23 Hazledene Road, Aberdeen, AB15 8LB, Tel 01224 208617

SHORT FINALS – 1st APRIL 1999

Well folks the spring has sprung and the grass has riz and here we are on the verge of a new flying season. Did you all refurbish your models for the new season? or did you build that new glider you have been thinking about ?. Neither did I, unfortunately the real world keeps getting in the way.

As you have seen from the last few newsletters I usually include some articles down loaded from the Internet for your information. The internet is a gold mine of info and I have included a list of relevant sites – make no mistake this list is only the tip of the iceberg, there are literally thousands of sites just for model gliding. While I am at it I must acknowledge the original authors of the material I have included both passed and future articles.

Internet shopping is also very easy especially from the USA or Australia, if you use your visa the exchange rate is worked out for you. A word of caution, the GPO make a handling charge for imported goods and this can be disproportionate to the value of the goods and can put the cost in excess of the UK cost, assuming the goods are available in the UK. A lot of the companies dealing on the internet now have secure ordering systems for transactions.

In terms of newsletter content if anybody has anything they would like to introduce do not hesitate to contact a member of the committee, lets start up some contentious correspondence.

You will note we have included a new membership application form for you to fill out and return to Neil, some of the data held in the membership database is obviously out of date and needs changing.

Who has e-mail? If you have and you let us know we can send your newsletter over the wire.

This months model is a chuckie, you should be able to scale up the plan if you want to make one, for the less energetic you can make a mini bungie.

The current situation with Calder Park is that Cove Rangers wants to develop the whole site as a football and training ground and also let the community use the facilities. I rang Aberdeen Recreation & Leisure and spoke to the man who runs the various parks and gardens around Aberdeen with a view to getting a move to Hazlehead Park sooner rather than later. He was not against the move but has asked the club to write to him with our proposal; I did this on 19th of March and await his decision. Watch this space.

The new club winch has arrived and had a line attached ready for the new season, thanks to Neil. Bill Stark has recently completed a new club Rookie and is in receipt of the servo's for installation.

Thinking out loud – we need a scheme for making sure the novices in the club are given proper training and not left to hang around on club nights at the field – How about an adopt a novice scheme? Proficient flyers would teach a designated novice upto solo standard.

Dates from the diary.

6th April Bring & buy at the British Legion Bon Accord Terrace 19:30hrs

9th May – Slope fly-in. Venue TBA. Contact Brian Ord.

