No. 308 FEBRUARY 2012

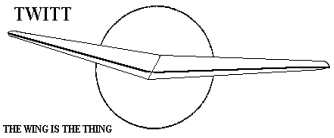
T.W.I.T.T. NEWSLETTER

Ed. – This is a collage of self-launching power sources I found at the recent SSA Convention held in Reno, NV. The right and left images show the more conventional pylon type of gas engines swinging big propellers, which are then stored in the fuselage. The larger image is obviously a jet engine that probably makes a lot of noise when operating. The SOLO engine has a much smaller propeller that folds when retracting and has a significant muffler. There was only one electric propulsion system on display with a propeller that folds back around the nose cone similar to electric R/C models. Considering the push for greener solutions it seems there was a big void on the pavilion floor.

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

The number after your name indicates the ending year and month of your current subscription, i.e., **1202** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, March 17, 2012, beginning at 1:30 pm at hanger A-4, Gillespie Field, El Cajon, CA (first hanger row on Joe Crosson Drive – Southeast side of Gillespie).



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.

T.W.I.T.T. Officers:

President: Andy Kecskes (619) 980-9831
Treasurer:
Editor: Andy Kecskes
Archivist: Gavin Slater

The **T.W.I.T.T.** office is located at:
Hanger A-4, Gillespie Field, El Cajon, California.
Mailing address: P.O. Box 20430
El Cajon, CA 92021

(619) 589-1898 (Evenings – Pacific Time)
E-Mail: twitt@pobox.com
Internet: http://www.twitt.org
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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 (#1720), east side of Gillespie or Skid Row for those flying in).

TABLE OF CONTENTS

PRESIDENT'S CORNER

I feel this is a good issue with some balance in presenting several different areas on flying wings. The letters section has stuff on R/C models and a full-scale design concept. There is a section from my new membership in the Backstrom flying plank discussion group and then the beginning of a paper by A.R. Weyl on wing tip design. So there is a little something for everyone.

I hope some of you find the time to respond to Jim Loyd's design proposal for modifying the plank. This is the type of thing TWITT was envisioned to be doing through the newsletter so please step up and let Jim know the answers to his bullet points.

I just got back from the SSA convention in Reno, NV, which is one of the reasons this issue is a little late in mailing. The theme this year is "Let's Go Gliding" and it is aimed at drawing more youth into the sport, which has been an underlying goal all along. So if you know of a way to introduce a young person to soaring or aviation in general, please take the time to carry it out.

The theme of several presentations was pilots recognizing their limitations as they get older, the other side of the spectrum. This is matter of doing your own risk assessment to determine what you are capable of all the time, but especially on the day you are going flying. Do you feel you could cope with all aspects of a flight, and if the answer is no to some of the conditions you might encounter, then don't go. Fly Safe

Andy

LETTERS TO THE EDITOR

January 23, 2012

Hi Andy,

While cleaning out some old drawings I came across these mods to Al Backstrom's plank sailplane I had thought about many years ago. I had planned to install a 15 to 20 HP snowmobile motor in it.

It occurred to me that substituting an electric motor system could create a bunch of advantageous results.

1. Installation is simpler, compact, light, reliable, clean and green.
2. No flammable fluids.
3. Easily streamlined.
4. Battery can be shifted fore and aft to adjust CG for different pilots.
5. Battery attached to pitch control could aid pitch maneuvers.
6. Prop easily "Parked" in slot.
7. Steerable nose wheel creates taxi possibilities.
8. Main landing gear could be widened by aluminum 'bar' type legs with braked and streamlined wheels.
9. Rearward folding outriggers with small wheels or skids on wings could stabilize single center main wheel configuration.

Flight advantages:

1. Instant motor start or stop lessens possibilities of 'Off Field" landings.
2. Instant motor start or stop aids landing approach.
3. Reversible motor rotation could be used for glide control while landing and braking while taxiing.
4. Sailplane can be flown with partial power to search for lift or to match high performance sailplane glide numbers.
5. Spare batteries would allow more flights per day and quicker `turnarounds'.

I'm hazy about the "prop in the slot" aerodynamics. I think there were a couple sailplanes with props in slotted rudders back in the 1970s-80s. I remember seeing one that had a Porsche engine in the aft fuselage that drove a prop in its slotted rudder. It seemed to fly OK.

I assume that the ideas presented in this letter could be possible in Jim Marske's Pioneer series or any flying wing with a central vertical rudder tail section. Any comments by other TWITTers are expected, accepted and appreciated.

