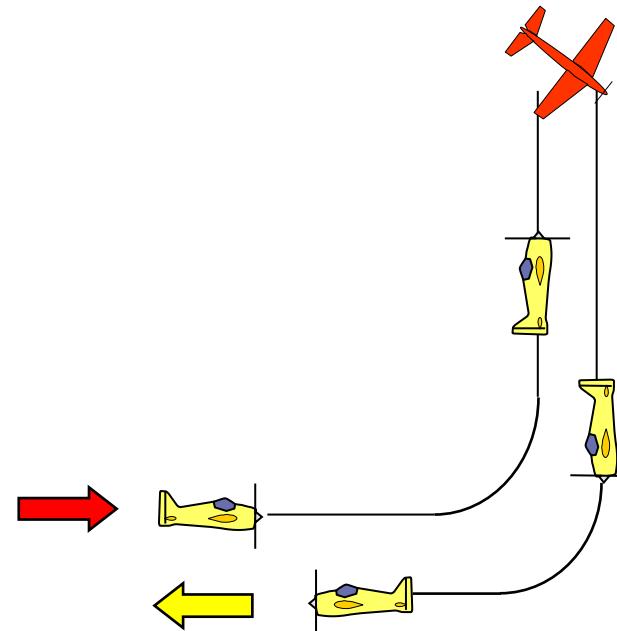
Rolls

- The rolls rate should be about 2 seconds for one roll
- This feels slow but gives you time to learn the corrections to keep it straight. Count 1,2,3,4 at normal pace for one roll.
- Start level – not nose up
- A short pulse of down elevator when inverted – but take it off once you have passed inverted or you will corkscrew the last half
- Over-rolling at the end is very common (usually because you have too much aileron throw)



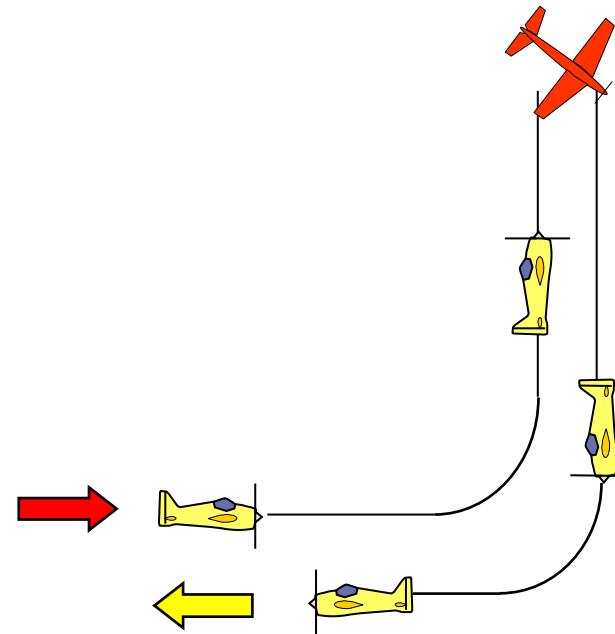
Stall Turn

- This is quite hard, but very rewarding when you get it right.
- Vertical flightpath going up. Allow for the wind!
- Reduce power to stop the vertical climb – but keep about $\frac{1}{4}$ power on so that the rudder still ‘bites’ in the airflow
- As the plane stops the vertical climb, smoothly apply full rudder to rotate around the yaw axis)
- Power to minimum once the nose is pointing down



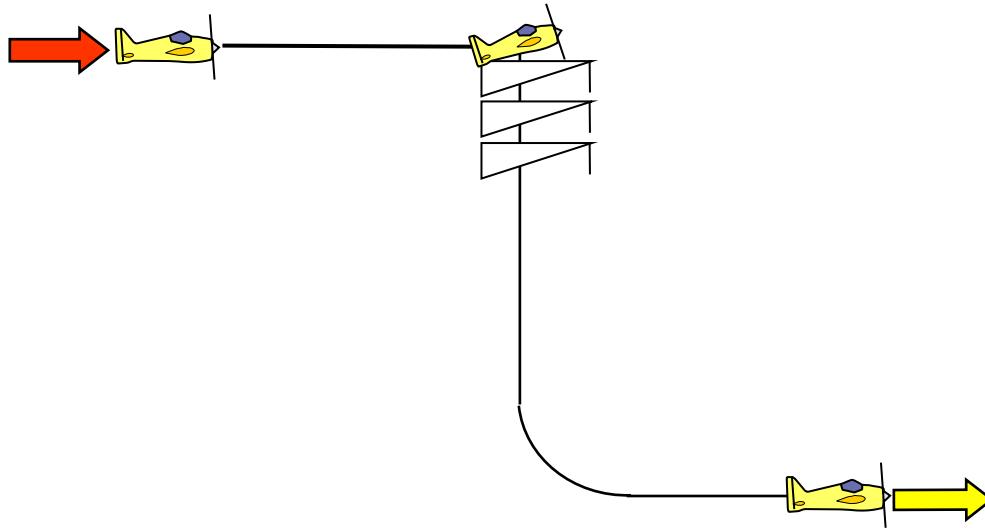
Stall Turn cont...