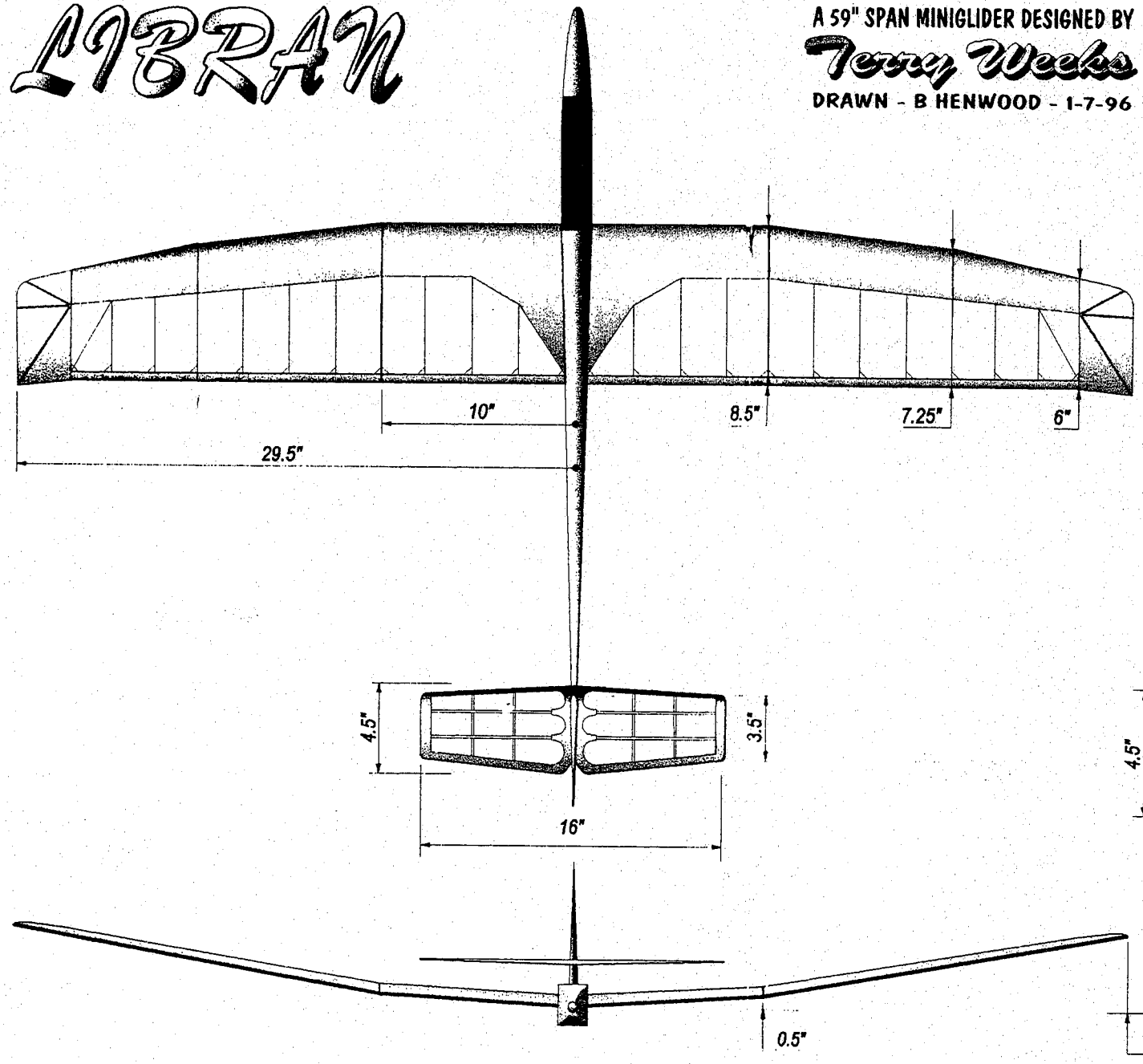
5th – 6th June. Club Fly –in & comp. Hazlehead Park. Contact Brian Ord.

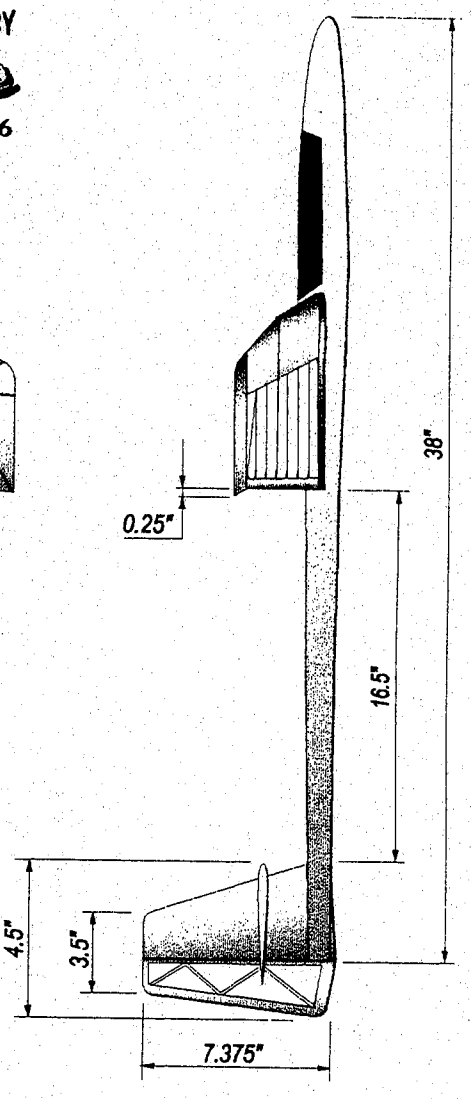
LIBRAN

A 59" SPAN MINIGLIDER DESIGNED BY

Terry Weeks

DRAWN - B HENWOOD - 1-7-96



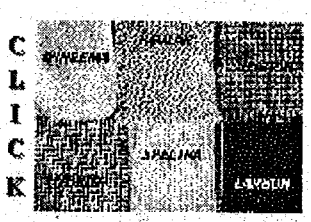


COMPOSITE MODELLING MATERIALS

Times change. Well over a decade ago I recall lusting after the latest model from Graupner - *the Cumulus*. It was then *state of the art* with white foam wings covered in balsa but now no longer available. The fuselage was some sort of nylon material and therefore very robust. Carbon fibre, Rohacell and Nomex were unheard of at that time. The latest all moulded models these days have carbon fibre skins and Kevlar™ reinforced glass fuzzes, the sandwich material may be the expensive Rohacell foam or even Nomex honeycomb but more often than not it's soft balsa.