Happy New Year Andy!! Manny thanks for your NEWSLETTER efforts. I always enjoy them!!!!!

Jim Loyd
Thornton, CO

(ed. – Thanks for submitting your ideas and the drawing I have included on the following pages. There continues to be on-going interest in Al's designs, and in your case a variation of one of his planks. I hope that we hear from some of our other members with their thoughts about this concept.

I imagine one of the reasons for the long lasting nature of Al's planks is their simplicity of design and construction with that Hersey bar wing and simple pod cockpit. They make it easy to build in your garage with skills easily learned.)

January 17, 2012

Thanks for the reply. Do you have any idea where to obtain The Kasper Wing book for a reasonable price? I found one on Amazon for $211. I have not contacted the publisher yet, but I am assuming it is out of print.

Also, I am just wondering what your opinion is of Kasper's claims regarding "his" design. Thanks!

Andrew McMath
<andrewmcmath@cnsp.com>

(ed. – Andrew was asking about the book we have listed as part of a complete package on the web site. I have included the book information below in case anyone has a copy they would like to sell or know of a source where it might be available at a reasonable price. Please let us and Andrew know.

I don't really have an answer for his question regarding the Kasper design so if anyone out there has some comments about the designs post BKB, please let us know that too.)

Kasper, Witold A., ed. H. Joe Meheen, The Kasper Wing, Meheen Engineering, 1562 S. Parker Road,

#228, Denver, CO 80231-2720, (303) 337-4040, 1979, pp. 55. Foreward (by Agne Lundgren) - Currently available technical data on the behavior of flying wings are fairly old, most of it dating back to the early 1930's. I am very grateful to my friend Witold Kasper that is willing and generous enough to share with aviation enthusiasts his discoveries of slow flight with safety. His explanations of controlled flight in deep stall by aerodynamic means and independent of forward speed, and his theory of stability are alone worthy of acceptance by the aeronautical community. Every student, every pilot and every aircraft designer will benefit from this. The road is now open for the advent of a safe air vehicle. Cost: About $10 from publisher noted above.

January 16, 2012

Hello Bob, (Hoey)

I have the plans for both your Turkey Vulture and Raven II. The question I have is why do you go from a very under cambered airfoil at the center transitioning to a flat bottom airfoil at the outside?

I am building a Pteranodon (below) and want to use the airfoil (modified to flat bottom, but still recurved, so I can penetrate the wind better), but was curious as to why you did this.

Any help would be greatly appreciated!

Thanks,

David Riedel

http://rst.gsfc.nasa.gov/Sect20/A12d.html

From Bob Hoey:

Hello David,

The transition to a thin, flat-bottom airfoil was only present on the Raven II wing. The Turkey Vulture was essentially the same airfoil all the way out. The original thinking was to introduce some equivalent twist (washout) to the wing by providing a reduction in camber near the tip. The reflex tends to counter that effect, so the real aerodynamic twist (if any) is pretty small.

I also wanted to transition to a simple wing tip configuration so I could experiment with different angles and shapes for the tip feathers. Once I added the tip aileron, and the resulting twist provided by the forward feathers, I reverted to a fairly constant airfoil.

Having said all of that, my observations are that the Raven II is the best flying of my bird models. I have successfully flown the Turkey Vulture with a flat sheet of foam taped to the bottom wing surface between the low point at the leading edge, and the low point at the trailing edge, maintaining the reflex for the aft inch-and-a-half or so. This provides the flat bottom for better penetration that you are seeking. It flew OK but needed slightly different pitch trim settings.

Good luck with your Pteranodon model. Let me know how it flies.

Items From The Flying Plank Group

(ed. – This is a thread on trying to obtain plans for a Backstrom plank sailplane and demonstrates the difficulties faced when trying to find and buy older plans. There are many approaches suggested, but it all seems to come down to an individual being willing to take on the task of plans reproduction.)

