What is “Pattern”?  
Radio Controlled Precision Aerobatics is usually referred to as “Pattern” since a predetermined “Pattern” of maneuvers is flown. Some guys fly in pattern competition to try and win, but most fly to have fun and improve their flying skills.

What are the “Classes”?  
There are six pattern classes: Club Class, Sportsman, Intermediate, Advanced, Masters, and FAI-F3A. Each class is more difficult than the previous both in complexity and number of maneuvers. There is a point system, which determines how quickly one will advance from one class to the next.

Why fly Pattern?  
Flying pattern maneuvers won’t necessarily make a person a better flyer, however the practice that goes along with it will. Most of the maneuvers flown in pattern are ones that may be flown at any given time by a sport flyer, but the challenge is in doing the maneuvers in their proper sequence, without any pauses, and flying them as smoothly and precisely as possible. Practice is the best way to improve one’s flying, and the discipline involved is what makes pattern such a good tool to do so.

What Equipment is Needed to Fly Pattern?  
First of all, an expensive pattern plane is not needed to get started; most sport planes are all quite capable of performing Club Class and Sportsman class maneuvers with ease. Even today, one of the most capable and clearly affordable airplane capable of flying modern day maneuvers is still the “Kaos”, dollar for dollar the best flying airplane for the money.
There is no size and weight limitation for "Club Class". Sportsman only has a size and weight limitation. The size limitation is an airframe no larger than two meters square with a total weight not exceeding 11 pounds.

A plane that rolls well and has some inverted capability is all that is needed for Club Class and Sportsman class. As one begins to get a handle on the maneuvers and starts to move up to the higher classes, then they should think about getting an airplane that is designed specifically for the more difficult pattern flown. That airframe does not necessarily need to be state of the art. It can be a used airframe designed and flown 10 years ago or more even.

One could spend a lot of money on a pattern plane, but when first starting out it is probably wiser to spend money on high quality batteries and PRACTICE. While the Club Class and Sportsman maneuvers are all relatively easy, the difficulty comes in doing each one in sequence in front of judges.

**Where are the Contests?**

In the back of Model Aviation magazine, Modelaircraft.org, NSRCA.us. Each one will list the contest location, dates, and persons to contact (usually the contest director). Each type of competition class is given a number code. Club Class, Sportsman, Intermediate, Advanced, Masters, and FAI classes of pattern are codes 400, 401, 402, 403, 404. Club Class may or may not be offered. If offered there will be a notation along with any other event deviations. In doubt, contact the contest director.

**Contest Structure and Scoring...**

When all the contestants in one class have flown in front of the same set of judges, that is called a "round". The flights are usually scored by two judges. They grade each maneuver on a scale of 0 - 10 based on accuracy (usually referred to as "Geometry") and smoothness. Each maneuver has a difficulty level assigned to it, called a "K-Factor" and the score for each maneuver is multiplied by this number. In the Club Class most maneuvers have K-factors of 1 or 2. All of the judge's scores are totaled, and at the end of the round the scores are normalized.

Normalization means that the person with the highest raw score during that round gets a normalized score of 1000, while everyone else gets a percentage of 1000 based on their raw score. For instance, if the person that won the round had a raw score of 200 and someone else had a raw score of 150, then the first person would get a normalized score of 1000, while the second person would get a normalized score of 750. Normalization helps to even out the effects of having low scoring judges on one round and easy judges on another round.
Usually, 3 to 4 rounds are flown at a one-day contest and 5 to 6 rounds are flown at a two-day contest, weather permitting.

Each contestant gets one score for one round, and some of the low scores are dropped. The number of low scores dropped depends on the number of rounds flown. If less than three rounds are flown, none are dropped. If three to five rounds are flown, one score is dropped. If six or more rounds are flown, the best four scores are kept. After the low scores are dropped, the rest are added together to give a final score, which determines the winner in each class. At an AMA AA contest, awards are usually given to the 1st place winner in each class.

**What is the “Box”?**

The “Aerobatic Box” is the area of the sky in which all of the maneuvers are to be flown. Looking straight out across the runway is the center of the box. To the right and left of the center (60 degrees each way) are the left and right boundaries of the aerobatic box. All scored maneuvers (except takeoffs and landings) must be flown inside the 120 degree box. The pilots must announce to the judges when their plane is entering or leaving the box. The center, left and right box boundaries are usually marked by poles or lines drawn on the runway. In addition to the left and right boundaries, there is a 60 degree vertical limit as well. If during a maneuver the plane goes outside the box, the part of the maneuver that is out is not judged. If half the maneuver is out, then the highest score possible is a 5.

