Control Line General

2017-2018

RULES GOVERNING MODEL AVIATION COMPETITION IN THE UNITED STATES

Amendment Listing

Amendment Topic	Publication Date	Description
Original Issue	1/1/2015	Publication of Competition Regulations
Use of 2.4ghz RC	1/1/2013	Paragraph 2
Profile Fuselage Width chart	1/1/2015	Changes to Profile Fuselage Width Chart, added Scale and Engine Mount
National Records	1/21/2015	Remove last sentence in 12.1 for CL Racing

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CONTROL LINE, GENERAL

Note: For FAI events, see the FAI Sporting Code.

The FAI Sporting Code may be obtained from AMA Headquarters upon request. (When FAI events are flown at AMA sanctioned contests, the common practice is to only use the basic model specifications and related items, such as timing procedures, from the FAI rules. Contest management and procedures usually follow the basic rule structure found in the General sections and specific category sections of the AMA Competition Regulations book.)

1. Applicability

In addition to the following General Control Line rules and the specific rules for each Control Line event, Control Line model aircraft construction, flying, and competition are also governed by the rules of the following sections: Sanctioned Competition, Records, Selection of Champions, and General. Although the following general and specific rules primarily govern competitive activity in AMA events, it is strongly recommended that, in the interests of safety and consistency, they be followed in all Control Line activity.

2. General

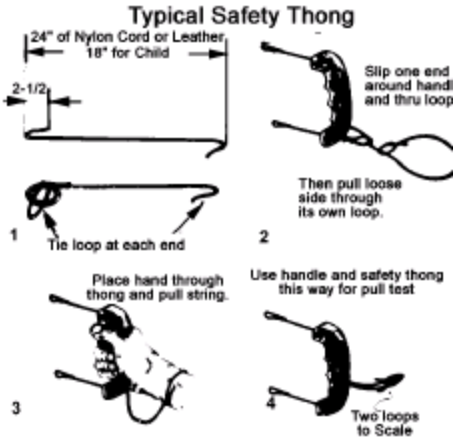
A Control Line model is flown on one or more steel or GSUMP, commonly referred to as Spectra or Dyneema, lines steel wire line(s) or metal line(s) of equivalent strength, attached to the model in a manner providing aerodynamic control of the model's elevation through manipulation of the control surfaces during flight. Movement of control surfaces, and any other of the model's operational features, may be accomplished by mechanical means, by electrical impulses transmitted through the line(s), or by any other control system that does not interfere with the control of any other model or present a safety hazard to competitors or spectators. The use of radio control to accomplish any control functions on Control Line models is specifically prohibited except as follows. The use of 2.4 GHz (utilizing spread spectrum, 47 CFR Part 15) radio control to accomplish functions other than providing aerodynamic control of the model's elevation on Control Line models is allowed, but only to the extent and in the manner specifically allowed by the rules of the individual event. All control functions must be under the direct control of the pilot and only the pilot.

3. Size and Type of Control Handle

The control handle shall not extend more than six inches (6) beyond the hand of the operator except in cases where control is accomplished by means of twisting a line, in which case the maximum extension shall be no more than 30 inches. Unless prohibited by the rules of the particular event, control handles providing for easy adjustment of line length are permitted provided they are equipped with a positive safety lock. Lines may be stored between flights, but lengths must be measured before each official flight. Altering line length after official measurement is cause for disqualification.

4. Safety Thongs

A safety thong connecting the handle of the Control Line models to the pilot's wrist, and strong enough to prevent accidental release of the model, shall be worn during all flights of Control Line events except all Racing events. The safety thong should have a minimum amount of slack to preclude accidental release or interfering with the controls. Releasing the controls during flight or before the model has come to a complete stop shall constitute a foul if the safety thong restrains the model and lines from flying free; if the contestant releases the controls and the safety thong during flight or before the model has come to a complete stop, the contestant shall be barred from further participation in the event and all of previous flights canceled. In those events not requiring the use of a safety thong, releasing the controls during flight or before the model has come to a complete stop shall bar the contestant from further participation in the event and void his previous flights in the event. The safety thong may be a point of attachment for conducting the pull test or the thong may be tested separately from the test of control handle, lines, and control mechanism. When the thong is tested separately, it must be pulled to the test load specified for the particular model involved. The method of thong attachment shall also be able to withstand the required pull test. Failure to use a safety thong in those events for which they are required shall constitute a foul. Although safety thongs are optional in Racing events, their use is encouraged in all events, particularly when Junior and/or Senior fliers are involved.



