

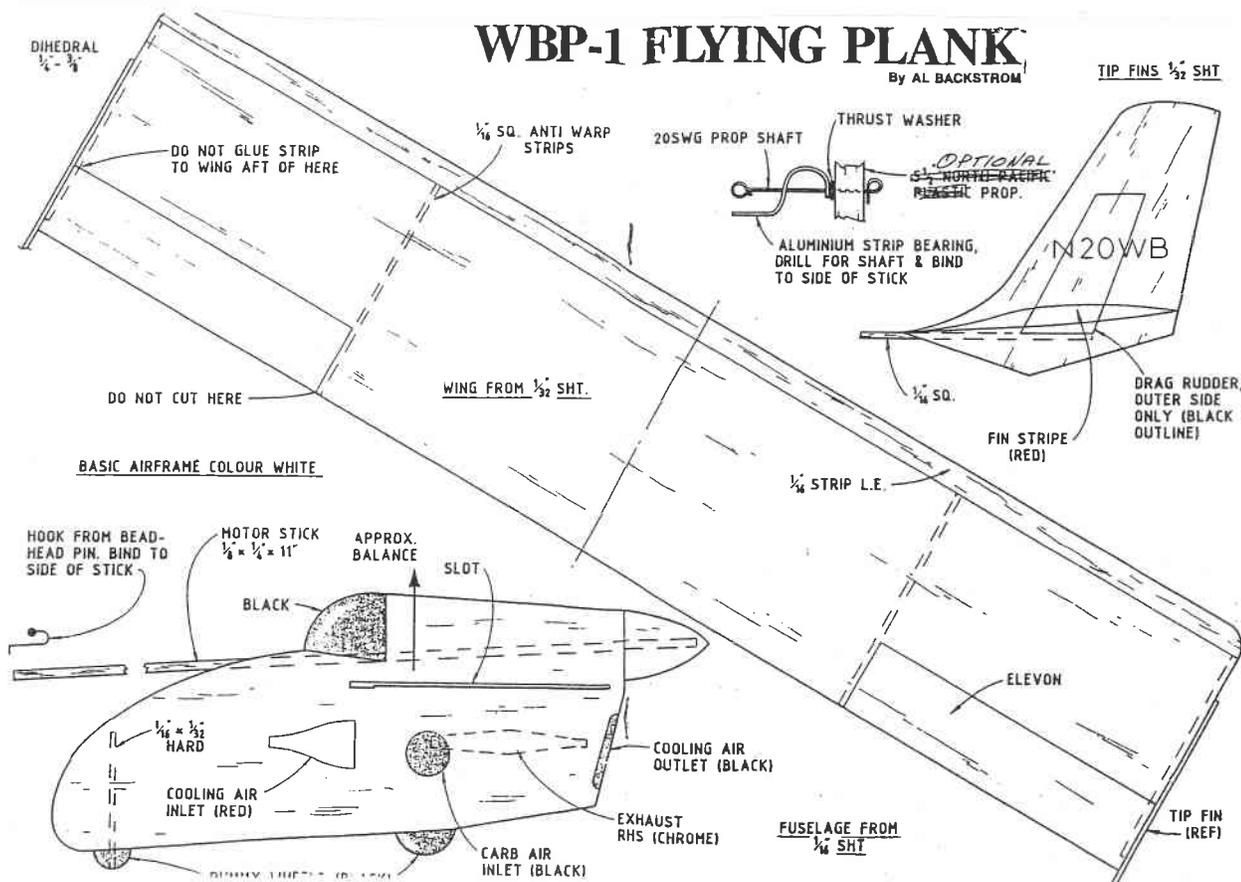
T.W.I.T.T. NEWSLETTER

WBP-1 FLYING PLANK

By AL BACKSTROM

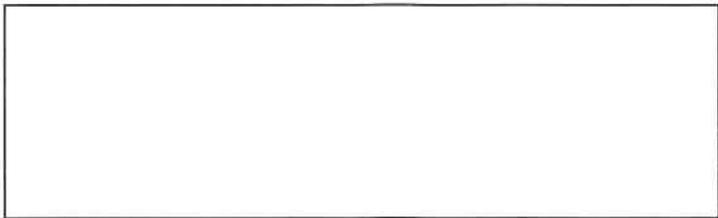
TIP FIN $\frac{1}{32}$ SHT

Al Backstrom offers a model of his unusual aeroplane. (possibly from an article in RCM, date unknown.) Models were the basis for this year's John St. Aeronautical Society gathering on New Year's day. (This is not to scale.)



T.W.I.T.T.

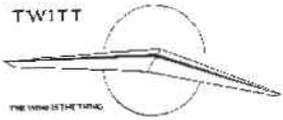
The Wing Is The Thing
 P.O. Box 20430
 El Cajon, CA 92021



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Next TWITT meeting: Saturday, March 16, 1996, beginning at 1330 hrs at hanger A-4, Gillespie Field, El Cajon, CA (first hanger row on Joe Crosson Drive - East side of Gillespie).

TWITT



**THE WING IS
THE THING
(T.W.I.T.T.)**

T.W.I.T.T. is a non-profit organization whose membership seeks to promote the research and development of flying wings and other tailless aircraft by providing a forum for the exchange of ideas and experiences on an international basis. T.W.I.T.T. is affiliated with The Hunsaker Foundation which is dedicated to furthering education and research in a variety of disciplines.

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Subscription Rates:

**\$18 per year (US)
 \$22 per year (Foreign)**

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 Postage Paid
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Meetings are held on the third Saturday of every other month (beginning with January), at 1:30 PM, at Hanger A-4, Gillespie Field, El Cajon, California (first row of hangers on the south end of Joe Crosson Drive, east side of Gillespie).