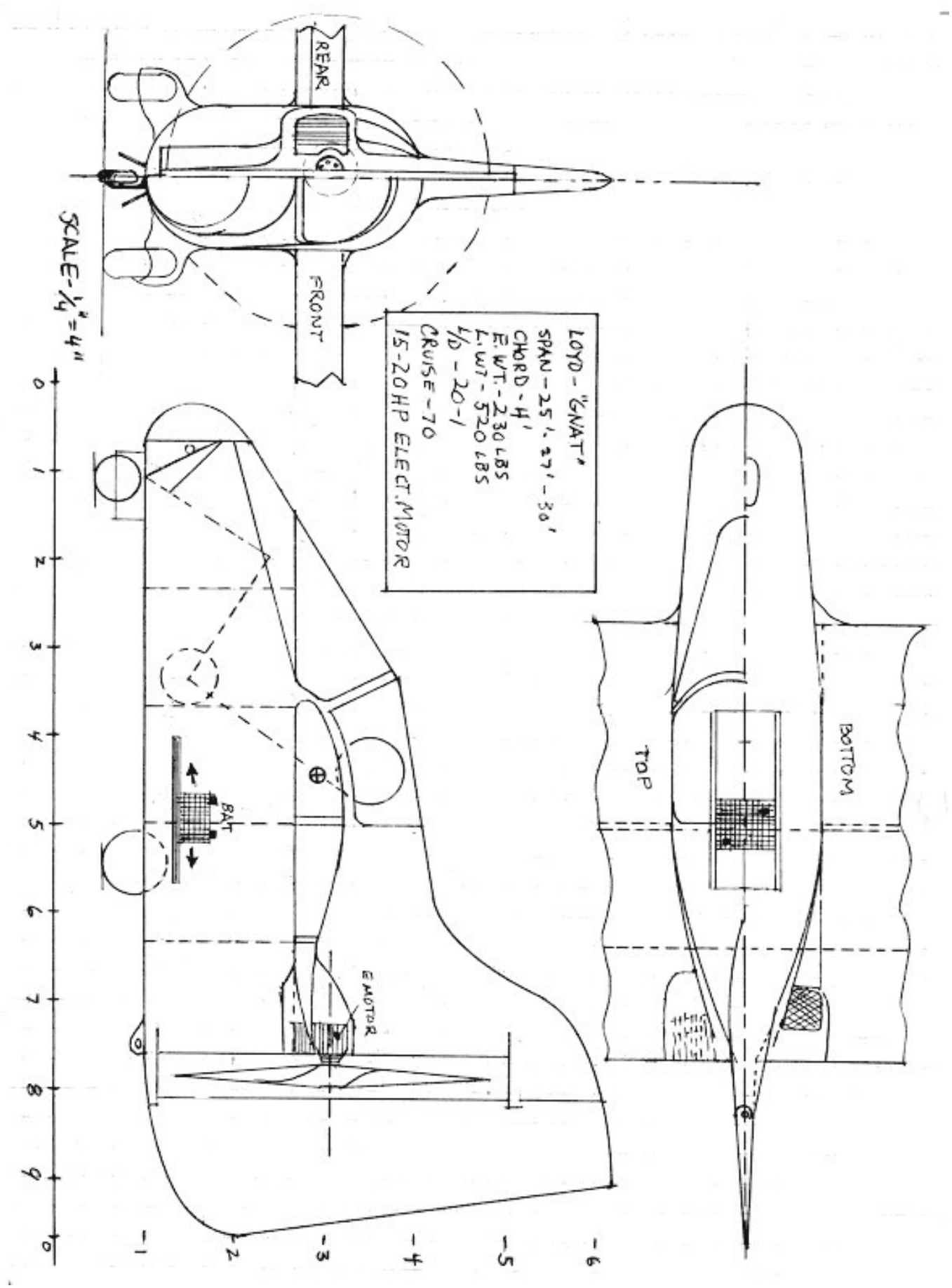
Does anyone here know where to get plans for an R/C Plank similar to Backstroms design? I am looking for a 36" to 48" span, built up balsa construction.