In addition to the left, right, and vertical limits, there is a distance limit as well. If the plane is flown far enough away to make it difficult to see the attitude of the plane, then the judges may start deducting points. Technically, the distance limit of the aerobatic box is approximately 150 meters, which is plenty of room to fly any of the maneuvers.

**What to Expect...**

The Contest Director (CD) will hold a pilot’s meeting at the beginning of the contest, and may additionally call meetings to discuss special situations (such as weather conditions). The CD will discuss any special situations that exist at the field. They will also announce the classes that are up to fly first, and what the flight order is for the first round. At that time the location where the flight order is posted can be seen so that the contestants can check it during the contest.
**Flight Line...**

The flight order is usually determined at random.

There are two "ready boxes" in which the planes that are 1\textsuperscript{st} and 2\textsuperscript{nd} up to fly will be placed, and the contestants are expected to be ready to fly when called upon. If one contestant can't fly or finish a whole flight, then the next one must be ready to go. This allows the contest to run quickly, and may mean getting an extra round in (i.e.: chance to move up).

As a matter of courtesy most contestants will not test their motors in the proximity of a pilot that is flying. Most will wait until the person flying has landed before attempting to check a motor or engine. Also, all contestants may let their helper carry their plane to the runway for takeoff, rather than risking a noseover and the consequent restart. This also helps to keep things moving along. A helper will also quickly retrieve the plane after it has landed so that the next flier can immediately takeoff.

**Keeping Score...**

During the contest the score-sheets must get from the judges to the scorekeeper, and at most local contests the judges give the score-sheets to a volunteer who in turn passes them on the scorekeeper. After all the contestants in a class have finished a round, the round scores for that class will be printed and posted.

A special situation that may exist (and this is rare) is when one class is split up on two flight lines. In that case, every contestant must fly in front of the same set of judges before the scores can be normalized, so two flights must take place before normalized scores can be computed.
Club Class

<table>
<thead>
<tr>
<th>#</th>
<th>Maneuver</th>
<th>K-Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Takeoff – Upwind (liftoff in front of judges)</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Straight Flight Out (upwind)</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Procedure Turn (turnaround)</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Straight Flight Back (downwind)</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Stall Turn without Rolls (upwind)</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>Immelmann Turn (upwind)</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>45 Degree Upline (upwind)</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Straight Inverted Flight (downwind)</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Two Inside Loops (upwind)</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Landing (upwind)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Total K-Factor</strong></td>
<td><strong>14</strong></td>
</tr>
</tbody>
</table>

Some maneuvers, such as Straight Flight - Procedure Turn - Straight Flight Back are flown together in the box. Every place in the sequence where “exit/enter box” is noted, the pilot will call “leaving the box” and proceed to fly out of the box, turn the plane around, and re-enter the box, again he or she will call “entering the box”.

Some maneuvers are centered, and the rest are turnarounds. The takeoff should be announced (i.e. “take off beginning now”) and the liftoff should be smooth and in front of the judges. Once the plane is six feet high, the pilot will call “complete”. When landing, the pilot will call “landing beginning at six feet”. The landings should be inside the designated landing area (usually 50 feet on either side of center) and should be flared nose high. (The CD may alter the takeoff/landing judging criteria due to the local field conditions.)
The Basics of Flying the
“Club Class” Pattern Schedule

*As an old wise man once said to me
“Anyone can do a loop, but can you do it front of you and make it round?”

When I heard that statement some years ago it really began to make sense. If you want to become a better flyer you must learn to position your maneuvers in a consistent manner.

The first order of business is to perfect your rhythm and get in the groove. After that, everything’s a piece of cake. Okay then, let’s get started on what the maneuvers are and how we do them. I’m concentrating only on the Club Class Schedule for now, if anyone would like to go beyond that stage, you’re reading the WRONG book.

**Takeoff Sequence**

The first step is to get yourself lined up for the “Take-Off Sequence” (upwind of course). You begin by lining yourself up parallel to the runway with your motor off (for electrics) or idling (for IC engines) and wait approximately 5-10 seconds. Call “Take-Off” to the judges and proceed to advance your throttle smoothly. Keeping your plane straight down the runway, slowly feed-in some up-elevator until your plane lifts off (under ideal conditions, the model should lift-off directly in front of the pilot and judges). When your plane has lifted and is approximately 2 meters above the ground, your take-off is complete. Remember, your take-off is a judged maneuver and it only gets more difficult from here.

After your take-off has been completed you now have an opportunity to get yourself “Set-Up” for the flying maneuvers, by making a “Free Pass” back downwind.

**Straight Flight Out (upwind)**

From upright, fly a straight line parallel to the flight path for a distance of approximately 100 meters (300 feet give or take) centered on the judges before starting the next turnaround maneuver (distance does not have to be accurate). Maintaining your heading and track is really the key to higher score.
As a side note: as simple as it may appear this maneuver often proves more difficult than most pilots realize. It pays to practice.