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PRESIDENT'S CORNER



As I begin to put the newsletter together this month I really don't know how it is going to turn out or whether it will be out on time. My employer is doing a full computer conversion along with moving from one

location to another here in San Diego, and my time has not been my own for the past several weeks. I also don't know quite what it is going to look like, since I may have to switch to a word processing software that I am not as familiar with as WordPerfect.

I hope you all receive this at least 4-5 days before the meeting. If not, I heartily apologize for the lateness, but I think the April newsletter will be back on schedule.

For those of you who live in Southern California and attend the meetings, I would appreciate it if you could look around your local area for some potential programs. Is there someone at your favorite airport who would make an interesting speaker on some aspect of aviation (even a general interest subject like a construction technique)? Do you have something that would be of interest to the membership at large you could give a presentation on?

The method of presentation (slides, view-graphs, charts, etc.) is not as important as the subject matter and its relevance to the group as a whole. Some of our best programs have been loosely organized general discussions around a central topic. The exchange of ideas, theories, and experiences sometimes turns out to be a better way of getting the message across than a fancy presentation. (This does not mean we haven't enjoyed these types of programs in the past, but we realize not everyone is cut out to make such an effort.)

The search for this month's program was much more difficult since Bob is running out of known resources. Any help you can be in finding suitable program material would be greatly appreciated by Bob and the general membership. If you have an idea or think you know of a speaker, please give us a call.

Andy

MARCH 16, 1996 PROGRAM

As of the publication date we still did not have a program firmed up for this month. Bob is continuing to work on getting a speaker who can cover some aspect of flying wings, tailless aircraft, or perhaps rigid wing hang gliders (from a different perspective than that offered by Chuck Rhodes several months ago).

(ed. - Now you can see why I made my comments in the President's corner about needing some fresh input on programs.)

If you live out of the immediate San Diego area, we strongly suggest calling either the hanger during the day, at (619) 596-2518, or Bob or Andy in the evening at the numbers listed on page 1, to find out about the program. You may not want to drive a great distance if we end up primarily having a hanger flying session, although sometimes these turn out to be just as good as a regular program.

We are sorry for the lack of information, but as I said above, it is getting tougher and tougher to come up with new and interesting programs after nearly 10 years of operation.

LETTERS TO THE EDITOR

1/14/96



TWITT:

It's been some time since I contributed to the newsletter. I have a lot of material, but don't always know what

would most interest you or other members. Perhaps the enclosed odd item will find a small following. As usual, questions abound.

In issue #93 I explored low-aspect ratio types, particularly regarding (L/D)max. Performance extrapolations of historic annular planes led only to "questimates" of how annular types compare, and no mathematical analysis appeared in response to my query. However, while researching material for tailless bibliography expansion, I came across the enclosed patent that addresses just that question.

U.S. Patent No. 4,307,856 (12/29/81) by Harold Walker of NASA includes approximate mathematical derivations of lift-curve slope, L/D, aerodynamic center, and longitudinal and lateral static stability for various ratios of inner to outer radii of tailless, annular planes. Classically generic derivations assume elliptical span-wise lift distribution, parabolic polar ($D \propto L^2$), A.R. = b^2/S , and USAF DATCOM equations unfamiliar to me. Effective midchord-line sweep angle (from integrating around 1/4-circle) and downwash effects are considered. Figs. 13-15 and four tables

display results. In Fig. 13, A = aspect ratio, ζ = distance of aerodynamic center from wing center (chords), $C_{L\alpha}$ = lift-curve slope, and $(\alpha_r - \alpha_0)/i$ (trim angle of attack) is the ratio of the difference of zero-pitching-moment and zero-lift angles of attack to angle of incidence. The "A" and "(L/D)max" curves converge neatly to accepted values, when $R_i/R_o = 0$ (solid disk; see TWITT #93), BUT, how USEFUL are these results?

Would any members comment on validity of these premises and merits of the results? Is this definition of A.R. meaningful for annulars, and can they approach elliptical lift distribution for varying α (wouldn't out portions gain lift disproportionately with α)? How much difference would actual wing sections with transitions make? Can a vortex method be applied? Does anyone know whether Mr. Walker or anyone else at NASA did experimental measurements on this configuration? Perhaps I'll send copies to a couple resident TWITT experts to see whether they'd care to comment.

The patent itself shows uniform, radially oriented, vertically and longitudinally symmetrical wing sections, conically inclined for decolage/dihedral (angle of incl. = i). While the control means might run afoul of Newton's third law, the patent is interesting and appealing.

The Tailless Bibliography continues to grow. At over 4,000 entries (up 30%, with substantive, high-quality additions) and enough unentered, related-interest items to outgrow any reasonable format, editing has become a major challenge. I am ready to cross-reference it (upgraded computer and several hundred hours should handle it now), but the cross-referencing outline itself is 7 pages; what to do?!! I am working on ways to minimize information loss while condensing, but would consider any suggestions on preferred material, size, or reference categories.

The newsletter's looking GOOD.

'Til next month,

Serge Krauss

(ed. - Thanks for the material. Obviously some of it made a good cover last month. I will put in Fig. 13, and do the cut & paste of some other pictures as you suggested, but I was not sure which ones were really appropriate to Fig. 13.

I hope our conversation last month was somewhat helpful in better organizing your material so that it is more sortable. I have had good luck with the database function of WP 5.1 for rosters and other information I wanted to sort and or put into different formats for printing.