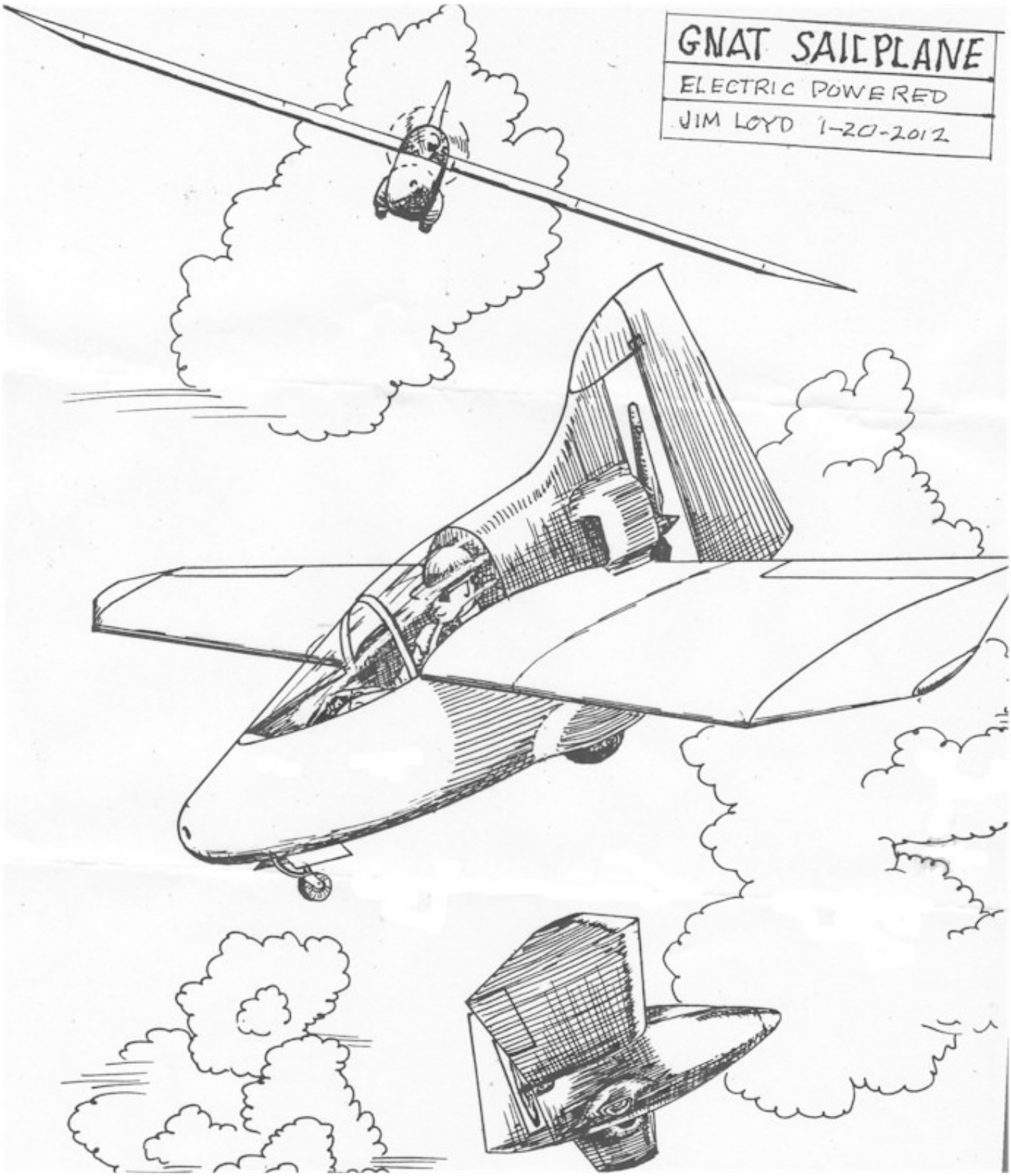
I already asked this question in the R/C Groups, Flying Wing discussion group.

Thanks,

Terry
<dfs_habicht@yahoo.com>

(continued on page 6)


REAR
FRONT
SCALE-1/4"=4"
LOYD - "GNAT"
SPAN - 25', 27' - 30'
CHORD - 4'
E. WT. - 230 LBS
L. W. - 520 LBS
L/D - 20-1
CRUISE - 70
15-20 HP ELECT. MOTOR
BAT
E. MOTOR
TOP
BOTTOM


GNAT SAILPLANE
ELECTRIC POWERED
JIM LOYD 1-20-2012

Check this out Terry:

R/C PLANK:
http://www.gliderireland.net/backstrom.htm

another R/C model:

http://scalesoaring.co.uk/yabb/yabb2/YaBB.pl?num=1306014200/5

More Plank photos:

http://www.picsearch.com/pictures/Vehicles/Aircrafts/Aircrafts%20B/Backstrom%20EPB-1%20Flying%20Plank.html

and info: http://www.facebook.com/pages/Backstrom-EPB-1-Flying-Plank/100822926670822

Tommy

Hi All,

I just joined this group. I joined because I want to build a "Flying Plank".

I haven't had much success in locating a full set of plans.

Are there or will there be any reproductions of an existing plan set available for late comers like me?

Just as an aside, it took me over 6 years to find a set of Carbon Dragon drawings . By then I had grown out of the design specs.

I would appreciate and advice or assistance.

Wally

Hi Wally,

A number of us on this group own plans. I purchased two sets and made a few copies for some other members.

Right off hand I don't recall how many sheets there are or their exact size.

But I have to drive 25 miles one way to a machine big enough to do the job.

