BAM *Racing Manual*

Club 40
Pylon Racing

Revision A

Bruce Burgess, BAM's 2010 Club 40 Season Winner

Table of Contents

Revision History

Date	Description	Revision
January 24, 2011	This is the initial release of the racing manual.	A

Introduction

In 2010, BAM introduced Club 40 pylon racing as a new club activity. This first release of our racing manual aims to capture and document Club 40 and BAM-specific rules for interested pilots. Much of the information is based on our experience and lessons learned from our first season.

The foundation for this racing manual is the set of rules defined by RCPRO's Club 40 Committee. Some information has been expanded to provide additional details and clarify rules that are unique to the conditions and constraints of our flying field.

Next to documenting relevant rules and requirements, we also hope to generate interest and inspire pilots who have thought about racing, but have not had the opportunity or courage to participate in the races.

Club 40 racing offers a low-cost and simple introduction to pylon racing. Thus, it represents an excellent opportunity for pilots to get a taste of racing. As for many of us who tried pylon racing for the very first time, it has been an enjoyable sport and showed us that pylon racing can be a fascinating club activity.

Our objective is to ensure safe, but fun racing. So please come and join us, and give it a try!

Sincerely,
Your BAM Racing Committee

First contest race (June 5, 2010)

Club 40 Rules and Requirements[1]

Airplane Specifications

NOTE: Some requirements have been expanded to provide additional details.

Recommended Airplanes

- Sky Raider Mach II ARF or ARC (by World Models)[2]
- LA Racer 40 ARF (by World Models)[3]
- Sky Raider Mach II Kit (Sanaloma Laser, LLC)[4,5]

Airframe Requirements

- Airframe must be assembled according to the manual, with the materials provided. However, the following modifications are allowed:

  - Recovering of plane
  - Repairs or reinforcement of airframe
  - Dual aileron servos
  - Removing wood to provide clearance for sport muffler or repositioning of throttle servo to the side
  - Standard size servos or mini servos with 4 screws are required

  NOTE: When building the Sanaloma Laser kit, use hardware that matches the World Models hardware (using imperial hardware to substitute metric hardware is allowed)

- Must use originally provided canopy or equivalent substitute (similar in size and shape)
- Minimum weight (dry weight/without fuel):

  - Advanced Class: 4 lb. and 8 oz.
  - Sport Class: 4 lb. and 4 oz.

- Landing gear:

  - Use original wire landing gear (or substitute with wire landing gear of the same diameter and shape/length)
  - Tail wheel must be steerable

- Wheel diameters:

  - Main wheels:[6]   min. 55 mm or 2 ¼ inches (min. width of 20 mm or ¾ inches)
  - Tail wheel: min. 25 mm or 1 inch

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[1] http://www.club40racing.com

[2] http://www.theworldmodels.com/para/products/airplanedetails.php?airplaneid=220

[3] http://www.theworldmodels.com/para/products/airplanedetails.php?airplaneid=130

[4] http://www.sanalomalaser.com/page_load.php?section_name=club_40_raider

[5] The Sanaloma Laser kit does not include hardware.

[6] For hard/asphalt runways, DU-BRO's low bounce threaded wheels work well (2 ¼ inch, cat. No. 255T)

- Wing requirements:

    - Wing must be held on with screws (original metal screws or nylon bolts)
    - Minimum wing area: 550 sq. inches
    - Minimum wingspan: 53 inches

- Control surfaces may be secured with metal or CA hinges, equivalent CA hinges, plastic hinges or hinge points
- Hinge requirements (per control surface):

    - 3 hinges per aileron
    - 4 per elevator
    - 3 per rudder
    - Hinge lines may be sealed using tape, stick-on plastic covering, or iron-on plastic covering

Propulsion System Specifications

Engine Requirements

- All engines must be stock, including carburetor and muffler as supplied by the respective manufacturer
- Shimming the engine mount to change the thrust line is acceptable
- Possible replacements/substitution parts:

    - Bearings
    - Gaskets (incl. head shims)
    - Glow plug
    - Head and crankcase bolts
    - Propeller nut and washer
    - Remote needle valve assembly

Engine Options for Advanced Class

- Thunder Tiger Pro .40 BB ABC with muffler (recommended)
- SuperTigre GS-40 ringed with silent muffler
- GMS .40 ABC BB with remote needle valve and muffler
- Evolution .40 NT with muffler
- OS .40 BB with muffler
- Any clones of above engines

