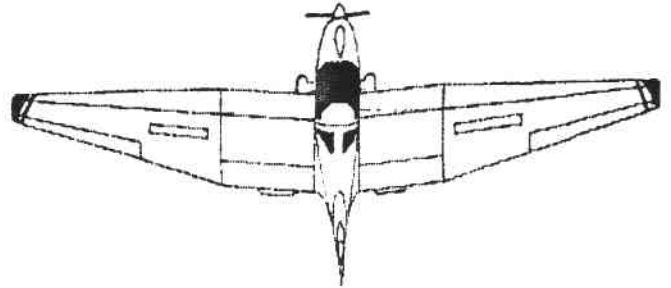
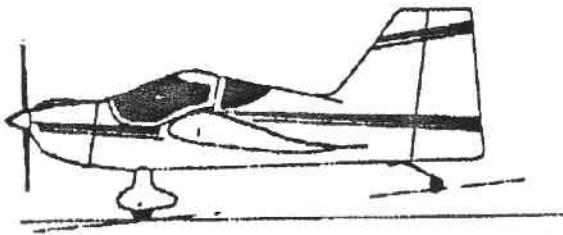
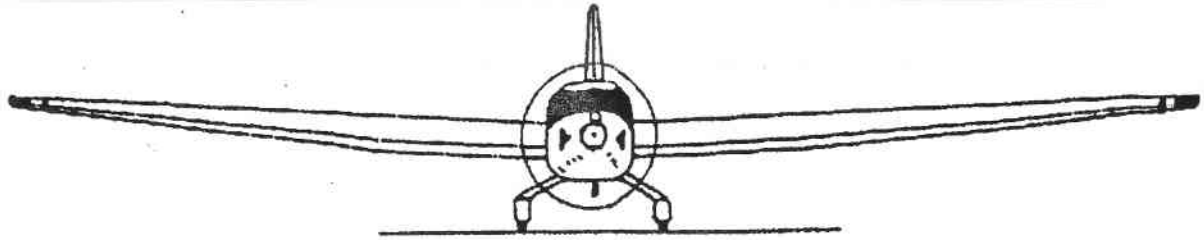


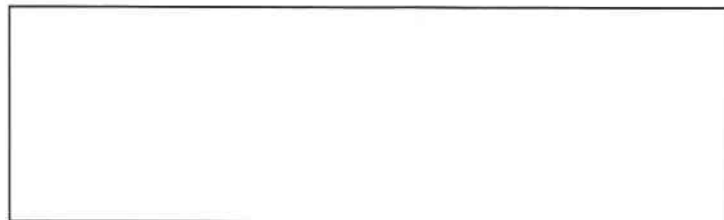
# T.W.I.T.T. NEWSLETTER



**CHOUCAS** - The creation of Claude Noin. He imposed the following constraints: the glider had to be bi-place with performance being at least equal to that of the Sirius (a monoplane) that he had already constructed; it had to be able to exploit this performance being self-launching without outside assistance, and; it must meet the French definition of an ULM of the era (175kg max empty weight, 10 kg/m<sup>2</sup> wing loading at max empty weight. (3-view from Phillippe Vigneron via Serge Krauss, text from Vol moteur, No. 130, Feb '97, as translated by David Fitchette.)

## T.W.I.T.T.

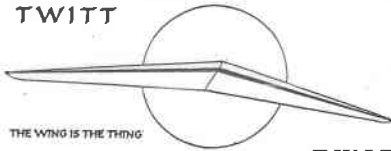
The Wing Is The Thing  
P.O. Box 20430  
El Cajon, CA 92021



The number to the right of your name indicates the last issue of your current subscription, e.g., **9704** means this is your last issue unless renewed.

**Next TWITT meeting: Saturday, May 17, 1997, 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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- Vice Pres: Bob Chase (818) 336-5485
- Secretary: Phillip Burgers (619) 563-5465
- Treasurer: Bob Fronius (619) 224-1497
- Editor: Andy Kecskes

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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**

**F**or the first time in a long time I have had more material than needed to put the newsletter together and it turned out to just as hard as when there isn't enough. This time around it was hard to decide what to put in this month and what could wait until the next issue.

I hope you will like what you see this month. As noted in the meeting minutes, the tape recorder malfunctioned (first time since I can remember) so the minutes are not as thorough as I would like them to be considering the speaker and topic. However, it left some extra room for more of the article by Robert Osborn on the Concept hang glider by Airwave. Robert sent me the whole thing via the internet, so all I had to do was clean up the formatting discrepancies between our systems and stick into the newsletter. That's my kind of article. The picture and graphs look even better in color, but unfortunately we can't bring them to you that way.

Next month I will finish up the Concept article and begin with part of the French report on the Choucas powered flying wing. David Fitchette provided a full English translation of the magazine article and I would hate for it to go to waste. The 1-page flyer sent to us by Serge Krauss made for a good cover this month as a lead-in to the upcoming story of this aircraft. I hope this makes you look forward to your May newsletter with some enthusiasm.

Did everyone find the new membership roster useful? Did you find anyone in your area that you could get together with at some convenient location and discuss flying wings? It would be nice to see some little regional pockets of members form up to exchange ideas and find ways to spread the word about TWITT and the value of flying wings to the sport aviation community.

