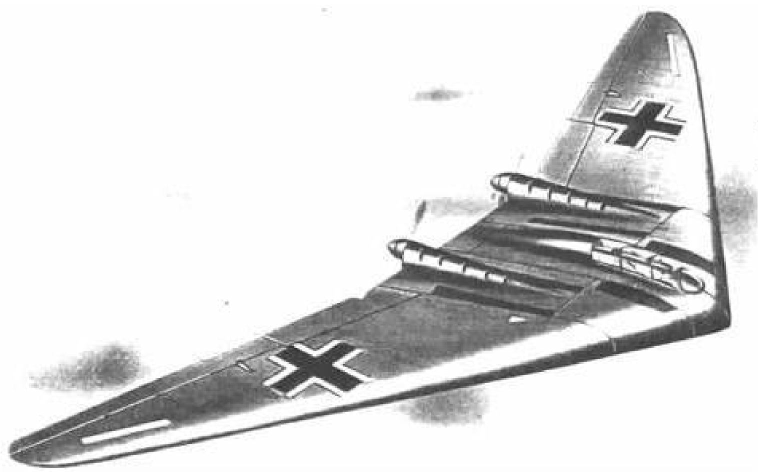
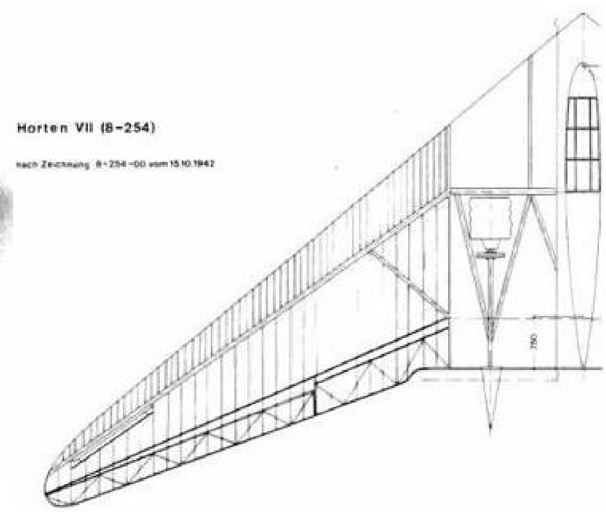
No. 191 MAY 2002

T.W.I.T.T. NEWSLETTER





The Horten Ho VII as shown in the Luftfahrt International publication, Nr. 15, May/June 1976. This is from part of the material sent to us by Eric du Trieu de Terdonck of Belgium. Most of the text is in French or German, so we can't offer more on the details at this time. The article includes a lot of construction photos showing the interior structure, but they are photocopies so won't reproduce very well. Our thanks to Eric.

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., **0205** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, May 18, 2002, 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.

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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).

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PRESIDENT'S CORNER

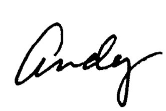
I have become very perplexed about the declining membership in TWITT. We have gone from being strong at 150 members down to 111 at the last mailing. Not knowing why members aren't renewing is particularly troubling. I don't know if it is because the newsletter content wasn't meeting their needs, the cost had gotten too high for the type of newsletter being produced, or their aviation interests just went in a different direction.

From the letters we get during some renewals, it appears people are pleased with the information being presented each month. I try to vary it as much as possible so everyone's interests are fulfilled as often as possible, but I am at the mercy of the material sent in or what I can find from other sources.

Bob thinks that perhaps the availability of flying wing information on the Internet is part of the cause for the decline. I'm not sure. There is a lot of flying wing sites out there, but in many cases they are just a few pictures with captions and no substantive material to go with it. There are very few that have the depth of TWITT or Nurflugel in covering all aspects of the flying wing world, plus I don't repeat a lot of what is in the newsletters on the website. I try to keep them complementary of each other so there is a benefit to subscribing.

I would be interested in hearing from some of you on why you won't be renewing when your subscription expires in the months to come. Of course, we don't want to lose you, but if you have some specific reason for leaving I would be most appreciative if you let me know. We can't make improvements if we don't know what might be broken or isn't proving of interest to a majority of the membership.

So please voice your opinions. You won't hurt my feelings as the editor, since I really want this newsletter and the website to reflect what our members need and expect.



MAY 18, 2002 PROGRAM

We were rescued at the last minute by our good friend and member Bruce Carmichael. He has volunteered to give his newest presentation "Aerodynamic Excellence: The Sailplane" that he developed for an upcoming northern California EAA regional meeting. The advantages and special problems of the sailplane relative to power planes is mentioned. Characteristics of present high performance sailplane are outlined. Some history of major steps in sailplane development are briefly given. The current trend toward smaller less expensive sailplanes, ultralight and light sailplanes, very low sinking speeds and dynamic soaring, variable area, boundary layer control, super sailplanes and other advanced projects are covered.

We will also have available a copy of the video "Stealth Secrets" produced by the Discovery Channel. This 50 minute footage covers the F-117 and B-2 stealth aircraft, as well as, show us a glimpse of the future that includes many different types of flying wing based aircraft. So, if you haven't seen the Discovery program here is your chance.

LETTERS TO THE EDITOR

March 30, 2002

TWITT:

Thank you for keeping the flying wing idea alive with your organization. I always enjoy the newsletter and all the information in it. Please find enclosed my subscription for the next two years.

Progress on my nurflugel work is slow at present. There are many other things that are more urgent at the moment or take much time. But there is always a little bit going on. I could contribute to secure the estate of a Horten-team member. Things will go into the Deutsches Museum, but at present I have the chance to search it for new data, interesting documents and pictures like the one printed on the reverse side. It shows Walter Horten at the tail of the H IX V1.

I have a new PC and this has changed my e-mail address also. The new one is: mw40200@mucweb.de.

Greetings

Reinhold Stadler
Karlsfeld, Germany

(ed. – Thank you for the long-term renewal. I am glad you enjoy the newsletter material. I can understand the problem with other things getting in the way of a more desirable project like researching the Hortens and flying wings. I run into it all the time with trying to get the newsletter done and website updated while family and work make more pressing demands on my time. Below is the picture Reinhold sent along.)