Engine Options for Sport Class

- Thunder Tiger GP-40 or GP-42
- OS .40 or .46 LA
- OS .40 FP
- Magnum .40 GP
- Tower Hobbies .40 or clones

Spinner Requirements

- Spinner shall be unmodified, commercially available and not exceed 2.5 inches in diameter
- Spinner weights that fit inside a spinner, heavy hub, and aluminum safety spinner nuts are allowed

Propeller Requirements

- Any size and pitch of propeller may be used
- Propellers shall be unmodified and commercially available. Balancing is only allowed as defined in the AMA pylon regulations for class 424 (rule 7.5.2, see below):

    7.5.2. In events requiring stock, commercially available propellers, the following modifications may be made without penalty:

        a. One blade may be sanded on the top (front) side only for balancing.

        b. One side of the hub may be sanded for balancing.

        c. The shaft hole may be enlarged, but only as much as necessary to fit the engine crankshaft. The enlarged hole shall be concentric with the original hole.

        d. Edges and tips may be sanded, but only as much as necessary to remove sharp molding flash.

Fuel Tank Requirements

- Any brand of tank may be used
- Tanks may be raised or lowered to allow for consistent engine runs
- The tank may only be pressurized with muffler pressure
- Bubble-less tanks with an internal bladder may be used
- The stock tank may be converted to use a fuel bladder

Fuel Requirements

- 15% Nitro fuel (NOTE: at this point, BAM will not supply fuel for races)

Hardware

- Control horns, push rods and linkages may be replaced with similar hardware
- Pushrods, if replaced, must exit the fuselage sides in the same position as original specification
- EZ-type connectors are only allowed on throttle (see section 8—especially a. and i.—of AMA Pylon Regulations or RCPRO Club 40 Procedures)
- Nylon wing bolts are allowed
- You may substitute machine screws, nuts and screws of same or larger diameter (#4 SAE is allowed)

Power System Specifications

Receiver Battery Requirements

- Nickel-Cadmium/Metal-Hydride/LiFe/A123 packs: 4-5 cells
- LiPo packs: 2-3 cells
- Recommended minimum capacity: 500 mAh

General Notes

- The race CD/event coordinator has the final say on the legality of "modified" aircrafts
- Technical inspectors may use templates or a "standard" aircraft for reference
- Any modifications deemed to be an attempt to provide for speed enhancement shall not be allowed

Performance Requirements

All entered airplanes must be in flyable condition. Airplanes that show signs of damage or wear that could impact safe flying may be excluded from racing. The technical inspection at registration should identify any safety issues.

Airplanes that have been damaged during a heat or show structural fatigue after a heat must be reported to the Event Coordinator for inspection. It is the pilot's responsibility to ensure the safety of the airplane.

Course Requirements

Safety

During flight operation (racing), **all persons** within 275 feet of the pylon line **must** wear hard hats. Furthermore, BAM utilizes a two-pylon course layout for safety reasons. The advantage of this layout is that no personnel have to be positioned on the actual race course—flying, calling, and judging can occur from safe positions.

In accordance with *Method 1* as described in section 13.2.2 of AMA publication "*Competition Regulations 2009-2010: Radio Control Pylon Racing*," a two-pylon course layout is as follows:

Pylon 2

Pylon 1

Flight Direction ➡
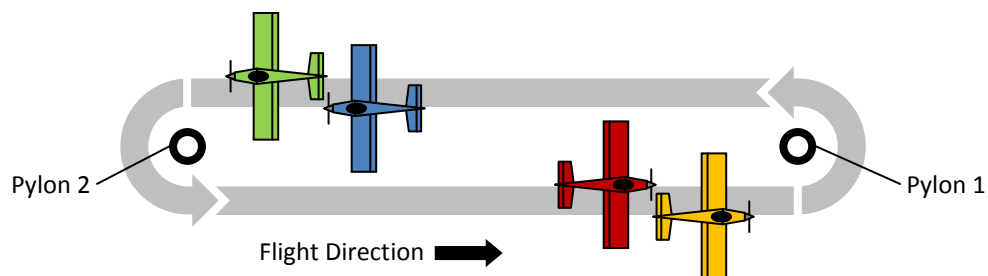
Roles and Responsibilities

General Requirements

A two-pylon course layout requires a minimum of 7 persons to facilitate a heat:

- One (1) Starter
- Two (2) Cut Judges
- Four (4) Lap Counters/Time Keepers (one per airplane, assuming a 4-pilot heat)

    NOTE: The Lap Counter and Caller may be the same person if an insufficient number of volunteers is available.