For most of us, the summer is fast approaching and that means getting back into the air, whether it's with your favorite model or in your man-carrying vehicle no matter what configuration it is. Take some pictures of your new exploits and share them with the rest of the members who may not be able to soar a tree covered ridgeline or circle in a hot desert thermal. It might just be the inspiration they need to begin building their dream machine.



**MAY 17, 1997  
PROGRAM**

**A**s usual, at publication date we still didn't have a firm program for the May meeting. Bruce Carmichael is looking into one possibility for us, and if that doesn't come through, Bob will get busy and see what he can round up.

If you know of anyone who could provide the group with some type of program related to flying wings or a subject the could be translated into the flying wing realm, please give us a call with any contacts or firm commitments.



**MINUTES OF THE  
MARCH 15, 1997  
MEETING**

**A**ndy delayed getting the meeting started hoping the turnout would improve over time, but it was not to happen. It turns out we were competing with the Chino Air Museum Open House and the fact that the President of EAA was in attendance at the local chapter's usual Saturday fly-in.

After the normal housekeeping items for the benefit of new quests and members, Andy announced that the Board of Directors had decided to designate Gavin Slater TWITT's official Archivist. This was in recognition for all the hard work he has put in over the past several months in organizing the back office area and getting things where they can be found much more easily.

A couple of more announcements followed, the first being that Vic Saudek, and long time standard bearer for the soaring movement passed away from a heart attack on March 2nd (Howie Burr has provided a memorial found later in the newsletter). And, our own Bob Chase (TWITT VP) had a heart attack yesterday morning, but was doing well at this time and was expecting to be at the May meeting. (We passed around a pad and had everyone give their wishes to Bob, which we sent along to him on Monday.)

We had two new members in the audience, Ted DeBoer and Peter Crosson, both having joined TWITT just before the meeting. We welcomed them to the group.

Andy announced that he had signed up with a flying wing (nurflugel) mailing list (via internet e-mail) and that it has been very active since going on-line in the past several weeks. He commented that much of the discussion between members of the list had revolved around Horten designs and that one member had arranged for obtaining copies of Horten documentation available in Argentina. Several TWITT members are already part of the mailing list

and the postmaster for the list gave Andy permission to put a brief advertise out letting everyone know about TWITT. So far it had resulted in one new member.

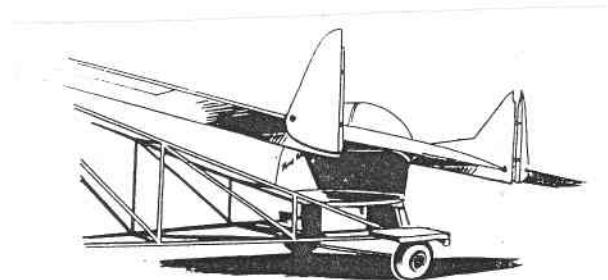
He went on to say that he was trying to collate all the questions and answers into a comprehensive package that would make more sense than reading bit and pieces as they come through the e-mail system. This would then become filler for the newsletter as he found appropriate pieces and felt the membership would be interested in it. (See how you can register for the mailing list on page 9 in this newsletter.)

Andy then introduced **Jack Lambie**, our guest speaker for the day. Jack was there to tell us about his experiences with the **Fauvel AV-35** he had back in the 1950's.

*(ed. - At this point in transcribing the minutes of the meeting I decided to tum on the tape recorder and see how well I did from memory, when I found that we had a technical malfunction on Saturday. For some reason the recorder didn't do it's usual excellent job of picking up the talk and there was nothing of Jack Lambie's presentation to transcribed. That will teach me a lesson about not taking written notes, however, in this case it would have been hard since I was holding Jack's video camera for him, taping the presentation for his own library. So, I will cover the highlights as best I can remember them this many weeks since the meeting. I apologize to Jack for the miscue, but these things happen now and again, and can't always be foreseen.)*

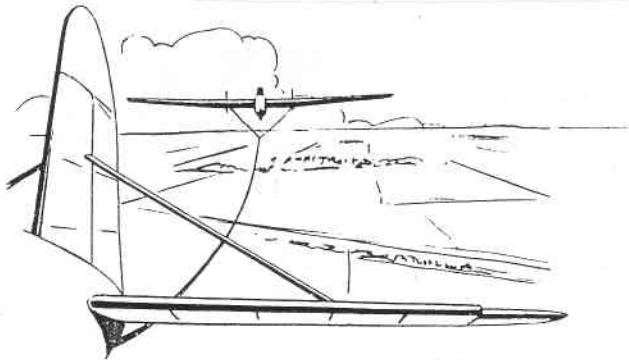
Jack started out with a little of the history of how he had come to own the Fauvel. The person the owned it had asked Jack if he would be interested in purchasing it, and after some negotiations they arrived at an agreeable price of \$4,000 (I believe). When Jack went to pick up the glider they somehow got into renegotiating the deal and Jack took the aircraft off the guy's hands for about \$400.

The Fauvel was put on the trailer as a single unit, although in somewhat a different manner than the method shown below. In Jack's case the glider was rolled into a set of wing cradles, locked into position and then with a winch it was raised into a new vertical position with the front facing wing rising above the back of the tow car. He did mention that they removed the rudders to prevent them from getting damaged by buffeting during transport. (The drawings were taken from Sport Aviation, April 1962, p. 19 and were in an article by Georges Jacquemin.)