**Procedure Turn (turn around)**

Here's a throwback from yesteryear, it's known as the Procedure Turn. Immediately after the Straight Flight Out maneuver the model must turn exactly 90 degrees to the right or left, (whichever will take the plane away from the runway/zero line) then exactly 270 degrees to the left (or right) and cross over the point where the first turn commenced. In this case it was easier to use a diagram than explain the steps.

![Diagram of Procedure Turn](image)

**Straight Flight Back (downwind)**

Immediately after the procedure turn maneuver the model shall fly back along the same line as the outgoing path. Straight flight back should be positioned identical to straight flight out except heading downwind. Maintain a distance of approximately 100 meters (300 feet give or take).
**Turnaround (unscored)**

Once you have completed the last maneuver you now the opportunity to get yourself situated for the next one. At this point you have the option to use your favorite move to turn your plane around. If you’re happy with the distance from you to your plane an excellent turnaround is a “Half Reverse Cuban Eight”.

The Half Reverse Cuban Eight is nothing more than, pull-up into a 45 degree climb, halfway through the climb-out, perform a half roll and continue up (your flying inverted at this point). At the top of the maneuver, reduce your throttle slightly and perform a half-loop. Keep in mind, on the down side of the loop your throttle is the controlling factor of your exit and entrance speed, so use it wisely (you certainly don’t want to be heading at warp factor 6 on the down side of this maneuver).

**Stall Turn (upwind) centered**

This maneuver is entered on the upwind and begins in front of you. Fly “Straight and Level” at approximately 40-60 feet above the ground and gently pull-up into a 90-degree climb (that’s straight up in case you didn’t know). At the top of the climb-out you gently reduce the throttle. At the point when your plane reaches the top of the climb-out you feed in “Full” left or right rudder (depending on the wind direction, but that’s another story). Allow the plane to perform a 180 degree rotation on its axis (remember, your airspeed has been reduced greatly, but don’t let the airplane stop flying). After your plane has rotated on its axis don’t let the rudder snap back, this is what causes “Tail Wiggle” on the vertical down. Now your plane has begun its heading on the vertical down, remember to keep off the throttle (ideally, your vertical down should be within 2 wingspan distance from the upward path of the model). Before the plane reaches the same altitude as the entrance altitude, you should gently feed-in up elevator and throttle until the plane has leveled off. Gradually increase throttle to maintain proper heading and tack.

You will get another chance to exit the aerobatic box in order to set yourself up for the next maneuver.

*Now isn’t this easy?*

**Turnaround (unscored)**

Here again you have the opportunity to use your favorite turnaround maneuver. Once again if you’re lined up and like your distance a “Half Reverse Cuban Eight” is a good choice.
With me so far? Excellent

**Immelman Turn (turnaround)**

To perform the Immelman, your approach is on the upwind with your wings “Straight and Level.” From level flight you gently feed-in up elevator to execute a “One Half Loop” then a “One Half Roll” at the top of your loop. Often times you run out of airspeed at the top of the loop and your roll looks more like a “Corkscrew” than a nice crisp roll. The main cause of this failure is nothing more than “You ran out of airspeed.” To correct this, you must either perform a smaller half loop or begin your half roll slightly before your plane reaches the top of the loop. After a bit of trial and error you’ll soon get the feel of what’s required.

The next maneuver is pretty straight forward.

**45 Degree Upline (upwind) centered**

From level upright flight the plane pulls and executes a one eighth (1/8) inside loop to a 45 degree up line, hesitates, performs a one eighth (1/8) outside loop to recover in upright level flight at a higher altitude. The center of this maneuver is the mid-point of the 45 degree line. There is no length requirement for the 45 degree line.

What to do when this maneuver is complete?

It’s easy; a “Split S” is the perfect way to get down in preparation for the next maneuver. Perform a “One Half Roll” into a “One Half Loop” and use your throttle wisely. Once again keep your speed in check, no point in entering the maneuver a warp factor 6.

**Straight Inverted Flight**

Due to the title of the this maneuver I didn’t think much explanation was required. From upright, perform a ½ roll to level inverted flight, fly straight and level inverted for a minimum of 4 seconds, perform a second ½ roll to exit upright. Be prepared to input some down elevator when the plane is inverted, anticipate this ahead of time (before the nose begins to drop) this with keep the plane flying level.

**Turnaround (unscored)**

Here again you have the opportunity to use your favorite turnaround maneuver. Once again if you’re lined up and like your distance a “Half Reverse Cuban Eight” is a good choice.
Two Inside Loops (upwind)

The next maneuver is the most tricky of them to impress the judges and your buddies, though you may think otherwise.