Furthermore, each racing event should include the following critical roles, which may be performed by pilots when not flying or other volunteers when not needed for a current heat:

- One (1) Event Coordinator
- One (1) Score Keeper

NOTE: The Event Coordinator and Score Keeper may be the same person.

In addition to the above course personnel, each racing team consists of the following flight crew:

- One (1) Pilot
- One (1) Caller (may also be the Lap Counter/Time Keeper)

Role Descriptions

Starter

The Starter ensures that each heat follows a predefined start sequence. In addition, the Starter announces each step of the start sequence and starts the heat by signaling a flag (or other appropriate signaling device). The Starter may abort a heat in case of unsafe flying, crash, or other reasoning that would not allow the proper and safe execution of a heat.

If appropriate technology is not available, the Starter shall count the laps of the leading airplane to determine the end of the heat (note: the leader may change during the race).

Lap Counter (Time Keeper)

The Lap Counter ensures that the assigned airplane completes the correct number of laps for the given heat. The Lap Counter may use a manual counter ("clicker") or an electronic clicker/device to register each completed lap.

If necessary to carry out the heat, the Lap Counter and Caller may be the same person. See also information for Caller.

Cut Judge

The Cut Judge counts the number of cuts by plane and per heat. If technology is available, the Cut Judge may communicate or signal cuts in real-time to the Score Keeper. If such signaling or communication devices are not available, the Cut Judge should note the airplane and number of cuts on a sheet of paper, for example. Once the heat is finished, the Cut Judge communicates the number of cuts for each airplane to the Score Keeper.

Each heat requires two Cut Judges (one per pylon).

Event Coordinator

The Event Coordinator ensures the correct setup and execution of the racing event. S/he shall conduct a pre-race pilot and ground personnel orientation and confirm adherence to Club 40 rules and requirements prior to the first heat and during the event.

Furthermore, the Event Coordinator makes sure that crashed airplanes are retrieved after a heat is finished and all Pilots have safely landed if the retrieval imposes a safety risk during the heat.

Score Keeper

The Score Keeper ensures that results for each heat are collected and recorded. After the last heat is finished, s/he shall determine final results and announce the results.

Pilot

The Pilot's responsibility is to safely fly the airplane during a heat and land the airplane after the heat is finished. The landing sequence matches the lane number of the pilot for that heat. For example, a pilot who starts the heat in lane 3 must allow pilots 1 and 2 to land first.

In case of emergency, the Pilot must announce the emergency to the other Pilots and Starter to request landing priority. If the airplane is out of control, the Pilot must immediately warn other pilots, ground personnel, and bystanders to avoid injury.

Caller

The Caller assists the Pilot by holding the airplane at the start of a heat. Moreover, the Caller announces to the Pilot the timing of turns during a heat and keeps track of the number of flown laps.

The Caller may also perform the role of the Lap Counter if no dedicated Lap Counters are available. The Caller may use a manual counter ("clicker") or an electronic clicker/device to register each completed lap.

Each pilot requires a dedicated Caller for a given heat.

Course and Safety Distances

NOTE: The following information is based on AMA Publication 540-b.

