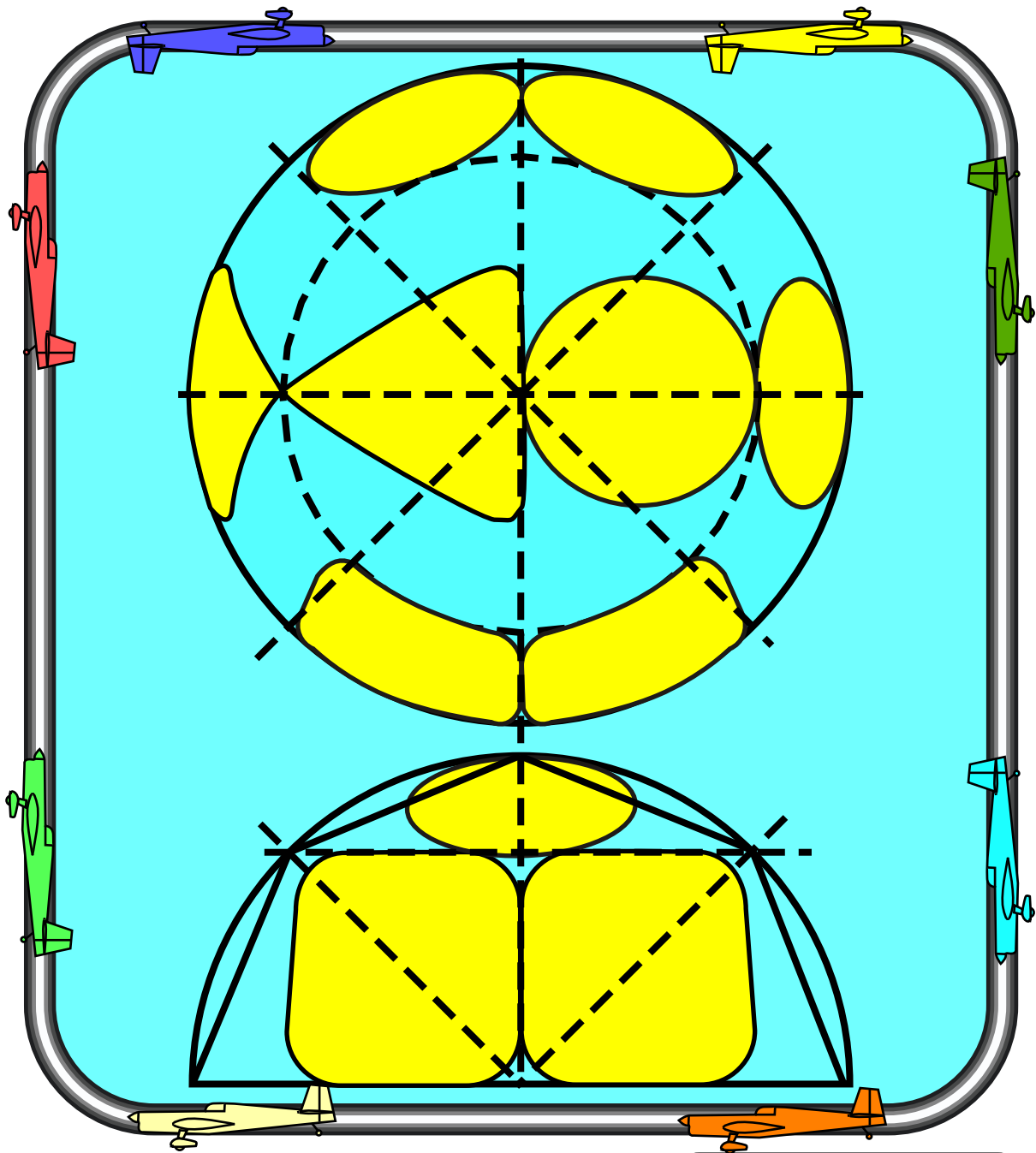


The Stunt Book

Control Line Precision Aerobatics

2004 Training Manual for Judges and Flyers



Dave Cook

- Rule Book Geometry -
- Tolerance Zones -
- Entry/Exit Points & Paths -
- Views from Judge's Position -

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1.0 Introduction

Control Line Precision Aerobatics is a competitive sport but deciding the winner is completely dependent on the knowledge, experience and skill of its judges. This book is an effort to establish a more consistent standard by presenting the rule book requirements in a form that is more visual. It also contains text on some of the issues of judging. We illustrate the tolerance zones as delineated in the rulebook and graphically depict the entry and exit points. The paths to enter and exit a maneuver that are not judged but are required for pattern points are also presented.

This is a supplement to the current rulebook for teaching judges and flyers the geometry, position, size and procedural requirements set forth in the rulebook. It is intended as a guide for teaching or running a seminar.

The rulebook is what must guide the sport. Errors were allowed in the current judging guide that was adopted into the rulebook in that a difficulty factor was allowed to creep in. Examples of this are "the pattern is much more difficult to fly small" and large maneuvers are easier to fly. There is only one criteria and that is rulebook geometry and under size is the same error value as over-size.

Keep in mind - Judging Stunt is an art, as is the flying of pattern. Although we place detail scores on each maneuver the winner is really decided by subjective human judgment, not by precision measurement with high-speed cameras, statistics or computers. No judge has a calibrated eyeball. They estimate the performance of the maneuver (shape, size, position and smoothness) as they see it. Then, in about 5 seconds, evaluate it and put down a score. This is a judgment call and subject to the skill experience and preferences of the judge. Judges are all different - two judges may put down the same number but seldom for the same reason.

As a judge expect to come under criticism for many reasons. But the Judge's score is absolute. The judge is the one put out there to select the winners and the Judge's decisions are final. Once the score for a maneuver is recorded it cannot, per the rulebook, be changed under any circumstances.

Critics seldom watch the entire flight nor do they watch from a proper point of view, yet they get very vocal about who, in their opinion, should have won.

This training manual provides course material and a recommended lesson plan for teaching judges. The points covered here should be presented by a dynamic chief judge who can convey the principals and oversee the field training. The goal is to get better understanding of the pattern requirements and more consistency in scoring. This is not an official AMA or PAMPA publication. It is put out as a training aid developed over many years of training stunt judges.

Dave Cook

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Control Line Precision Aerobatics Judge Training **Basic Lesson Plan**

This Lesson Plan outlines the recommended training sessions to be used in preparation of a national/world level competition. The principals in the book are applicable to any seminar or local competition.

Phase I:

Consisting of 2 to 3 hours of classroom training presented by the Chief Judge covering the information contained in this manual. This is best done in a group discussion format using the Stunt Book material. Participation by all judges is highly encouraged.

Phase II:

Consisting of 4 to 5 hours (2 sessions if necessary) of "Round Robin" practice judging. In this session each participant scores the flight. The chief Judge then leads a review of the flight, maneuver by maneuver, with each individual stating the score they gave. If the score is out of the average the Chief Judge will ask they give reasons why they scored as they did.

One judge will be at 90 degrees to the upwind judges recording errors at "0", "38", "45" & "90" degrees. This judge will present the deduction on each maneuver during the review. All of this is aimed at getting consistency in point awards as well as training to better judge the 38, 45 and 90 degree points

Phase III:

Consisting of a 1 hour (4 or 5 flights) "Round Robin" judging session for warm up prior to each days official flying.

2.0 Why Train Judges?

Subjective judgment by a trained and experience human judge is absolutely necessary in this sport. Recognizing and recording all of the factors required (shape, size, smoothness and position) in about 5 seconds is a task that takes experience and training.

Most judges do not dissect a maneuver point by point while judging - they rely on experience to react with a score for the whole maneuver, taking in all of the above factors. This ability is reinforced by training, experience and practice.

The main ingredients in a good judge are an open mind, intelligence, common sense, a good eye for geometry, knowledge of the pattern and experience.

Maneuvers are presented in the book as flat projection but in actuality we fly compromised geometry on the surface of a hemisphere. The pilots see the maneuver as a flat projection, flying the geometry true to their point of reference, element by element. Verticals are seen as 90 degrees to the horizon and all loops and squares will be flown true to the a conical projection from the center of the hemisphere (as if it was hot wire cut out of a foam hemisphere).

Training helps the judge recognize this and allow for distortion not only from the hemisphere but also from their point of view outside the circle. Each loop element of a square figure eight or clover will be flown true to itself. The judges also have to be trained not to penalize heavily for perceived small errors at points in the pattern that they cannot accurately judge (45s, 38s and overheads). Points with a good reference like level flight are easier to judge accurately.

It also is a chance to exchange ideas with other judges. This exchange happens very readily with the combination of classroom & field training at the Nat's. It also motivates the judge to participate and contribute to the general discussion thereby improving concentration and performance.

Very few judges have a real good feel for how they compare to other judges. They see random score comparison but not a comprehensive overview. Training helps a judge get scores in the general range of fellow judges (so his scores won't be always tossed out).

The training provides feedback, a very important tool for self-improvement. The main person that is going to improve a judge is the judge him/herself. They have to have a good report card that they can study after the meet to make comparisons and adjustments to bring them closer to the "standard".

3.0 Principals of Judging.

This is a competitive sport in which a presentation of flying skill, precision and aircraft performance is made to a set of judges. The presentation is flying a set of geometric figures set forth in the rulebook and the flyer, who in the judges opinion, best performs those figures to the rule book requirements wins. Judging is not an exact science, it is subjective, therefore limited by human frailties of inconsistency, fatigue and emotion. Performance is estimated subjectively by a group of human judges and the scores are averaged.

Subjectively, meaning - "from one's own view point".

The sole purpose of the judge is to render a decision as to relative placement of the flyers (1st, 2nd, 3rd, etc). Scoring is only a means by which we keep track of the judge's opinion on each maneuver. Other than its relative value for placement, it means nothing.

Judges will vary in point awards, mainly on the value an error. The variation is twofold; what is a minor error to one judge can be a major one for another and a major deduction for one judge is 10 points, for another judge it is 5 points - and so on. The point is that we have to contend with this in subjective judging and only good training and experience will reduce these variances. To win, at any given contest, you must impress the judges that are on the field. Regardless of the competency of the judges, you must fly what pleases them.

Protesting of the scores of a flight already flown is useless. The subjective score given by a judge will not be changed under any circumstance. Errors in tabulation or a flagrant breach of the rules can be protested and corrected, but the number given by a judge cannot be changed.

To get the best performance possible out of the judges we must train them, encourage them to practice and arrange the contest format to give them the best possible conditions to evaluate flyers. These are major factors in running a fair competition

3.1 The Basics

The best place to start in teaching stunt is an understanding of the elements that are the foundation of the sport. We group these foundation elements into the following Basics:

3.1.1 Take off, Level Flight, Inverted, Bottoms & Landing Basics

All of these maneuvers deal with the level flight zone or flat plane at 4' to 6'. This plane forms a "0" degree point, or bottom, of the hemisphere in which the pattern is flown. All other points (45, 38 & 90 degrees) are referenced to this plane. If this plane is not held nothing else is correct.

The take off should leave the ground smoothly and, in one lap, climb steadily, with no discernable deviations, to level flight and continue there for two more laps. Level Flight at, nominal 5', generally puts the lines parallel to the ground (except in the case of a very short or very tall flyer). Inverted Flight should be steady for the entire 6 laps even though only the middle two are judged.

Landing should be a smooth, steady continuous descent from the point that the airplane starts down with a smooth no bounce touchdown.

Level flight within the 4 to 6' zone is established by the take off maneuver as the rulebook states in Par11.1 "All flyers shall attempt to perform maneuvers of approximately the same angular dimensions". This sets the requirement for size and position consistency throughout the pattern. This includes bottoms ("0" degrees) used in most maneuvers in the pattern as well as the height of both level and inverted flight. How well the flyer does in maintaining consistent size and position from maneuver to maneuver throughout the pattern affects scores given.

We emphasize that the lines should be approximately parallel to the ground, or horizon, and sweep a flat 360 degree plane at 4' to 6' that is the "0" degree flat plane from which 38, 45 and 90 degree points are referenced. Once a flyer commits to a height (4', 5' or 6') they must stick with it throughout the flight for maximum points.

One of the reasons for emphasizing the "0" degree or level flight is that it is the most easily judged of the points in the pattern. Any good judge can tell the difference between 4' and 6'. However with the variety of line lengths and lack of reference no judge can accurately judge 45 degrees within 2'.

3.1.2 Square Corners

It is speculated that if you recorded a corner with a high-speed camera, a stunt ship is not capable of flying a 5' radius as required for a square corner. Who cares - this is a sport judged by human beings - if it looks square to the judge - it is square!