- Often you need a bit of down elevator as the plane reaches the vertical dive.
- Smooth pull out
- Stall turn into any crosswind



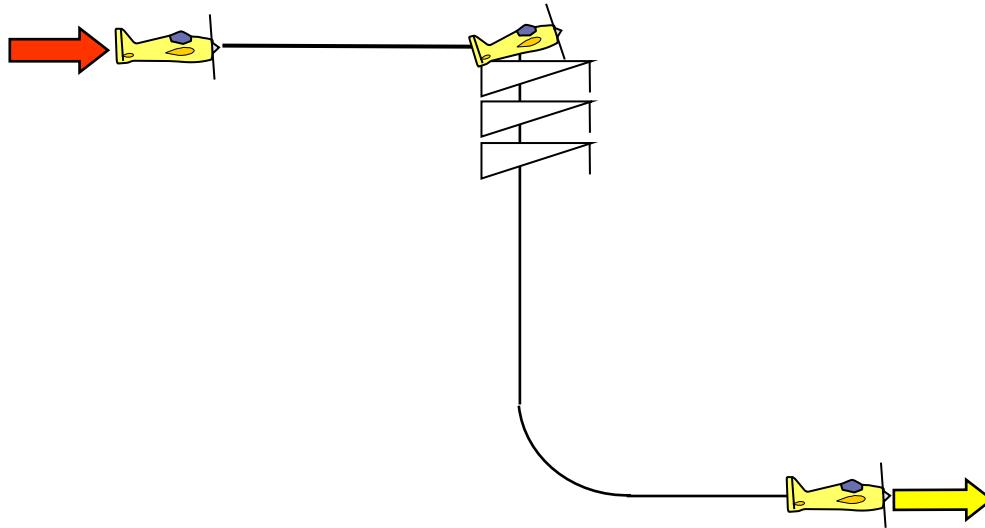
Spin

- CG is important – if it is too far forward a spin will be hard
- Use high rate elevator for this manoeuvre
- Switch high rate elevator in early during the run into the spin
- Entry – slowly and be patient
- Nose up attitude, horizontal flightpath with decreasing speed
- As the plane stalls and the nose drops, apply full rudder then aileron (if you need aileron)



Spin cont...

- Count the turns! Many people do one too many. Count them out loud.
- All controls back to neutral to stop the spin.
- Fly a straight vertical downline then a smooth pullout to exit (you did start high enough for this???)
- Using aileron in a spin isn't a crime.
- Not using aileron in a spin isn't a crime either – different designs spin in different attitudes.



General points for practice

- Adjust control throws as required to ensure your plane will spin both ways.
- Learn how to roll, stall turn and spin in both directions left and right. Don't become handed.
- Become confident flying inverted – straight lines, left circuits, right circuits, fly for two minutes inverted etc.
- Make notes between flights – you will be concentrating so hard that you will forget otherwise.
- Fly even when it is windy – or you won't fly enough. This is the UK!



Common Myths

Myth

- Aerobatic planes are ugly

Truth

- All aeroplanes are designed with a purpose in mind. Try a knife edge loop with a fun fly plane...
- You will like the look of some planes and dislike others. That's your opinion and it is absolutely fine.
- Nothing flies precision aerobatics better than the current designs



Common Myths

Myth

- Aerobatic fliers are aloof and think their planes are better than yours

Truth

- We are all just ordinary people who enjoy the challenge of flying our planes well
- We all wish that good quality planes were cheaper!
- Aerobatic planes last for hundreds (sometimes thousands) of flights. On a cost per flight basis they are a bargain compared with some cheaper planes.



Common Myths

Myth

- You need a 2m plane to be competitive

Truth

- You don't – you need a straight plane, set up correctly and you need to fly it often.
- Read this month's BMFA News to see how you can start in aerobatics and do well



Common Myths

Myth

- Aerobatic flying is boring

Truth

- OK – it's not a spectator sport (unless you want to be a judge!)
- If you do want to become a judge get in touch – it's as demanding as flying but at least you get a seat all day and everyone is trying to impress you!
- Try a few of the things covered in this presentation in different weather conditions
- If you think you've mastered the basics then it's time to try a competition



Common Myths

Myth

- Transmitter stick mode 1 / mode 2 is best

Truth

- Stick with the mode you fly now.
- Watch a YouTube video of any of the world's top fliers then tell me which stick mode they fly – you can't
- It's the same for thumbs, finger and thumb, neckstrap, tray etc.



What Next?

- Fly a sequence – aerobatic flights are one continuous sequence of centre and end (“turnaround”) manoeuvres
- If you've learned the basics, a sequence will be fairly easy. If you haven't learned the basics...?!
- Come to an “Introduction to Aerobatics” day at BMFA Buckminster – see BMFA News / website / BMFA Facebook page
- Join the GBRCAA - £25 a year – lots of advice, help and support available
- Come to watch a competition
- Enter a competition!