The below distances represent **minimum** values. Where safety is of concern, distances should be increased. Furthermore, all authorized persons located within 275 feet of the *Pylon Line* **must** wear hard hats <u>during</u> racing.
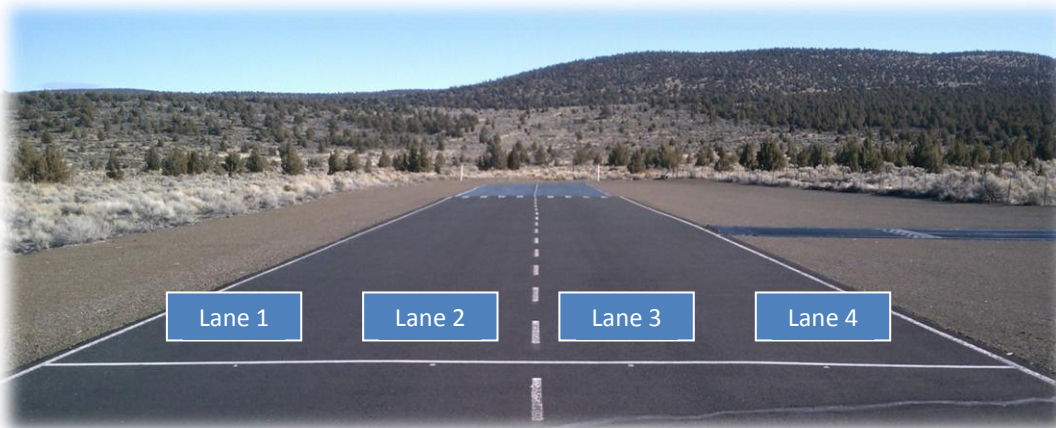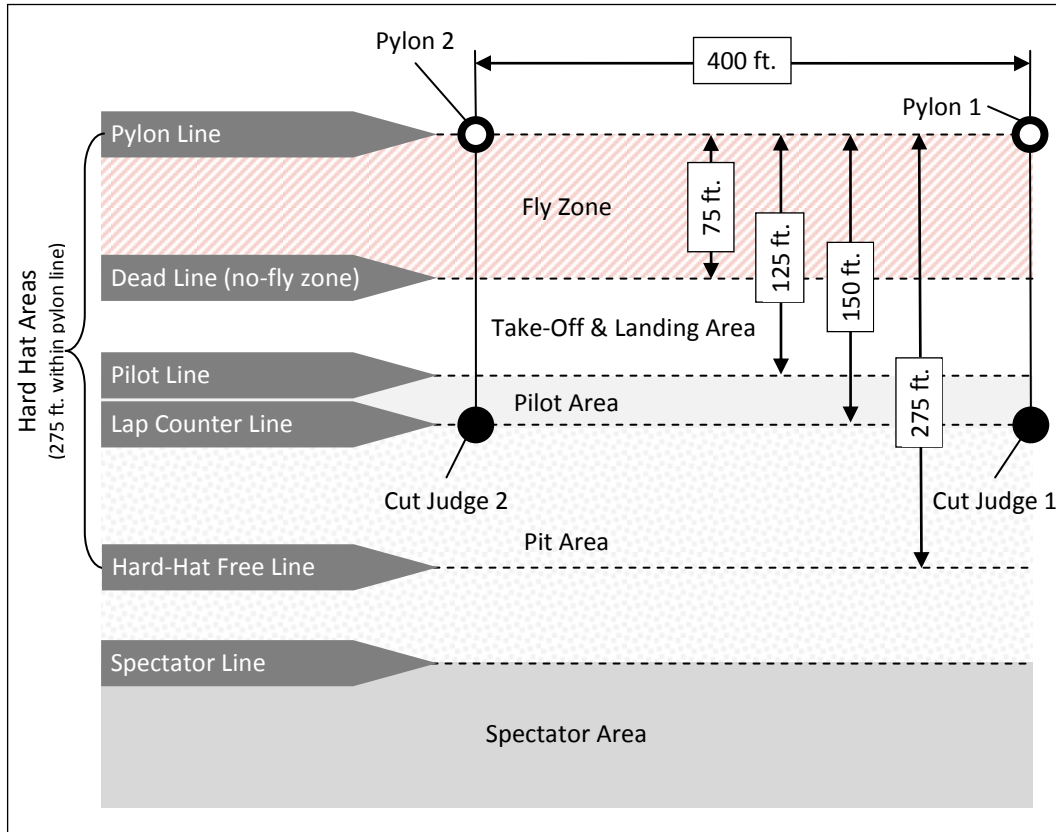
Popp's Field: Runway view at start-finish line, looking east.

Judging

Objectives

Pilots should aim for the following objectives:

- Be the fastest (complete all laps as quickly as possible)
- Complete each heat/race without penalties
- Score the most points to win the racing event

Cuts

A *cut penalty* is given for each of the following racing violations:

- **Turn Cut.** Pilots that make a turn before breaking the cutting plane (defined by a pylon) receive a cut penalty.

   NOTE: The airplane does not need to completely pass through the cutting plane, but at a minimum, it has to clearly break the cutting plane with its airframe (any part). The cutting plane is defined by the vertical center line of each pylon.

- **Early start.** Pilots whose Caller releases or pushes off the airplane before the launch signal is given by the Starter, receive a cut penalty.