Human perception of a moving object is based on about 30 images per second being captured. This is why we need about 30 frames per second in movies or video to see a smooth flow of events. If we apply this to our sport it means that we see the position of the moving airplane about every 1/30th of a second and the brain fills in between. At a 5 second lap speed on 70' of line the judge only sees the airplane about every 3 to 4 feet in corners and the brain "interpolates" the rest of the movement. Bottom Line - again if it looks square to you it is square!! Each judge makes their own judgment as to which or who's corner "looks" sharper to them

3.1.3 Shape, Balance & Overlay Basics

This is basic geometry being flown in the pattern - Rounds should be round and squares square - etc. Eights should be balanced (inside portion the same size as the outside portion) and the 2nd maneuver should overlay the 1st within 2 ft.

3.1.4 Size and Position Basics

In order to maintain rulebook size the "0" Deg. ("Normal level Flight") 45 Deg., 90 Deg. & 38 Deg. (Clover) points must be maintained. Look for consistency from maneuver to maneuver as well as proper rulebook position in each maneuver. Note that the bottoms of maneuvers (when specified) must be at the 4' to 6' height or the rest of the maneuvers size and position points are suspect.

Again we reference the statement in Par11.1 "All flyers shall attempt to perform maneuvers of approximately the same angular dimensions". These means all maneuvers with common reference points should all be the same size.

The maneuver has to be in the correct position in reference to the flat "Level Flight" ground plane. Correct size means hitting all the Rule Book size reference points (0, 45, 90, 38, etc.). Correct position is putting the entry point where it should be per the Rule Book entry point references (level flight, 45 degrees, etc.). Position basics include intersections as missing an intersection puts that maneuver out of shape or out of position.

Also keep in mind the length of the lines affects size - i.e. the longer the lines the larger the maneuver. Round, Square and Triangular elements (except for the clover) should all be the same size. While no judge can accurately evaluate the 38 & 45 degree points, from their upwind position, they can evaluate consistency in size by comparison with the previous maneuver(s)

3.1.5 Smoothness, Tracking & Precision Basics

The error sections of each maneuver in the Rule Book use several words to describe errors. Such as “bounces”, “not gradual”, “not smooth”, “wobbles”, “rough”, “irregular”, “not precise”, “not straight”, “wobbles on turns” etc.

The overall message here is - the model should fly a precise smooth track through the maneuver without deviation. This should be maintained throughout the entire pattern. Poor tracking, kinks, wobbles, bounces and rough irregular maneuvers are grounds for significant point deduction, even though the size and shape are basically maintained. The model should maintain a smooth steady heading or attitude with it's thrust line parallel to, and centered on, the maneuver track.

4.0 Qualified Judges

Building a cadre of qualified judges is a continuing effort. We now have a group of qualified people that judge at the national events on a regular basis. Each of them has gone through the judges training program at the Nat's. The formalized training program has helped motivate as well as increase the knowledge of the judges.

It has also helped in recruiting and training new people. These new judges are rotated in so we have a mix of old and new that keeps a pool trained and experienced judges available.

5.0 Contest Formats and Contest Planning

Without good judging competition is meaningless but even the best judging can be compromised by bad contest formats. Best possible - If you have over 10 or 15 contestants, elimination rounds should be held to reduce the finals to preferably 5 but no more than 10 contestants.

After the first round, the flying order should be low score up to give the judges the most direct possible comparison between flyers. Once an elimination round is set, no flyer that missed the cut will be advanced to replace a top round flyer that drops out. The flyer that drops out will retain last place in that round. If more than one drops out the previous round scores will determine placing.

The judges shall not look at the score postings, other judge's scores or discuss scoring with anyone until the competition is over. Adequate rest periods, sun protection and drinking fluids shall be provided the judges wherever possible. Judges shall be warmed up prior to competition. The warm up shall include a maneuver by maneuver “talk around” between the judges right after each warm up flight. Each judge, in turn, will state the score given and reasons.

Cancellation of Competition. - The Rule Book lists winds of 40 MPH as reason to cancel competition. Winds less than 40 MPH, Heavy rain, hail lightning, etc. are also reasons for cancellation. Under marginal conditions the Contest/Event Director can declare conditions flyable and if one pilot elects to fly then the contest is on. If the Contest/Event Director declares the meet cancelled great care must be taken to see all pilots get a fair shake - the CD can cancel scores and give a re-fly to contestants who flew under poor conditions. If someone crashes prior to the cancellation then you have a problem.

Official Flight - Think about what you will do if a contestant forgets the wingover.

Disqualification and Fouls - Dropping Parts while in the air. Loss of any part of the aircraft while in the air (the rulebook says during flight) other than the propeller but including wheels and/or tires constitutes a foul - the score will be nullified and the contestant will be charged with an attempt.

Things that can affect a judge's scoring.

Lack of training, experience and practice

Fatigue caused by too long a judging day.

Judging the first couple of flyers in a round before you are warmed up.

A flyer with a reputation or a flyer you don't now

Seeing a very good flyer right after a poor flyer and the same goes for the opposite. An abrupt change in skill level can affect your scoring either up or down depending on the situation

Being out of position to the maneuver. If you are not directly opposite the maneuver, especially Squares, Triangles and Hourglass it will distort what you see.

Things that flyers do to get an advantage or make judging more difficult.

Hiding the maneuver - Moving the maneuver around the circle so it is not directly opposite the judge. It is a good move for the Head Circle Judge to ask the flyer if they use the technique of moving the maneuver away from the downwind position so that the judges can anticipate and move to the correct judging position.

Hyping a flyer - promoting a flyer or downgrading a flyer in the presence of the judges.

Changing the flying order - Intentional wave off to move later in the order. Flyers that draw 1st or 2nd in the flying order will try to move later in the round by using an attempt so as not to be subject to lower scores from judges that aren't warmed up yet. This is also used to get practice in.

Complaining about judging between contests - Some flyers will complain loud and long after or between contests in order to get potential judges sympathy.

A Word on Protests

The only people that will be fully satisfied at the end of the contest are the winners. A small number of the others will grumble and bitch and rarely some will even protest.

Flyers can protest to the Event Director but it will not affect the outcome. The Rule book says that the flyer shall be supplied a copy of their score sheet but they are not allowed to talk to the judges! Subjective scoring is essentially not protestable. - Pg. 10. Sect. 8 states: "While errors in score computation shall be corrected, at no time shall the number of points awarded for an individual maneuver or characteristic be altered."

Builder of the Model Rule:

Under current AMA rules there is no official way around the builder of the model rule for AMA events (only the Nat's at this point). Eliminating the rule is a very controversial issue. We do have the option to allow a model not built by the flyer by not giving appearance points in PAMPA events. The other option is to run the event under FAI rules and eliminate the problem completely.

We are always looking to improve the flying and judging of the pattern - please pass on any suggestions for improvement you may have.

Dave Cook

AMA Rulebook Section

The following text is copied from the AMA Rulebook - Control Line Precision Aerobatics
For event 322, 323, 324, 325, 326. Authors comments are in underlined italics.

1. Applicability. All pertinent AMA regulations (see sections titled Sanctioned Competition, Records, Selection of Champions, and General) and the Control Line rules shall apply, except as specified below.

2. Model Requirements and Contestant Classification. Engines shall be of the reciprocating internal combustion type or of the jet type. No combination jet-reciprocating engine installation will be allowed.

2.1. It is recommended whenever possible that the three (3) AMA age classifications be adhered to, though it is acknowledged that three (3) age classifications are sometimes not possible due to space, finances, manpower, etc. Emphasis is placed on this recommendation because of the tremendous amount of manual dexterity required to be proficient in this event, and the usual vast difference in manual dexterity according to age. If individual competitions cannot be staged for each age group, it is preferable to have only an Open age class competition, Senior age class competition, etc., rather than to lump all age classes together. Any limitations or combinations should be clearly stated in contest announcements.

2.2. Contestants will be allowed the use of a second model if the first is damaged or destroyed. Appearance points will be awarded to the second model following verification of substantial damage to the first model. The second model and its appearance points will be used for subsequent attempts.

2.3. All models shall be identified by the contestant's AMA license number permanently affixed to the upper side of the right-hand lifting surface or to each side of the fuselage or vertical stabilizer. The height of numerals shall be at least one (1) inch (25.4 mm). Both stroke and width shall be such to enable ready recognition. It is suggested that the letter "N" be placed in front of the license number when the number is affixed to the side of the fuselage or vertical stabilizer.

3. Safety Provisions. The control handle/device, thong, connections, lines and internal control system of the model, up to the point of attachment to the model (e.g., bellcrank or other device) will be in good condition, free of kinks, rust, etc., regardless of whether the equipment has already withstood the pull test. The judges' opinion will be final in regards to safeness of a model or equipment. Judges shall exert their authority to disqualify a model deemed unsafe for flight. Safety precautions must be adhered to by the contestant while the model is in flight, with unnecessary and/or persistent low flying under 1.20 meters (3.9 feet) being grounds for deduction of points or disqualification. The flier will retain the control handle in his hand at all times during which the model is in motion.

This low flying statement in the rules was a safety precaution put in years ago to keep from hitting squirrels, worms and other ground dwellers. In my opinion 3' is the same error as 7' and 2' is the same error as 8'. This statement should be eliminated. Low flying (under 4') does not present any more significant danger than 4' to 6' does. Penalty should not increase for low flying over high flying.

3.1. A pilot's circle shall be clearly marked. That circle shall have a minimum radius of three (3) feet but not larger than five (5) feet in radius.

4. Control Lines. As per the chart.

5. Pull Test. As per the chart. Pull tests shall be performed immediately before each flight. The method of holding the model for the pull test as specified in the Control Line General rules shall not apply to CL Precision Aerobatics. Considering the fragile construction of Precision Aerobatics models, they may be held in any manner as long as no bodily contact is made with the leadouts, flying wires, or any other element of the control system.

6. Landing Gear. The landing gear must consist of any combination of permanently affixed wheel(s) and/or skid(s) which allow the model to take off and land under its own power in a normal manner. Any main landing gear or other appendages affixed to the model which, in the judges' opinion, are unrealistic or impractical for use on full-size, man-carrying aircraft, will not be allowed. Drop-off gear or similar takeoff devices are not permitted. If a retractable gear is used for takeoff, it must extend to its original position for landing

7. Flight Procedure. Each contestant will be called to the circle when it is his or her turn to fly. From the time they are called to the circle, contestants will have a maximum of five (5) minutes to give the hand signal to begin starting their engine(s). Once the starting hand signal has been given, contestants will be allowed a maximum of three (3) minutes to become airborne. A contestant may make as many starts as necessary, or may take off, land and restart if necessary, as long as the three minute time period has not been exceeded. If a second takeoff is made during the three minute time period, the first takeoff score will be canceled and a new score given. Failure to give the starting hand signal within five minutes of being called to the circle, or failure to become airborne within three minutes of giving the starting signal, shall be charged as an attempt. Contestants shall be allowed three (3) attempts to make two official flights.

7.1. AMA Nationals Procedures. A procedure with periods of qualification, semifinals and finals which uses more than three (3) attempts, two (2) officials, and which accumulates points from more than the single best flight may be used at the AMA National Championships.

8. Duration of Flights. Eight (8) minutes total elapsed time is allowed from the time the contestant gives a hand signal prior to starting his engine (this should be done with a prearranged plan, and upon signal to or from judges) to start, take off, complete the flight pattern and land. No maneuver, including the landing, will be scored after the eight (8) minutes allowed have elapsed. No restriction is placed on maneuvers a contestant may wish to practice between completion of the pattern and landing; however, a contestant may be disqualified, or points may be deducted from his total score, if he indulges in any manner of unsafe flying during this free period.

What constitutes unsafe flying? When is the last time you saw anybody hurt by a low flying stunt ship or even a crashing stunt ship - should be removed as it can cause problems if invoked by an overzealous judge. The rule is obsolete.

9. Judges and Scoring. There is no substitute for experienced judges. When experienced judges are not available, the Contest Director should arrange for practice judging. No judge should start the day "cold." Usually there are contestants available who are willing to fly a pattern for practice judging. If this practice procedure is followed, judges must not discuss the flier's pattern or divulge the potential score of the flier in any manner. If possible, judges should not alternate or be substituted during the entire period in which any given age classification is being judged. If the event is divided into age classifications but with a prize for most points regardless of age, all ages should fly before the same judges if possible. Seldom do judges score alike; thus it may place some contestants at a disadvantage if all do not fly before the same judges. Wherever possible, each judge shall have an assistant whose duty it shall be to mark score sheets as the judge calls out the scores. In this way, the judge need never remove his eyes from the model.

9.1. Scoring shall be based on the appearance of the model and the degree of perfection with which maneuvers are performed. The contestants' flight point score for competition purposes shall be the average of the scores given by no less than two (2) judges. Flight points used shall be those accumulated during the better of the two (2) official flights permitted.

Notice the standard of perfection for point scoring - that is what the judge is looking for

9.2. A contestant shall be permitted to attempt his second official flight when it is his turn even though other contestants may not have completed first flights. Scores shall not be withheld from contestants; preferably, scores should be posted as soon as possible after each flight is completed for all to see.