I appreciate the helpful hints in your P.S. about which codes to use for getting the various formula items. However, Control-2 doesn't do anything in my program, but Control V gives me the Key= function for entering the code. If you don't know the Key numbers, you can simply hold down the ALT key and input the ASCII number for the item and it will produce the same results (reveal codes will then show you what the Key numbers are).

(Continued on Page 5.)

(ed. - I thought everyone would get a kick out of the abstract from the patent document, seeing that it is only two sentences long and reads like most pieces of federal regulatory agency statements of rules and regulations used to enforce most laws.)

"An angular wing particularly suited for use in supporting in flight an aircraft characterized by the absence of directional stabilizing surfaces. The wing comprises a rigid annular body of substantially uniformly symmetrical configuration characterized by an annular positive lifting surface and chord line coincident with the segment of a line radiating along the surface of an inverted truncated cone whereby a decalage is established for the leading and trailing semi-circular portions of the body, relative to instantaneous line of flight, and a dihedral for the laterally opposed semi-circular portions of the body, relative to the line of flight, the direction of flight and climb angle or glide slope angle being established by

selectively positioning the center of gravity of the wing ahead of the aerodynamic center along the radius coincident with an axis for a selected line of flight" (You get all that?)

The definitions below should help clarify the scales in the following figures extracted from Patent Document 4,307,856, December 29, 1981.

- ζ = distance of a.c. from wing center in chords
- α_T = zero-pitching-moment angle of attack
- α_o = zero-lift angle of attack
- i = angle of incidence (angle of incl. at each station)
- $C_{L\alpha}$ = lift-curve slope
- R_o = wing outer radius
- R_i = wing inner radius
- e = Oswald efficiency factor
- q = dynamic pressure
- b = span = $2R_o$

Fig. 13 is a graphic view depicting efficiency of the wing
 Fig. 14 & 15 are graphic views illustrating lift-drag characteristics of the wing.