Warnings

- **Flying over "no-fly" zones.** Pilots that fly over any designated no-fly zone will receive a warning. Repeated flying over a no-fly zone can lead to disqualification. No-fly zones will be communicated to all pilots prior to each racing event.
- **Low flying.** Pilots that repeatedly fly below the pylons will receive a warning. At this point, BAM will not enforce a low-flying penalty. However, pilots will be warned if their low flying endangers the safe execution of the race.

Penalties

The following outcomes result from *cut penalties*:

- **Disqualification.** Pilots can have one cut penalty per heat to successfully complete a heat. A pilot with two or more cut penalties per heat is automatically disqualified for that heat and receives no points.

   NOTE: In case of repeated violations by the same pilot (multiple heats), the Starter and/or Event Coordinator (e.g., CD) may disqualify the affected pilot from all remaining heats.

- **Extra lap.** Pilots that receive a cut penalty (turn cut or early start) must fly an extra lap. This penalty applies if technology allows real-time recording of cuts. If not available, the following point-deduction rule applies:

   - **2-point deduction** for one cut per heat. Disqualification for multiple cuts per heat.

Scoring

A pilot receives the following points per heat (excluding any cut penalties). The final score for a flown heat should include any deductions as a result of cut penalties or racing violations.

4-Pilot Heats

1st place = 4 points

2nd place = 3 points

3rd place = 2 points

4th place = 1 point

3-Pilot Heats

1st place = 4 points

2nd place = 3 points

3rd place = 2 points

Deductions

Real-Time Cut Recording

If real-time recording and announcement of cuts is possible for a given heat, pilots that receive a cut penalty (turn cut or early start) must fly an extra lap. The final score is based on their finish after completing all required laps (10 laps plus extra lap).

Delayed Cut Recording

If cuts cannot be recorded in real-time, the first cut results in a 2-point deduction from the above scores (for the given heat). Any additional cuts during the same heat automatically disqualify the pilot for that heat.

Finish Adjustments

Pilots who are disqualified for a given heat lose all points for that heat. As a result, all other pilots who finished behind the disqualified pilot in that heat move up in the finish sequence. For example, if the first two pilots in a 4-pilot heat are disqualified, the third and fourth pilots advance to 1st and 2nd place accordingly.

Tie Breaker

Single Heat Tie Breaker

Heat tie breakers should be applied in the following sequence:

1. **Head-to-head competition.** If two pilots are tied, the results of each race in which the two pilots raced against each other should be checked to see which pilot garnered the most points. The pilot with the most points in all of the head-to-head races would win this tie breaker.

2. **Number of wins**. The pilot with the most wins would win this tie breaker. If each pilot has the same number of wins (can be zero), the pilot with the most second places would win the tie breaker. If the pilots are still tied at this point, then it would proceed down to the most third places. This tie breaker is only used if the first tie breaker doesn't resolve the tie.

3. **Fly-Off.** If the pilots are still tied after the first two tie breakers, a fly off would need to take place. In the event one of the pilots can't participate in the fly-off for any reason (airplane crashed on last landing, has to leave, etc.), that pilot would forfeit the fly-off and the other pilot would win the tie breaker. In the unlikely event neither pilot can fly in the fly-off, the tie would not be resolved and the pilots would remain in a tie.

Event and End-Of-Season Tie Breaker

After the final race of the season and the points are tallied, the following tie breakers apply:

1. **Most cuts.** The pilot with the fewest cuts for the season wins the tie breaker.

2. **Fly-off.** The pilots that are tied for the same place will fly off against each other. If there are more than four pilots tied for the same place, pilots will be grouped into multiple heats (each heat should have the same number of pilots if possible).

Marking Airplanes

To provide an easy method for identifying airplanes during racing, airplanes shall be marked using two colored, letter-sized paper sheets that are taped to the bottom and top of one wing. The applicable color and wing (left or right wing) shall depend on the group to which the pilot has been assigned for the racing event.

Marking airplanes shall occur as part of the racing matrix preparation and shall be communicated by the Event Coordinator to each pilot prior to the first heat. Each pilot shall receive colored paper and tape to mark his airplane. The Event Coordinator shall check that each pilot has marked his airplane correctly prior to starting the first heat. The methodology and color-coding shall follow the approach outlined by the National Miniature Pylon Racing Association (NMPRA)[7].