Walter Horten (left) standing at the rear of a H IX V1

February 7, 2002

TWITT:

Sorry not to have answered your e-mail before. I am also sorry to have forgotten to send you the renewal for my subscription to the newsletter. I have now been to the bank and I shall send you my renewal for 2 years together with some documentation I have copied from different publications. These copies come from various German and French publications. Some from old publications and some others from recent ones (especially for which concern the Horten flying models - 3 are existing and are available in Germany).

I take also the opportunity to wish you and all the TWITT members a happy New Year 2002. For the moment, I have very little time for the flying wings because I am fully occupied with my house which still needs a lot of my free time and with another of my hobbies, hot air balloons.

With my best regards.

Eric du Trieu de Terdonck and his family
Eric_du_Trieu_de_Terdonck@vesuvius.com

(ed. – It was good to find you once again and we are happy you have re-subscribed to the newsletter, especially for two years. I can understand the family commitments and the other hobbies taking your time.

Depending on room in the newsletter, I will try to put in some of the better pictures and drawings from the material Eric sent along. It is quite extensive and covers a wide range of aircraft subjects. I would like to thank Eric for this great contribution. It is going to take a while to get through all of it.)

March 20, 2002

Dear Bruce & TWITT:

Not infrequently when I get a problem that requires help, I take it to TWITT and usually Bruce answers, so I send this one direct to him, but I think TWITT might be interested, so I send it to them, too. Hence the salutation.

I have in the past been impressed by the quality of Robert Hoey's study of wing-tip feathers, as well as the studies of others, and what I present is of a much lesser quality. Also, I do not intend to remote control it, because too many things are going on, but rather I intend to fly it in person since it is too much for a radio control box.

So the following is first in the nature of a caution to all of us who study and admire the better life form than ourselves, called collectively birds and, I offer a few observations taken directly from the Smithsonian's great book Lords Of The Air, pages 117 to 139, because it behooves all to recognize the astonishing perfection of those we might hope to emulate. I feel strongly that before we launch ourselves into a new concept, we should consider our betters.

Sincerely,

Syd Hall
Nevada City, CA

(ed. – The Smithsonian material is obviously too long for total reproduction in this newsletter, but I will try to extract the more pertinent pieces, as well as, include some of the drawings that illustrate the uniqueness of birds.)

The following are excerpts from Lords Of The Air, by J. Page and E.S. Morton, published by The Smithsonian Book of Birds, Smithsonian Books, Washington, DC, 1989 (1995 reprint edition) (Topics include flight, food, migration, communication, societies, etc.)

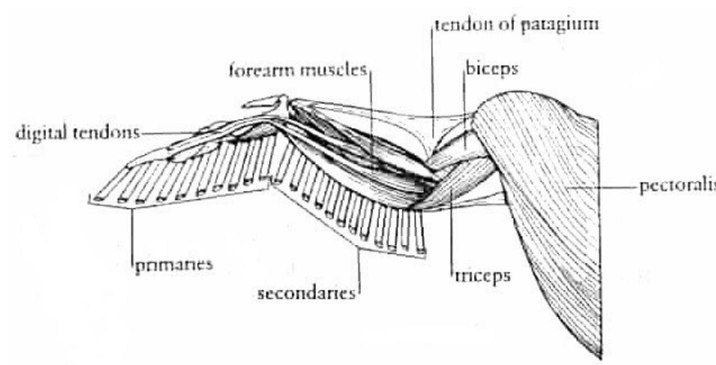
". . .birds evolved a strong keeled breastbone to serve as an anchor for large flight muscles and thin, hollow bones that in many cases are fused together. They needed a large, efficient heart, a greatly refined respiratory system, and a high-energy diet." *(ed. – These are some of the attributes that Al Bowers mentioned last month that limited man from duplicating bird flight.)*

"Virtually everything about birds, in other words, is modified to meet the two basic requirements of all flying machines: low weight and high power. And, as in all engineering designs, most solutions are compromises. A hollow tube is far lighter but not as strong as a solid rod. Add a few well-designed internal struts to a hollow tube, and the result is a great gain in strength for a small addition in weight. Inside the wing bone of a vulture, one finds diagonal struts up and down the length like an endlessly repeated WW. In some airplane wings and steel structural members, engineers use a nearly identical configuration called the Warren truss, named for the engineer who invented it for the second time."

"Perhaps the most astonishing example of lightness is the frigate bird. While it has a wingspan of seven feet, its entire skeleton, including the skull, weighs a mere four ounces – less than its feathers and the same weight as two Grade A large chicken eggs."

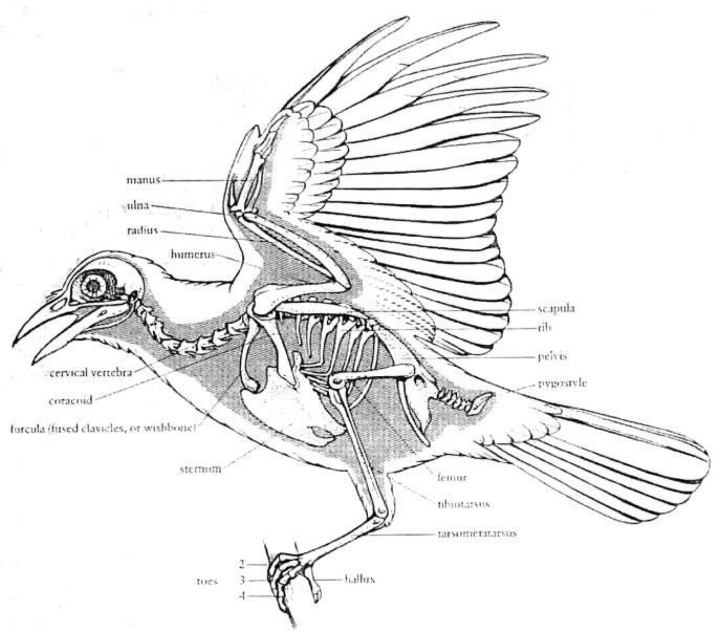
"The fusion in birds of what we call collarbones (or clavicles) into the familiar wishbone (or furcula) used to be seen as part of the general strengthening of the chest area. But recently, using high-speed X-ray movies, scientists peered at the skeleton of a European starling thrashing away in a wind tunnel and noted what generations of children making wishes with the Thanksgiving turkey's wishbone knew. It is highly flexible: you have to hang it up somewhere for several days before it is brittle enough to be used for wishing. Watching the starling's wishbone in action, the scientists saw it open and close with each wing beat and realized that it serves as a spring. It stores energy on the downbeat and releases it to the wings on the upbeat. The wishbone may also assist the bird in breathing, pumping air throughout its respiratory system as it alternately bends and recoils.