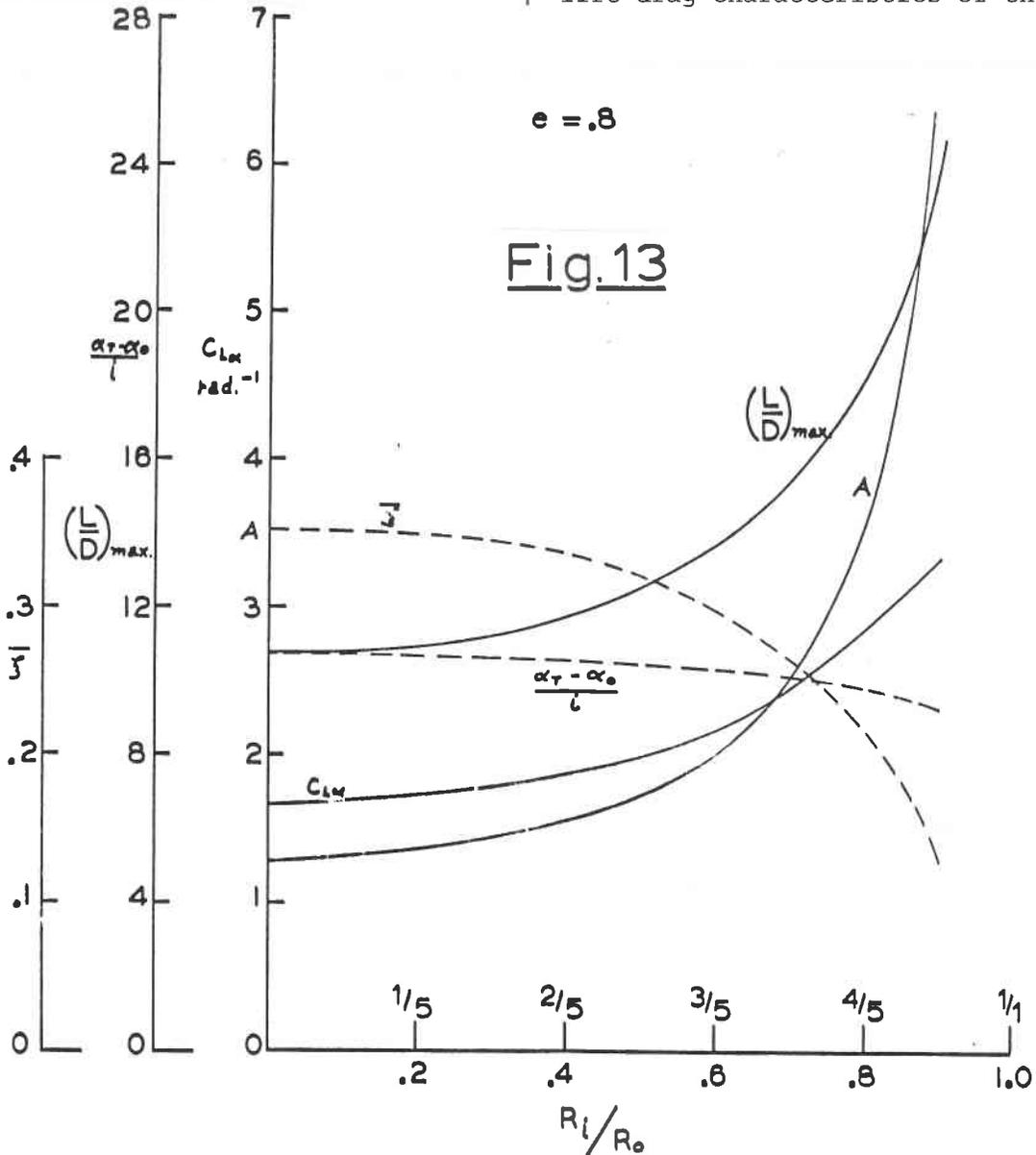


Fig. 14

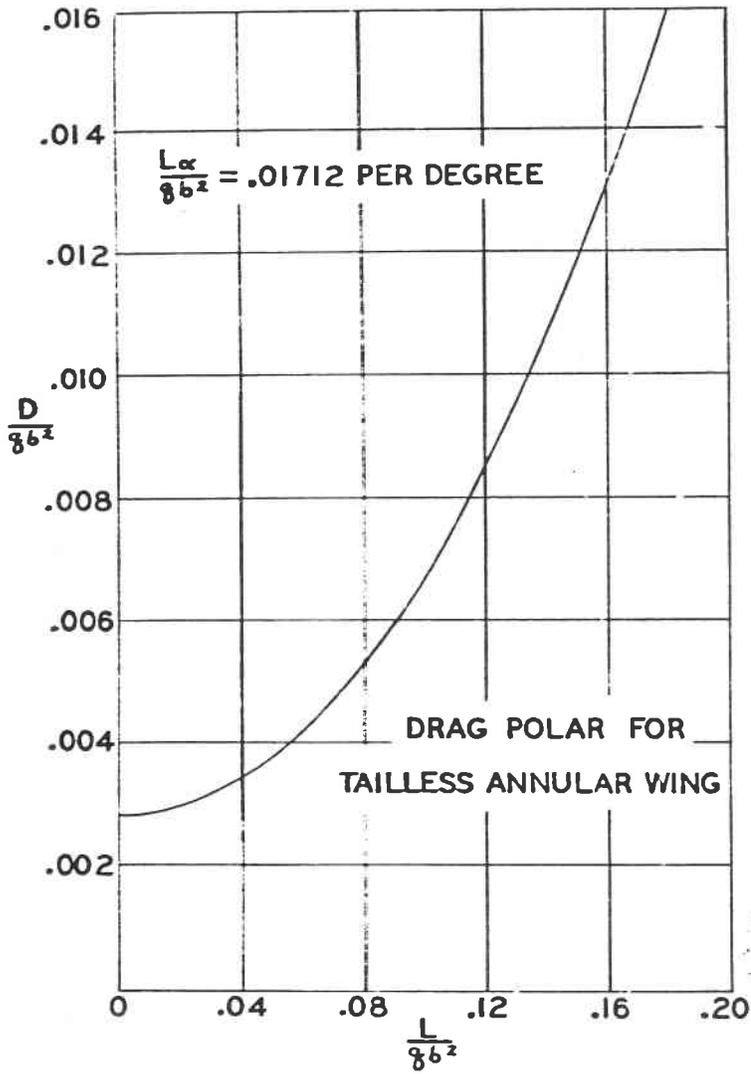


Fig. 15

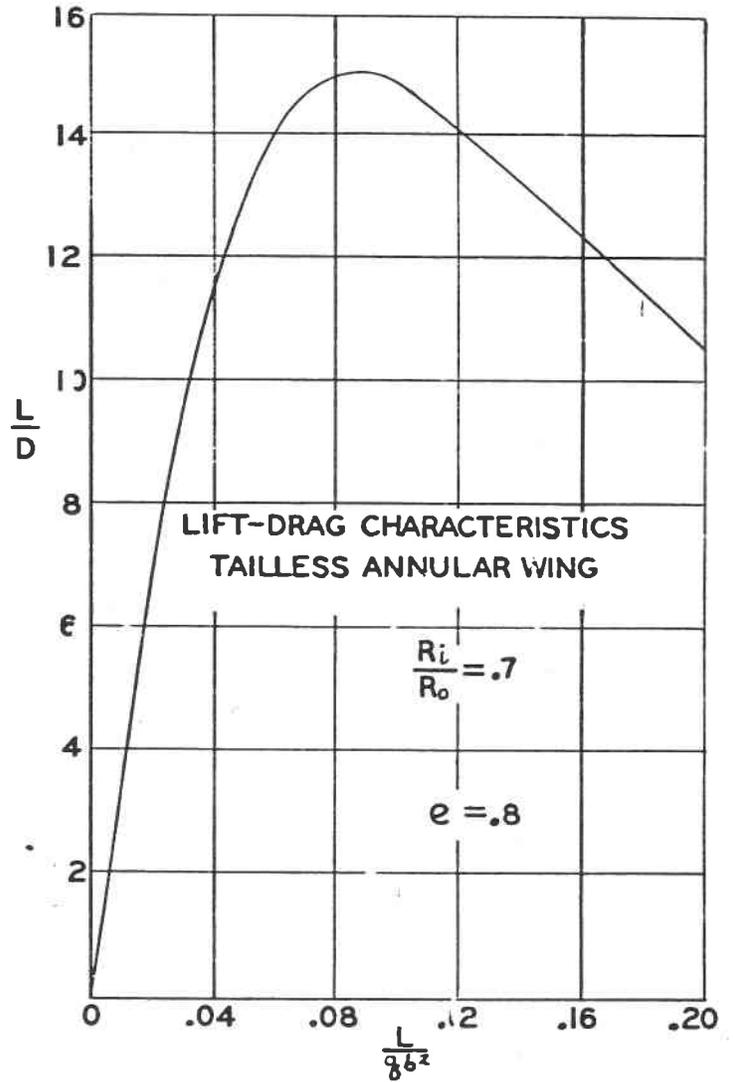


Fig. 6 is a diagrammatic view of the wing shown depicting forces acting thereon during flight.