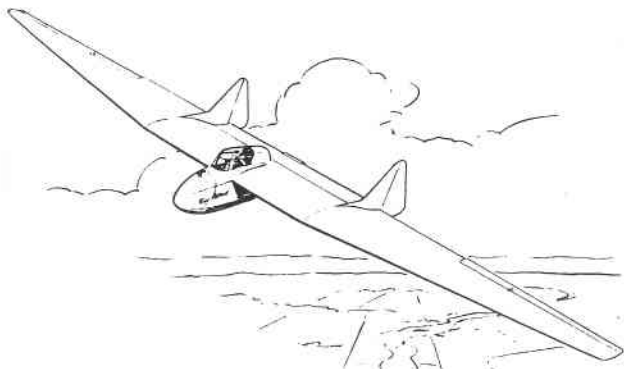


Jack talked some about the first time he flew the glider fully expecting it to have some weird handling characteristics. However, he was surprised to find it handled normally on aero-tow once you safely got rid of the take-off dolly. This was a tricky operation and on several

occasions the dolly had come back up into the glider and done some damage, fortunately, none serious enough to cause a crash. The aircraft was towed via a bridle arrangement versus the usual tow ring in the nose setup. This can be seen in the drawing below.



He talked extensively on how the glider had a really bad tendency to ground loop at the slightest provocation. This created many anxious moments even when landing at normal airports, let alone at an off-site field. Most of the time the ground loops didn't do much damage, although he did find he needed to put some additional reinforcing material on the bottoms of the vertical fins since they had a tendency to get broken off.



One of the flight characteristics he mentioned was the glider's lack of response to elevator when in the last stages of the landing. In one instance he was trying to put it down in between rows of large field sprinklers and needed to do a zoom type maneuver to clear one of the rows. When he pulled back on the stick to go over the sprinklers the glider simply started sinking rather than flying up. He managed to overcome the problem and get the glider down in one piece, but it made him painfully aware of the need for betting glide path planning in the future.

With Jack you can always expect a tall tale or two along the way, and he didn't disappoint us. In one of his off-site landings he ended up in a field full of cows. Well, as we all know cows like to eat gliders covered in dope and fabric so

he had a dilemma on his hands. About this time the farmer came along wanting to know who had landed in his field and was messing with his cows. Jack went into his usual mode and praised the farmer for having such a nice field and good a landing site it made and how it really saved Jack's life. Once the farmer was convinced of all this, Jack asked him and a couple of the hands to help him lift the glider over a nearby fence to get it away from the cows. When the retrieval crew arrived they found the glider neatly parked between two fence lines not much wider than the wing span with Jack telling them about how he expertly put into such a tight space.

Jack made a number of long cross country flights in the Fauvel, including several gold badge distance runs. He noted that it was a fun airplane to fly. He was asked if he had ever gotten it to tumble like some of the flying planks were famous for, and he commented that it didn't tumble but made very, very tight loops. At this point there were more questions from the group, but I can't think of what they were or who Jack responded.

I guess the most notable thing to come out of Jack's presentation was how normal the Fauvel was, rather than how abnormal it could have been or as people had perceived it to be over the years. He enjoyed flying it right up until the time he sold it to someone in Texas.

At the conclusion of Jack's talk, the meeting was adjourned and the group broke up to enjoyed the beef and chicken barbecue sandwiches provided by our Hospitality Chairpersons, Chris and Connie Tuffli. It was so good that by the time the hanger flying session was over with, there wasn't any barbecue left for them to take home for dinner.

---

## IN MEMORIAL

**VICTOR M. SAUDEK** was a soaring pioneer who contributed continuously all his life to soaring until his passing March 2nd. Vic assisted in most of the early National Soaring meets in Elmira, NY. He was primarily interested at that time with the barograph aspect as well as meteorology working with Martin Schempp on the SSA expedition to explore Big Meadows, Virginia as a potential soaring site. In 1939 he had two articles in the October issue of Soaring. One on the American Open Contest at Sleeping Bear sand dunes near Frankfort, Michigan, and the other on the details of barographs applied to soaring. Vic's ability to write stayed with him throughout his career, contributing much over the years to SSA, SCSA, SHA, VSA and NSM. He has presented papers to OSTIV, the International Soaring Technical Association.

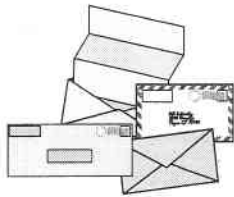
Vic worked for North American, Pratt Read, All American Eng., Luddington Griswold, Kolesman Instruments, and Hughes Aircraft. After WW II, Vic was Technical Director of the Sierra Wave Project in conjunction with Dr. Klemperer, to study the phenomena of standing waves. Vic's role was instrumental in the success of the project. Vic's association

at this point with Dr. Kuettner opened a friendship and technical association ever since. Vic was affectionately known as the little guy with the deep voice. He was much admired for his technical articles on wing smoothing, lift theory, boundary layer control, etc.

Vic certainly made his mark in the soaring world and will be missed by all who knew him. He is survived by his wife Martha, his son Glen both of Los Angeles, and a brother Robert of Washington, D.C.

Howie Burr

LETTERS TO THE EDITOR



Dec. '96

TWITT:

I have sent you some money to pay for the information package I asked about in my second letter that included information on the Zanonia seed.

The other money is for an information package on wings of WENK's geometry like the 1931 Schul-glider, or similar to the Charlotte B 1 and B 3, and Weltensegler or Feldberg that I have. I am interested in simple designs of models of tailless aircraft of that type.