"How efficient is it to fly? According to Vance Tucker, also of Duke University, flying has it all over the locomotion of ground animals in terms of speed and endurance. Ducks cruise at speeds between 40 and 50 miles per hour. A cheetah, the fastest land animal, can achieve 70 miles per hour, but only for a short distance, after which it is so exhausted it needs a half-hour to recover. Neal Smith of the Smithsonian Tropical Research Institute in Panama has



shown that broad-winged and Swainson's hawks, by carefully using thermal updrafts and other air conditions, can soar from southern Texas and other southwestern regions of the United States all the way to Central and South America in their annual migration, traveling thousands of miles without ever needing to eat. In terms of energy cost (how many calories are burned over a given distance), flying also wins. 'A walking or running mammal,' Tucker has written, 'expends 10 to15 times more energy to cover a given distance than a bird of the same size does . . . a pigeon flies more economically than a light plane. Moreover, a Canada goose may be able to perform better than a jet transport.'"

"The high metabolic rate of birds is costly. Thus it is to the bird's advantage to conserve energy by flying as little as possible, and this is what they tend to do. Except in the rarest circumstance, birds never fly for what we might call the fun of it. As seen in many cases of flightlessness in birds, it is mainly predators that keep birds in the air. In their absence, birds tend to give up the entire expensive business of flight and act more like mammals."



ABOVE 2 Diagrams: "Skeletal adaptations of birds include a flexible neck; strong, light bones; nearly immobile or fused thoracic and abdominal vertebrae and pelvic girdle providing a compact, rigid support structure for muscles; and the keel-shaped sternum or breastbone and furcula or wishbone, to which the massive primary flight musculature, above, is attached."

"Certain modes of flight are more efficient than others. The amount of energy it takes to soar in circles, making only fine adjustments to use thermal updrafts, clearly is next to nothing compared with the blinding buzz of the hummingbird."

"As with airplanes, the most critical times in flight seem to be taking off and landing. Some birds have great difficulty getting into the air, although once there they do fine. Loons and large waterfowl, including geese and swans, have to run across the water all the while flapping their wings in order to produce enough speed to achieve the needed lift to become airborne. (Much of this is, from an engineering standpoint, a matter of the ratio of body weight to wing-surface area, and much of it is related to wing shape.)"

"One of the more comical sights in nature is an albatross coming into some oceanic island for a landing: as often as not these ultimate gliders, capable of spending even months aloft gliding over the seas by manipulating the wind and air currents off the waves *(ed. – dynamic soaring?)*, will swoop in to land and crash in a cumbersome, unathletic jumble. Once righted, the bird goes on about its business unperturbed. It may be because of this slap-stick association with the land that sailors came to call them gooneybirds."

(ed. – My personal experiences with albatross' on the island of Midway, confirm the above observation. On one occasion while walking on the golf course a gooneybird tried three times to take off downwind and downhill off of an elevated tee area. Each time he rolled up in a ball at the bottom of the small hill, picked himself up, then walked back to the top for another try. He was unsuccessful and eventually walked away to do something else.

On another occasion, there was one about 75-100 feet in the air that decided to land directly below himself. He folded his wings and dove for the spot. Shortly before reaching the ground in what would have been a crash landing, he thought better of it, fully spread his wings and swooped to within inches of the ground during the pullout. Now at breakneck speed he was headed for a group of trees surrounding a golf course green. Rather than pull up and go over them, he rolled up into the vertical (very similar to the cover picture last month) and went in-between two trees. Somehow, he managed to do a 180 degree roll over and go between two other trees. But his luck ran out and we heard him crash into the leaves and pine needles. A few minutes later he came wandering out of the trees shaking his wings while folding them against his body and, proceeded to walk off like nothing unusual had happened.)

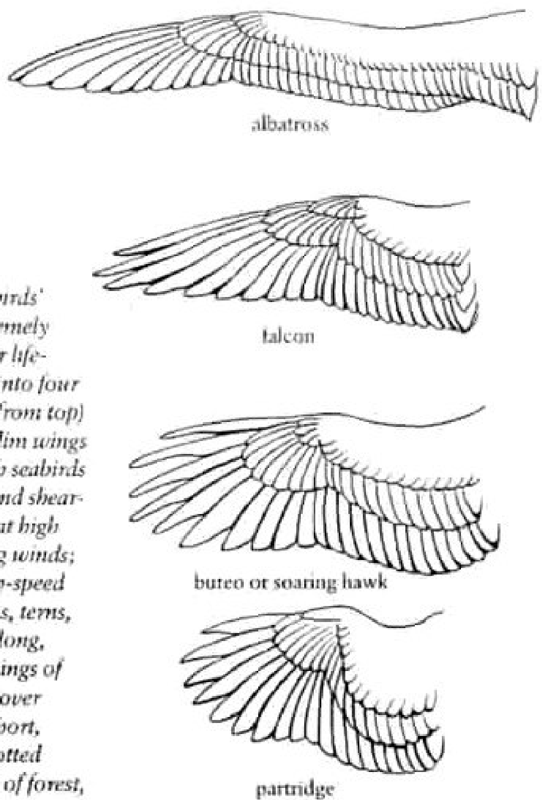
"Birds with well developed tails tend to be good at landing, and for obvious reasons. A quick spreading and lowering of the tail at the appropriate moment, tied to a high angle of attack by the wings, causes an immediate and controllable stall. Some birds also use the tail as a kind of rudder, twisting it to one side or another to change direction, which can also be accomplished by changing the angle of attack – or the shape – of one wing compared with the other." *(ed. – This type of tail has been tried by Bob Hoey and his group and was also done on the Nighthawk by Jim Theis.)*

". . . And, of course, on this basic plan of airfoil and propeller, birds have developed as many variations on a theme as Vivaldi, each suited to a particular need or set of needs in the business of flying"

"In general, however, there seem to be four basic shapes for birds. The most common is the elliptical wing typically found on birds that have to make their way through restricted openings, such as the leafy branches of a tree. This type of wing has a low aspect ratio, meaning that it is comparatively broad in relation to its length. It has, as a result, a relatively low wingtip vortex and confers on the bird a high amount of lift. Chickens, pheasants and quail have such wings, accompanied as well by a high degree of slotting – a necessity in getting these relatively heavy birds off the ground for their short flights."