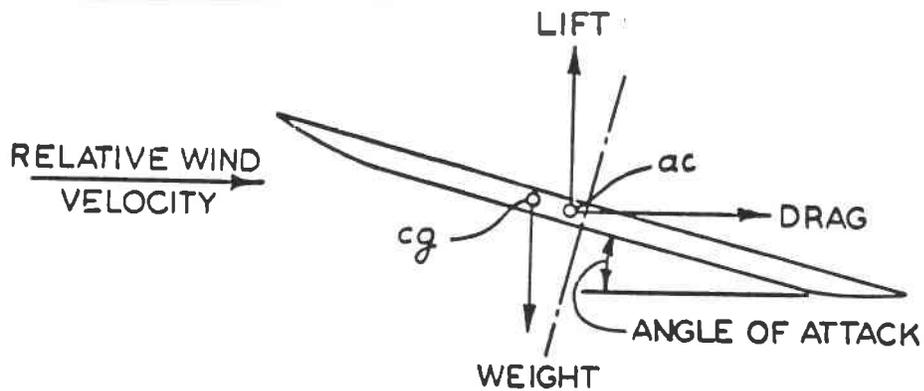


Fig. 6

It appears you will have the most definitive work on tailless aircraft in the world if you keep going the way you are. I hope the references I have been including in the newsletter as we add to the library have been sufficient for your use. If not, make sure to let me know what other data you need off the material if you want to include it in the bibliography.)

2/10/96

TWITT:

The airframe of my YV-49 is complete, save for canopy installation which I will do when the weather is warm enough to work with epoxy. In a couple of weeks I expect to bolt on the engine and get it working. All the controls work as to the electrical systems and plumbing.

I have to wait till May to have it painted. I intend to use PPG Durothane rather than any DuPont products for personal reasons. I shall have a professional painter do it because urethane paints can be dangerous and an experienced painter I know does it better than I can.

Perhaps its first flights can be made with only primer paint on it.

Barney Vincelette

(ed. - Barney included a picture of the airframe and instrument panel, but we didn't have enough other material to get them half-toned this month for publication. It is obvious from the pictures that the cockpit, panel, and engine mount have been added since the last picture in the December newsletter.

Except for the canopy, we are glad the cold weather in Delaware hasn't slowed you down too much in getting your project done. You have moved along faster than most on a project this complex, and you should be congratulated for that.)

11/29/95

TWITT:

Here's \$5 Canadian for your info pack on TWITT. Don't forget my change!! (We haven't \$1 US bills in Canada.)

I'm looking around for a Mitchell Wing B-10 that I can convert to C-bar and prone harness. I have an ATOL system on an old car and fly my hang gliders right off of its trunk.

Do you know of the safest way that I might learn to fly the Mitchell Wing. I am an advanced pilot; 20 years and 700 hours on a variety of hang gliders.

Thank you,

Miheu Oarud
306 Riverside Dr. #8
Sudbury, Ontario
Canada P3E 1H6

(ed. - Although Miheu has not joined TWITT yet, I would be nice if someone could answer either of his questions. Perhaps if we showed him the

interaction and information exchange available within TWITT, it would convince him to join.)

2/10/96

TWITT:

I found these articles on Bernie Gross in an old AIR PROGRESS HOMEBUILT ANNUAL, probably from the mid-sixties or early seventies. Bernie may remember. I thought the group would be interested.

Plus, with Bruce Carmichael's input and library, I am making progress on a joined wing study. More on that later.

Mark Motley

(ed. - Thanks for the pictures. I am not sure if they will reproduce very well, but if Bernie (our birthday January birthday boy) doesn't have copies we will give him these.

The caption to the article stated:

"New Yorkers Bernard Gross and Ralph Squeglia have worked together on several amateur aircraft projects. Restoration of a Bowlus-designed, Nelson-built Dragonfly powered sailplane was one undertaking. . . that craft is shown on page 36. Here the pair, both licensed pilots, work on a Kirk design in the attic of Gross' home. That both are meticulous craftsmen is apparent from the quality of this framework and the thoroughness with which they approach each project. Total cost was about \$1,000."

This attention to detail can also be seen in Bernie's Deaf Hawk Marske Pioneer flying wing which he also built.)

1/23/96

TWITT:

Hi, I've received your January copy of T.W.I.T.T. and my compliments for your newsletter. I'm waiting for some nice weather to come in the next few days, so that I can test my B10 Mitchell wing. It's a restoration to which I've modified the winglets and stabilizers (I hope I've translated that right).

I also have a U2 kit which I will get to shortly. In the future, it's my intention to restore an AV36 and I'm collecting all necessary information about it in the meantime.

Most of my spare time is dedicated to airplanes and most of all to flying wings/tailless aircraft; I'm always adding books and other material to my library, due to this passion.

This is just a short note to say that I follow your newsletter and am a strong believer in flying wings, and I hope that this is a way of being in contact even through Internet.

Ciao

Olindo Zuanon
Italy e-mail:
zuan001@pn.itnet.it

(ed. - Olindo is a new member of TWITT, obviously from Italy which seems to have a large number of aviation enthusiasts who are interested in flying wings or tailless aircraft.

I was glad to see his message come in via the Internet, since this is the way I hoped we could communicate with our foreign members on a more frequent and less costly basis.

If you are looking for books, you might want to consider purchasing a copy of Serge's bibliography, which includes foreign editions as well as English versions.)

2/18/96

TWITT:

While many of us like to talk about flying wings, there is a group in England that is doing something serious about one.