So what are these materials? Read on then and we'll have a look at a few of the composite materials used in models today. I'll start with woven materials for the reinforcement of resin matrixes.

#1 WOVEN MATERIALS



Everyone reading this will have encountered fibre glass fuselages but very few will have made one for themselves from a mould. Moulding does give you experience and the ability to judge and appreciate the efforts of others. If you were going to do some moulding which materials would you use and why? Cheque book fliers miss so much in this respect. For those uninitiated souls and beginners, here's a few pointers on the cloth available for aeromodelling. Later articles will cover foam and resin addtives.

GLASS FIBRE

There are several different types of glass fibre - the one we usually use is called E-Glass - a description going to back to the early days when glass was used primarily for E-electrical insulation. This is not the strongest glass available, that is given by a S-Glass not so common here but you may see it advertised for sale in the States. A-Glass is a third type of glass, the lowest strength/quality often used in chopped strand matt for simple filling. Since the fibres are not woven and therefore have no coherent direction, chopped strand adds only a little strength to resin matrixes. Even so it is still a useful material for filling although a little heavy. In fact, glass is the heaviest of reinforcement materials with a density (S.G. if you prefer) of ~2.5g/cm³.

CARBON FIBRE

I love carbon fibre - it's easy to work and provides exceptional strength. It does have the drawback that it's expensive, an order of magnitude more than glass fibre, especially the lighter weaves; it's also very brittle and snaps suddenly with little bending beforehand. It's lighter than glass too coming in at ~1.8g/cm³. Areal weights are generally 100-200 gsm although I see that woven carbon is now available in Germany at 60 gsm - whether this is a result of a loose weave or some lighter variant of carbon fibre itself I do not know. Certainly, it's a useful addition to the range of cloths available for tailplanes, HLG's and the like.

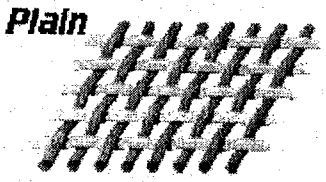
ARAMID FIBRE

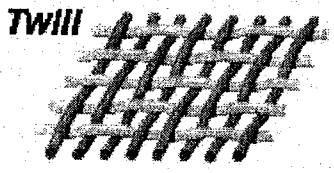
This is the yellowish material fuselages are made of, or reinforced with. I personally try to avoid using it because of the fuzzing you get when trying to sand exposed material. It has the benefit of being rather good at sustaining impacts (cf. bullet proof vests and body armour) and is therefore ideal for fuselages. It is no where near as brittle as either glass or carbon fibre. It's the lightest so far of the materials with a density of ~1.45g/cm³. It's also often known as Aramid fibre . The type used for models is Kevlar 49 - different types such as Kevlar 29 and Twaron have different properties.

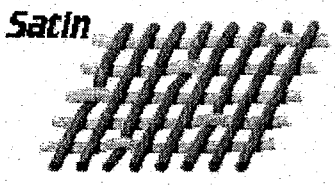
POLYETHYLENE FIBRE

Spectra, the latest in the line of modeller materials, is the lightest material so far with a density of 0.97g/cm³ less than water. It is a long chain polythene chain molecule with a high impact resistance and the highest strength to weight ratio so far. Like aramid fibre it has the drawback of fuzzing when worked on. I have used it and like the idea of using it - but working is problematical as I say. Surprisingly little used. Spectra is the US name, in Europe it's called Dyneema. If you're into fishing or kite flying you will have come across these two fibres already.