"The opposite is the high aspect ratio wing, in which the length is far greater than the width, like the wing of a glider plane, the analogue in aviation for the great gliders of the ocean – albatrosses, tropic birds, and the like. Slotting is rare among such glider's (albatross) wings: the vortexes at the wing tips are too far apart to make much difference. Sailors in southern latitudes often will find themselves accompanied all day by an albatross making gentle S-curves behind, beside and ahead of their vessel, utter masters of the breeze."

“The third basic wing type is the high-speed wing, long and relatively slim, often with swept-back hands without slotting. More suited for fast, level flying than maneuverability and quick takeoffs, this is the wing of the falcon, of terns and sandpipers, swifts and swallows, and hummingbirds. It is among birds with such wings that many of the spectacular records in speed and aerial prowess are to be found. A peregrine falcon will fly normally between 40 and 60 miles per hour, but when it dives after prey, it may achieve speeds approaching 200. The fastest normal wing-flapping flight ever clocked was of the white-throated needle-tailed swift in India: a reported 219 miles per hour.”



The shapes of birds' wings are supremely adapted to their life-styles, and fall into four basic designs: (from top) the very long, slim wings that enable such seabirds as albatrosses and shear-waters to soar at high speeds in strong winds; the shorter high-speed wings of falcons, terns, and swifts; the long, wide, slotted wings of birds that soar over land; and the short, wide, many-slotted elliptical wings of forest, ground, and perching birds.

“Ultimate in flight and flight characteristics are the hummingbirds, evidently descended from some swiftlike ancestor. In all, there are today some 319 species of hummingbirds, all restricted to the Western Hemisphere, all adapted to sipping high-energy nectar from flowers, and – more than any other birds – playing an active role in the pollination of flowering plants, from which they also take trapped insects for protein. Master hoverers, they have evolved a system that is most akin to that of helicopters, enabling them to fly directly up, sideways, even backward at will. Their flight musculature is about 30% of their weight, proportionately greater than that of any other bird, and some of this added weight is given over to muscles that provide extra power on the upstroke. The wing is mostly hand (propeller) and is attached to the shoulder in such a manner that it can swivel uniquely, permitting the hummingbird to adjust the wing’s angle of attack on the powered upstroke as well as on the downstroke. Add to this the fact that for some small hummers, the wing beat is some 70 per second, a rate higher than an other bird’s, and you have much of the secret of these astonishing little packets of energy darting here and there at speeds of more than 30 miles per hour – what some would say are the most highly evolved of birds.”

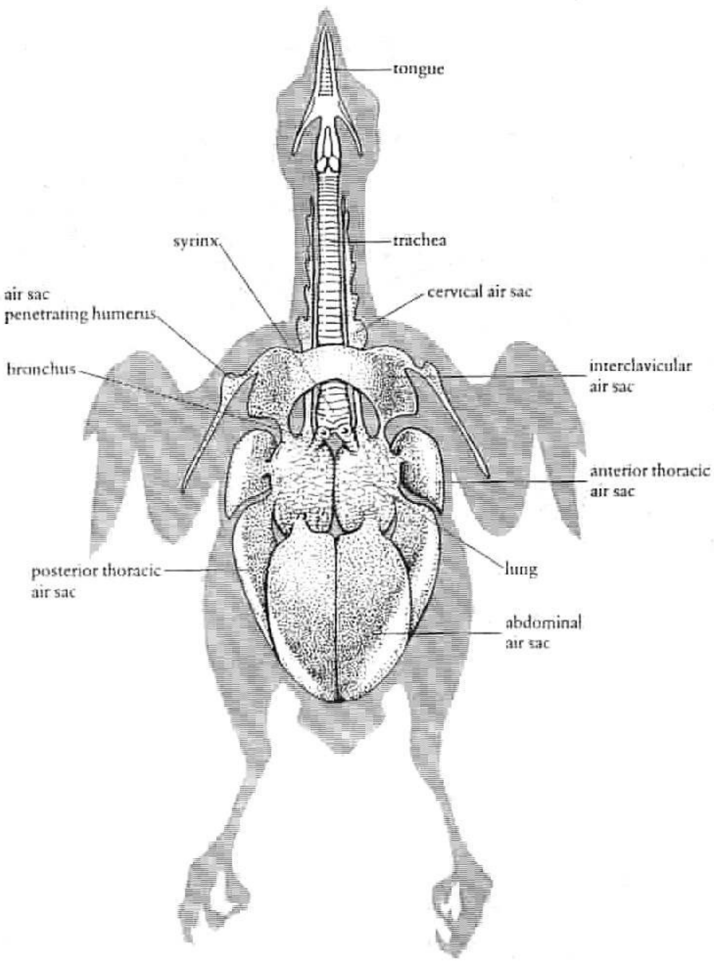
“The fourth basic wing type is the slotted high-lift wing, which brings to mind eagles and most birds of prey (but not falcons, which rely more on speed and thus are equipped with high-speed, scimitar-shaped wings). This wing has a relatively low aspect ratio with a strong camber and a typically high degree of slotting. The result is a great deal of lift, needed not just to get the bird aloft and keep it there – these birds are the great soarers – but also because the bird will (if it is good at its job) find itself hauling fair-sized prey in its talons.”