There is a private organization in Southend-on-Sea, Essex, England that is restoring an AVRO Vulcan bomber to flying condition. The group is known as the Vulcan Restoration Trust. They have gotten as far as actually taxiing the aircraft under its own power. They have a homepage on the Internet at:

<http://ourworld.compuserve.com/homepages/gpenn/vulcan.htm>

For those that are unfamiliar with the Vulcan, it is a very large delta wing design. I saw one at an airshow about ten years ago and it is an impressive aircraft in flight. In airshow configuration (no weapons, and minimal gas) it has a very low wing loading, and consequently an incredibly tight turn radius. This same type of aircraft was featured in one of the old James Bond movies (Thunderball) back in the 1960s. The Vulcans were brought back into service for the Falklands war (they had been retired, but not yet scrapped), but went out of service in the mid 1980s.

Kevin Renshaw
Fort Worth, TX
Email: kaki@airmail.net

(ed. - Yet another Email submission for the newsletter. You guys are really getting into the modern age of communications. Besides it makes it easier for me to incorporate it into the newsletter since I don't have to retype anything.

I witnessed several international airshows in England during the early 80's and the Vulcan was truly an impressive sight as it made low passes along the runway and then did pull-ups into chandell types maneuvers. It is something you don't often see a very large plane do.

I also had the opportunity to go up into the cockpit of one, which is sort of small compared with other aircraft of its size. It was more like being in a fighter cockpit, but it was a great experience. A personal observation here - European airshows seemed to be much superior to those we typically see here in the states, due in part to presentations like those of the Vulcan.

I checked out the homepage and found that at least 111 other people showed an interest in their cause. I registered my contact with the page in the hopes we might hear more from them.)

NEW CONSTRUCTION MODES ("MIROUSE's Foam'n tape")

By Alain MIROUZE of Le Sylvacane, 13127 Vitrolles, France.

(ed. - Alain sent along this material to show a simple way of doing some basic construction for ultra-lights and some types of prototypes. Not being a builder, nor really familiar with working in foam, epoxy, etc., I hope the text and accompanying figures will give you the general idea being presented by Alain.)

THE PRODUCTS

- ▶ Aluminum tubing (ex-hang gliding if available).
- ▶ Polystyrene foam (house building and repairs) in pressurized cans.
- ▶ Polystyrene foam, either blue, green (extruded) or even white (expanded).
- ▶ This polystyrene foam may be substituted by either PVC foam ("Klegecell") though more costly, or by polyurethane rigid foam (in areas likely to be attacked by gas or oil).
- ▶ Adhesive reinforced tape (or even normal one, from packaging industry) or adhesive film, glass fiber reinforced or not.

METHOD

See Figures No. 1, 2 & 3.

- ▶ After accurately placing the aluminum tubes and foam blocks, polyurethane foam is injected into the 1 cm gap between these elements.
- ▶ Care must be taken to depolish the aluminum, and to calculate the foam blocks volume in order to be in excess regarding the final shape.
- ▶ This structure has to take all compression forces.
- ▶ Over this shape will come adhesive reinforced film (tape, generally) taking all pull forces.
- ▶ This same film give the surface finish and enough elasticity to allow for ordinary local shocks to be suffered without damage.

PRACTICALLY

- ▶ Where concentrated efforts are localized (engine, landing gear, spar), ordinary techniques will be used (see below for the poor man's pultrusion method).
- ▶ In between, use reinforced aluminum tubing (sleeves, or other) which will transfer the efforts.
- ▶ As seen in Fig. 2, long nails or big wire can hold the components in place waiting for the foam to harden (1-4 hours according to