The drive, doing the copies and getting back home is several hours.

Tommy

Hey Wally,

Have you checked with the Vintage Sailplane Association for plans?

I purchased mine from them a few years ago.

Terry Menees

I use to be a VSA member. They don't not provide any glider plans anymore. They were all turned in to be digitized. None were digitized and the plans were not returned!

I just emailed archivist Raul Blacksten raulb@earthlink.net this week & he informed me of all of this.

Tommy

Interesting, the Fall 2011 *Bungee Cord* lists the following plans for sale from *digitized** *originals:

Hutter 17
Grunau Baby II
SG-38
Franklin PS-2
Baby Albatross
Baby Albatross Instructions
Bowlus Standard Design Parts
WACO Primary
Ross R-3

Additionally I know that more were digitized because my friend Neal Pfieffer did the digitizing and I saw them on his computer. Not all of them are available for sale for various reasons, such as respecting the wishes of the family of the designer in at least one case.

The Fall 2011 *Bungee Cord* also announces that Jeff Stringer is now in charge of selling copies of plans for the VSA and any questions should be directed at him. His email is jstringe@mail.nysed.gov. Jeff is a nice guy and I bet he would tell you any info he has about the availability of Flying Plank plans.

Tony Condon

(ed. – Tommy Thompson offered the following information on the cost of reproduction that he was willing to do. I include just so you can see the problems associated with making copies of aircraft plans. BUT then another member of their group offered a different approach that might be less pricey for a set of plans so read beyond this one.)

There are 8 sheets in the plans.

I called FED-EX Kinkos in Winston Salem NC / 20 miles south of me.
Copies are 75 cents a square foot

$11.25 (1) 36 x 60 full size airfoil sheet
$04.50 (1) 24 x 36 central fin sheet
$54.00 (6) 36 x 48 wing / pod & 3 views sheets
$05.50 (1) shipping tube

$75.00 total

I have to drive 20 miles (40 miles / 1 hour travel time roundtrip) three hours at the store & have to address tubes and mail them there or US post office on the way back home. Need to check which ones rates are better too.

We are talking 64 copies here folks. And they are not the fastest machines in the world to use. Several minutes per copy. You pile the plans on a table, scan a sheet place it out of the way on another table and pick up the copy and stack it on a 3rd table. It's real spread out and not near as easy as it seems. It's not like making copies on a office copy machine! It rolls you plans in and over the back then rolls it back to the front again.

I'll have to pay $75 for each plan set plus my gas & 4 hours of time.

Would you drive to town and spend 4 hours doing this? If so, what would you charge? Or what would be a fair price to have someone do this for you?
I'll let you all decide.

Tommy

Umm, if you send me one set of plans I can scan them full size to PDF and everyone can have it for nothing....

Bill Ray
<billyvray@yahoo.com>

This would be great Bill :)
But everyone getting them for nothing isn't 100% right.

I'd need to copy my set & pay the postage to send the copy to you.

I seriously doubt I'd send my only set by mail to anyone these days!

So how about the people who want copy send me $10 each? That will cover the cost of a copy & my postage to Bill.

Then we will give Bill the copy for scanning it for us?

What do you all think?

Tommy Thompson
<soar8hours@yahoo.com>

February 5, 2012

Last Call For Plans:

To all members of The Flying Plank Yahoo Group.... This is the last call for the very rare 1955 Plank Plans. I am making a copy of my full size set. Then having them digitally scanned. There are eight very large detailed pages all together. A PDF file will be made & you'll get a copy by email. You'll be surprised how nice they are. It will contain the central fin / rudder sheet as well.

Send $10, check, money order or PayPal.

My PayPal address is: falconflyer225@hotmail.com

Foreign / Canadian $$$$$ ok
My bank will handle the exchange

Or send cash, check or money order to:

Tommy Thompson
1022 Trinity Place Road
Tobaccoville, North Carolina
USA 27050-9622

(ed. – Many of the group members that had ordered plans jumped on this offer so I guess Bill Ray is the one to contact if you are interested in a set, but you need to pay the up-front amount to Tommy.)

September, 1945 AIRCRAFT ENGINEERING

Wing Tips for Tailless Aeroplanes

By A. R. Weyl, A.F.R.Ae.S.

Introduction

The study of the flight of birds has provided and still provide much valuable information for the progress of human flight. Many suggestions for the improvements of wings by the use of special wing tips owe their existence to the observation of nature. In spite of such suggestions, free-flight experimentation - as far as published work goes - is still rather rare and restricted in scope. This reluctance may be due to practical design considerations (handling) as well is to the necessity of making the conventional aileron as efficient as possible; it may also be caused by the impression that experiment in this direction is not worth the effort.