“The shape of the wing is one thing, but there is also an important mathematical consideration involved in bird flight – the ratio of wing-surface area to body weight. If you double the surface area of a solid – such as a cube or, for that matter, a bird – you triple (not double) its volume. This geometrical fact predicts that, if you were somehow to double a particular bird’s wing-surface area, you would also triple the bird’s overall weight. A chimney swift, for example has a wing-surface area of about 120 square centimeters and weighs about 20 grams. If you doubled its wing-surface area to 240, you would expect a bird of some 60 grams. Nature has almost done this for us: the re-winged blackbird’s wing-surface area is about 250 and it weighs about 70 grams – close enough.”

“Mathematically this can be stated as follows: wing-surface area is equivalent to weight to the two-thirds power, or weight $^{2/3}$. In other words, if you square the weight and then take the cube root of the number, you should have the wing-surface area. It turns out that this magical bit of natural math holds roughly true for most birds – the swift, the blackbird, doves, swans, and chickadees, and many others. On the other hand, some birds, such as hummingbirds, loons, and geese, have wing-surface areas that are *less* than weight $^{2/3}$, and they make very poor soarers. Similarly, the good soarers, such as eagles, herons, gulls and purple martins, have wing-surface areas larger than weight $^{2/3}$. *(ed. – If you recall, Al mentioned daVinci’s 1505 treatise on birds that included a statement that birds work according to mathematical law and it is within the capacity of man to reproduce it. Al also noted that daVinci hadn’t accounted for man’s muscle physiology that couldn’t create enough power for a flying machine.)*

"All birds that fly are especially sensitive to the air. Anything from a small gust to a gale affects their progress through the sky, and they all make constant adjustments. But soaring birds seem especially gifted in sensing the

ABOVE & RIGHT: "Strong, hollow bones and a unique



respiratory system are among bird's most important adaptations for flight. The skull of a crow (right) is paper thin, while the beak is buttressed from within, as this cut-away drawing reveals. A system of air sacs connected to the lungs (above) enables birds to extract the maximum amount of oxygen from the atmosphere, even at high altitude. Air travels through the lungs to posterior abdominal sacs, then back through the lungs to the anterior interclavicular sacs, then out. One breath leaves the bird's body only after it takes the next breath."

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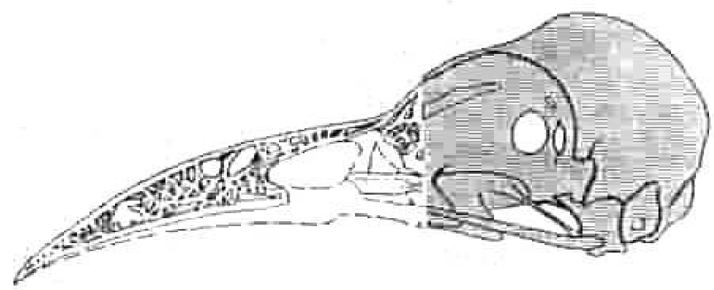
invisible motions of the air. Wind blowing across an obstruction – a wave, a sand dune, a shoreline, a hill – causes an updraft. An albatross takes advantage of these evanescent updrafts in series, ascending and descending, gliding for hours near the surface of the sea. *(ed. – Reminds me of the German video using an albatross to illustrate dynamic soaring.)* On land, an open area of field will warm up faster than surrounding woodland, and the air over it rises in a great column. Vultures will soar in circles on these thermals, defining their edges. Meanwhile, over the sea, warming water sends air up in groups of thermal columns, and gulls may be seen soaring in circles around them. If there is a fresh wind – at least 24 miles per hour – it will tend to blow these columns of air over sideways. Each column of warm air rotates, even when prone, and this causes another updraft between the columns. Gulls and other seabirds will soar along these, gaining altitude as they go."

"Even as a bird gains altitude while soaring, it is in fact in a descending mode. It rises because the current of air is rising faster than the bird is dropping. This sounds like a very efficient means of travel, and it is, but the actual efficiencies of ascending and descending flight are not always what seem obvious. Wind tunnel flights of parakeets have shown that efficiency – in terms of energy expenditure – is a combination of many factors, especially speed. Flight for a parakeet at 12 miles per hour is not as efficient as it is at its normal cruising speed of 22. On the other hand, ascending at an angle of about five degrees while flying at 12 miles per hour turns out not to take much more energy than merely flying at that speed. And as the speed of ascending flight increases toward cruising speed, the overall cost of ascent keeps going down (as flight itself becomes more efficient). In this equation, one can see that for some birds it might be possible to save energy over an entire journey by spending a good deal of the time descending (with minimum cost) and ascending at not much greater cost than straight flying. Such is the flight pattern of goldfinches and woodpeckers – an undulating path through the air. Aeronautical engineers have yet to devise as fuel-efficient a system for airplanes. They also envy birds for their feathers."



"It is the manipulation of feathers – by the bird and the air – that allows for many of the subtle maneuvers of birds in flight and on takeoff and landing. It is ffeathers that permit birds to fly relatively soundlessly: imagine the human misery if birds made proportionately as much noise in flight as airplanes. It is feathers that turn what are chunky and awkwardly shaped bodies into streamlined, aerodynamically sound fuselages. That birds spend a good deal of time preening, dusting, oiling, and otherwise caring for their feathers is no surprise: feathers are probably the most important pieces of avian apparatus."

"Each flight feather itself is an aerodynamic marvel. The forward vane is narrower than the rear vane, and air pressure acts differently on the feather, pressing more heavily on the wider vane and twisting the feather to the proper angle. In this the quill colludes, being rigid toward the base but flexible and flatter toward the tip."

"Tail feathers are counted in pairs. While most birds have six pairs of tail feathers, this, too, varies widely: hummingbirds, swifts, cuckoos and others have five pairs; some cuckoos have a mere four. Other birds have far more. Like flight feathers, tail feathers are overlaid by coverts, swimming birds having more coverts than tail feathers."

"All told, the flight feathers and their associated coverts account for a small proportion of the feathers that cover a bird. Most of these are contour feathers, all of which typically grow from specific tracts on the skin, and down, which can grow almost anywhere and which provide insulation. Contour feathers usually have well-formed vanes that are downy at the base. They cover the body and give it its aerodynamic shape, though in many instances they have evolved into highly elaborate structures for display, as in such bizarre and beautiful creatures as the birds of paradise."