If you can help me, thanks; if you cannot, I understand it's difficult to go back in time on designs or photos, so send me designs of "golden age" as in the previous letters.

I take seriously your invitation to send new proposals or experiments. As for me, I am experimenting only with free flight but maybe something will be of interest for others.

I am writing a short history for French tailless' for an Italian magazine. Can I include material on Alain Mirouze's wings? It could be good publicity for the French designer!

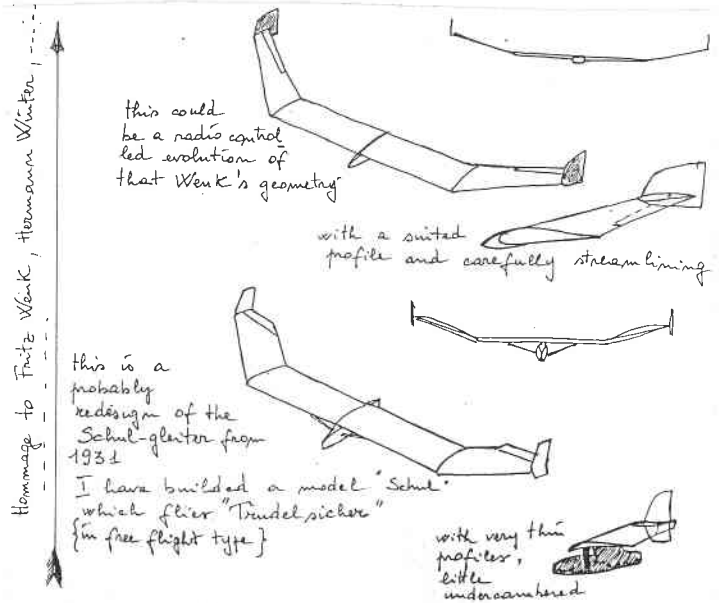
And, last but not least, I wish you and all a HAPPY NEW YEAR 97.

With my best regards,

Curzio Vivarelli  
Verona Italy

*(ed. - Mistakenly, Curzio's letter got in the wrong pile of stuff and got overlooked at New Year's. I hope that by now he has gotten a hold of Alain and found out if it was all right to use his designs in the magazine article.)*

*I will give the letter back to Bob and Gavin for research into the files and see if we have anything about the Wenk type aircraft. He included some small drawings of his free flight models with this type of geometry and I have reduced them down for inclusion in the newsletter.)*



2/8/97

TWITT:

Enclosed please find my renewal and a little extra for the general fund.

Also enclosed is an article from Aviation Week describing Paul MacCready's latest flying wing project with the AeroVironment company. This is an unmanned high altitude drone designed to be solar powered. The design could be called a "Super Plank" since it is a 200' span constant chord wing.

Speaking of Flying Planks, the enclosed photo shows Al Backstrom and Jim Marske at the SSA National Convention on January 30th. They are discussing a model of Marske's Genesis sailplane. The Genesis is in the process of being redesigned for production in Lithuania. The Genesis team gave a presentation at the convention describing the changes they are making to the design in hopes of raising the L/D to 45:1. They have changed the outboard airfoils and twist distribution and are working hard to get weight out of the airframe. They claim that with new wing twist and airfoils, the wing will essentially be operating at zero pitching moment at cruise, with the small horizontal surface only used to change angle of attack when a speed change is desired. In essence, they are designing a flying wing with an unloaded auxiliary pitch control.

Kevin Renshaw

*(ed. - Just about the time Kevin was putting his letter in the mail, I was already putting the MacCready Centurion information in the newsletter since it had been provided earlier by Chris Tuffi.)*

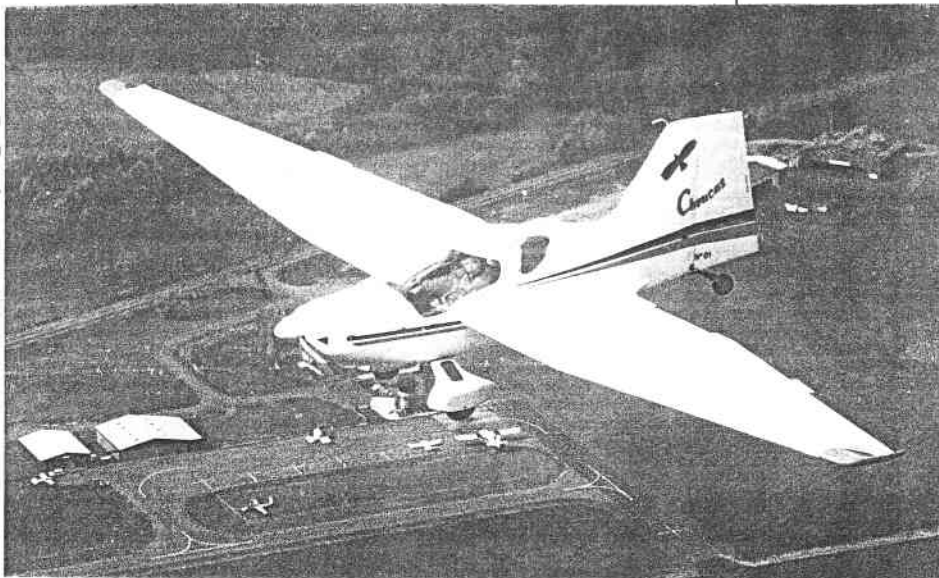
The information on Genesis is new in terms of the redesign effort and it will be interesting to see if they achieve their objective L/D.)