Admittedly, for a conventional aeroplane of mediocre aerodynamic efficiency, not much can be hoped for in the way of improvement by the adoption of a special wing tip. But when it comes to a struggle for the last ounce of aerodynamic efficiency, nature can be made to concede to us: research along the lines indicated may well become a paying proposition. This is especially the case with the flying wing where, moreover, the demands for stability and controllability are apt to interfere seriously with the aerodynamic performance and the practical adaptability.

The conventional aileron is also greatly to blame for the reluctance to shape the tips of a wing in a more efficient manner. The history of the plain wing with positively raked tips (i.e., leading edge shorter than the trailing edge) provides a good example of this.

Importance of Tip Shape

E.W. Lanchester very early recommended such raked tips for higher efficiency as they were able to suppress or delay the pressure equalization at the end of the wing. A wind-tunnel investigation made by O. Foeppl in 1910 on the basis of Lanchester's recommend-ations in fact proved beyond doubt that positive rake gave either higher lift (at equal incidence) or better lift./drag ratios up to moderate incidences, in comparison with square or rounded wing tips, and that this holds particularly well for cambered aerofoil sections. Saenger's experiments, to which further reference is made later, also confirm this result. N. A. V. Piercy found that with suitably shaped raked tips (Alula type), cored vortices were not present in the downwash at incidences of normal flight, and that this meant a direct saving of drag of the order of 10 percent and more.

The influence of the induced drag on the performance is not negligible. For a good practical aerofoil section (R.A.F. 34), the lift/drag ratio, i.e. the characteristic governing the thrust required and the gliding angle, is at infinite span (two- dimensional flow) at its best about 80, at the, Reynolds numbers at present in use. The same aerofoil section in a wing of aspect ratio 6 (a common value today), gives an optimum L/D ratio of only 22.

However, the latter optimum occurs at smaller incidence (4-5 deg. against 7 deg. for the optimum for the wing of infinite span). Referred to equal lift (4.5 deg. of the finite-span wing), which does not mean equal incidence for both wings because of the change in the slope of the lift curve (dC_L/da) due to the induced downwash, the L/D ratio of the infinite span wing would be only about 50. For high speed flight, this difference of 50- 22=28 would be the would be the actual loss in L/D due to the induced drag. A part of this loss may be made up by a suppression of the marginal vortices.

For economical flight at minimum sinking speed which takes place at higher CL values, the loss sustained by the induced drag is more substantial. Hence a recovery of part of this loss is more a direct contribution to economical flight than to performance at maximum speed.

The influence of wing-tip shape on stability is also of importance. Lanchester suggested in 1910 that square wing tips would be of great benefit for the lateral stability although by this expedient, all increase of drag would result (*cf.* R. & M. 59 of 1911, p. 103). It is experimentally established today, that square tips indeed improve the roll-damping at and near the stall, and since in 1910, aeroplanes flew usually very near the stall, Landchester's suggestion was a very sound one, besides proving how far in advance of his time his aero dynamical insight must have been in those days. Mervyn O'Gorman, then Superintendent of the R. A.F. at Farnborough, did not follow Lanchester's suggestion, for the reason that "Nature had provided no bird with square wing tips". Thus the modern elliptical wing tip was created at Farnborough.

D.H. Williams investigated the rolling and yawing moments of half-wing models having tips of different shape. He observed that an abruptly swept-forward tip was beneficial for the rolling moment beyond the stall. On the same occasion, the tip shape suggested by H. Hocke was experimented with. This

tip is tilted upwards about an axis, which forms an angle with the plane of symmetry of the wing (intersecting either in front or behind the wing). According to Williams the Hocke tip (Fig. 1 below) is neither beneficial nor harmful. Hocke claimed that his upwards tilted tip would improve the stability especially in circling flight; adjustment in flight by changing the, angle of upwards deflection was intended. (Note: The side loads produced at such tilted-up tips have been calculated (on the basis of minimum induced drag) by Maingler. As to the efficient of shutter tips for control purposes, older American wind tunnel tests may be indicative.)