There are four color and wing location combinations, which include:

Low Green   **Low** Red   **High** Green   **High** Red

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[7] http://www.nmpra.org/basics.htm
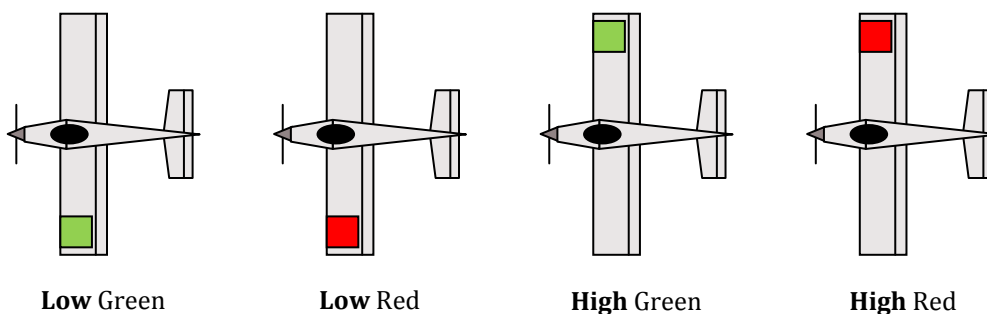
The "low wing" color combinations always carry the markings on the **left** wing while the "high wing" combinations show the markings on the **right** wing. Thus, pilots should pay attention to the group they are assigned to. Furthermore, each combination shall correspond with a lane number. For example, **Low Green** corresponds with **Lane 1** and **High Red** corresponds with **Lane 4**:

LANE 1	LANE 2	LANE 3	LANE 4

Low Green	Low Red	High Green	High Red
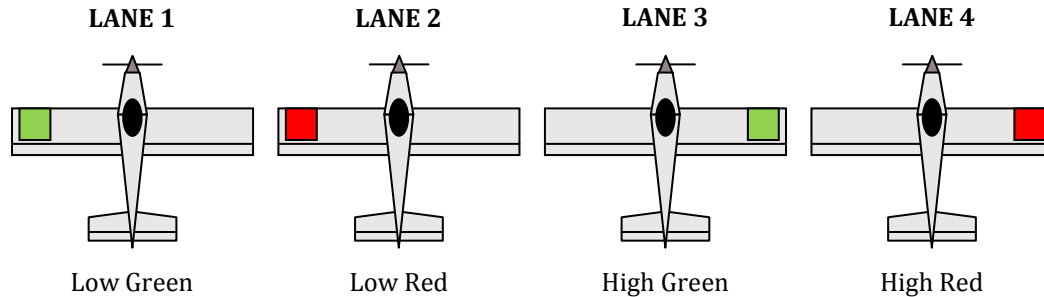
A 4-pilot heat shall contain one of each combination. That is, no combination shall occur multiple times in the same heat. Although this marking methodology limits the balancing of heats, the benefits of this approach outweigh the disadvantages. For example, pilots are always assigned to the same lane and airplanes can be easily identified by the cut judges regardless of the color scheme of each airplane.

Racing

Each racing event consists of heats and rounds. A heat is a race of ideally four pilots, but fewer pilots can participate in a heat if an equal distribution of pilots and/or an insufficient number of pilots does not allow four-pilot heats. A round consists of all heats that allow each pilot to fly (participate in) one heat. It is at the discretion of the CD or event coordinator to determine how many rounds a racing event will include.

Each event should include at least four (4) heats per pilot for the given racing event. This provides a sufficient number of heats to balance the competition and give each pilot an adequate number of trials to score points.

For safety reasons and because of the width of the runway at Popp's Field, only two airplanes shall start at the same time, followed within one (1) second by the second pair of airplanes (or single airplane in case of a 3-pilot heat).

To ensure adequate spacing between the starting pair of airplanes, lanes 1 and 3 always launch together as well as do lanes 2 and 4. Because pilots often drift to the left at the start of a heat, keeping a safe distance minimizes the chances for collision.