WARP AND WEFT





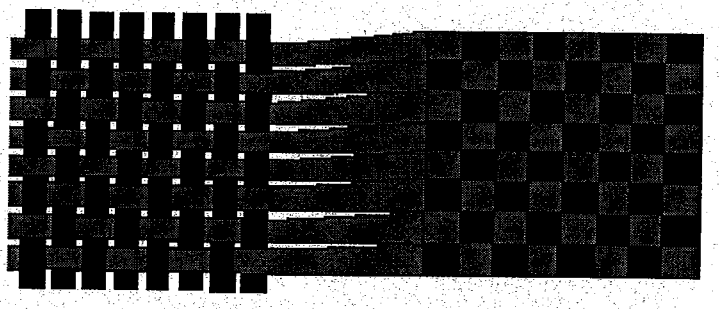


Many modellers still ask which fabric they should use for moulding, unclear as to the relative merits of plain, twill and satin weaves. Unaided, pretty soon they realise that plain weaves are not much good for moulding fuselages - don't get me wrong, it can be done but there are better choices. What is the difference in these weaves, then? Let's begin with Uni-Directional materials. Simply the fibres or tows of fibres all run in one direction, UD comes with a few weft threads of glass or aramid woven in or even some sort of backing material to keep them in order. Fine they may be for some wings but not for surfaces where strength is needed in more than one direction so we choose a woven material. The following weaves are in order of their drape, strength and generally, expense.

- **GLOSSARY**

- **WARP** = Lengthwise threads, i.e. they run the length of the roll of woven cloth.
- **WEFT** = The transverse, or crosswise, threads woven into the warp threads.
- **DRAPE** = The way the cloth drapes over or fits into compound curves.
- **AREAL WEIGHT** = Weight of cloth generally in gsm (gram per square metre)
- **SIZE** = Nearly all fabrics are sized or *coated* with epoxy resin (~1%) for adhesion.
- **BIAS** = The angle of the warp and weft threads, usually 90° but can be 45°.
- **UD** = Uni-directional. Tows of fibres held in position in a scaffold of fine weft threads.

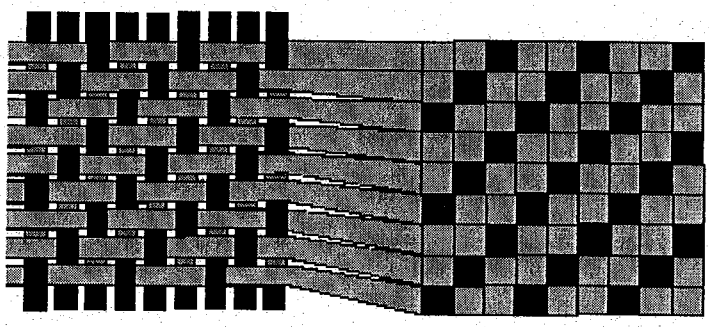
PLAIN WEAVE



The simplest fabric to understand is a Plain Weave; it's simply *over and under* in each direction. (That is to say; the weft is carried over all odd-numbered warps and under all even-numbered warps. For the next pass of the shuttle, the weft passes over the even-numbered warps, and under

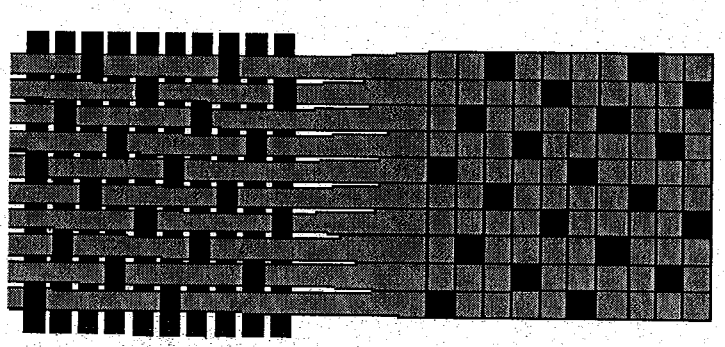
the odd.) Sometimes it's two over and two under. It has the advantage of giving strength in both directions with a 90° bias but the disadvantage of halving the UD strength (since half the cloth is at 90°). Another disadvantage of the plain weave is that the cloth is bent over and under which imparts some shearing distress on the fibres therefore weakening them compared to UD fibre which lays flat. Plain weaves will curve over simple one-way curves but with compound curves there can be a problem. Try pushing some in a mould and you'll find out - you'll end up with wrinkles and will have to snip the cloth here and there if you're not careful. The finest plain weave glass is about 25gsm. (German Plain = Leinwand)

TWILL WEAVES



Twill Weaves are better at handling compound curves than plain weaves. Look closely at the diagrams and you'll see the way the weave is formed. (The twill is formed when the weft passes over warps 1 and 2 and under warps 3 and 4, and in the next pass, the shuttle of the loom passes over warps 2 and 3 and under warps 4 and 5.) There are many variations on the theme so you will see twills listed as 1/2, 2/2, 1/3, etc. Twill fabrics are characterised by their appearing to have diagonal lines running either right or left on the fabric face.The first advantage is the fewer number of times the fibres go under and over one another. A variation of the twill is the Crowsfoot or cross twill. Twill weaves feel generally tighter, or more closely woven, than plain weaves. For most purposes a nice 100 - 160gsm twill is the best choice. (German Twill = Köper.)