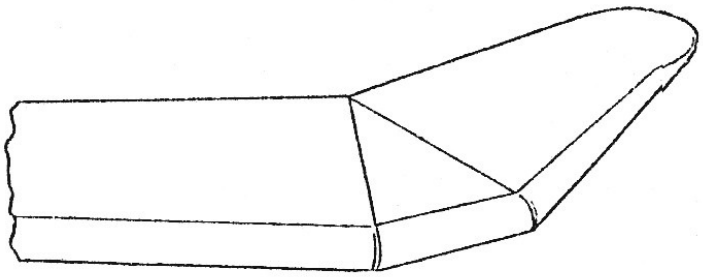


FIG. 1.—*Hocke wing tip, 1927*

D. L. Bacon measured the pressure distribution over moderately raked tips. With positive rake, two regions of low pressure are apparent on the upper surface of the swing near the tip, one at the leading edge which is apparently caused by the core of the marginal vortex, and the other near the extreme end of the tip. A downward displacement of an aileron at such a tip greatly accentuates the intensity of the second low-pressure region, and thus reacts unfavorably on the hinge moments of the aileron.

More recently, J. Valensi has experimentally investigated the marginal vortices formed at different tip shapes by the means of the smoke-thread method (Lit. 76). Unfortunately, the effects of wash-out and sweep were not included in this valuable research.

Uncommon Tip Shapes

The Zanonia category referred to in the historical survey, may be described as a plain wing to which tips of the significant shape are fitted. This was indeed the design employed by the original Focke-Wulf aeroplanes, which came under the Zanonia category, though belonging otherwise to the conventional Pénaud type. Great merits have been claimed for wing tips of this class, especially in connection with lateral stability and freedom from autorotation when stalled (though it was evident that the elevator control was not powerful enough to stall the aeroplane completely). It was stated that wing tips of such shape gave also a high aerodynamic efficiency to wings of low aspect ratio. Such tips are distant relations to the Diffuser Tip, which will be discussed further below.

In connection, with the wing-tip problem, the *annular wing* already referred to may be mentioned.

Aerodynamically, such a wing system has no tips, but it is yet of finite span, i.e. subject to induced drag. It would seem that the lift-generating circulation about the front part of the circle continues into the lateral parts, and that marginal vortices in the common sense may form only at the rearwards parts. If this is so, the existence of such continued circulation (over the dorsal surface from outward to inward) must favorably affect the rolling moment due to side-slip (L_v), and this effect may continue up to large angles of incidence, because of the superposition of the circulatory motion with the relative airflow. At the same time, the rearward aerofoil part of the annulus will have a diminished lift, not only because of the downwash, but possibly due to the influence of the continued circulation at the lateral parts; this would also result in eddy formation. Based on this assumption, the longitudinal and the lateral stability of such a wing system seem assured. There is also a possibility that the induced drag is somewhat decreased, as compared with a circular aerofoil of equal span. Tilghman Richards has communicated pressure-distribution tests from which it is evident that the centre-of-pressure travel may be made stable with such aerofoils.

Slotted Wing Tips

When discussing the autorotation of isolated wing systems, attention was drawn to the possibility of excluding this phenomenon by the use of lattice wing tips, and devices suggested by F.S. Barnwell and W. Schmidt were mentioned in this connection.

Lattice wing tips are related to multiple-slot wing tips for which priority may well be claimed by the birds. If, why, and to what extent, birds exploit the slot effect of such tips during certain flying conditions (hovering flight and landing) does not yet appear to be fully understood, but that their wings are equipped with slot-like devices is generally established.

The human mind bent on imitating nature blindly, very often without any attempt to understand the implications of nature's arrangements, has, of course, not let the slotted wing tip pass by unnoticed. The Wolfmueller-Geest sailplane of 1909, which had bird's shape had a gull wing and multiple-slat tips. In 1921, Dornier and Diemer secured a patent for a wing tip consisting of a number of adjustable slat elements.