9.3. The score sheet at the conclusion of this section is recommended by the CL Contest Board, but any other system with which the judges are familiar may be used, provided it is at least as comprehensive as the one recommended. (As scoring is very important for this event, the CB is constantly looking for improvements. Suggested improvements should be sent to AMA Headquarters for forwarding to the CB Chairman.) 10. Appearance. Models shall be judged for appearance complete and ready to fly. After model has been judged, nothing will be removed from or added to the model which, in the judges' opinion, changes in any manner the appearance of the model from the way it was when presented for appearance judging. However, during an attempt for official flight after the contestant has begun to crank the engine, if it becomes necessary to remove the propeller spinner or change of propeller, etc., then it is permissible to leave off the spinner for that particular flight. Any damage to the model after judging, or changes that may be made as a result of such damage, will not be cause for loss of appearance points. Appearance judging will take place just before contestant's first flight. Judges shall exercise prudence in assigning points, and reserve excellent point values for those models which are decidedly above average. Minimum/Maximum Appearance 0 - 2010. 1. Appearance points are added to the contestant's flight points for scoring purposes.

11. Flight Pattern. Maneuvers shall be accomplished in the order listed below under

”“Maneuvers.”

The contestant shall notify the judges prior to the flight as to the specific maneuvers he wishes to omit in order that the judge will not be confused as to what maneuver to follow. Twenty-five flight pattern points shall be awarded a contestant who successfully completes the entire pattern as listed below. Each maneuver may be attempted only once. Not doing the correct number of consecutive maneuvers, doing less than two (2) laps between maneuvers, entering or exiting a maneuver in any way other than is illustrated in the maneuver section, and doing an incomplete maneuver all will result in a loss of pattern points. Omitting any maneuver, either intentionally or otherwise, or completing a maneuver out of its proper order shall result in loss of flight pattern points. A crash or failure to complete the pattern due to engine failure shall also result in loss of pattern points. Exceeding the eight (8) minute total elapsed time limit will cause loss of points on any maneuvers performed after the time limit, as well as loss of flight pattern points.

These statements set the rules for getting pattern points - study them and note that proper entry, exit and full completion of the maneuvers in book sequence are all required.

11.1. At least two (2) laps of level flight shall precede each maneuver, including landing. (A nominal interpretation of the “two (2) lap” level flight requirement is the accepted interpretation, allowing the starting point of one (1) maneuver to begin slightly less than two (2) full laps after the exit point of the prior maneuver due to the width of the maneuvers.) Judges shall not require more than two (2) level laps between maneuvers due to the time limit imposed by these regulations. Level flight at an altitude of from 1.20 to 1.80 meters (3.9 to 5.9 feet) will be considered normal level flight, regardless of the height of the flier. The portions of certain maneuvers which require normal level flight elevation must be accomplished between 1.20 and 1.80 meters (3.9 and 5.9 feet) for maximum points. Fliers and judges alike shall note that maneuvers shall be flown and judged in relation to two (2) or three (3) reference points, depending upon the particular maneuver. For example, loops shall be performed with bottom track at approximately 1.50 meters (4.9 feet) elevation, and the top track at 45 degree elevation of the lines; the vertical eight shall also have the approximate 1.50 meter (4.9 foot) lower track elevation, and the top of the figure(s) shall not be more or less than 90 degrees from horizontal, or directly over the flier's head. All fliers shall attempt to perform maneuvers of approximately the same angular dimensions.

The preceding statements establish the need to be consistent in size and heights during the entire pattern

11.2. Attempted/Incomplete Maneuvers. The model enters the starting point of any maneuver but that maneuver is not fully completed. The attempted/incomplete maneuver shall be awarded a minimum score of 10.

12. Official Flight. The flight will become official when the aircraft turns into the inverted part of the Reverse Wingover. The pilot has the right to call off the flight at any time before this maneuver by signaling the judges.

Official flight should be changes to simply - “The flight becomes official at the end of the 5th lap from the point of release, unless the pilot waves of the flight by signalling the judges prior to the end of lap 5.”

Pattern Geometry and Maneuvers

In order to be awarded 25 Pattern Points

- All of the maneuvers must be complete.
- All must be completed within the 8 minute time limit.
- Maneuvers must be in sequence as shown in the rulebook.
- Prescribed entries and exits must be flown.
- Proper number of laps between maneuvers must be flown.

**Rule Book
Tolerance Zones &
Size of Maneuvers**

Judges View 90 Degree Zone

"90" Degrees

+/-
2' Zones

Anywhere in this zone from the judges view can be a legal loop depending on line length.

On 70' lines a 45 degree loop is 54' (16.5 Meters). Add the tolerance of plus or minus 3' (1 Meter) = an allowable loop size of 57' (17.3 Meters) to 51' (15.5 Meters)

On 60' lines a 45 degree Normal Loop is 46' (14 Meters). Include the tolerance of plus or minus 3' = a loop of 43' (13 Meters) to 49' (15 Meters).

On 60' lines a 38 degree Clover Loop is 39' (12 Meters). Include the tolerance of plus or minus 3' = a loop of 36' (11 Meters) to 49' (13 Meters).

On 70' lines a 38 degree Clover Loop is 46' (14 Meters). Add the tolerance of plus or minus 3' (1 Meter) = an allowable loop of 43' (13 Meters) to 49' (17 Meters)

45/38 Deg +/-
2' (.6 Meters)
Zones

"45"
Degrees

15'

38" Degrees

46'

57'

39'

Level Flight
+/- 1' (.3 Meters) Zone

Lines must be about parallel to the ground plane to establish true "0" degree reference

"0"
Degrees

4.9' (1.5 Meters)

Judges View of Level Flight Zone

Note:
The rule book calls for all maneuvers to be the same size and common points to be in the same relative position.
Bottom tracks as well as 45 and 90 degree points should be held in the same position thruout the flight. Once a pilot sets level flight in take off & level flight it should be held on all bottoms in the flight. the same goes for 45 & 90 degree points.

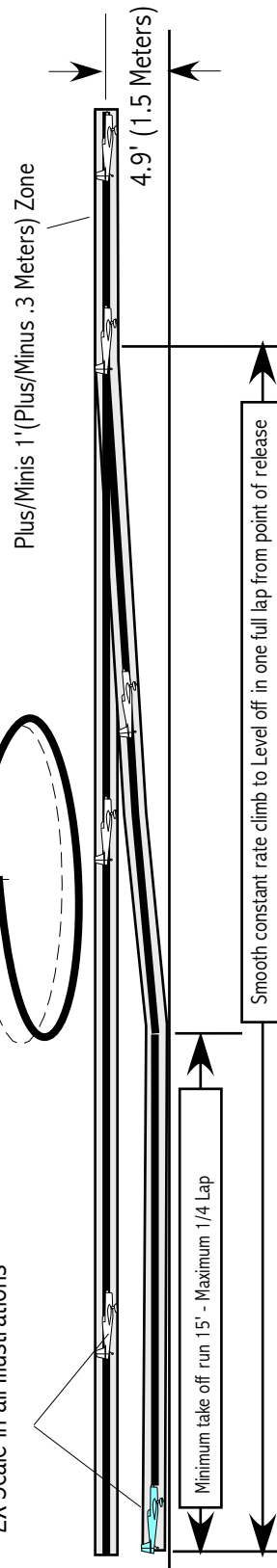
#1 Take Off & Level Flight

Rulebook Requirements:

13.1. Takeoff: A correct takeoff consists of the model rolling smoothly along the ground for a distance of not less than 4.5 meters (14.8 feet), but not greater than one quarter of a lap. The model then rises smoothly into the air with a gradual climb and a smooth leveloff to normal flight level over the point at which the model commenced its ground roll. The model continues on for two (2) smooth laps of normal level flight to point of original leveloff.
Maximum 40 points. Minimum 10 points.
Errors: The model bounces or becomes airborne too soon, or too late. Takeoff, climb or leveloff is not gradual and is smooth. Leveloff occurs too soon, or too late. Leveloff and normal flight level are not within a height of 1.2-1.8 meters (3.9-5.9 feet).

Level-off at Normal Level Flight height at exactly one lap from point of release, then continue for 2 laps at Normal Level Flight height

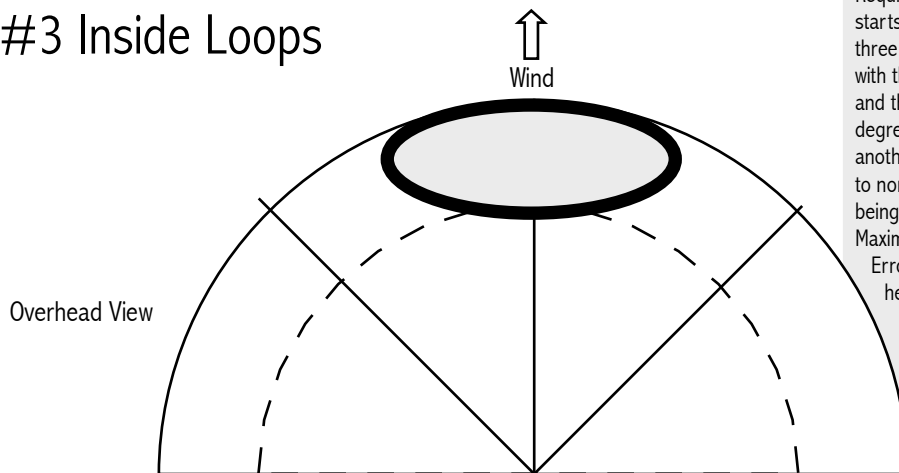
Note:
Model is shown at 2X Scale in all Illustrations



Required Pattern Sequence



#3 Inside Loops

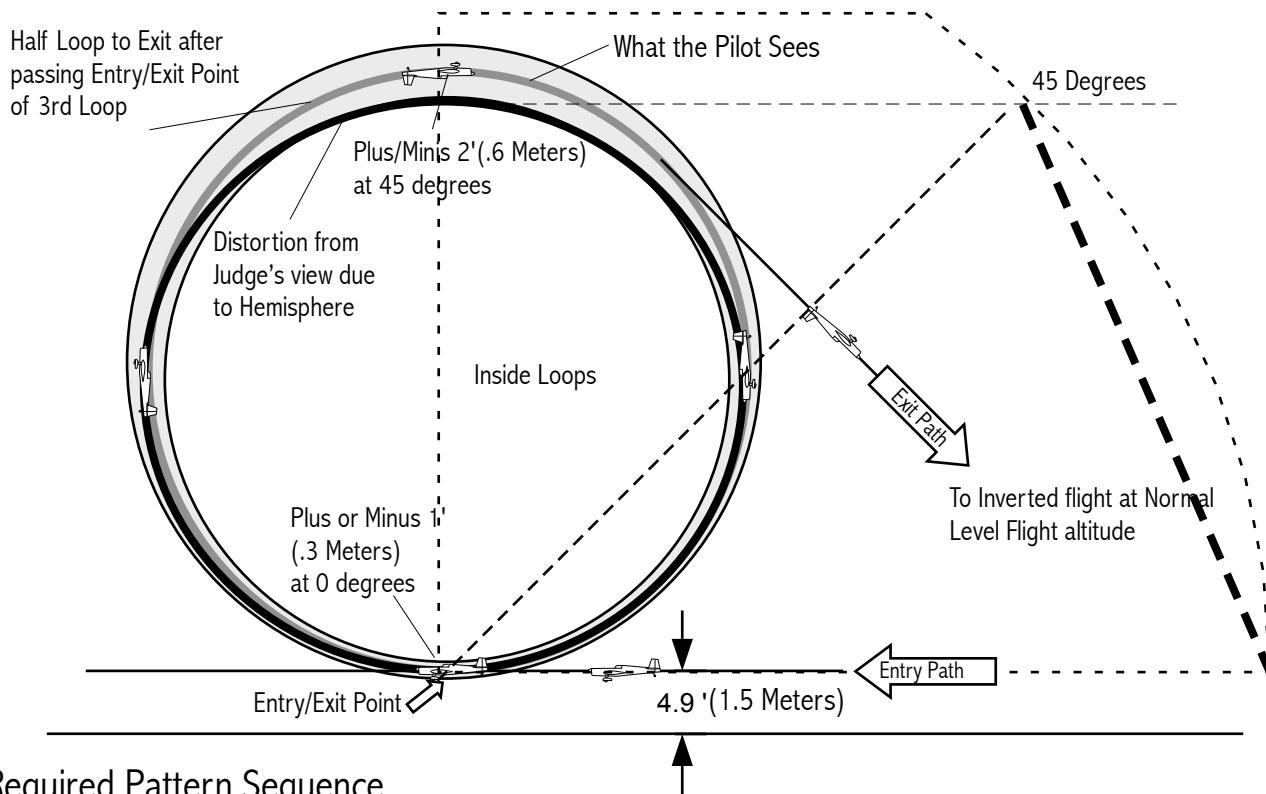


Rulebook Requirements:

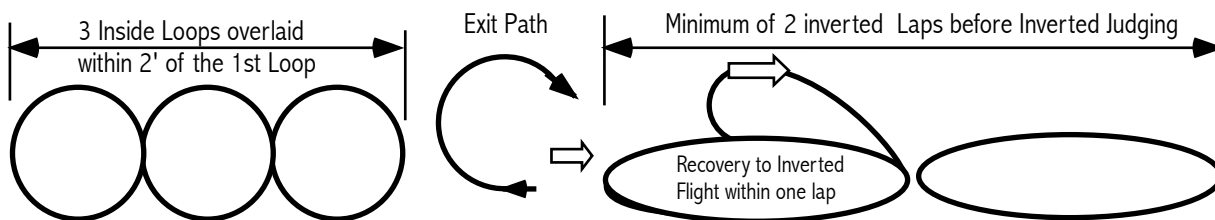
13.3. Consecutive Inside Loops(Three (3) Required). Correct loops are judged when the model starts from normal flight level and makes a series of three (3) smooth, round loops, all in the same place with the bottoms of the loops at normal flight level and the tops of the loops with the line(s) at 45 degrees elevation. The model then continues for another half loop, recovering inverted and descending to normal flight level, flying two (2) laps before being judged for inverted flight.