In addition, to ensure that each pilot gets an equal chance to start first, the start sequence shall alternate for each pilot from heat to heat whenever possible. For example, a pilot assigned to lane 1 shall start first in heat 1, then second in heat 2, then first in heat 3, and so on.
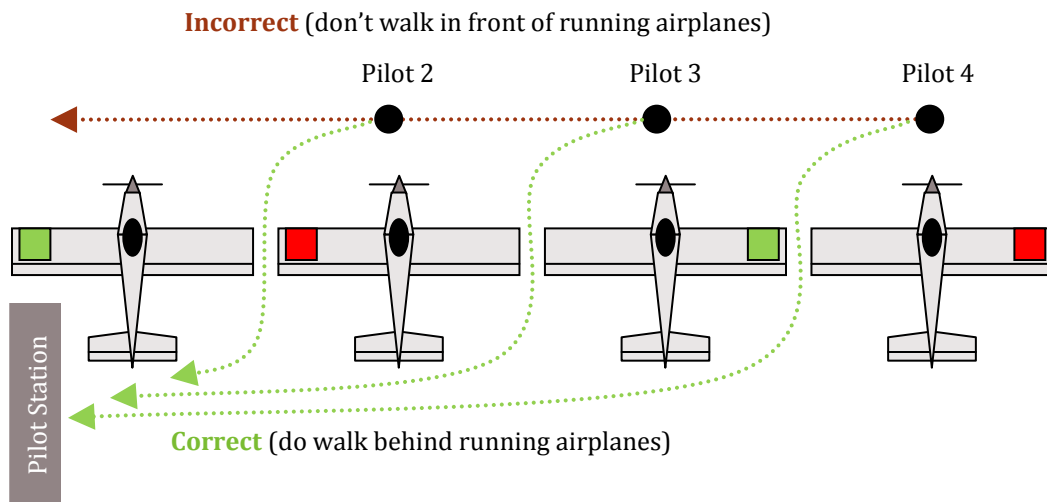
Start of a Heat

At the beginning of each heat, pilots line up their airplanes according to their lane/color assignment. The pilot's Caller shall hold the tail of the airplane to prevent a premature start or rolling during engine start and prior to the start signal. The tip (spinner) of each airplane must be behind the start-finish line.

Pilots are not allowed to start their engines until the Starter signals the engine start. Once the signal is given (e.g., verbal announcement), pilots have 60 seconds to start their engines and move their field equipment to a safe, dedicated spot (heat pilot station). When moving to the dedicated heat pilot station, pilots shall not walk in front of other running airplanes to prevent injuries should an airplane take off prematurely. For safety reasons, pilots shall walk towards the back of their airplane (between airplanes) before crossing the runway.

This applies to the three pilots (4-pilot heat) who are the farthest away from the heat pilot station (since they have to cross the runway to get to the pilot station). The below example illustrates the correct practice:

Incorrect (don't walk in front of running airplanes)

Pilot 2   Pilot 3   Pilot 4

Pilot Station

Correct (do walk behind running airplanes)

As pilots successfully start their engines and move to the heat pilot station, each pilot shall indicate his readiness to the Starter by raising the radio transmitter once. The pilot shall ensure that his Caller is also ready and paying attention to the Starter.

Once all pilots indicate their readiness, the Starter shall proceed with the start sequence by raising the signal flag to indicate the imminent launch of the heat. By lowering the flag in a downward swinging motion, the first pair of airplanes takes off. Pilots of the first wave can take off **as soon as** the flag starts the downward motion.

As soon as the flag reaches the low point and starts moving upward, the second wave of airplanes can take off. The Starter shall ensure a consistent motion. The elapsed time between the start of downward and upward motion shall not exceed 1.5 seconds to avoid the delayed start of the second wave.

If one or more pilots require more time to start their engines and reach the 50-second mark, the Starter shall raise the signal flag to indicate that 10 seconds remain until the start of the heat. At 60 seconds, the Starter shall give the signal to launch the heat. If a pilot fails to successfully start his engine at the launch of the first heat, he is automatically disqualified for that heat and needs to immediately remove his airplane and equipment as soon as all other airplanes have taken off.

Race Preparation

1. Course and equipment setup (incl. race equipment check)
2. Pilot registration
3. Technical inspection
4. Practice/test flying (optional)
5. Pre-race orientation for flight crews and ground personnel (incl. safety briefing)

Race Sequence

1. Heat lineup (per predefined racing matrix)
2. Engine start (within 60 seconds)
3. Launch readiness (signaled between Pilots and Starter)
4. First wave launch (signaled by Starter or signaling device)
5. Second wave launch (signaled by Starter or signaling device)
6. Complete required laps
7. Land (in sequence of lane number or immediately in case of emergency)

NOTE: We highly recommend that pilots fly one extra lap just in case (11 total) even if no cuts have been reported.