5. Size, Construction and Measurement of Control Lines

Length, diameter, and types of lines permitted are stated under the specific rules for each event. The number and sizes of lines to be used, as specified for each event, are minimum requirements; they may be exceeded at the discretion of the contestant. However, if more and/or larger lines are used, no adjustment in the timing and/or judging procedures will be made to compensate for them. All lines used to control flights shall be steel wire or metal of equivalent strength, in good condition, and free from kinks and rust. Line connections to handle an aircraft must have a strength equal to or greater than that of the flying lines. No swivels are to be used as part of the control system of Control Line models. Control lines shall be of uniform diameter from the lead-out connections to the handle. No more than two (2) connectors may be used per line.

5.1.

Each load-bearing line connector shall have a test rating equal to at least the total pull test required on the model (i.e., if the model requires a 40-

pound pull test, the connectors will have to be test rated at a minimum of 40 pounds each). The burden of proof of the test ratings of line connectors shall be the contestant's responsibility. Test ratings on factory-packed connectors will be considered as acceptable proof.

5.2.

The length of the control system is measured from the center point of the grip part of the control handle (device) to the fore and aft center line of the model. All speed computations are to be based on the lengths specified for the event, and no allowance is to be made where lines used exceed those lengths.

5.3.

Line construction shall be as per the methods described in Figures 1 through 4. The Contest Director may allow alternate line terminations if he can satisfy himself that they are at least as strong as those shown. The construction method shown in Figure 2A is not allowed for Jet speed models nor for speed models with engine displacements over 0.4029 cubic inches.

5.3.1.
The methods illustrated in Figures 1 through 3 are recommended for all applications of single strand (commonly called solid) control lines.

Line terminations using the crimped tubing style of construction, as are supplied on commercially available ready-to-use control lines, are acceptable on multi-strand (commonly called stranded) lines only. Crimped tubing line terminations constructed by the modeler (i.e. not commercially available) may also be used on multi-strand control lines, provided they are made using soft tubing material such as is supplied with commercial line sets and provided they are made according to instructions provided with commercial line sets or Figure 4. It is mandatory that three line thicknesses pass through the tube before crimping. It is recommended that the crimped tubing line terminations be carefully inspected, on a regular basis, to check for possible broken strands caused by flexing of the wire against the ends of the crimped tube.

5.3.2.
In those events where they are permitted, multi-strand lines may also use terminations constructed as shown in Figure 3.

5.3.3.
Line terminations as constructed in Figure 1 or 1A may be used for two-line single-strand applications provided buttons of suitable

size and strength are used as the line connectors. See Figure 1 for minimum mono line button diameters. This shall also apply to line eyelets as shown in Figure 3. Dimension “A” will be ½ inch for Classes ½A and A, 5/8 inch for Classes B and C, and ¾ inch for Classes D and Jet. In this rule, line connectors refer only to line connectors between control lines and lead outs and not to control lines and bell cranks.

5.3.4.
For aircraft which utilize button connectors attached directly to the bell crank, single-strand lines must employ a double-loop termination as shown in Figure 1A. Such terminations are also a permissible alternative to Figure 1 in all classes

5.3.5.
Only permanent-type end terminations and connections as shown

ASTM A228M TENSILE REQUIREMENTS

Music Wire Size	Diameter	BreakingStrength Min (LB)	BreakingStrength Max (LB)	Music Wire Size	Diameter	Breaking Strength Min (LB)	Breaking Strength Max (LB)
00	0.008	17.6	19.5	9	0.022	125.3	138.7
0	0.009	22.3	24.6	10	0.024	147.9	163.5
1	0.010	27.4	30.3	11	0.026	172.1	190.5
2	0.011	33.1	36.5	12	0.029	211.5	233.8
3	0.012	39.2	43.3	13	0.031	240.0	265.2
4	0.013	45.8	50.6	14	0.033	270.0	298.2
5	0.014	52.8	58.4	15	0.035	301.5	333.3
6	0.016	68.3	75.5	16	0.037	334.3	369.9
7	0.018	85.6	94.5	17	0.039	368.5	408.0
8	0.020	104.5	115.6				