"In association with contour feathers are odd hairlike feathers called filoplumes with vestigial vanes at the ends. These feathers, which generally lie under the contour feathers, baffled ornithologists for some time. They were suspected of having some sensory role, and recently West German scientists studying pigeons found that the filoplumes are directly connected to sensory receptors in the skin that detect mechanical stimuli – this is, motion. If the filoplume, or the nearby contour feather, is wiggled, the signal is transmitted directly by the filoplume to the bird's central nervous system. A contour feather that is out of place can cause a loss of heat. Perhaps more important, a contour feather this is ruffled cuts down on the streamlining of the bird's body. And it may also be that a change in pressure on a contour feather during flight, once signaled via the filoplume to the central nervous system, plays a role in the constant fine tuning called for in the conduct of flight."

"There apparently is nothing – no feature – of these superb athletes that does not owe its original design and function to the overriding task of flight, the amazingly complex talent birds possess that is so unimaginably liberating and, at the same time, so elegant a straitjacket.

(ed. – Next month I will include Syd's design concept, since he asked that everyone absorb this piece before presenting the design. I will say it is an adaptation of an existing homebuilt ultralight sailplane and is, indeed, very interesting. I find it interesting how this all goes together with what Al Bowers covered in his March presentation. These excerpts show how much we have learned about the mechanics of flight from the experts, but also on how much we have yet to learn that will help with man's quest for flight.)

BISHOP SEIRRA WAVE PROJECT
National Landmark of Soaring No. 12

From: Motorgliding & Gliding News

By Bertha Ryan
Posted Monday, February 04, 2002

On June 15 many early soaring pioneers and current enthusiasts will gather at the Bishop Airport to dedicate a landmark to honor and recognize the Sierra Wave Project of fifty years ago.

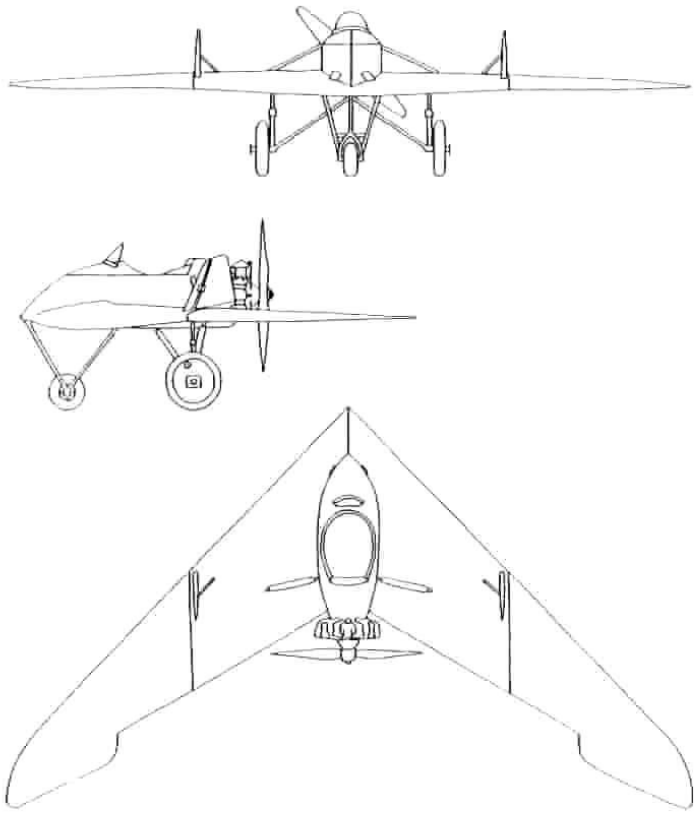
Pilots in Germany first flew their gliders in wave conditions where Dr Joachim Kuettner wanted to learn more about this smooth lift accompanied by stationary clouds. It wasn't until the early 1950s that a group of weekend pilots in Southern California, along with Dr Kuettner, managed to get sponsorship for the first scientific exploration of the wave. Many of these participants, including Dr Kuettner, Larry Edgar, Betsy Woodward, Paul MacCready, Harold Klieforth and John Robinson, will join in the celebration. A comprehensive description of this flight investigation is reported in the book Exploring the Monster by Robert F. Whelan, published in 2000 (Wind Canyon Books).

Bishop Airport, the main site of the project, is located near a small town at the northern end of the narrow Owens Valley of California with high mountains on each side (many peaks are more than 14,000ft) - the Sierra Nevada to the west and the White and Inyo mountain ranges on the east. The celebration will consist of a landmark dedication at the airport at 1pm and a dinner in the town of Bishop in the evening, including a talk by Einar Enevoldson on the Perlan high altitude project and a panel discussion by original participants in the Sierra Wave project. There will be soaring at the airport including participation by the Vintage Sailplane Association.

Sylvia Colton is organizing the event but for dinner reservations and further information contact me by email at ryanbm@alum.mit.edu. Sylvia's address is PO Box 1435, Bishop, CA, 93515, USA; tel +760.872.1573. (She has no fax or e-mail, but does have an answering machine.) Also see: http://www.glidingmagazine.com/ListNewsArticleDtl.asp?id=385

ANOTHER PAPER WING

(ed. – Herman Gates sent us the plans for a quick to build paper flying wing that really works well [at least the sample he sent along does]. The diagram for this model can be found on the last page of the newsletter, that way when you cut it out you only lose the classified stuff but none of the text material. He used half-inch wide masking tape to hold the leading edge folds down and overlapped the tape slightly into the wingtip area to provide support for the winglet joint line. He indicated the winglets should be up 15 degrees and, that a higher A/R should improve performance, i.e. transfer the design to legal size paper.)



Technische Daten:

Hersteller	Alexander Soldenhoff
Erbauer	Karosseriewerk Langenthal
Typ	Soldenhoff S-5
Bauart	Nurflügelflugzeug
Verwendung	Versuchsflugzeug
Baujahr	1935/36
Spannweite	7,5 m
Länge	4,3 m
Höhe	1,7 m
Triebwerk	Salmson, luftgekühlter 9-Zylinder Sternmotor (29,4 kW / 40 PS)
Besatzung	1 Pilot

ABOVE: This is one of the 3-views from the material sent to us by Eric du Trieu de Terdonck. Soldenhoff's aim was to build a wings-only aircraft that with the minimum engine capacity could achieve a maximum flying capability.