You begin the “Two Inside Loops” with your wings “Straight and Level.” The tricky part of this maneuver is maintaining a consistent altitude for each loop as well as maintaining the same diameter for each one (each loop must be concentric). Enter the loop at high throttle and gently feed-in up elevator as the plane begins to climb into a half loop. At the top of the loop is when you need to use “Throttle Management.” As the plane begins to enter the down side of the loop, you begin to reduce throttle (this is where you can perform Stealth corrective action). What really makes this maneuver more difficult than others is the need to use all four inputs, throttle, elevator, rudder and aileron. The majority of your corrective inputs can be accomplished by using aileron and elevator. The proper aileron input can often correct the “Corkscrew Effect” and proper use of elevator will eliminate the “Egg Shape Effect.” Before the plane reaches the bottom of the loop, increase to high throttle and repeat your inputs for one more loop. Upon completion of Two Loops you now exit the aerobatic box and prepare for the last maneuver - Landing

It’s almost over now so relax.

The next maneuver is landing and this is the final step in scoring a 1000, so be prepared.

The “Landing” is judged when your plane crosses the threshold and is approximately 2 meters above the ground. Beginning your final approach, enter the upwind and establish your glide, keeping the plane lined up with the runway’s centerline. Maintain a consistent decent rate with your wings “Straight and Level.” Once your plane touches down, maintain a STRAIGHT path down the runway (centered) and allow the plane to come to a complete stop before you head it back to the flight line. Call “Landing Complete” and bring it back, better yet, get your caller to fetch it.

You’ve now completed the “Club Class Schedule,” how’s it feel?. This is where it all begins. With more practice and practice your flying abilities will increase exponentially. The next step from here is “Sportsman Class.” Imagine the possibilities...
A Few Key Points to Keep In Mind

- Smoothness is the key to flying precision aerobatics.
- Always enter the maneuver with your wings “Straight and Level”.
- Throttle management is essential in “Setting Yourself Up for and Throughout the Maneuvers”
- There is no need to fly the maneuvers at Warp Factor 6, use the throttle - it's your friend.
- Maintain consistent positioning for all of your maneuvers.
- A properly “Trimmed” plane **WILL** enhance your flying abilities.

Are you really interested in the finer points of the game? Why not join the N.S.R.C.A. (National Society of Radio Controlled Aerobatics). The NSRCA is a special interest group of the AMA devoted to Precision Aerobatics. Yearly dues are a mere $40.00, which includes a subscription to their monthly newsletter, the "K-Factor." This publication contains 20-30 pages of some of the best information related to Pattern Flying as well as construction advice, product evaluation, hints and tips. Send $40.00 payable to:

NSRCA
2627 Silver Shadow
Conroe, TX. 77304
936-494-0063
www.NSRCA.us

*The remark “As an old wise man once said to me” originated from my close friend Dave Mathewson former President & Executive Director of the AMA, a friend to the aero modeling community.*
All maneuvers with the exception of the “Turn Around Maneuvers” are positioned on the “Center Line.”
All maneuvers stated above are assumed with no wind correction necessary.
All “Centerline and Turn Around Maneuvers” are placed either within the 120° flying area as well as the 60° altitude marker.

## Club Class
### Maneuver Schedule

<table>
<thead>
<tr>
<th>Club Class Schedule - Maneuver</th>
<th>Direction</th>
<th>K Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Takeoff</td>
<td>U</td>
<td>1</td>
</tr>
<tr>
<td>(enter box)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Straight Flight Out</td>
<td>U</td>
<td>1</td>
</tr>
<tr>
<td>3. Procedure Turn (turn around)</td>
<td>U</td>
<td>2</td>
</tr>
<tr>
<td>4. Straight Flight Back</td>
<td>D</td>
<td>1</td>
</tr>
<tr>
<td>(leave box)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Stall Turn</td>
<td>U</td>
<td>2</td>
</tr>
<tr>
<td>(leave box)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Immelmann Turn</td>
<td>U</td>
<td>2</td>
</tr>
<tr>
<td>(enter box)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. 45 Degree Upline</td>
<td>U</td>
<td>1</td>
</tr>
<tr>
<td>8. Straight Inverted Flight</td>
<td>D</td>
<td>2</td>
</tr>
<tr>
<td>(leave the box)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Two Inside Loops (centered)</td>
<td>U</td>
<td>2</td>
</tr>
<tr>
<td>(leave box)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Landing</td>
<td>U</td>
<td>1</td>
</tr>
</tbody>
</table>

| Total K-Factor |          | 15       |

**U**= Denotes Upwind  
**D**= Denotes Downwind