Notes: Breaking Strength Based on Nominal Wire Diameter – Wire Tolerance
***(This Chart Applies Only to Those Events with ASTM A228M Tensile Requirements.)**

PULL TEST

Pull Test	Multiply Model Weight in Ounces by:	Pull Test	Multiply Model Weight in Ounces by:
32G	2.00	52G	3.25
36G	2.25	56G	3.50
40G	2.50	60G	3.75
44G	2.75	64G	4.00
48G	3.00		

and described in this section in paragraph 5 through 5.3.4. are permitted. Any system of using knots in steel or stainless steel lines is specifically considered 'not as strong as' those systems shown as required in 5.3. Any system of using knots is specifically

not considered “as strong as” those systems shown as required in 5.3. Splices at any point along the lines are not considered a “termination” and are not permitted.

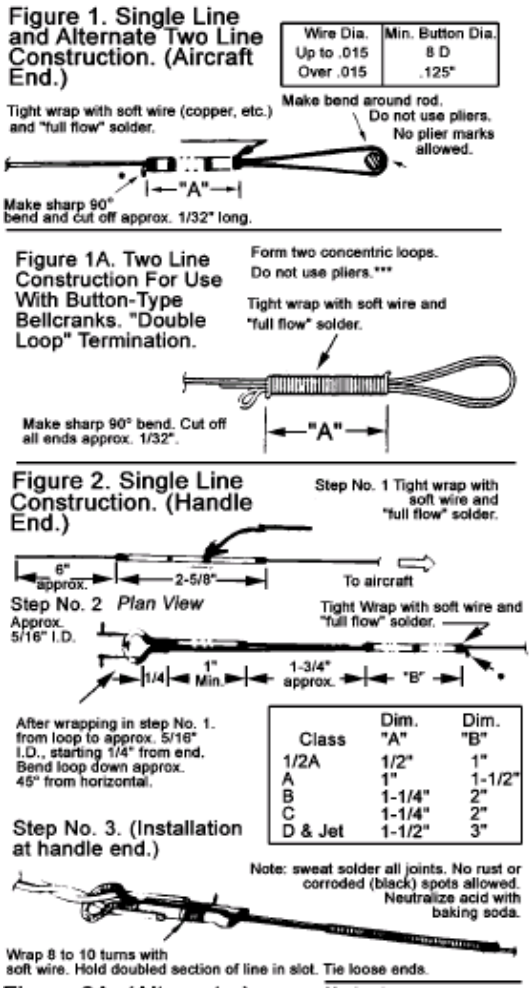
The guidelines for construction of the control lines are also recommended for construction of the aircraft lead-out wires.

5.3.5.1 Spectra Lines

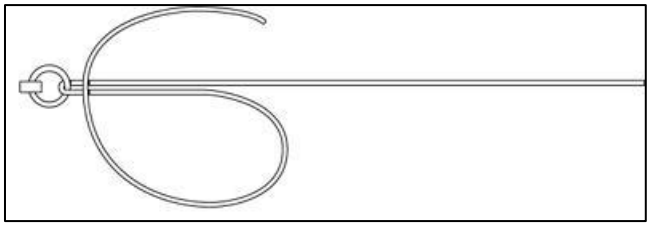
Lines made of Spectra fiber, made of gel spun ultra-high molecular weight polyethylene are permitted for sport flying and demonstration purposes. Spectra lines are not permitted in competition unless the specific rules for the event flown expressly permit such use. The use of high visibility yellow lines is recommended, but not required. For sport and demonstration flying with two lines, Spectra lines shall have the following strengths:

Aircraft Weight	Engine Displacement	Watts	Rated Spectra St.
24 oz.	.09	300	20 lbs. .010”
40 oz.	.25	450	40 lbs. .013”
64 oz.	.40	600	60 lbs. .016”
75 oz.	.75	750	100 lbs. .018”