Maximum 40 points. Minimum 10 points.

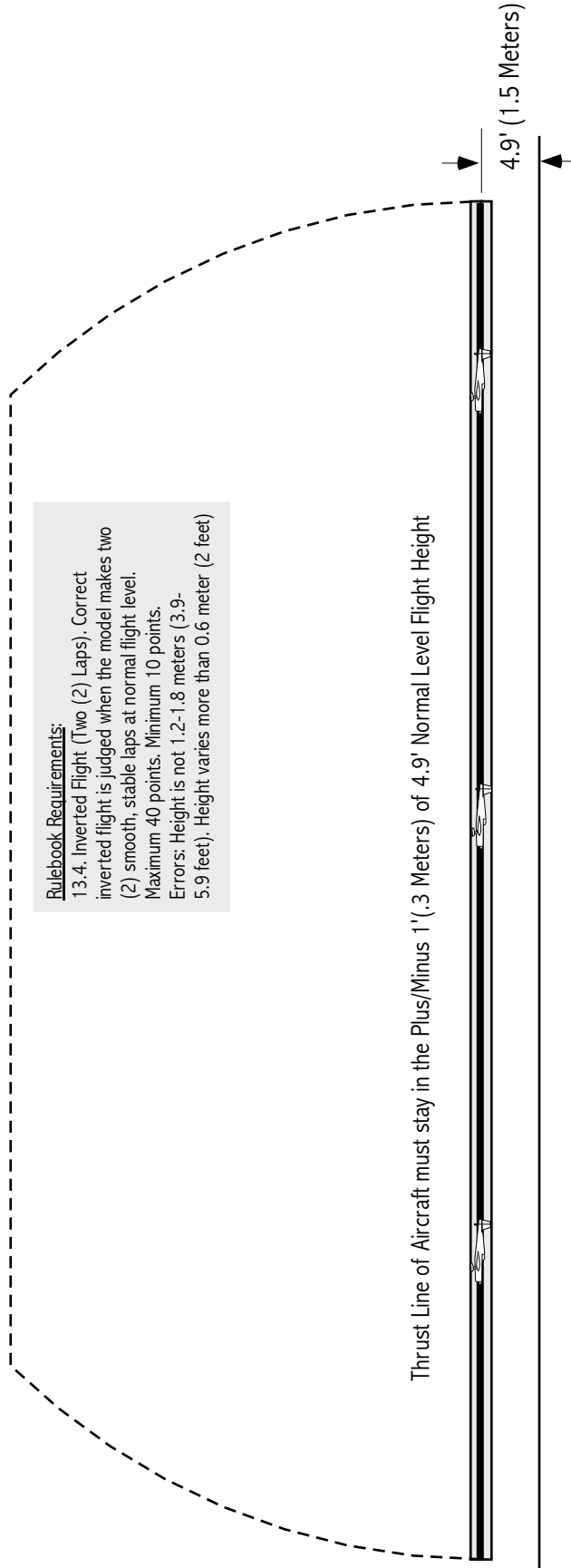
Errors: Loops are rough and irregular (i.e., eggshaped, hexagonal, etc.). Bottoms of loops are not at 1.2-1.8 meters (3.9-5.9 feet) height. Tops of loops vary more than 0.6 meter (2 feet), plus or minus, of the 45 degrees elevation point. Second and third loops vary more than 0.6 meter (2 feet) from the path of the first loop.



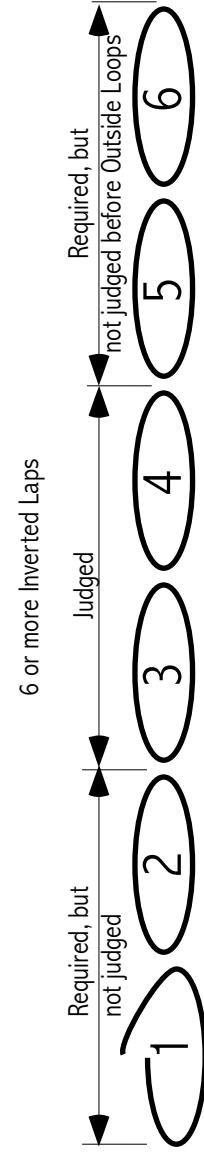
Required Pattern Sequence



#4 Inverted Flight



Required Pattern Sequence



6 or more Laps are required - only the 3rd & 4th laps are judged
 Judges & Flyers must pay attention to this so that the correct laps are properly flown and judged.

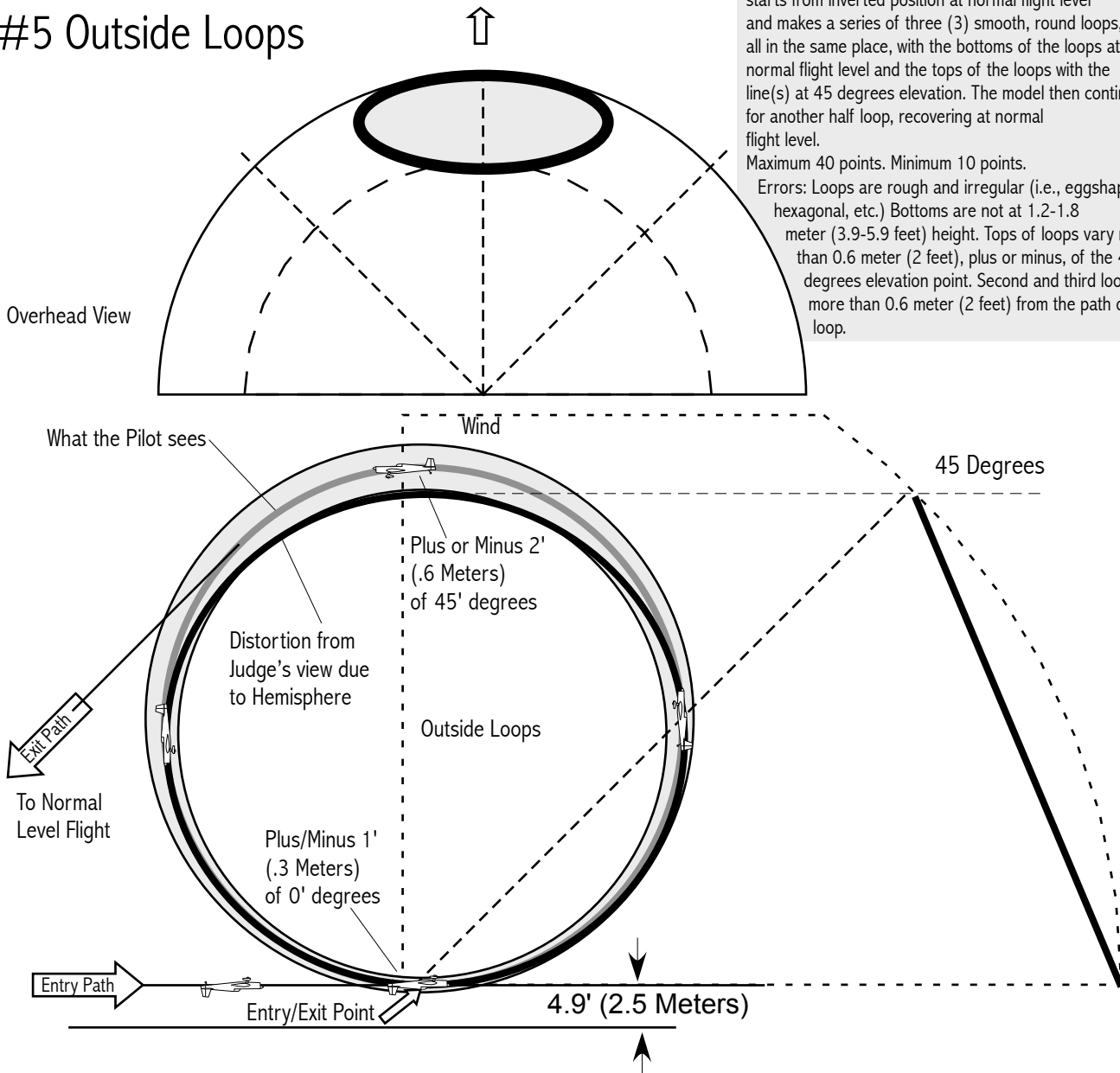
Rulebook Requirements:

13.5. Consecutive Outside Loops (Three (3) required). Correct loops are judged when the model starts from inverted position at normal flight level and makes a series of three (3) smooth, round loops, all in the same place, with the bottoms of the loops at normal flight level and the tops of the loops with the line(s) at 45 degrees elevation. The model then continues for another half loop, recovering at normal flight level.

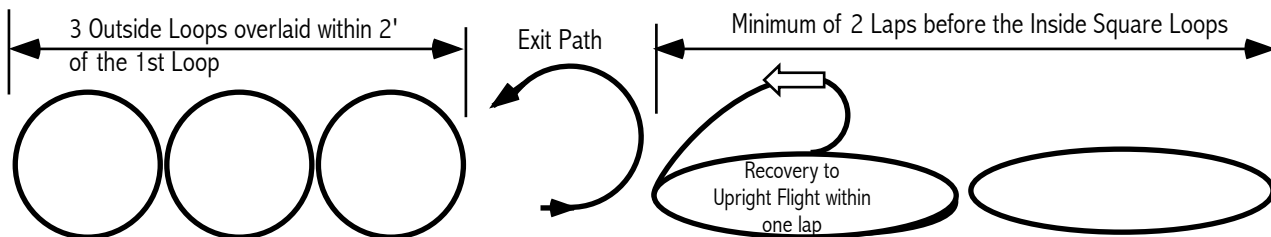
Maximum 40 points. Minimum 10 points.

Errors: Loops are rough and irregular (i.e., eggshaped, hexagonal, etc.) Bottoms are not at 1.2-1.8 meter (3.9-5.9 feet) height. Tops of loops vary more than 0.6 meter (2 feet), plus or minus, of the 45 degrees elevation point. Second and third loops vary more than 0.6 meter (2 feet) from the path of the first loop.