2/22/97

TWITT:

Enclosed is my renewal check and a few enclosures. Quite a few hours have gone into Tailless Aircraft Bibliography work since our last conversation, but much work remains before the next offering! I still have concerns relating to size/scope/cost. Despite known specialized areas still needing to be filled in, volume is the great concern. Editing skills may have to incorporate some hatchet work. Still I am gratified by the response (see enclosed) and will keep at it as time allows.

I have enclosed two items I received from Phillippe Vigneron last year. The "Choucas" is a French design by Claude Noin ('looks like Fauvel AV-22 derivative) offered to homebuilders as a kit. The ultralight wing "Projekt 'A' Aachen" is by Ulrich Schäfer, who spent four weeks with Reimar Horten in Argentina in 1987, where he is said to have designed and constructed a 12-m ultralight flying wing. "Projekt Aachen" was begun in 1989, completed in 1994, and flown 1/27/95. It is marketed by Christiani Wassertechnik, Heinrich Heine Str. 15, D-52249 Eschweiler, Germany (phone: 02403/53047, Fax: 02403/51468). The photocopies are about the same quality as my own.



ABOVE: The CHOUCAS as photographed in-flight in the French magazine Vol moteur, No. 130, Feb 1997. p. 37.

Also enclosed is a lengthy printout of some "in-progress" supplemental information for my bibliography. It consists of three appendices to be used together to track information:

1. Alphabetized listing of designers/constructors of tailless and related aircraft, their aircraft, and dates (continually expanded from previous editions).
2. Builders/designers listed by aircraft name/ designation (new).
3. An attempt at listing tailless and related aircraft by configuration/category.

I would appreciate very much if you could offer it to Bruce Carmichael or any other knowledgeable member(s) at a meeting for advice concerning accuracy, content, omissions, and format, or whether it should be thrown out as a waste of time/space. If and when I ever succeed in illustrating or publishing a "picture-book" supplement, #3. will probably become superfluous anyway.

You have probably received several answers to Mr. Vivarelli's inquiry in TWITT 1/97. I have received his further request, and will (when time permits!) send him what I have. There seems to be meager information on some of the types requested, several concerning patents which found application only in models or full-sized planes with tails, but were remarked in the tailless literature because of perceived usefulness in the tailless realm. The "Luftwacht" article of 2/32 is "Schwanzlose und Nurflügler" by Robert Lademann, translated as NACA TM No. 666 (4/32) by Dwight Miner. It contains tables of information on early tailless types through about 1931 and a pictorial chart reprinted in books by E.T. Wooldridge, R. Horten (P. Sellinger), and F. Galé. I believe that TWITT has a least one copy of this TM.

The "Schwalbe II" drawing on p. 10 of TWITT 1/97 is by Harold Krauth and part of his article "The Flying Wing - Blunder or Blessing", Soaring, 11/71, pp. 18-24. Finally, the Jim Gordon photo on p. 11 is from Sport Aviation, 10/96, p. 37. Thanks for the biblio. info. included elsewhere! I hope this was of help and look forward to advice on the enclosed supplemental material.

Serge Krauss

(ed. - Thanks for all the great information. I hadn't read through all of it by the last meeting so didn't give the material to Bruce, but I will mail it to him this week so he can go through it and bring it to the May meeting for others to peruse.

I am sure Curzio is appreciative of any information you can provide him and the above is obviously a big step in that direction. I will have Bob and Gavin check the files for the NACA paper and make sure a copy gets off to him if we have it.

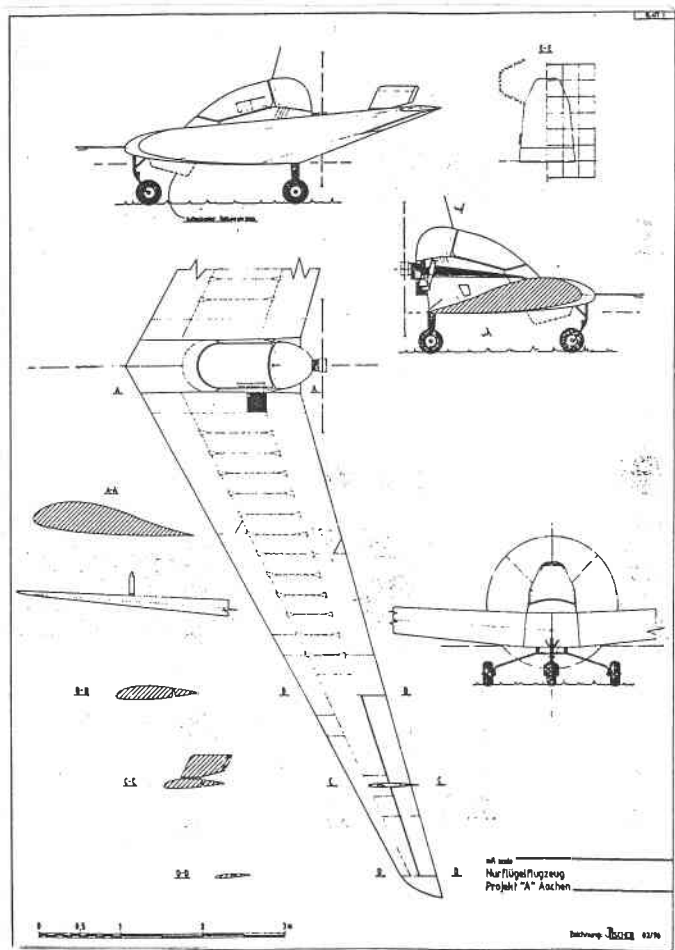
I have received three pieces on the Choucas in the past month, including the original pages from the French magazine Vol moteur, No. 130, Feb 1997. pp. 37-41, and the full magazine with an English translation of the article done by David Fitchette. This

is obviously a aircraft that has been built and is flying rather than just an idea of what might be.