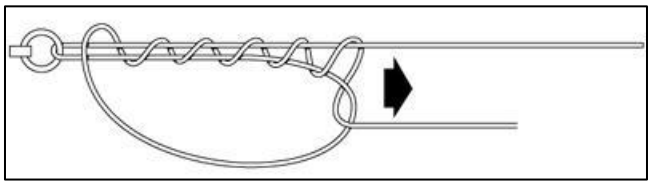
All lines shall be pull tested to 10 times the model weight. An aircraft must meet both the weight and power standards to qualify for the stated line size. Exceeding either standard places the aircraft in the next larger line size bracket. Aircraft shall be weighed with either a full fuel tank or battery on board.



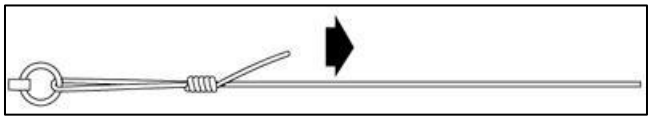
Terminations shall be constructed using a 5 turn uni-knot, tied on a bight, or two strands of line looped back from the free end. An instruction film of the knot can be found at www.youtube.com/watch?v=cGL2aD9q-cE. The drawings below show a single strand for clarity, but should be tied on a bight. The knot is tied as follows:



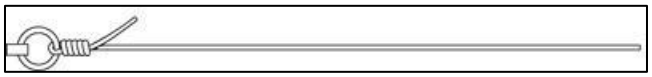
1) Run at least six inches of line through the eye of the clip, and fold to make two parallel lines. Bring the tag end of the line back in a circle toward the clip.



2) Make six turns with the tag end around the double line and through the circle.
3) Hold the double line at the point where it passes through the eye, and pull the tag end to snug up the turns.



4) To create a loop connection: Adjust the loop size by sliding the knot up or down the standing line. Then pull the tag end with pliers to maximize tightness.



5) To create a snug knot: Pull the standing line to slide the knot up against the eye. Then continue pulling until the knot is tight. Trim the tag end flush with the closest coil on the knot.

5.3.6.
Modification of the control lines from their basic aerodynamic and mechanical configuration of separate and independent round wires or cables by coupling, fairing, or any other means is not allowed.

5.4.

Measuring instruments for checking line diameter shall be capable of measuring to .0001". These measurements shall be rounded off to the nearest thousandth (.001) as follows: .0001" to .0004" shall be dropped, and .0005" to .0009" shall be rounded up to the next highest thousandth (.001).

6. Pull Test

The pull test shall be applied prior to each flight or heat by the officials or their assistants (contestants may be designated to be assistants). The control handle, safety thong (where applicable), lines, line attachment, lead outs, the control mechanism and its attachments to the model shall be strong enough to withstand a

pull test of the amount specified under the rules for the particular event. Control handles having non-metallic flexible extensions shall be separately pull-tested at twice the amount specified under the rules for the particular event. The pull test shall be applied by slowly increasing the pull so that no sudden load is applied. The pilot must apply the pull test, unassisted, before each attempt.

Figure 3. Two Line Construction

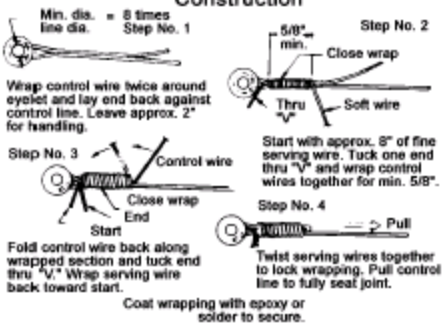
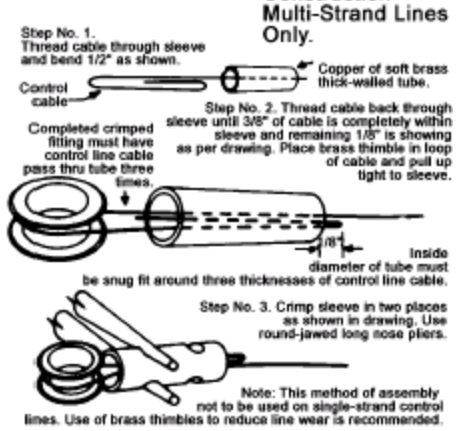


Figure 4. Alternate Construction Multi-Strand Lines Only.