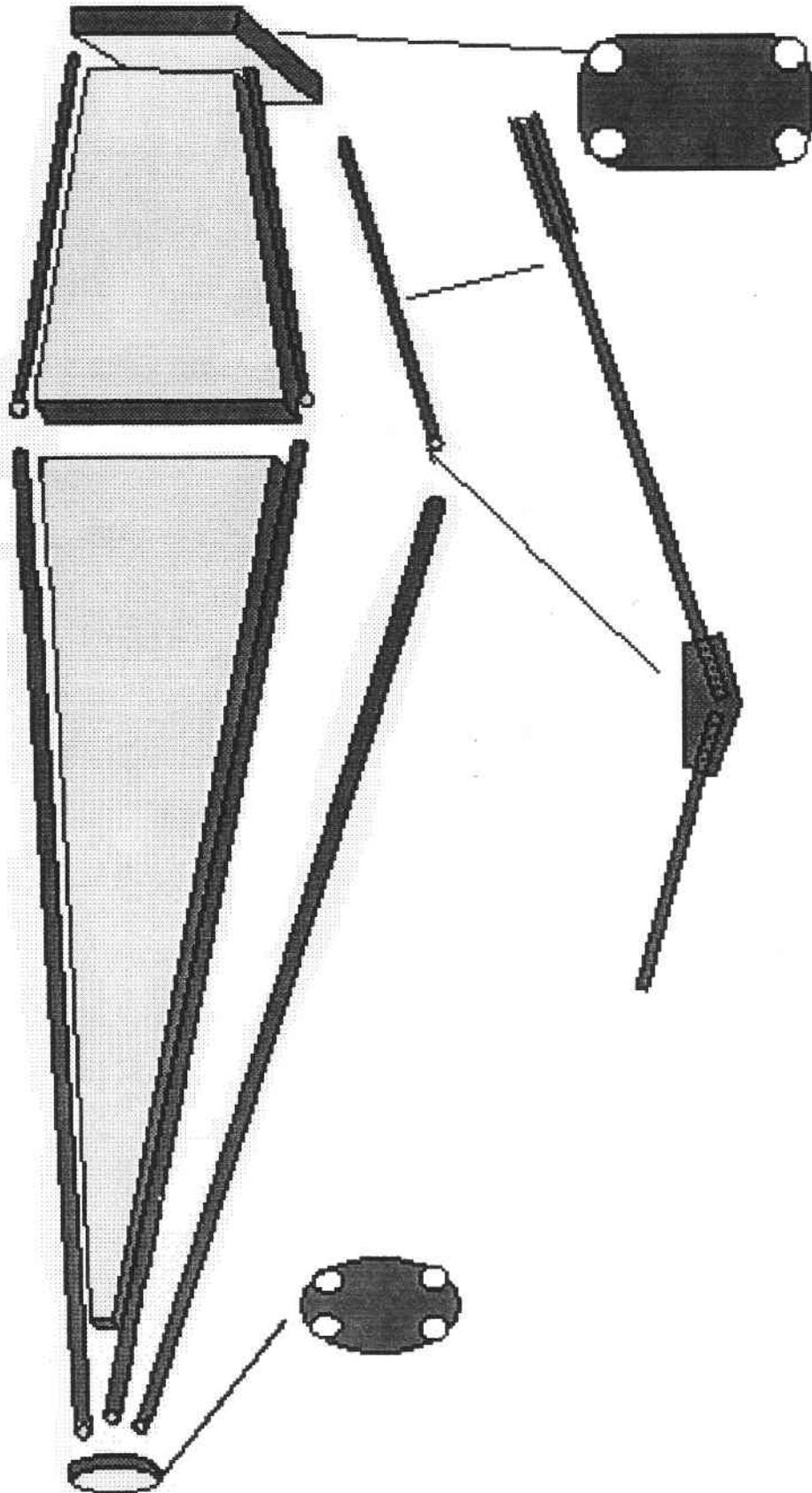


Fig N° 1

Fig N° 2

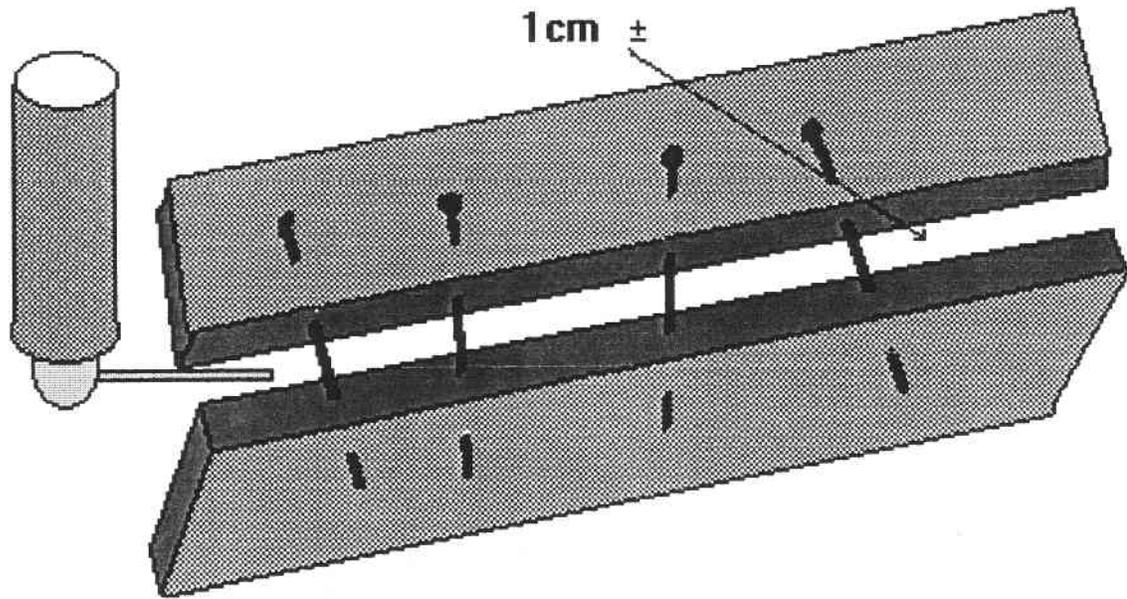
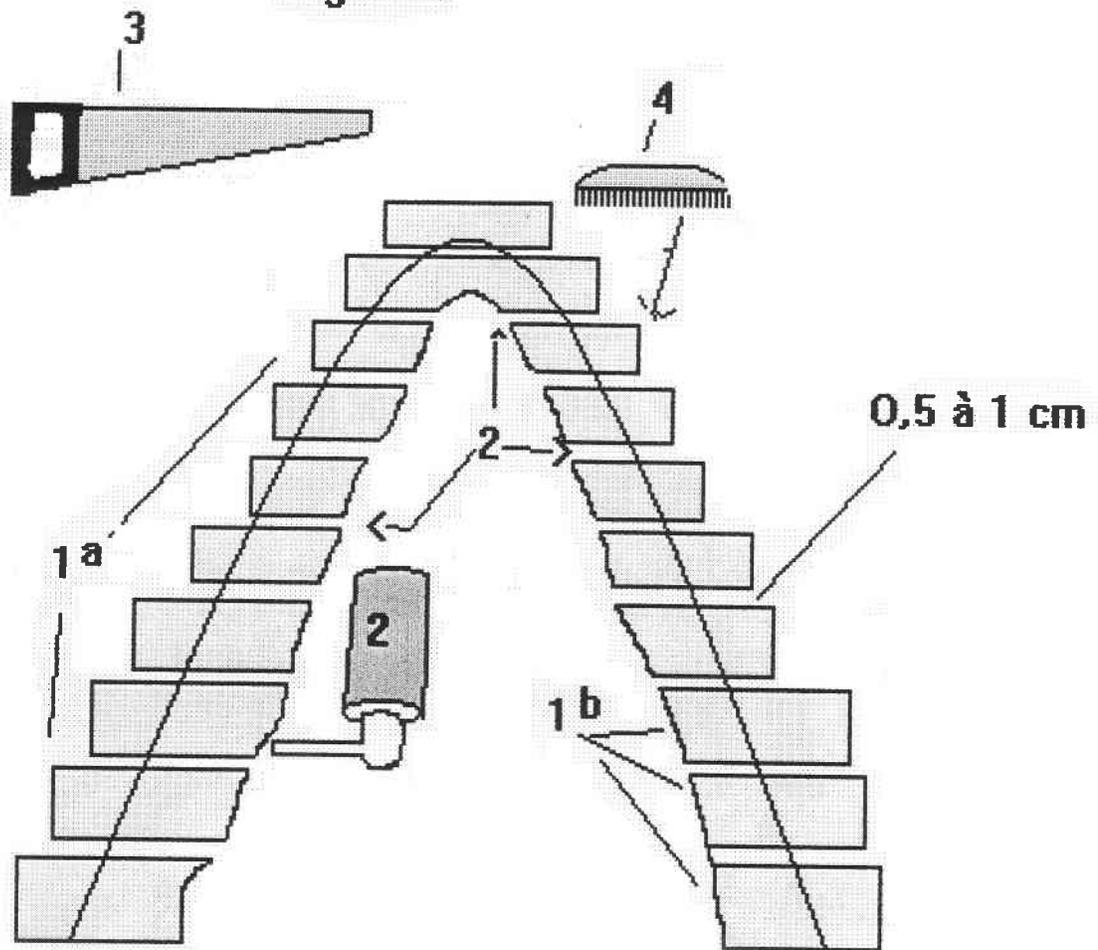