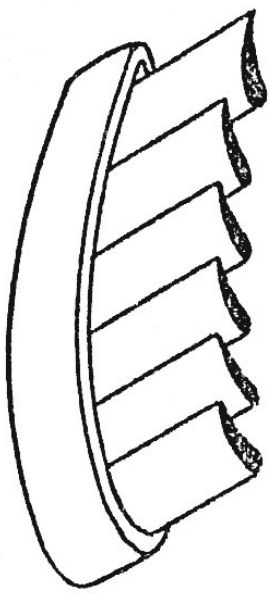


FIG. 2.—*Principle of slotted wing tip*

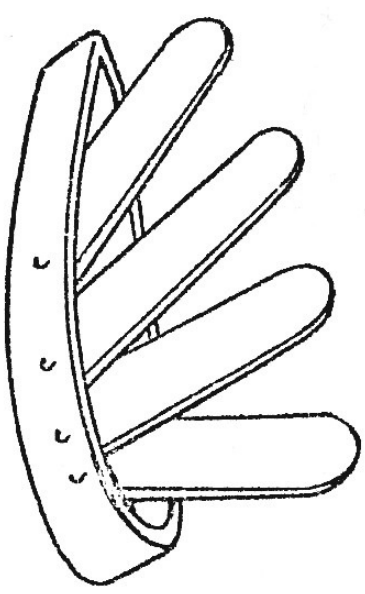


FIG. 3.—*Principle of Schmidtl wing tip*

A slotted wing tip prevents the separation of the airflow over the tip at all incidence at which the rest of the wing is stalled. Control organs fitted to such tips may hence retain their effect at and beyond the stall. But the same effect can be achieved by washout toward the tips. Greater lift cannot be expected to occur at such wing tips, since the development of high-pressure differences is obviated by pressure equalization around the tips, and the only result would be a marked increase of the induced drag. Nevertheless, with tailless aeroplanes, the slotted tip might be of value to such stable wing systems which secure stability by having the higher specific lift near the wing tips, i.e. for the Buzzard category (swept-forward plan shape). Here the slotted tip may be advantageously employed in connection with either wing-tip discs or other devices discouraging pressure equalization at the tips.

For the Flying Plank and for the Arrow category, the multiple-slat tip scarcely promises advantages. Also, it is not a device to render a wing system safe against autorotation, since a slotted wing still retains a range of incidences within which autorotation can develop.

A different kind of tip slot intended to suppress marginal vortices was suggested by A. Baumann in 1923. A nearly chord-wise running slot was provided very near to the actual tip through which air should be exhausted.

A device of perhaps more importance is formed by narrow aerofoil shaped elements arranged with a span wise slot between them which ran be singly swiveled in flight about axes which are normal to the wing surface. The elements call thus be folded together backwards, not unlike a fan. Spreadable wing tips of this kind permit a decrease in wing area and span. They can form a control device as well as one for stability and performance. In design, they are, however, rather complicated, though structurally by no means beyond the range of practical construction.
In 1909, the French motorcar firm of Mors secured a patent for a wing tip consisting of a triangular sail, which could be reefed, in flight. No slots were provided. The first fan-like spreading tip with slots between the aerofoil elements formed the interesting feature of the Austrian Ludwig Schmidtl monoplane in 1913. A quarter of the semi-span was taken up by these tip elements. Unilateral adjustments of a tip effected control in roll, while simultaneous spreading or folding back was intended as assistance to the elevator. A somewhat similar, but structurally more advanced idea formed in 1921 the object of a patent by A. P. Thurston and the Bristol Aeroplane. Here, however, the aim was not to vary the waving area and the span to an appreciable extent. When the tip elements were spread out, they assumed a greater

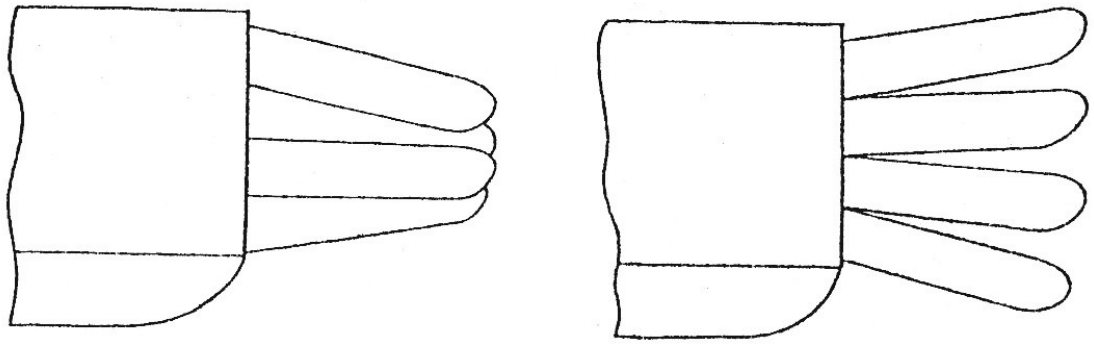


FIG. 3(*a*).—*Slotted wing tip of A. P. Thurston and the Bristol Aeroplane Co. according to a 1921 patent. When the elements are fanned out (as shown on the right), their incidence is greater than that of the fixed wing*

incidence than that of the fixed wing part. In 1932, the spreading wing 4ip was reinvented by Custosa and the Italian Air Force made some experiments with it.

(Continued next month)

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