SATIN WEAVE



In the Satin Weave, the weft *floats* or skips over as many as 12 warps before being woven in. The next pick repeats the float, but on a different set of warps. Compare the weft over the warp threads in the diagram below. You may see satin fabrics labelled as 5 or 8 harness satin weaves indicating the degree of float. The one here is a 5 harness - the weft floats over 4 warp threads. In Germany these weaves are called Atlas verbindung. These are probably the best fabrics to use for complex moulds but can appear to be tightly woven and therefore difficult to wet out with resin. Since the threads have less *crimping* than plain and twill, satins make for the strongest use of the fibres.

HYBRID MATERIALS

In an attempt to harness the stiffness and compressive strength of carbon fibre with the impact resistance and tensile strength of aramid fibre, hybrid fabrics are also available. These come in many forms - the carbon/aramid twills have rather nice yellow and black patterns to them too. I actually have some rather nice UD carbon and UD Dyneema with a 45° bias.

PREPREG MATERIAL

As its name suggests, prepreg is pre-impregnated material i.e. impregnated with mixed epoxy resin. It comes with a backing paper and has a limited shelf life and must be stored in cool conditions. Pre-preg carbon has the appearance of sticky liquorice. This material is NOT suitable for modelling since autoclaves and high temperatures are needed to cure the resin. Newer types use thermoplastics instead of Epoxy resins and are like stiff plastic until softened by heat, e.g PEEK (polyethyl ether ketone).

Special type of woven cloth - a woven tubing if you like - rather like a Chinese finger puzzle. It's sometimes called braid. Ideal for spars, fuselage booms, fuselage pods, engine nacelles, etc where no seam is required. It effectively forms a spiral weave for cylindrical objects and pulls round compound curves. I used it with the lost foam method to make an HLG fuselage. Available, only from Germany and the USA as far as I know, in glass, carbon, aramid and carbon/aramid hybrid forms. Many diameters from 5 mm up to 150 mm before stretching.

E-MAIL HOME

Links

Email to links@rc-soar.com for changes/additions.

✶ = Recommended

Clubs and Personal

- ✶ Aeolus Home Page Well designed site with interesting technical articles by Graham Woods.
- ✶ All about Polymers "A cyber wonderland of polymer fun".
- Andy MacDonalds page Good vacuum bagging resource plus links. He did the page with Notepad, too!
- Antik Modellflugfreunde Deutschland e.V." Antique glider construction. nice pictures if a bit slow.
- BARCS British Association of Radio Control Soarers.
- ✶ Compass Soarers Slope Soaring Club Carl Trollope's UK-based page. Kit reviews, pictures for scale and F3B/F3F. Good stuff.
- NEW Dave Jones Soaring page from Heidelberg Heights, Victoria, Australia.
- Concorde 2000 - Belgian club page - "The club is located in Herselt, Belgium (and for those from far away), Europe"...
- NEW Electronic Gadgets for Radio Control For electronic freaks, articles for alarms, chargers, cyclers etc, some on the site itself, some links to other sites.
- ESL Eastern Soaring League promotes flying in Eastern USA.
- ✶ Fatlion Excellent resource for beginners in R/C soaring
- FAI Fédération Aéronautique Internationale. Rules and regulations.
- Foom Delta Dutch site devoted to a foom ("foam"!) delta design. Includes drawings - print out, get out the hot-wire and start building! I like it, but it's a bit slow to download.
- Foam Cutting Machine How to build an NC controlled foam cutter.
- Frits Donker Duyvis "The trick, Fletcher, is that we are trying to overcome our limitations in order, patiently. We don't tackle flying through rock until a little later in the programme."
- Hovercraft FAQ
- NEW John McCurdy's F3F page UK F3F league program & results.
- League of Silent Flight (LSF) Details of achievement schemes and membership form.
- ✶ Ken Hewitt's PIC page R/C related electronic projects.
- MetWeb UK Weather forecast.
- NEW ✶ Matt's Micro R/C Planes very nice sight devoted to this increasingly popular branch of the hobby.
- Olivier Bordes - French F3F page.
- R/C Sailplanes Good resource for beginners. Explains handlaunch, slope, radio and construction. Several models described.
- Rivington Soaring Association UK soaring club page.
- SAM600 Australia Home Page - Antique model flying down under, mainly engines powered, but there's a glider section too.
- SA Model Gliding Association Info on the 1999 F3B WC's in South Africa.