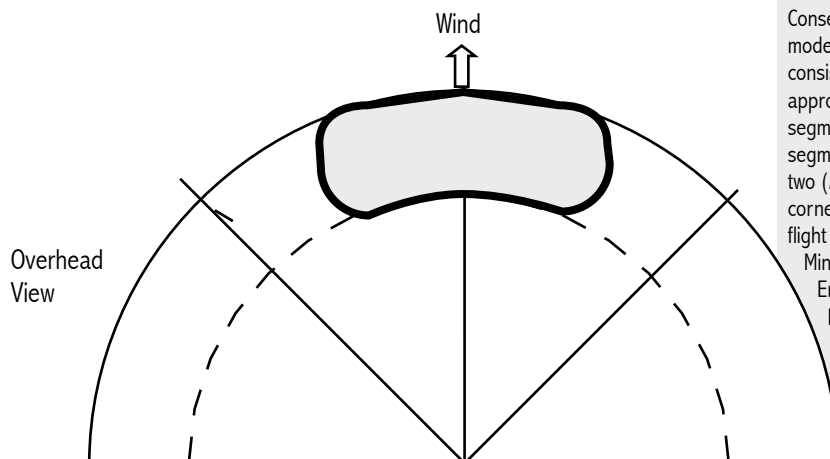
#5 Outside Loops



Required Pattern Sequence



#6 Inside Square Loops

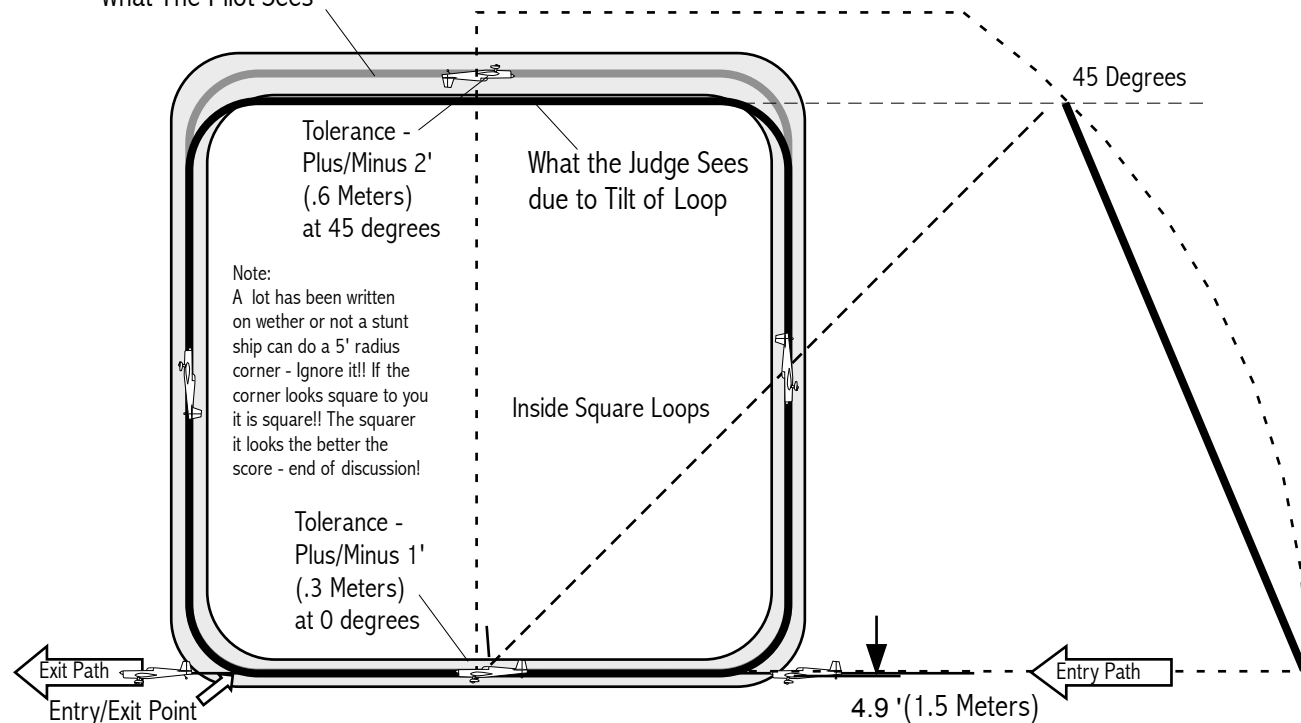


Rulebook Requirements:

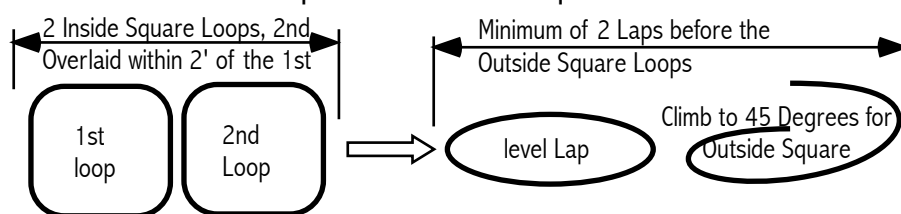
13.6. Consecutive Inside Square Loops (Two (2) required). Consecutive inside square loops are judged correct when the model starts from normal flight level and flies a square course consisting of two (2) loops, each with four (4) inside turns of approximately 1.5 meters (4.9 feet) radius and straight sized segments with bottom segments at normal flight level and top segments as inverted level flight at 45 degrees elevation. The two (2) bottom corners are equal and so are the two (2) top corners. The maneuver begins and ends with the model in level flight at the point of start of the first turn. Maximum 40 points. Minimum 10 points.

Errors: Model wobbles on turns. Lower height is not between 1.2-1.8 meters (3.9-5.9 feet). Upper height is not within 0.6 meter (2 feet) of the 45 degrees elevation point. Turns are not precise and exceed 2.1 meters (6.9 feet) radius. Side of loops are not equal. Second loop is not in the same flight path as the first loop.

What The Pilot Sees



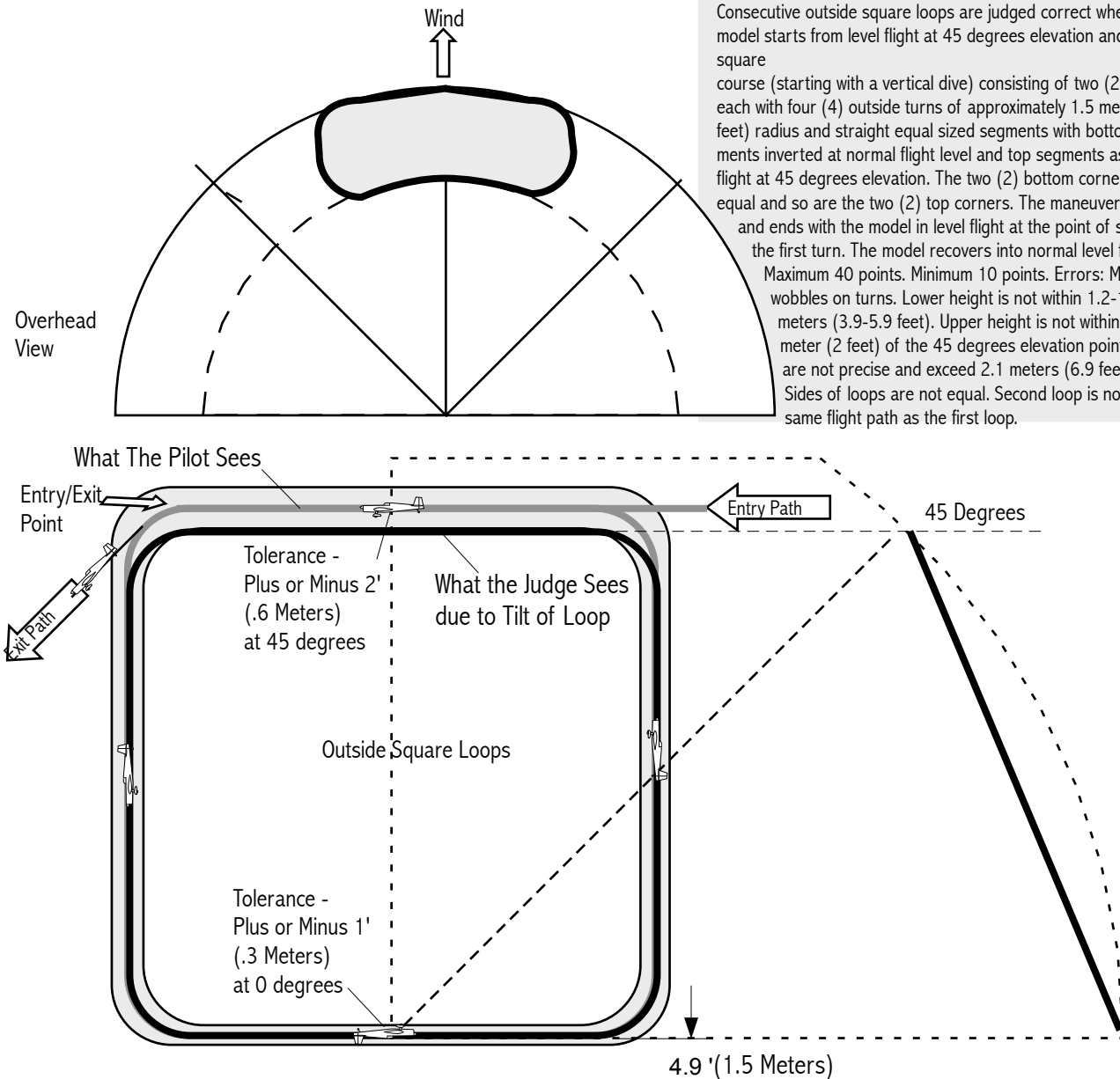
Required Pattern Sequence



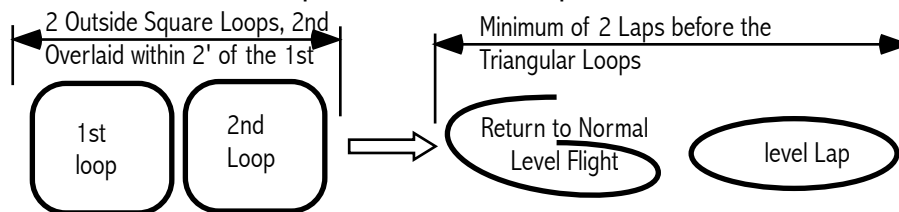
#7 Outside Square Loops

Rulebook Requirements:

13.7. Consecutive Outside Square Loops (Two (2) required). Consecutive outside square loops are judged correct when the model starts from level flight at 45 degrees elevation and flies a square course (starting with a vertical dive) consisting of two (2) loops, each with four (4) outside turns of approximately 1.5 meters (4.9 feet) radius and straight equal sized segments with bottom segments inverted at normal flight level and top segments as level flight at 45 degrees elevation. The two (2) bottom corners are equal and so are the two (2) top corners. The maneuver begins and ends with the model in level flight at the point of start of the first turn. The model recovers into normal level flight. Maximum 40 points. Minimum 10 points. Errors: Model wobbles on turns. Lower height is not within 1.2-1.8 meters (3.9-5.9 feet). Upper height is not within 0.6 meter (2 feet) of the 45 degrees elevation point. Turns are not precise and exceed 2.1 meters (6.9 feet) radius. Sides of loops are not equal. Second loop is not in the same flight path as the first loop.

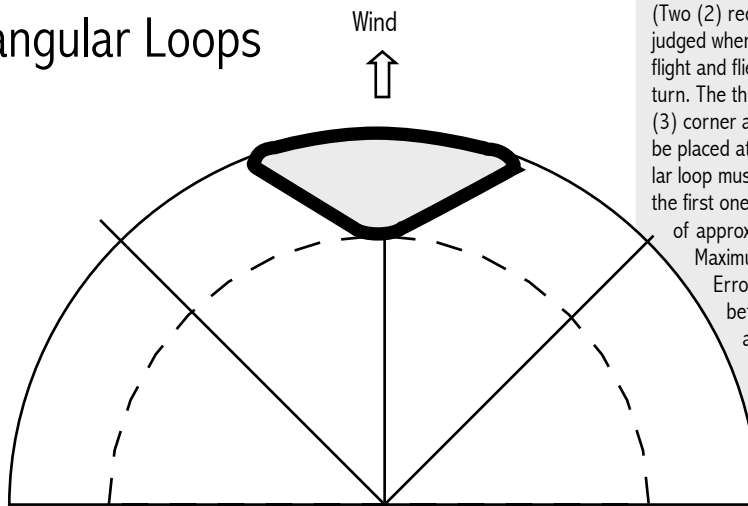


Required Pattern Sequence



#8 Inside Triangular Loops

Overhead View

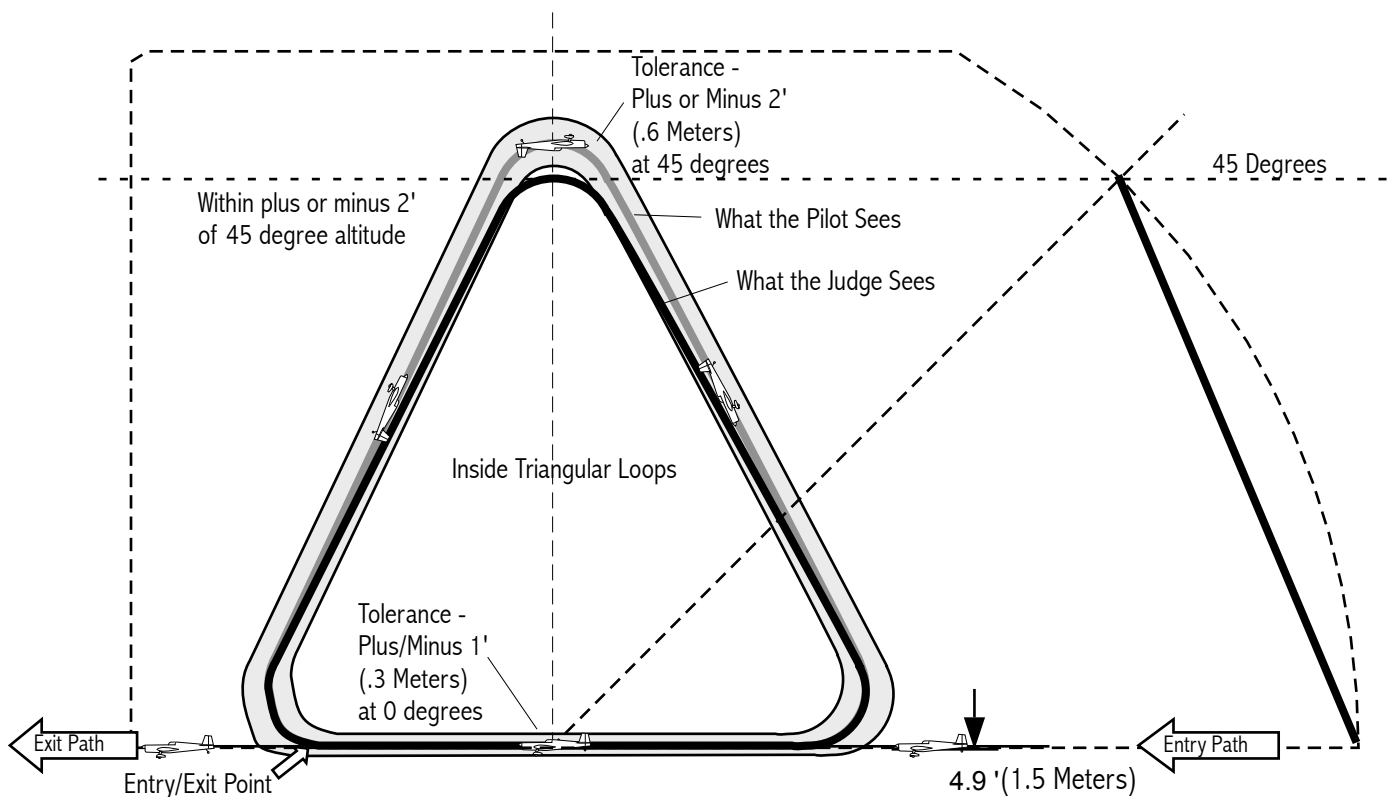


Rulebook Requirements:

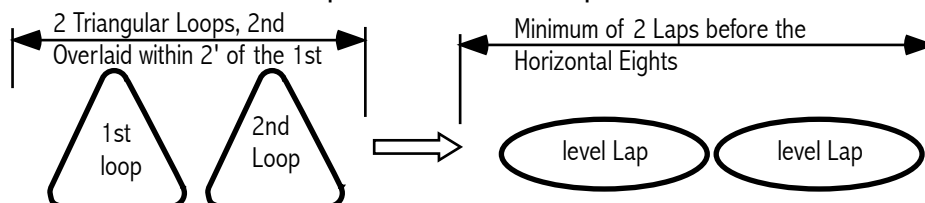
13.8. Consecutive Inside Triangular Loops (Two (2) required). Correct triangular loops are judged when the model starts from normal level flight and flies a triangular course, starting at the base turn. The three (3) sides of equal length and the three (3) corner angles of equal size. The top corner must be placed at 45 degree elevation. The second triangular loop must be flown in the same flight path as the first one. All corners must be smooth, precise and of approximately 1.5 meters (4.9 feet) radius.

Maximum 40 points. Minimum 10 points.

Errors: Model starts at a height other than between 1.2-1.8 meters (3.9-5.9 feet). Turns are rough and wobbly or exceed 2.1 meters (6.9 feet) radius. Peak of second turns is not within 0.6 meter (2 feet) of the 45 degrees elevation point. Sides are wobbly and not equal in length. Second loop is not in the same flight path of the first loop.

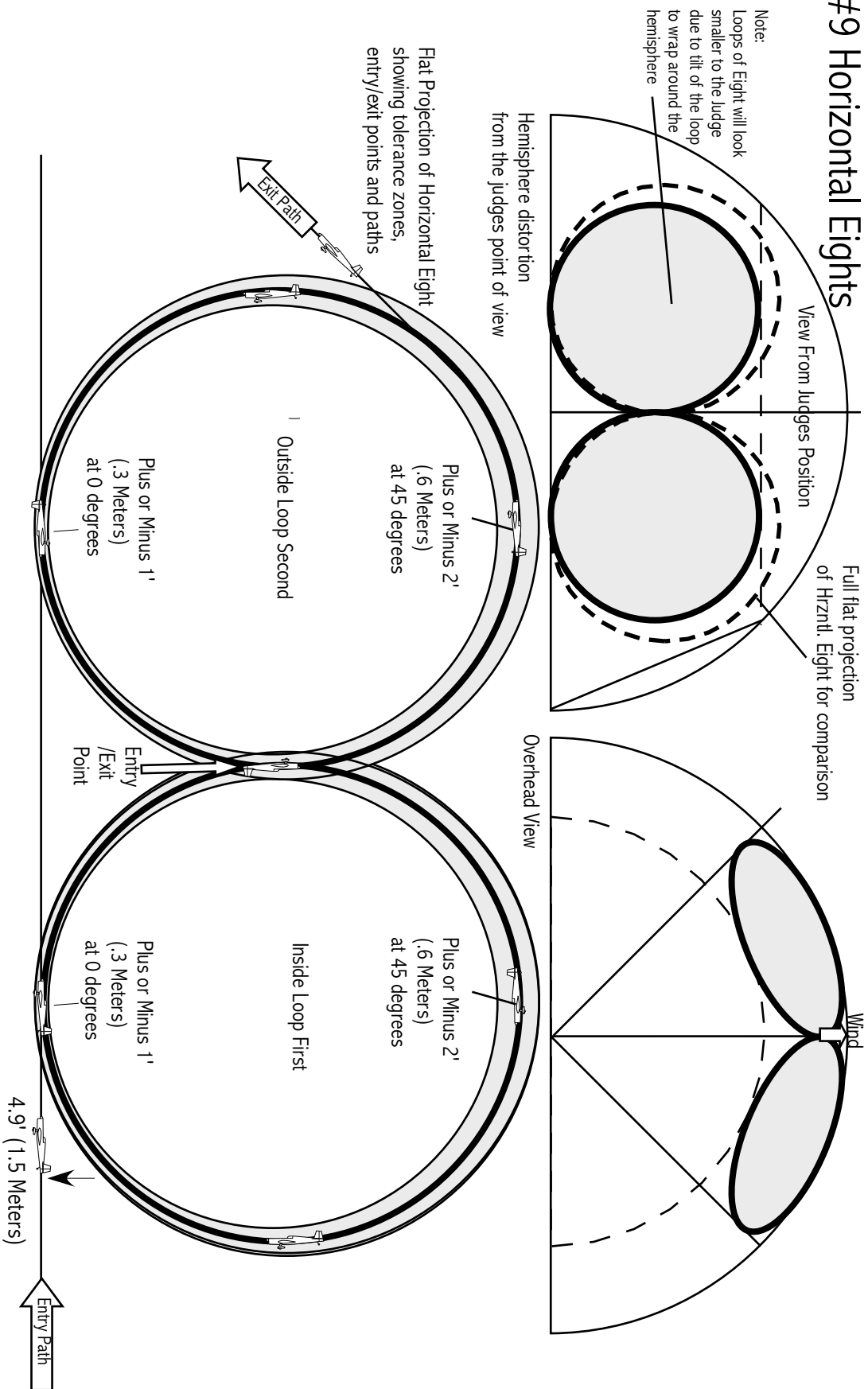


Required Pattern Sequence

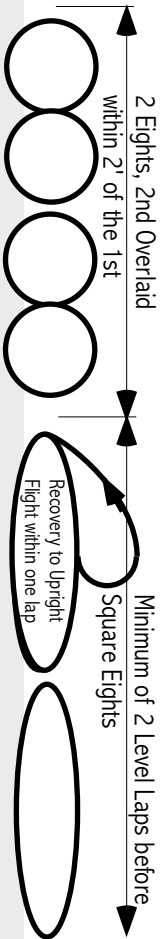


Dave Cook

#9 Horizontal Eights



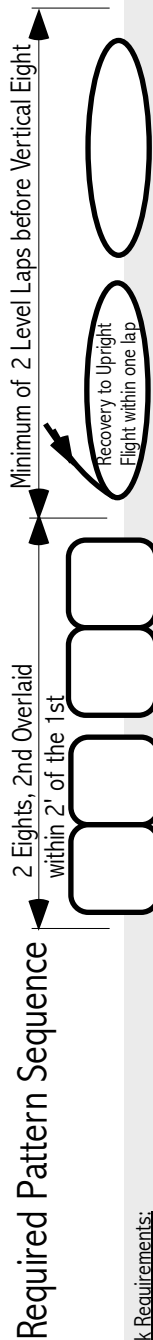
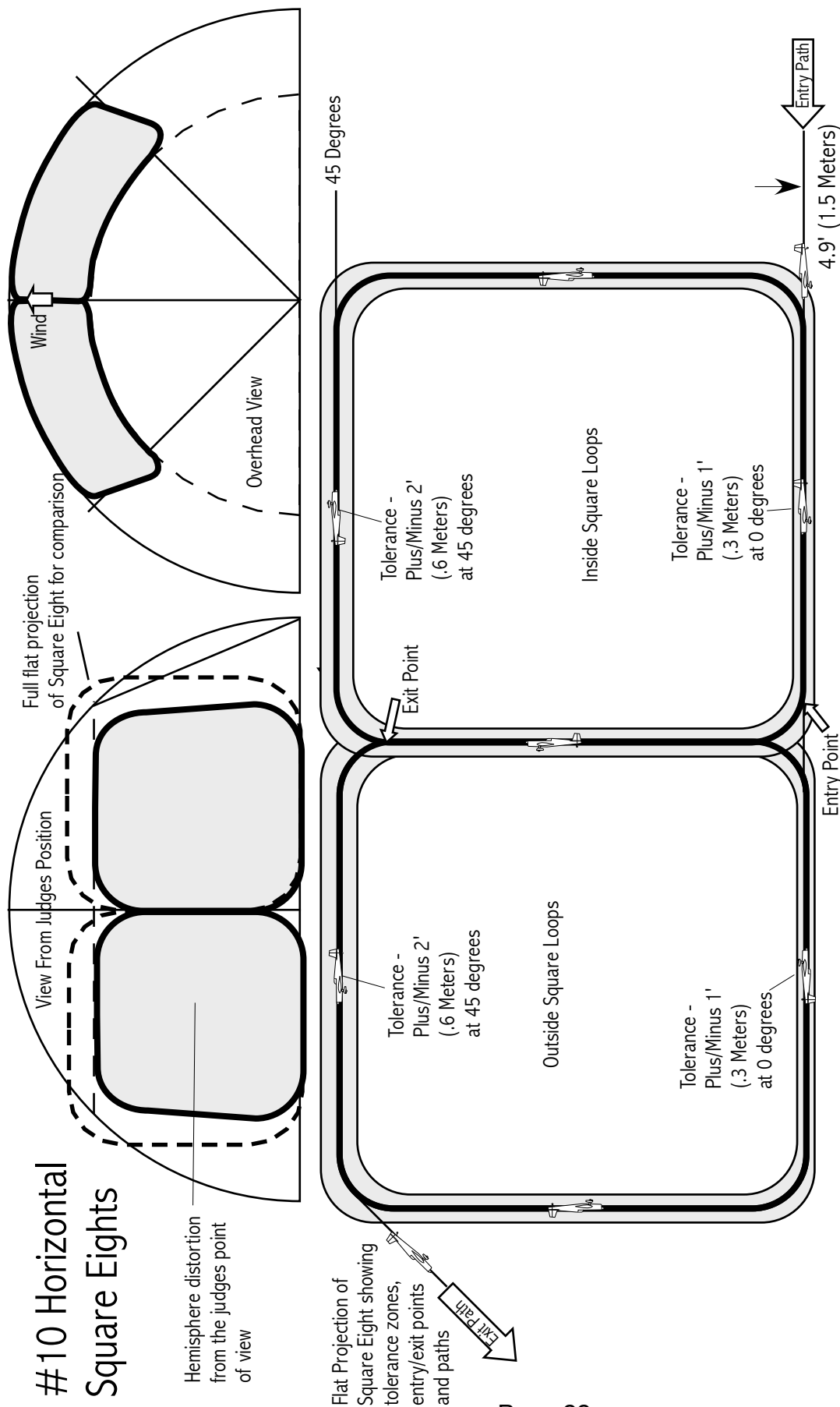
Required Pattern Sequence



Rulebook Requirements:

13.9. Horizontal Eights (Two (2) required). Horizontal eights are to be entered and completed at the intersection point of the circles and exit at the same point. The inside loop must be flown first. Correetights are judged when the model makes two (2) eights, each consisting of two (2) round circles or loops of the same size, tangent to each other, and in a horizontal line. The model must enter the eight from normal flight level and be vertical at the intersection point of tangency of the circles. The eights must be symmetrical. At the top of each circle the model must be at the 45 degrees elevation point; the bottoms of circles must be at normal flight level. Maximum 40 points. Minimum 10 points. Errors: Model is not vertical at entry. Model at top of circles is not within 0.6 meter (2 feet) of 45 degrees elevation point. Bottoms of circles are not within 1.2-1.8 meters (3.9-5.9 feet) height. Loops are not round and equal in size. Point of intersection varies. Second eight is not in the same position as the first.

