

What is a “2 meter” RC sailplane?

There were no AMA regulations for RC sailplanes in 1971, but by 1992 the Competition Regulations divided RC Soaring into

- Class A – Hand Launch (1.5m/59” span), now FAI F3K,
- Class B – Two meter (2m/78.74” span), now FAI F3L,
- Class C – Standard Class (100” span), and
- Class D – Unlimited Class (span greater than 100”), now FAI F3B (winch), FAI F3J (hand tow)

Current AMA Competition Regulations have dropped Class C Standard Class.

NOTE: In Australia, the 2M Class is considered to be a beginners’ class formulated for inexpensive radio systems, and the Class is limited to two servos and two control surfaces.

- AMA rules – span limited to 2 meters/78.74 inches, plus FAI specifications for wing area, weight, wing loading, and minimum nose radius. Launch by hi-start or winch.
- FAI rules (F3L) - span limited to 2 meters/78.74 inches, FAI specifications for wing area, weight, wing loading, and minimum nose radius, with additional limitations on control surfaces and construction materials. Launch by specified hi-start (8 pound pull) only.

How are 2 meter RC sailplanes designed?

Because the 2M Class is predominantly defined by the span limitation, designers have been able to be tremendously creative, taking advantage of materials and technology advancements to improve their designs. The creation of F3L, first as a provisional and now as a permanent FAI Class, has driven 2M design in a different direction because of strict rules regarding materials. Because of 50 years of experience with 2-meter aircraft, F3L has undergone a very rapid evolution.

Let’s start at the beginning...

Three inter-related factors:

- (1) Launch method
- (2) Planform
- (3) Structure

The greatest load on the wing will most likely take place during launch.

- A Ford long-shaft starter motor (6V) on a 12V battery can pull between 100 and 200 pounds, depending on drum diameter.
- A hi-start, on the other hand, is usually limited to around 25 pounds or so. (Zip-starts, which are a ballistic launch method, can be found with 70# pull.) FAI F3L hi-starts are limited to 8 pound pull over a maximum distance from slack.

The launch method may therefore dictate certain portions of the design process.

Once you know the maximum wing loading you’ll be able to start the wing design process.

The lift distribution across the span will most likely be elliptical ($e=1.0$) or close to it because of the span limitation. A thinner airfoil improves “penetration” more than creating a more efficient lift distribution ($e=1.0>$).

The wing structure must be able to withstand the dynamic loads placed on it during launch, high speed flight, and landing. This includes both bending loads and torsional loads.

How wing structures have changed over the last five decades?

- Open bay - ribs with spar, leading and trailing edges
- D-tube – ribs with spar and sheeting (usually 1/16") over upper and lower surfaces back to high point/spar.
- Fully sheeted – ribs with sheeting (usually 1/16") over upper and lower surfaces, spar optional
- Composite – foam core covered with obechi, balsa, fiberglass, kevlar or carbon

OR

- Hollow core (very thin stiff foam covered on both sides with fiberglass, Kevlar or carbon fiber and formed into an upper surface or lower surface shell) with composite spar of carbon fiber

Let's talk about spar systems...

- Cross-section
- * I-beam – strong in bending, but lacks torsional rigidity without a D-tube.
- * the box beam - top and bottom spar caps with facing on both sides taking the place of a single internal vertical, strong in bending and able to withstand torsional loads
- * Circular (rod or tube) – can control torsional loads if installed properly, but not as strong in bending as I-beam and box beam
- Materials
- * Balsa caps and webbing
- * Spruce caps and either balsa vertical grain internal webbing or plywood (45°) external webbing
- * Carbon fiber caps and end-grain balsa for internal webbing (wrap with kevlar thread)

Let's talk about leading and trailing edges...

- Leading edge
- * Round leading edge – dowel, carbon fiber tube
- * "Accurate" leading edge - formed with D-tube sheeting or with composite materials
- Trailing edge
- * Trailing edge stock
- * Upper and trailing edge sheeting beveled with 1/64" plywood between

Airfoil evolution...

1970s – Clark Y

1980s –

1990s –

2000s –

2010s –

2020s – Drela Sprite AG40-43

Empennage (if there is one)

- * Sheet balsa, painted or covered
- * "Open" structure formed with thick sheet balsa, sheet and/or stick balsa, and trailing edge stock, and covered with fabric
- * Composite with foam core

Examples of 2 meter RC sailplanes