I think I will take David's translation and work it into the newsletter in serial fashion along with the article I have from Robert Osborn on the Airwave Concept. This will provide material for several newsletters, and keep everyone coming back for the "rest of the story".

I have reduced the Aachen 3-view page down to get it into this issue of the newsletter (see below).

I wish you good luck in your ability to keep moving along on the bibliography project. As well as your others sold, I am sure that a market can be found for a new edition. This mailing list group that is mentioned in the meeting minutes might be a good customer source since they seem to be interested in historical material and are always sighting reference material. By the way, as soon as I have a few minutes I will try to extract the references for you and send them along for comparison to your stuff. You never know, there might be something new in it.)



3/18/97

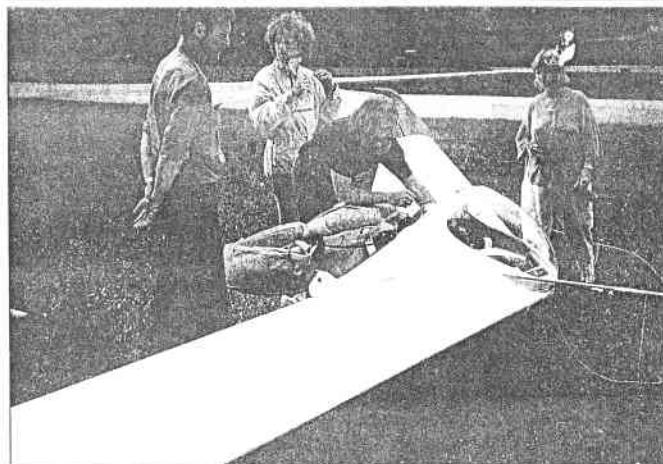
TWITT:

In the No. 129 newsletter there was some discussion of the Flair 30 glider. Some time ago I found a paper that deals with the Flair in the November 1989 issue of a

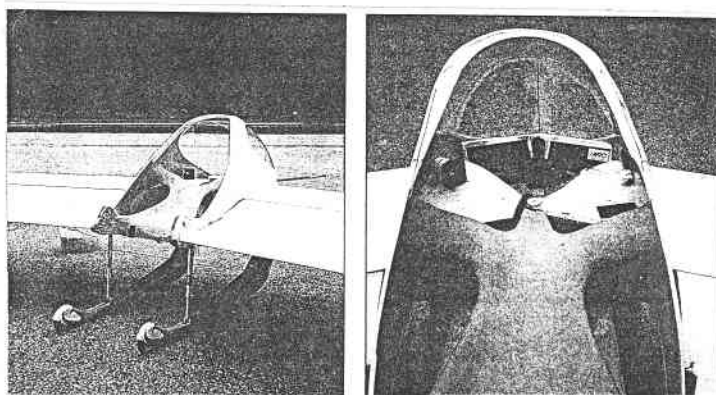
German model plane builder magazine named FMT (Flug und Modell Technik - Flight and Model Technique). Enclosed you will find a copy.

The three pictures are titled as follows:

**Top Left (below):** Before being towed by aircraft at Unterwössen (a location in South Germany) Günter Rochelt is giving last instructions to the pilot.



**Bottom Left (below left):** The Flair is standing on skids before taking off conventionally (i.e., towed by aircraft).



**Bottom Middle (above right):** Everything is unusual in this aircraft and this holds also for the cockpit. The Flair has digital instruments. A design being as simple as possible together with the use of progressive materials and technologies result in nearly incredible flight performance. And despite of this the Flair is nothing more than a simple hang glider compared to G. Rochelt's next project, the Solar Flair. It there are really still milestones in aviation developments, than the Solar Flair should become one of the few really important ones.

Concerning drawings of the Flair, I know that one day (1992 or earlier) an accident happened with the Flair and the pilot (not G. Rochelt) was killed. So I think that the development of the Flair is no longer in progress.

If you want to see what Mr. Rochelt is working on now, look at:

<http://www.netsurf.xtension.de/~jdela/solair/EHome.htm>

You will find a description and photos of the Solair II, a solar energy powered aircraft, but no flying wing.

Best regards,

Diedrich Rotert  
Hannover, Germany

(ed. - Thanks for all the information on the Flair 30. I will do what I can with the photos so everyone can get a better idea of this unique aircraft.

The Nurflügel mailing list group has mentioned it several time but no one has seemed to have much information other than the crash. I will pass on the web site address to the group along with the source of the article in case one of the German members of the group would like to get the magazine and translate the article for them.)