Fig N° 3



humidity and thickness).

- ▶ When all the blocks are foamed together, shaping is easy with the following method:
 - ▶ The main task is done with either a band saw or a hot soldering iron (care must be taken not to go too deep).
 - ▶ Then, the best tools are a set of metallic brushes (strong, and other differing shapes).
 - ▶ With them it is easy to get all the complex shapes quite accurately.
- ▶ Finishing is done quite classically with grit paper.
- ▶ Clean thoroughly (vacuum).
- ▶ However, one of the drawbacks of the method is that it is impossible to surface the holmmow areas (ed. - sunken areas??) with adhesive tape: it would shrink and come unstuck.
- ▶ Even large flat areas are not very suitable for this building system, unless holding the tape here and there with some system of gluing (epoxy spots used as rivets).
- ▶ We are waiting for new adhesive polystyrene foam compatibles.
- ▶ If the cover is correctly done, paint (yes, why not?) can be sprayed and even some gasoline spilling will not attack the substrate.
- ▶ One good way of protecting the foam without adding weight, if no film is to be put over it (inside hollow surfaces), is to coat it with modern water-based glues (wall paper type) or polyvinyl based paints (here though weight may become a problem).
- ▶ Rigid polyurethane foam, which is quite solvent-resistant, is not suitable to be covered by adhesive film: The micro-surface to be in contact with the film is too small.
- ▶ It is necessary to carefully (mind the weight, though) "paint" it with some latex-based (neoprene) adhesive.

STRENGTH AND AGEING

- ▶ One test probe was subjected to a 200 Km/h speed without any problem (except escaping radar on the French highways).
- ▶ Some experimental ultra-lights and free gliders have suffered many shocks and, for the latter, crashes, with no or only minor damage, quickly repaired (cut, discard, replace block, foam, shape, cover).
- ▶ One of the first structures done this way has now been 15 years in a hot, dry place: covering tape and film would have to be removed, nothing else.
- ▶ In fact, if tape (more so than film), is used without protecting paint, repeated weather aggression, rain, frost and sun, will deteriorate the cover quite rapidly (six months outside in the open).
- ▶ If correctly used, the whole system is not very prone to flutter due to the small weight of the elements.

PRICE

- ▶ A prototype glider (small aspect ratio, so no problem with a spar) has been realized at less than 800 dollars.

WEIGHT

- ▶ Basic structure can average less than 1 kilogram per square meter (then, of course, add engine, accessories, landing gear, cockpit, etc.).

BUILDING TIME

- ▶ A frame can be done in six days; a wing in two (if spars are already available). Changes are easy.

AVAILABLE PLANS & REFERENCE MATERIAL



Tailless Aircraft Bibliography

by Serge Krauss

4th Edition: An extensive collection of about 2600 tailless and over 750 related-interest listings. Over 15 pages of tailless design dates, listing works of over 250 creators of tailless aircraft, and the location of thousands of works and technical drawings for the Ho 229 (IX), Me 163, & Me 262.

Cost: \$23 (Domestic)
 \$32 (European destinations)
 \$35 (Asia/Australia destinations)

Order from: Serge Krauss
 3114 Edgehill Road
 Cleveland Hts., OH 44118

Tailless Tale, by Dr. Ing. Ferdinando Gale'

Consists of 268 pages filled with line drawings, tables and a corresponding English text. It is directed towards modelers, but contains information suitable for amateur full size builders. Price is \$38, postage and handling included (also applies to Canada and Mexico).

You might also want to purchase his new book **Structural Dimensioning of Radioguided Aeromodels**, priced at \$18.00.

On The Wing...the book, by Bill and Bunny Kuhlman (B²) is a compilation of their monthly column that appears in RCSD. Many of the areas have been expanded and it includes