6.1.

Where the control mechanism is attached to the wing, the wing may not be held during the pull test, except in the case of a Precision Aerobatics model or a fuselage-less flying-wing type model, in which case the model may be held by the wing. If the control mechanism is attached to the fuselage, the model may be held by the fuselage. It is intended that the fuselage be held for the pull test unless there is no fuselage.

6.2.

During the pull test before each flight, the pull test official must make a thorough visual inspection of the aircraft's flying mechanism. If any part of the mechanism is found to be of faulty construction creating an unsafe condition or, if any gimmick is found on the aircraft which will not allow a true pull test on the aircraft's flying mechanism, this shall constitute a foul.

6.3.

Non-enclosed jet engines on Jet Speed models shall receive an engine mount pull test of 48 pounds. This shall be accomplished while the pull test scales are still attached to the control handle immediately following the airplane pull test. The engine must be gripped and the pull applied in a manner that does not allow any horizontal or vertical pressure to be applied to the line(s) at the wing tip bearing point(s). This may be accomplished by grasping the tailpipe and/or head with hands paced equidistant from the wing tip bearing point(s) and a "twist" to the grip as necessary to keep the wing horizontal.

7. Safety Rules

Where a protecting barrier is not available offering complete protection, the flying area should be clear of all nonessential participants and spectators. Any contestant

Profile Fuselage Width		
Class/Event	**Maximum Fuselage Width**	**Max Width of Additional Reinforcements**
1/2A Proto	½ inch	3/8 inch
Scale Racing	5/8 inch	No limit
Slow Combat	¾ inch	¾ inch
Navy Carrier	¾ inch	¾ inch
Slow Rat Racing and Rat Racing	¾ inch	No limit
Scale	1 inch	
Engine Mount Vertical		Mounting Lugs Plus ½ Inch
Horizontal		½ inch

whose model breaks loose during a takeoff, flight, or landing (unless due to midair collision or line entanglement in multiple pilot events) shall be barred from

further participation in the event, and his previous flights in the event shall be voided. A foul shall be called against a contestant when any part of his model

other than the propeller(s), but including wheels and/or tires, is lost during flight (unless due to midair collision or line entanglement in multiple pilot events).

8. Model Limitations

Unless otherwise permitted under specific event rules, no Control Line model shall have a flying weight of more than four (4) pounds.

9. Fouls

For events other than precision aerobatics, any foul as defined in these regulations constitutes an attempt with no time or score being recorded. For precision aerobatics, any foul defined in these regulations happening between when the model begins a takeoff and when the model comes to a stop shall result in the flight being official and receiving a zero score. Repeated violations may be cause for revocation of a member's AMA license. Whipping the model in an event where speed is a factor in scoring shall constitute a foul.

10. Profile Definition

The fuselage of a profile model resembles that of a conventional airplane in the side (profile) view and appears as a thin flat sheet in the plan (top) view. When a conventional, single cylinder, internal combustion engine is used, the engine shall be completely exposed from the centerline of the crankshaft to the top of the cylinder head when viewed perpendicular to both the crankshaft centerline and the cylinder centerline. In the case of internal combustion engine with multiple cylinders, the preceding rule shall apply to all cylinders with allowances made by the officials for appropriate mounting of the engine. No fairing may be added to the engine which violates the "completely exposed" requirement of the previous sentences, and the engine cylinder shall not be contoured to present a streamlined cross section to the airflow. Additional reinforcements such as plywood nose doublers and cheek cowls or fairings are permitted within the width limits defined in the accompanying table. Such additional fuselage reinforcements may extend from the prop drive washer to a point 25 percent of the wing root chord back of the wing leading edge at the root and may be faired in. Cheek cowls used in

Racing events may be of unlimited width, but may be used only on the side opposite the engine and only on models with side-mounted engines. In the case of inverted or upright engine installation, engine mounts may protrude from the fuselage sides beyond the width limitations of the table. They may extend no further aft than 25 percent of the wing root chord back of the leading edge at the root. Any such protruding engine mounts shall be of constant cross sectional shape and dimensions, without tapering. The rear portion of those mounts shall terminate in an angle of at least 45 degrees to the longitudinal axis of the fuselage unless they terminate within the wing structure. Nacelles, as used on multi-engine models are subject to the requirements of this definition.