- SA F3B The South African F3B Team's Home Page. Read about Michelle Goodrum, sole female competitor in F3B WC's.
- SA Model Aircraft Association Includes competition diary. Go there for more info on 1999 F3B World Championships.
- Shamim Mohamed Soaring FAQ, Plotfoil software, plus travel and cycling interests.
- S Wales Soaring Association Competition news and other club-related info from Kev Robertson.
- Southern Soaring League Largest group of soaring enthusiasts in South Australia
- Soar Valley Fliers UK club page
- Toine.Martens Page Lively Dutch R/C Site.
- Vacuum Bagging Information from the Bearwood homepage in NZ

Manufacturers and Retailers

- Aveox E-flite motor manufacturers, top-notch web site.
- NEW Canterbury Sailplanes NZ based retailer with on-line ordering facilities
- Compufoil Commercial airfoil plotting software.
- Dave's Aircraft Works Range of foamies and wood models. Excellent section on foamie tips/tricks.
- Digital Aerial Photography Dave Grenewetzki's page. Commercial controllers and lots of info.
- NEW Endless Lift Home of the Endless Lift soaring videos site. Graphic rich but quick-loading, if the videos are as good as the site...
- East Coast Model Center "Canada's Leading Dealer for Radio Control Models". With introductary articles for the beginner.
- EPP website An industrial FAQ for the manufacture of EPP mold processes, fixtures, and the material itself.
- FMA Direct Direct sales of airborn stuff. Informative site.
- Hanley Innovations NACA airfoil plotting software.
- NEW Hobby Club retailer with on-line secure ordering for all types of flying model. Muliplex dealers.
- Hitec Radio control manufacturers.
- ICARE sailplanes from French speaking Quebec - "specialise in manufacturing and distributing scale sailplane fuselages, kits and electrics".
- Northeast Sailplane Products Handlaunch, Electric, Slope, Thermal and Scale products.
- Planes Wings and Things-R/C Sailplanes, Supplies and Accessories
- NEW Purbeck Sailplanes UK manufacturer of scale soarers and the Adrenaline aerobatic sloper.
- NEW Punctilio Model Spot Ltd UK manufacturers of props and Multiplex dealer.
- SFSPC Demo Soaring Simulator for IBM compatible PCs.
- Sky Bench Aerotech Mail order retailer in Washington MI. Nice page.
- Soaring Stuff Taylor Collin's shop for soaring bits and pieces - winches, parachutes, books and other accessories.
- Trick R/C Home of the ZAGI
- Volz Servo manufacturers home page. Nicely designed.

R/C Indexes, Search Sites etc.

- B2Streamlines Specialty books for modelers
- Manny Tau's R/C Yellow Pages Email addresses and web sites
- Martin Hepperle Home of MH airfoils. "The purpose of this site is to provide material about aerodynamics of model airplanes.Most of the information is the result of work dedicated to high performance contest model aircraft."
- Tower Hobbies R/C Directory Comprehensive links to R/C resources.
- UIUC Airfoil Data Site Michael Selig's airfoil warehouse

- The Complete RC Websites Index contains currently over 2000 R/C links world-wide.

Other R/C-related

- Battery Clinic Good resource on Nicad technology.
- R/C Flight Unlimited For power freaks, comprehensive kit reviews.

General Aviation

- ✶ Burt Rutans' Scaled Composites "Founded in 1982 by Burt Rutan, Scaled has a broad experience in air vehicle design, tooling, and manufacturing, specialty composite structure design, analysis and fabrication, and developmental flight test."
- Deltaweb Aviation Website. Full-size airshow information. UK based. Contains the official **Red Arrows** aerobatic team page.
- ✶ Design a Subsonic Transport Educational service created by the Systems Analysis Branch of NASA Ames Research Center

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Last updated March 12, 1999