## The Development of the Airwave Concept

by: Robert Osborn MEng (Oxon)

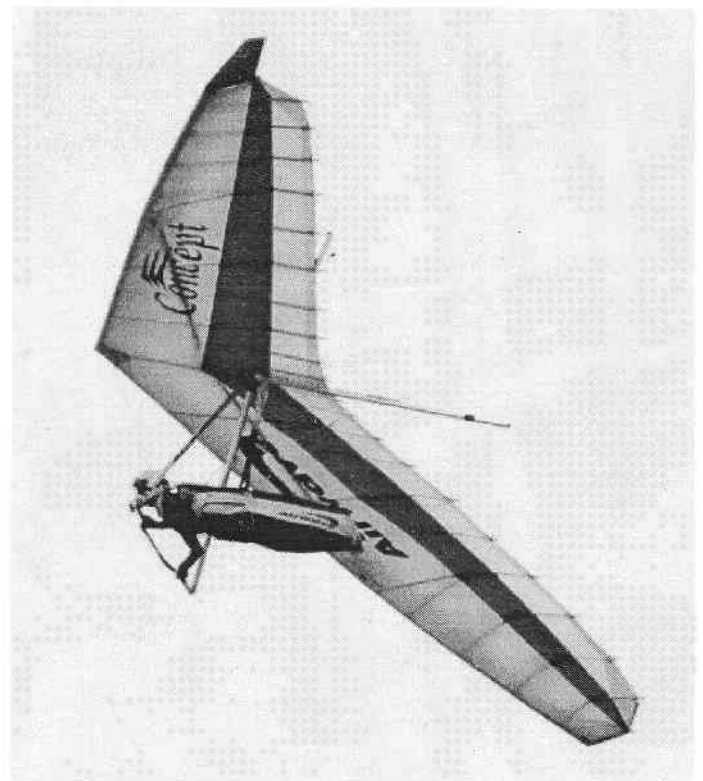
As a hang glider design consultant for Airwave I have closely followed the development of the CONCEPT. In this article I hope to provide a few insights into how it was developed, and explain a little of the theory behind the improvements in handling, climb and glide.

### Design Philosophy: a blue print for broadening hang glider XC potential

Steps forward in a single area of a glider's performance envelope are not enough to ensure competition success and club pilot acceptance. If a glider has a good glide, it is more likely to make it to the next thermal trigger point or active cloud at a workable height. If a glider has good climb ability the pilot will be able to climb out in the rough and disorganised lift which often marks a crucial low save. If a glider has light and predictable handling the pilot will be fresher, and more confident about flying for long periods, and have the ability to feel the texture of the air when precision flying is required for maximizing use of lift. Compromise on any one of these aspects and the glider may lose all of the advantages gained in the other areas.

The initial seed for the development of the CONCEPT was the success of topless gliders, entered in the 1995 World Championships, at delivering competitive performance especially at high speed. Although these topless gliders performed well, they did not out-perform the best of the conventional gliders (with top rigging); clearly other design features were as, if not more, important. Furthermore, the luff lines were cutting in at

the extremes of the flight envelope :- at low speed damaging handling, and at high speed increasing bar pressure and destroying high speed glide.



### Drag Analysis: cleaning up!

During the early phase of the development of the CONCEPT, various design configurations were considered. To help judge which of these configurations would deliver the greatest performance, a theoretical analysis was done to quantify how much drag the key components of a hang glider produced. What follows is a summary of this study.

Figure 1 shows a breakdown of the relative contributions of drag on a conventional high performance hang glider. To illustrate the effect of washout on performance, this diagram represents induced drag in its component parts. **Lift induced drag** is the widely discussed component of induced drag which reduces with speed.

While the lesser known **Twist induced drag** is the component of induced drag which actually **increases** with speed, and is due to the difference in lift coefficient from root to tip. (For further details on the components of induced drag see *Theory of Wing Sections*, by Abbott and Doenhoff, pages 10-18.)

The most startling aspect of this analysis is how important wing efficiency is to overall performance. The combination of induced drag and profile drag is responsible for nearly 90% of all drag at minimum sink, around 75% at best glide and is still greater than 50% at maximum speed.



Furthermore, the luff lines produce over 40% of the drag of the whole top rigging, and as such removal of the luff lines has the potential to improve best glide by 3% and high speed glide by 5%. Complete removal of the top rigging could add a further 4% on best glide, and 7% at high speed. However, these improvements are very small compared to the drag produced by the wing, and consequently any compromise in wing efficiency, due to the new pitch stability system, could destroy any gain from reduction in parasitic drag.

Clearly the greatest improvements in performance, throughout the speed range, are achievable by reducing the combination of induced and profile drag. Further small but useful gains at higher speeds could be achieved by removal of part or all of the top rigging, but only if a pitch stability system could be devised which did not compromise wing efficiency.

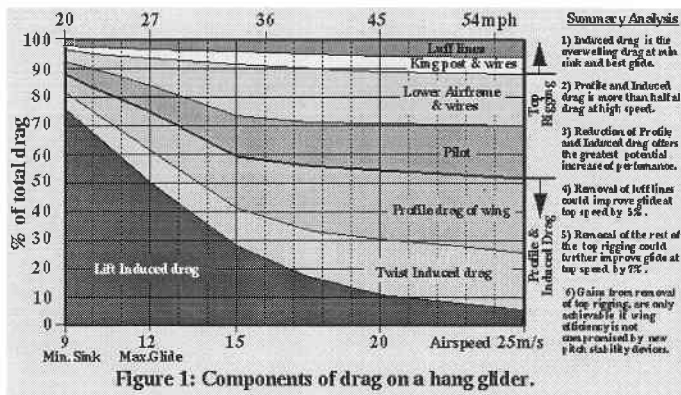


Figure 1: Components of drag on a hang glider.