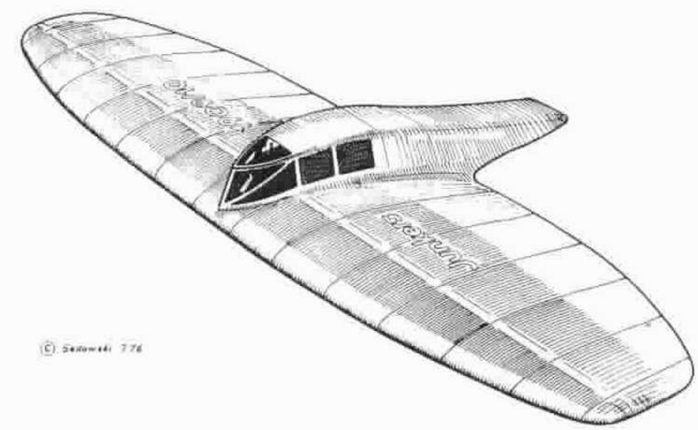


Abb. 5: Die vier Versionen des Junkers'schen „Gleitfliegers", wie sie – nach der Rekonstruktion – ausgesehen haben dürften. In allen vier Darstellungen fehlen die (in der Patentschrift nicht erwähnten) Leitwerke.

5a (oben) zeigt den eigentlichen „Gleitflieger", wie er in der Patentschrift beschrieben ist – ohne Antriebsanlage und ohne Fahrwerk.

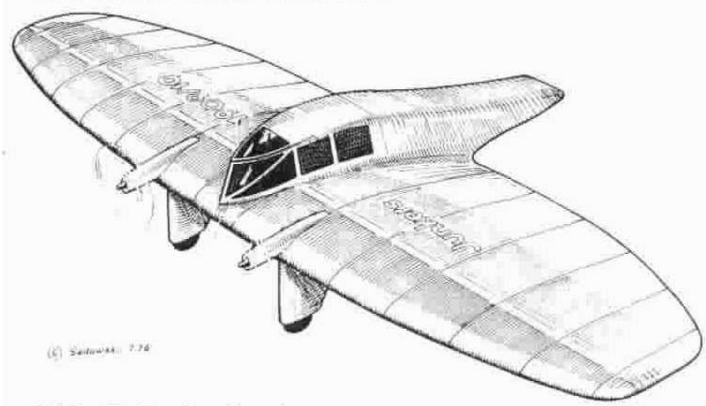


Abb. 5b: Für diese Darstellung des motorisierten und mit zwei Zugschrauben und Fahrwerk ausgerüsteten „Gleitfliegers" dienten Patentschrift, Junkers eigene Handskizzen aus dem Entwurf zur Patentanmeldung und vergleichbare Windkanalmodelle als Vorlage.

ABOVE: This is a Junkers design concept that went through several variations from a glider to a 4-engine (see next page) version. Unfortunately, this was one of the article Eric sent along that is all in German so more details are not available right now. The source was: <u>LUFTFAHRT International</u>, Issue 18, published sometime around the end of 1976.

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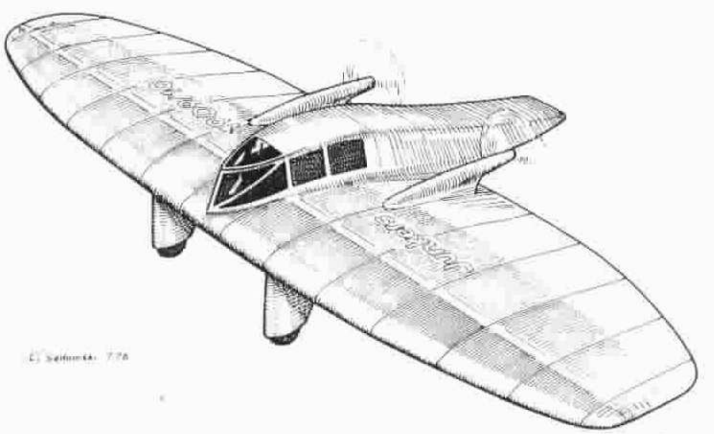
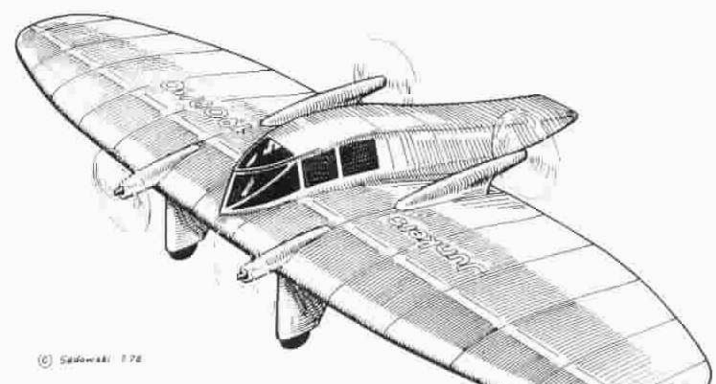


Abb. 5c. Eine weitere motorisierte und mit Fahrwerk ausgerüstete Variante des Gleitfliegers: hier mit zwei Druckschrauben.



Alle Zeichnungen Dipl.-Ing. H. Sadowski

Abb. 5d: So etwa hätte die vierte mögliche Variante des Gleitfliegers aussehen können: mit Fahrwerk und je zwei Zug- und Druckschrauben.

Tailless Tale, by Dr. Ing. Ferdinando Gale'

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VHS tape of July 15, 2000 presentation by Stefanie Brochocki on the design history of the BKB-1 (Brochocki,Kasper,Bodek) as related by her father Stefan. The second part of this program was conducted by Henry Jex on the design and flights of the radio controlled Quetzalcoatlus northropi (pterodactyl) used in the Smithsonian IMAX film. This was an Aerovironment project led by Dr. Paul MacCready.