Appendix

Technical Inspection Checklist (Sample)

Technical Inspection Checklist
Club 40 Pylon Racing (Advanced Class)

General Assembly

Airframe must be assembled according to the manual, with the materials provided, however, the following modifications are allowed:

- ☐ Recovering of plane is allowed
- ☐ No airframe modifications other than repairs or reinforcement.
- ☐ Minimum weight (dry weight/without fuel), is 4 lb. and 8 oz. (Advanced Class)
- ☐ If wheels are substituted, must be as large in diameter and as wide as original
- ☐ Material may be removed to accommodate (clear) the muffler

Acceptable Engines for Advanced Class

- ☐ Thunder Tiger Pro .40 BB ABC w/Muffler
- ☐ SuperTigre GS-40 Ringed w/Silent Muffler
- ☐ GMS .40 ABC BB Remote Needle Valve w/Muffler
- ☐ Evolution .40 NT w/Muffler
- ☐ OS .40 BB w/Muffler

Fuel Tank

- • Any brand of tank may be used
- • Tanks may be raised or lowered to allow for consistent engine runs
- • Tanks may only be pressurized with muffler pressure
- • Bubbleless tanks with an internal bladder may be used

Servos

- ☐ Standard size servos or mini servos with 4 screws
- ☐ Dual aileron servos are allowed

Control Surfaces

- ☐ May be hinged with metal or CA hinges, other CA hinges, plastic hinges or hinge points
- ☐ A minimum of 3 hinges per aileron, 4 per elevator, and 3 per rudder are required
- ☐ Hinge lines may be sealed with tape, stick-on plastic covering, or iron-on plastic covering

Landing Gear

- ☐ Must have steerable tail wheel
- ☐ Originally supplied wheels or equivalent substitute (similar in size and shape)

Bend Aero Modelers   Revision 01   Page 1 of 2

Technical Inspection Sheet (Sample)

Technical Inspection Sheet
Club 40 Pylon Racing (Advanced Class)

Pilot: _____   **Date:** _____

Airplane

☐ Sky Raider Mach II   Engine: _____
☐ LA Racer 40

Engine and Design Requirements

NOTE: For detailed engine and design requirements and specifications, please refer to the BAM Racing Manual and the Club 40 rules.

Weight

☐ Minimum (dry) weight is 4 pounds and 8 ounces   Actual weight: _____

Notes (optional)

_____

_____

_____

_____

_____

Acceptance

☐ **Pass**

_____
Inspector Name

☐ **Fail**

_____
Inspector Signature

Bend Aero Modelers   Revision 03   Page 1 of 1

Pre-Race Orientation Sheet (Sample)

Pre-Race Orientation
Club 40 Pylon Racing

Safety

- Low-flying & no-fly zones
- Hard hats & safety areas
- Start (move start equipment and step aside)
- Landing (in order of start; emergency landings have priority)

Starter

- Flag & Stop Watch
- Signals (ready, first wave, second wave)
- Counts laps (by leader) and signals when first airplane completes 10 laps

Cut Judges

- Location of cut judges
- Identify airplanes prior to heat

Cuts

A *cut penalty* is given for each of the following racing violations:

- **Turn Cut.** Pilots that make a turn without breaking the cutting plane (defined by a pylon), receive a cut penalty.

  NOTE: The airplane does not need to completely pass through the cutting plane, but at a minimum, it has to clearly break the cutting plane with its airframe (any part). The cutting plane is defined by the outside diameter of each pylon.

- **Flying over "no-fly" zones.** Pilots that fly over any designated no-fly zone, receive a cut penalty. No-fly zones will be communicated to all pilots prior to each racing event.

- **Early start.** Pilots whose Caller releases or pushes off the airplane before the launch signal is given by the Starter, receive a cut penalty.

- **Low-flying.** BAM does currently not enforce the low-flying rule. Thus, pilots should be reminded to stay above the pylons for safety reasons. No penalty will be applied for low-flying at this point.

References

Club 40

http://www.rcpro.org/html/rules/club_40/club_40.htm

AMA

http://www.modelaircraft.org/files/events/rulebooks/rcracing.pdf

NMPRA

http://www.nmpra.org/index.asp

Feedback

This racing manual is a work in progress and we will continue to add and expand information to make it useful to interested pilots and to reflect new ideas, rules, and lessons learned. Should you have any comments, suggestions or find errors, please contact BAM's pylon racing committee.

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