#10 Horizontal Square Eights



Rulebook Requirements:

13.10. Square Horizontal Eights (Two (2) required). The eight is to be entered in the direction of the climbing sides of the loops, and after completion of two (2) eights the exit is made in the same direction. The inside loop must be flown first. Correct eights are judged when the model starts a vertical climb and makes a modified inside square loop followed by a vertical climb at the same point. The loops are modified so their climbing sides are vertical, and the loops are tangent to each other along these sides, and the turns starting and ending the climbs are 90 degrees. The top sides are slightly shorter than the remaining sides which are of equal length. The maneuver is repeated to form two (2) eights. Tops of loops must be at 45 degrees elevation, bottom of loops must be at normal flight level, and all turns must be smooth, precise, and of approximately 1.5 meters (4.9 feet) radius. Maximum 40 points. Minimum 10 points. Errors: Corners exceed 2.1 meters (6.9 feet) radius. Sides are not straight. Vertical sides and bottom sides are not equal in length. Loops are not equal in size. Top and bottom sides are not horizontal. Turns starting and ending the climbs are not 90 degrees. Tops of loops are not within 0.6 meter (2 feet) of 45 degrees elevation. Bottom of loops are not within 1.2-1.8 meters (3.9-5.9 feet) in height. The position of the climbing side varies. Second eight is not in the same position as the first one.

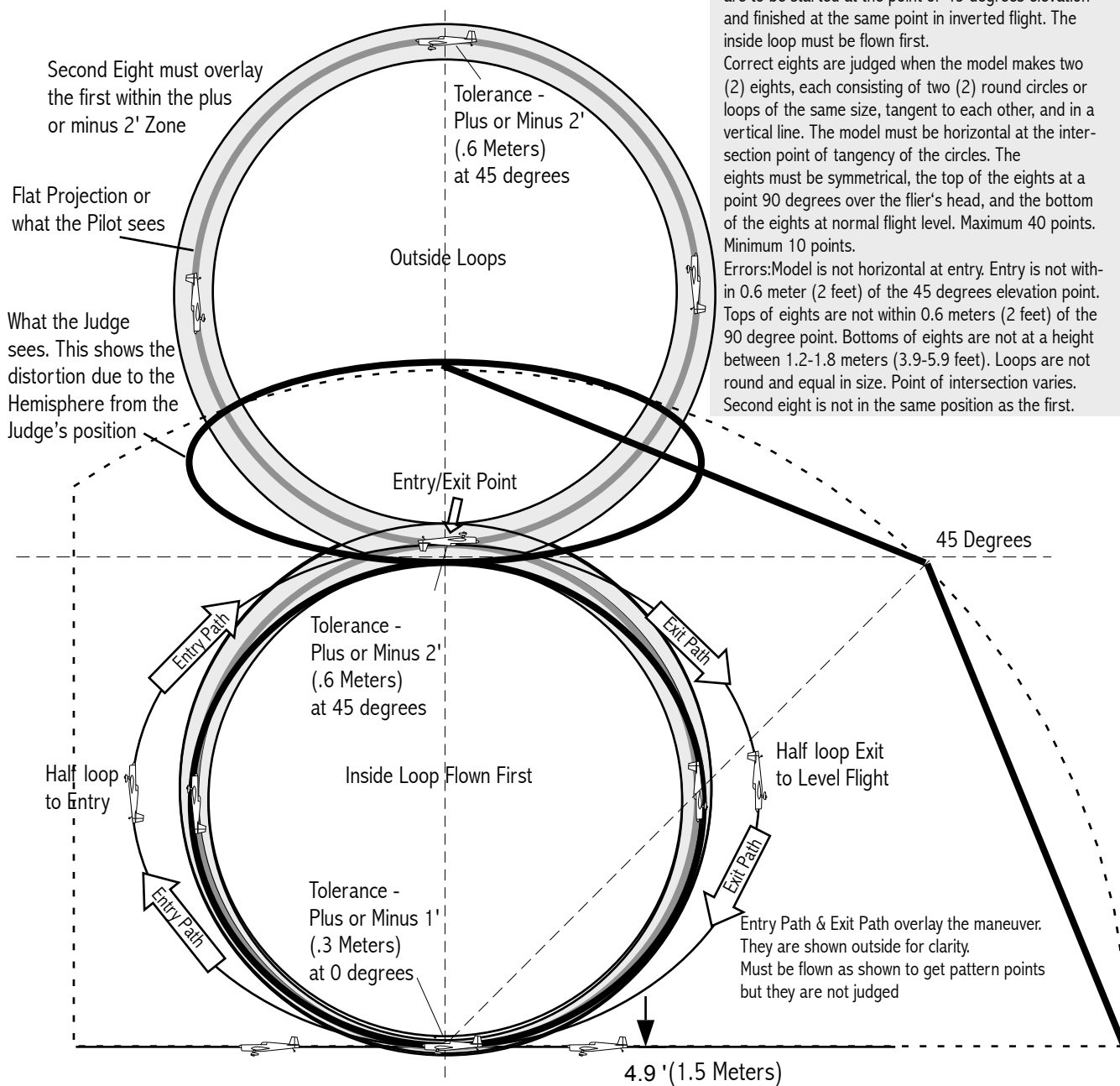
#11 Vertical Eights

Rulebook Requirements:

13.11. Vertical Eights (Two (2) required). Vertical eights are to be started at the point of 45 degrees elevation and finished at the same point in inverted flight. The inside loop must be flown first.

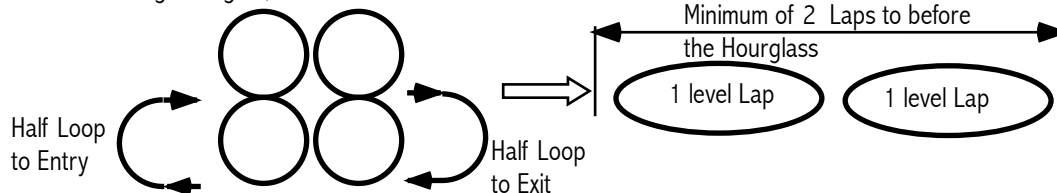
Correct eights are judged when the model makes two (2) eights, each consisting of two (2) round circles or loops of the same size, tangent to each other, and in a vertical line. The model must be horizontal at the intersection point of tangency of the circles. The eights must be symmetrical, the top of the eights at a point 90 degrees over the flier's head, and the bottom of the eights at normal flight level. Maximum 40 points. Minimum 10 points.

Errors: Model is not horizontal at entry. Entry is not within 0.6 meter (2 feet) of the 45 degrees elevation point. Tops of eights are not within 0.6 meters (2 feet) of the 90 degree point. Bottoms of eights are not at a height between 1.2-1.8 meters (3.9-5.9 feet). Loops are not round and equal in size. Point of intersection varies. Second eight is not in the same position as the first.



Required Pattern Sequence

2 Figure Eights, 2nd within 2' of the 1st



Dave Cook
6/1/03

#12 Hour Glass

Plan View -
What the Pilot Sees

Many flyers will narrow
up the Hourglass to
minimize the curvature
seen from the
hemisphere
distortion effect.

Tolerance -
Plus or Minus 2'
(.6 Meters)
at 90 degree
Wingover Track

45.00 °

Rulebook Requirements:

13.12. Hourglass Figure (One (1) required). The correct hourglass figure is judged when the model starts from normal flight level and flies an hourglass course starting with an abrupt turn followed by an inverted climb, turns into a wingover path across the circle center for a distance equal to half the total climb, turns into an inverted dive, and recovers at normal flight level. The flight paths of the climb and the dive cross at 45 degrees elevation. The four rounded corners of the figure shall have a radius of approximately 1.5 meters (4.9 feet) and the flight path forms two (2) equilateral triangles of equal size, turned peak to peak, and one (1) in vertical line above the other. Maximum 40 points. Minimum 10 points. Errors: Maneuver starts at other than the normal flight level of 1.2-1.8 meters (3.9-5.9 feet). Turns are rough and wobbly or exceed 2.1 meters (6.9 feet) radius. Top of figure is not within 0.6 meter (2 feet) of the 90 degrees position over the pilot's head. Triangle segments are not of equal length. The maneuver is not symmetrical around the vertical line through the crossing point at 45 degrees elevation. Recovery is not at normal flight level of 1.2-1.8 meters (3.9-5.9 feet).

Hemisphere Distortion View -
What the Judge Sees

45 Deg

Tolerance -
Plus or Minus 2'
(.6 Meters)
at 45 degrees

Tolerance -
Plus or Minus 1'
(.3 Meters)
at 0 degrees

Exit Path

Entry/Exit Point

4.9' (1.5 Meters)