**Pitch Stability: Spare Ribs - the enabling technology**

Pitch stability is one key aspect of glider design which cannot be compromised, and the best measure of stability in hang gliding is the combined standards set by the HGMA, the BHPA and the DHV Airworthiness schemes. The task for Airwave was to develop a new pitch stability system which comfortably passes all Airworthiness schemes without any detrimental affect on handling, or wing efficiency.

All previous Airwave hang gliders have relied upon luff lines for stability, and this is where their expertise lay. Developing a new pitch stability system meant that new skills and knowledge had to be acquired. A great deal of time was invested in computational analysis, test rig work, research into new construction techniques, test flying and lots of head scratching (I guess this is why the R&D team are all going bald!)

Hang gliders, being swept tailless aircraft, derive their pitch stability from a combination of sweep, washout and reflex. This is true for all hang gliders, regardless of whether they have luff lines or not. A consequence of removing the luff lines is that reflex cutting in at low angles of attack cannot be relied upon as a quick fix to

pitch stability. Instead, washout control becomes the key source of stability.

To achieve this, rather than have two points of support (midspan and tip) as used by other manufacturers, Airwave chose to individually support the four outer battens with light weight carbon fibre ribs - **Spare Ribs**, see Figure 2. This approach has two advantages 1) it maintains a wide region of defined washout and accurate profile control out at the tips where it is most effective for pitch stability, and 2) it allows the sail between the root and midspan to wash in, increasing lift at nose. These effects make **Spare Ribs** more efficient at providing stability than either the two point support system or luff lines. The effectiveness of **Spare Ribs** means that their heights can be set lower than the alternatives, and thus do not interfere with the sail in normal flight and make possible improvements in handling and wing efficiency.

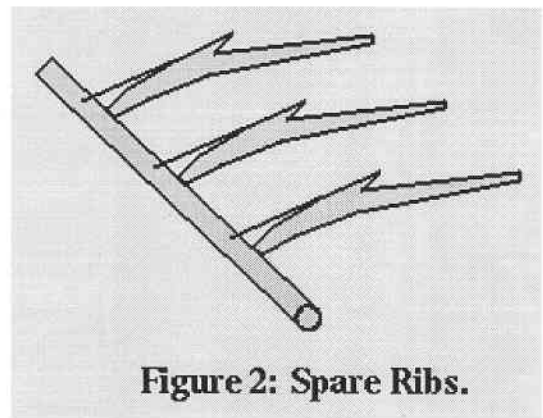


Figure 2: Spare Ribs.

(ed. - Next month we will finish up this excellent article by Robert Osborn. Topics to come include:

- New Profiles: lower twist, lower drag, and lower stall speed.
- Wingleted wing efficiency.
- Glide performance: four ways are better than one.
- Climb performance: guaranteed not to get you in a spin.)

**NURFLÜGEL MAILING LIST**

The Nurflügel (flying wing) Mailing List serves as a discussion forum for fans of flying wings. Pretty much everything that pertains to this subject is welcome. It is the product of Douglas Bullard, and as the administrator he asks those who wish to participate to follow some very simple rules, such as, blatantly

commercial e-mail, spam, sexual or racist material being posted will result in removal of the sender from the list. Do not send binary attachments in your postings since some users are charged for large e-mail files. He will be creating a "bulletin board" section on his nurflügel home page for such stuff where everyone can see it.

All routine administrative requests (including subscriptions and unsubscriptions) concerning the mailing list are handled by an automated server. The following will explain how to get on the listing and then back off again if you find it is not what you wanted to be involved with.

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**The find out more about the automated server** and the commands it understands, send the following command to "Majordomo@lists.teleport.com":  
help

**To send a message to the group** just draft it like you would any other e-mail and send it to:

nurflügel-I

Once it hits the automated server it will be sent out to everyone participating on the list. In fact, you will receive a copy of your own message since you are on the list.

So far the group has talked about a lot of different aspects of flying wings, including historical material on Horten and Lippisch, the ME-163, the SB-13 and some talk about hang glider performance. If you don't have anything to contribute right away, just monitor the mail and see what everyone is into at the time. If you have a specific question, stick it out there and almost surely someone is going to give you an answer. It has been a very active group of nurflügel enthusiasts.

Give this mailing list a try and see how you like it. The more people on it, the better it will become from an information exchange standpoint. If you find you don't like it, simply unsubscribe.

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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

(B<sup>2</sup>) is a compilation of their monthly column that appears in RCSD. Many of the areas have been expanded and it includes coding for several computer programs to determine twist and stability. Priced at US\$28.00.

All these are available from B<sup>2</sup> Streamlines, P.O. Box 976, Olalla, WA 98359-0976, or (206) 857-7249 after 4pm Pacific Time. Orders shipped elsewhere will be sent surface mail unless an additional \$10 is included to cover air mail postage. Washington residents must add 7.5% sales tax.

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**Personal Aircraft Drag Reduction**, by Bruce Carmichael. This 207 page, soft cover, 8½ x 11" book starts with a chronological history of experimental verification of large theoretically predicted drag reductions on aircraft components having extensive laminar boundary layers. Practical problems which could limit attainment of these large drag reductions are discussed and methods to