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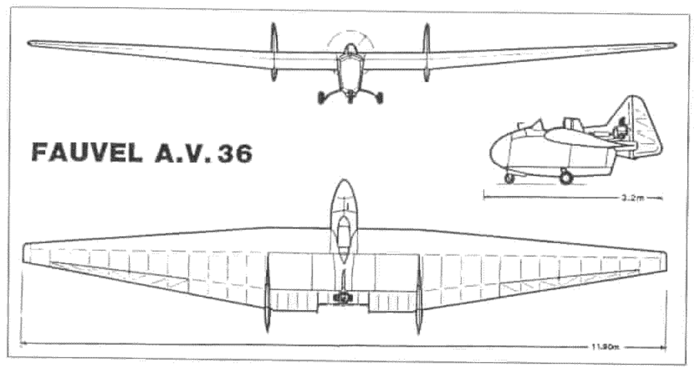
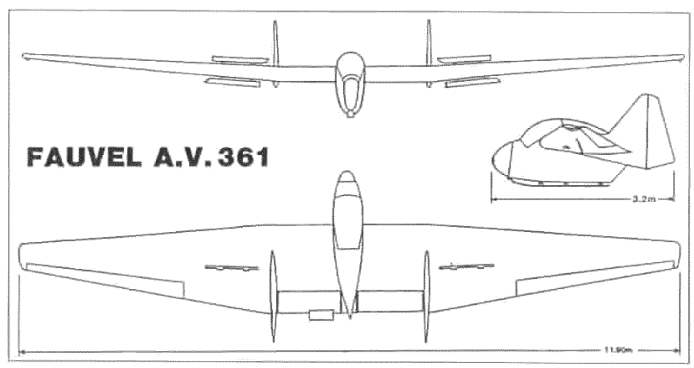
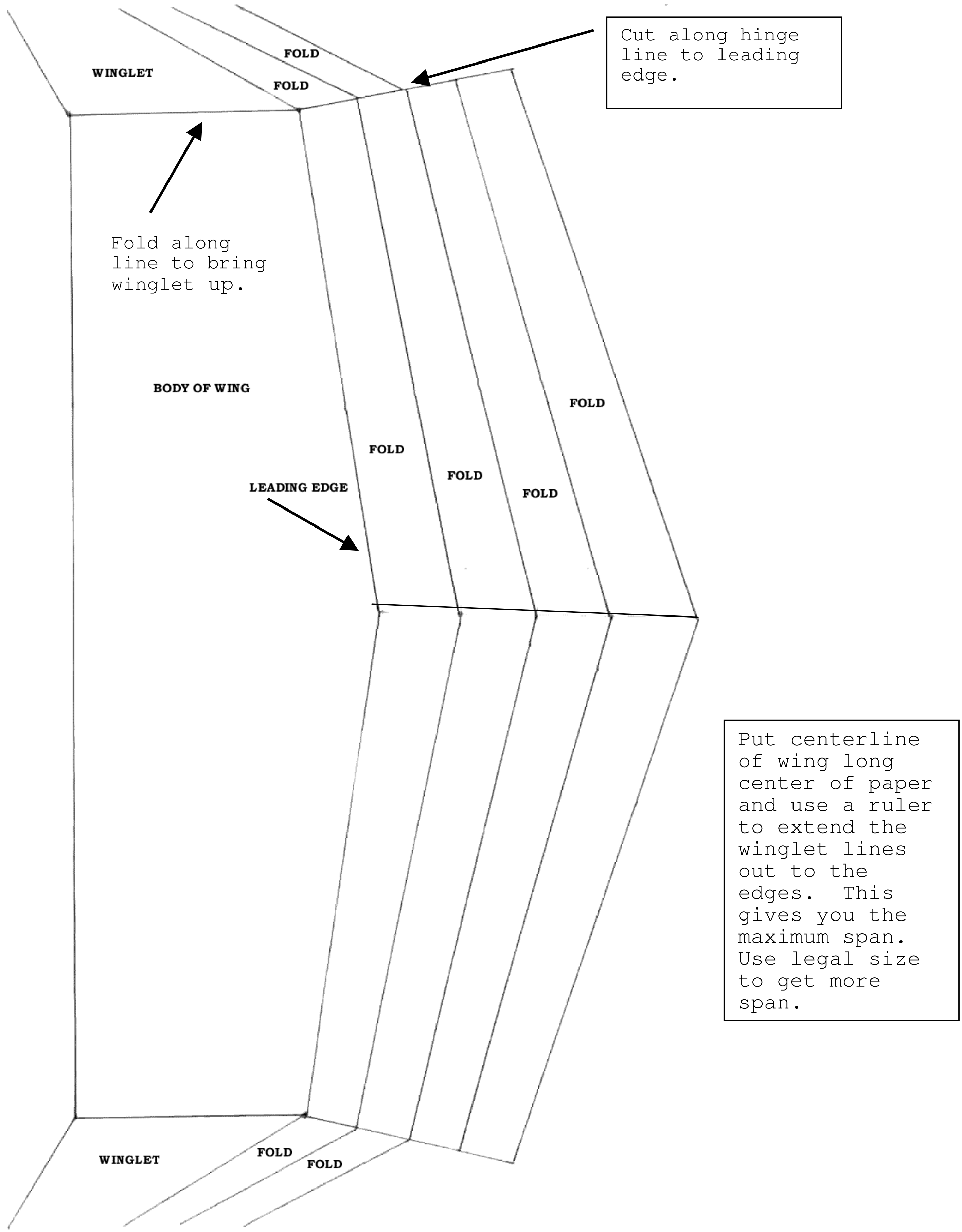




ABOVE: From some of the Fauvel material sent along by Eric. This was an article apparently comparing the full size aircraft to various R/C versions.


Cut along hinge line to leading edge.
WINGLET
FOLD
FOLD
Fold along line to bring winglet up.
BODY OF WING
FOLD
FOLD
FOLD
FOLD
LEADING EDGE
Put centerline of wing long center of paper and use a ruler to extend the winglet lines out to the edges. This gives you the maximum span. Use legal size to get more span.
WINGLET
FOLD
FOLD