Entry Path

Required Pattern Sequence



2 1/2 Laps for upwind entry
to Overhead Eights

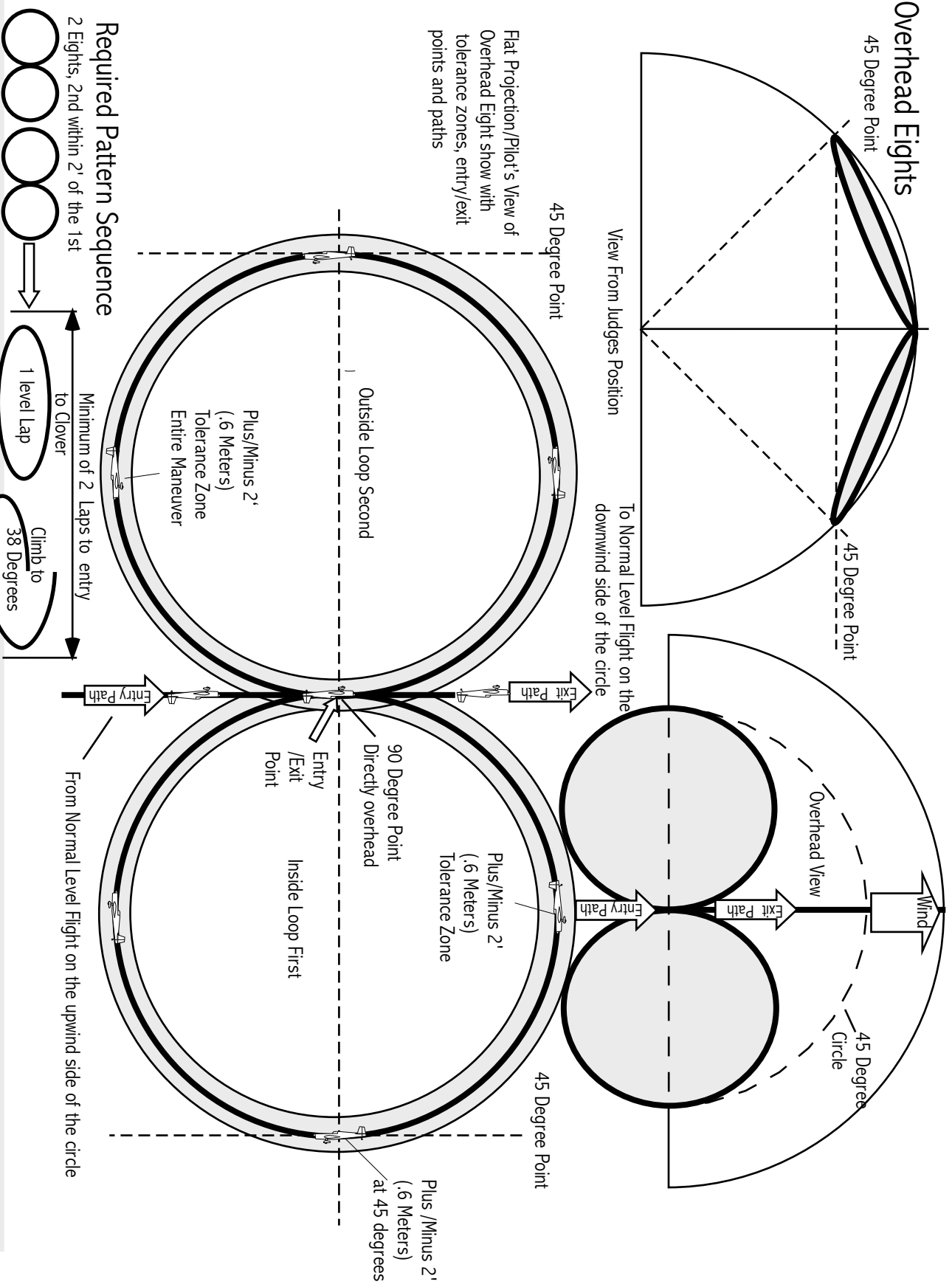
1 level Lap

1 level Lap

1/2 level Lap

Dave Cook
11/14/02

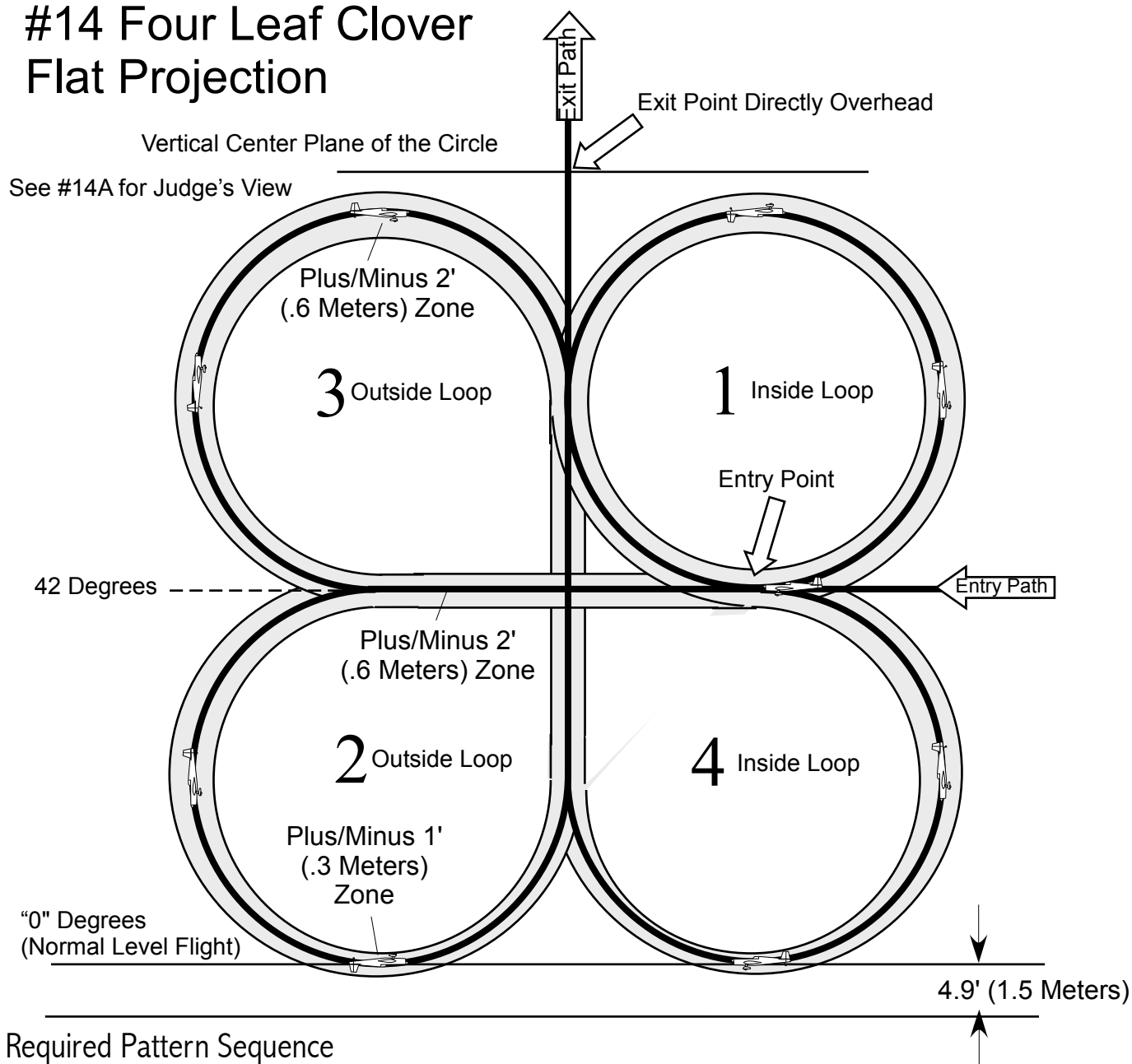
#13 Overhead Eights



Rulebook Requirements:

13.13. Overhead Figure Eights (Two (2) required) Overhead eights are to be entered and completed at the intersection point of the circles, directly over the flier's head, and exit from the same point. The inside loop must be flown first. Correct overhead eights are judged when the model makes two (2) eights, each consisting of two (2) round circles of the same size, with the intersection or point of tangency directly over the flier's head. The model must enter the eights with a vertical climb through the center of the circle, and must always point in this direction at the center of the eights. The eights must be symmetrical and the model at the lowest point of each circle must be at a point of 45 degrees elevation. Maximum 40 points. Minimum 10 points. Errors: Model is not vertically overhead at entry, Low point of circles is not within 0.6 meter (2 feet) of the 45 degrees elevation point. Loops are not round and equal in size. Point of intersection varies. Second eight is not in the same position as the first.

#14 Four Leaf Clover Flat Projection



Required Pattern Sequence



Rulebook Requirements:

13.14. Four Leaf Clover(One (1) required). The maneuver is entered from level flight at approximately 42 degrees elevation, and consists of one (1) full inside loop, level flight, three-fourths (3/4) of an outside loop, vertical climb, three-fourths (3/4) of an outside loop, level inverted flight, three-fourths (3/4) of an inside loop, and a vertical climb. The right loops are tangent to the left loops along a vertical plane of symmetry through the center of the clover leaf, and the bottom loops are tangent to the top loops. The loops are of equal size and they are connected by horizontal and vertical flight paths. The bottom points of the maneuver shall be at 1.5 meters (4.9 feet) height, and the top shall be tangent to the vertical plane through the circle center. When the last loop is performed, the maneuver is made complete by a vertical climb through the center of the four leaf clover. Maximum 40 points. Minimum 10 points. Errors:Entry is not within 0.6 meter (2 feet) of 42 degrees elevation point. Loops are rough or not of equal size. Paths connecting loops are not properly horizontal or vertical according to the maneuver sketch. Bottoms of lower loops are not at a height between 1.2-1.8 meters (3.9-5.9 feet). Tops of upper loops are not within 1.2 meters (3.9 feet) of the vertical plane through the circle center. Loops are not properly tangential to form a square pattern. Model recovers before it has flown vertically through the clover pattern.

Overhead View

Wind

Exit Point

Entry Point

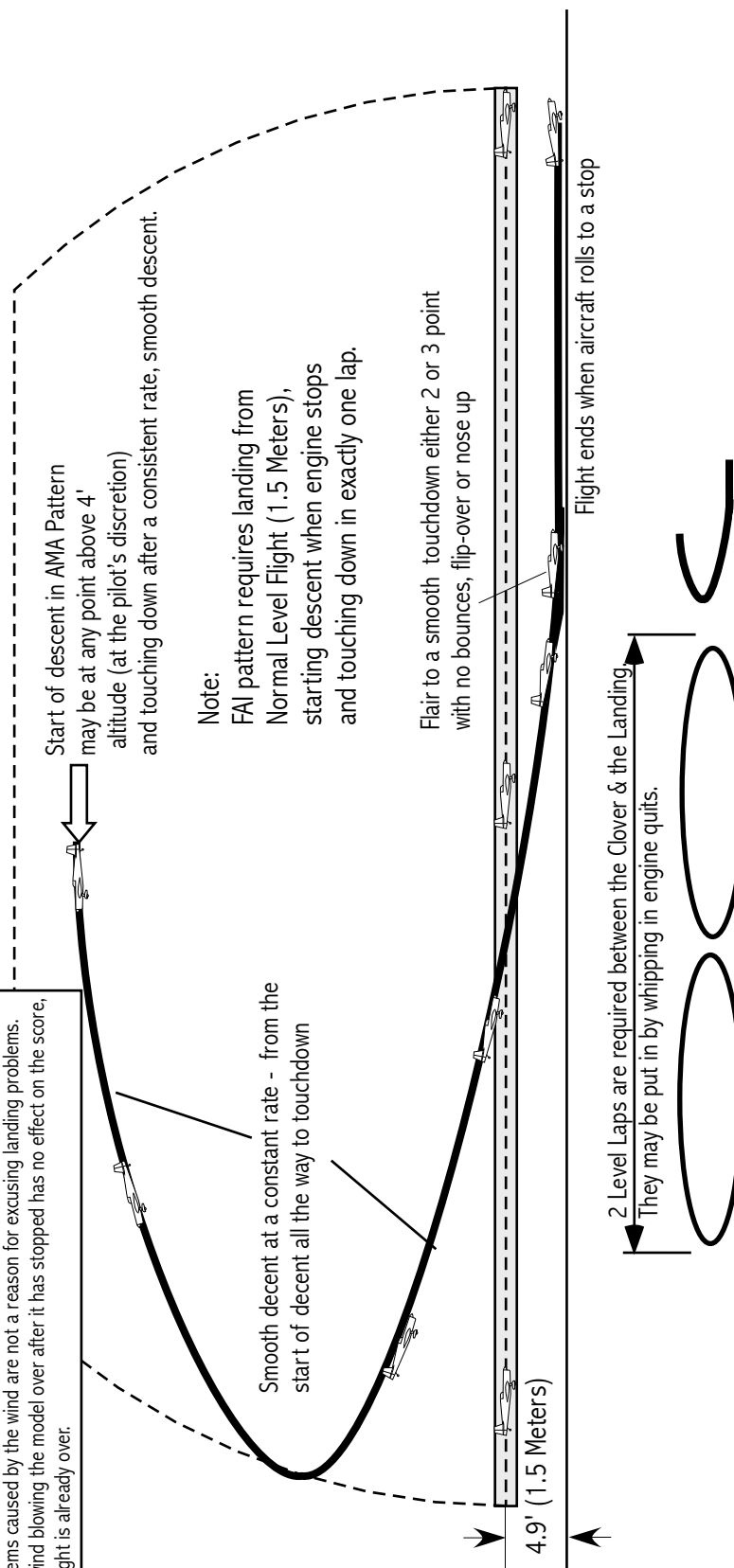
k



#15 Landing, Approach & Touchdown

Note:

This is the only maneuver that "0" points can be given even if it is attempted. Generally a flip over or standing on it's nose, during roll-out, is considered a crash and results in "0" points and loss of pattern points. Dragging a wing tip or other minor contact is up to the judge and scores as low as "10" can be awarded. Flip overs, etc. on roll-out that are caused by runway conditions (not in the control of the pilot) can, at the discretion of the judges, be ruled not affecting the score and normal points for the landing awarded. Problems caused by the wind are not a reason for excusing landing problems. The wind blowing the model over after it has stopped has no effect on the score, the flight is already over.



Rulebook Requirements:

13.15. Landing. A correct landing is judged when the model descends smoothly to land with no bounce or unusual roughness, and without any part of the model other than the landing gear having touched the ground. Main wheel(s) or three-point landings are permissible. The duration of the flight ends when the model rolls to a stop. Maximum 40 points. Minimum 0 points.

Note: Illustrations are for anticlockwise flight and are reversed for clockwise flying. Errors: An error is committed whenever the model bounces or when any part of the model other than the landing gear touches the ground. A crash, or a flip over, a belly or upside down landing receives no marks. An error occurs each time the model deviates from a smooth descent. Any unusual circumstances, outside the pilot's control, which may have caused one of the above mentioned errors will be taken into consideration by the judges. Note: It is permissible to extend (by whipping) the descent, to achieve the minimum two (2) laps between maneuvers, to maintain eligibility for pattern points.

AMA/FAI Score comparison.

FAI	AMA	
0.0	0	
0.5	2	
1.0	4	
1.5	6	
2.0	8	
2.5	10	← AMA Minimum Points for an Attempt/Incomplete
3.0	12	<p>← Very Poor</p> <p>↑</p> <p>B</p> <p>E</p> <p>G</p> <p>I</p> <p>N</p> <p>N</p> <p>E</p> <p>R</p> <p>S</p> <p>↓</p> <p>↑</p> <p>I</p> <p>N</p> <p>T</p> <p>E</p> <p>R</p> <p>M</p> <p>E</p> <p>D</p> <p>I</p> <p>A</p> <p>T</p> <p>E</p> <p>↓</p> <p>↑</p> <p>A</p> <p>D</p> <p>V</p> <p>A</p> <p>N</p> <p>C</p> <p>E</p> <p>D</p> <p>↓</p> <p>↑</p> <p>E</p> <p>X</p> <p>P</p> <p>E</p> <p>R</p> <p>T</p> <p>↓</p>
3.5	14	
4.0	16	
4.5	18	
5.0	20	
5.5	22	<p>← Poor</p>
6.0	24	
6.5	26	<p>← Good</p>
7.0	28	
7.5	30	<p>← Very Good</p>
8.0	32	
8.5	34	<p>← Excellent</p>
9.0	36	
9.5	38	<p>← Perfect</p>
10.0	40	

Note: an attempted but incomplete maneuver results in loss of Pattern Points

Rough range of expected scores for each PAMPA Class. Use with caution as a Beginner could throw a 40 pointer at you at any time.

Dave Cook
12/15/03