11. Nominal Classification of Control Line Models

Models powered by reciprocating engine(s) are classified by total piston displacement of engine(s) as follows:

Class ½A: 0000—.0504 cubic inch

Class A: 0505—.1525 cubic inch

Class B: 1526—.3051 cubic inch

Class C: 3052—.4028 cubic inch

Class D: 4029—.6500 cubic inch

Jet: Internal cross-sectional area of the tail pipe(s) at the point of minimum cross-section shall not be greater than 1.25 square inches.

Turbine: The Maximum static Thrust to Weight ratio shall be .9 (dry).

11.1.

Sixty percent of the actual piston displacement of four-stroke cycle engines shall be taken for competition classification purposes.

11.2.

Combination and/or modification of the above classifications is permissible within the rules for specific events and/or at individual contests (but must be so stated on sanction applications and contest announcements).

12. Records

AMA national records are recognized for each age group in Control Line Speed, CL Racing, CL Endurance, and CL Navy Carrier. The following criteria must be met to establish records in these events (also refer to each individual event section for record requirements that pertain to that event only).

12.1.

Records for CL Speed and Navy Carrier may be set only during the course of normal competition flying at an outdoor A or higher-rated AMA sanctioned contest or the US FAI Team Selection Finals (for .15 FAI Speed) when all AMA record establishing requirements and procedures have been met. Endurance records may be set at any sanctioned contest or record trials which includes Control Line event(s), providing prior Contest Director concurrence has been obtained.

12.2.

All requirements in the "Report of Record Performance" paragraph of the "Records" section of the rule book must be met. It is the flier's responsibility to see that the requirements for record application are followed through.

13. Launching

Unless otherwise specified under the rules for the particular event, any method of launching may be used provided the line(s) are fully extended during launch. Should a removable takeoff gear be used which does not fall free of the model as it becomes airborne, including drop-off gear operated by delayed action, a safety line to prevent hazard to spectators shall be provided.

13.1.

The "tail wheel" of a model does not satisfactorily fulfill the requirement that "models shall have a minimum of a one-wheel landing gear."

13.2.

The "landing gear" must be the main load-supporting landing gear, and the required "one wheel" must be in reasonable proportion in size to the rest of the model.

13.3.

The "one wheel'' landing gear shall provide full prop clearance when the model sits in a normal unassisted "at rest'' position.

13.4.

When ROG is required at a contest, the model must be launched from its "at rest" position. Any other type ROG will not be considered "unassisted."

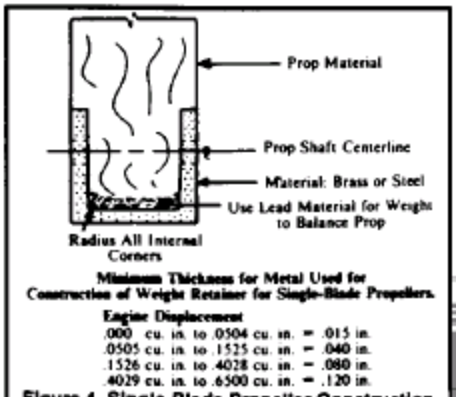


Figure 4. Single Blade Propeller Construction

14. Propellers

Single blade propellers, if used, must be constructed as shown in Figure 4. The metal retainer should be machined or formed to create a holding mechanism for the lead weight. The lead weight must be contained within the metal retainer. The retainer must form an integral part of the single blade propeller. The intention of this retainer is to keep the lead weight from slinging off at high engine rpm. The propeller spinner cannot be used in any way as part of the weight for the single blade propeller. Other construction techniques, if used, must be at least as safe and secure in the opinion of the CD.

15. Pressure Fuel Systems

A pressure fuel system is one in which pressure from any source is imposed on the fuel in addition to the pressures normally imposed on the fuel by gravity, centrifugal force, vent tubes bent into the airstream, and ambient atmospheric pressure.