No. 188 FEBRUARY 2002

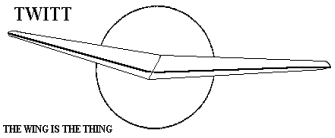
T.W.I.T.T. NEWSLETTER

Center section of the Altostratus – see inside for the rest of the story.

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., **0202** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, March 16, 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).

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PRESIDENT'S CORNER

I hope everyone is having a good new year so far, even though it is still rather young. I imagine many of you are using the winter months to work on your projects in the warmth of a cozy workshop. All I ask is that you get your camera out now and then and take a couple of pictures we can share with other members to let them know what's happening in the world of flying wings.

By the time you receive this newsletter there will only be a couple of weeks left before the old website URL will stop working. Make sure to update your favorite sites links to reflect:

http://members.cox.net/twitt

If you have other links to pages within the site all you need to do is bring up their properties and change the word "home" to the word "cox". This will eliminate the need for going to each page, saving the link and then deleting the old link. Right now both web sites are running and duplicate each other except for a few nice to have items I have also taken this opportunity to change the e-mail address to one that will remain stable no matter what happens to the provider hosting the website. So update your address book to reflect:

twitt@pobox.com

I would like to thank Jim Wixson for suggesting this option since I would like to eventually find another provider that can host us under a regular domain name like "twitt.aero" when that extension is approved, hopefully, later this year. This would then allow us to create a "members only" section where I could post the newsletter for electronic viewing that would include the color pictures. It also would mean newsletter would be available much sooner to everyone, including our overseas members. Stay tuned for more.

Andy

MARCH 16, 2002 PROGRAM

The March program will feature Al Bowers giving us an insight into origination of flight and where we are going in the future. His program is titled: "From Birds, Through da Vinci, the Wrights, Through Today: The Disassembly and Reintegration of Flight - Challenges for the Second Century of Flight."

How did aircraft evolve to their present configurations? Somehow, we moved from birds as a model for flight, to mechanical flight which doesn't use many of the same integrated features birds use to fly. By examining bird flight, can we learn anything new? This presentation supposes that birds still have a few tricks to show us, if we're astute enough to look back and carefully reexamine birds as a model for flight. A strong connection to aerodynamics, stability, control, structures, and propulsion are shown; how we solve those problem today, and how birds solve them. Finally the question is posed: can we do better in some areas by following the bird model?

This sounds like a very intriguing topic and will surely raise many questions from the audience about theory and practical applications. Mark your calendars for March 16th and tell your friends to come along for an interesting Saturday afternoon away from sports television.

JANUARY 19, 2002 MEETING RECAP

In his usual fashion, Andy opened the meeting welcoming the "crowd" to the first meeting of 2002. The program for the day was going to consist of two aspects, the first being Gary Fogel on the Altostratus and, the second being Gerry Lee Heflin's water launched surface skimming wing.

Bob Chase shared with us an article from the January 2002 Air & Space magazine the latest developments in ornithopters, specifically the Big Flapper being designed by James DeLaurier and Jerry Harris. A side note in the article was Jim's relationship with Jim Theis who had developed the Nighthawk and Nighthawk II. The Nighthawk is a feature on our website and we expected to hear more from Jim Theis on this continuing project. However, it turns out that Jim passed away in January 2001, but his project is being carried on by Brian Said and may be eventually flown by Jim's son Charlie.

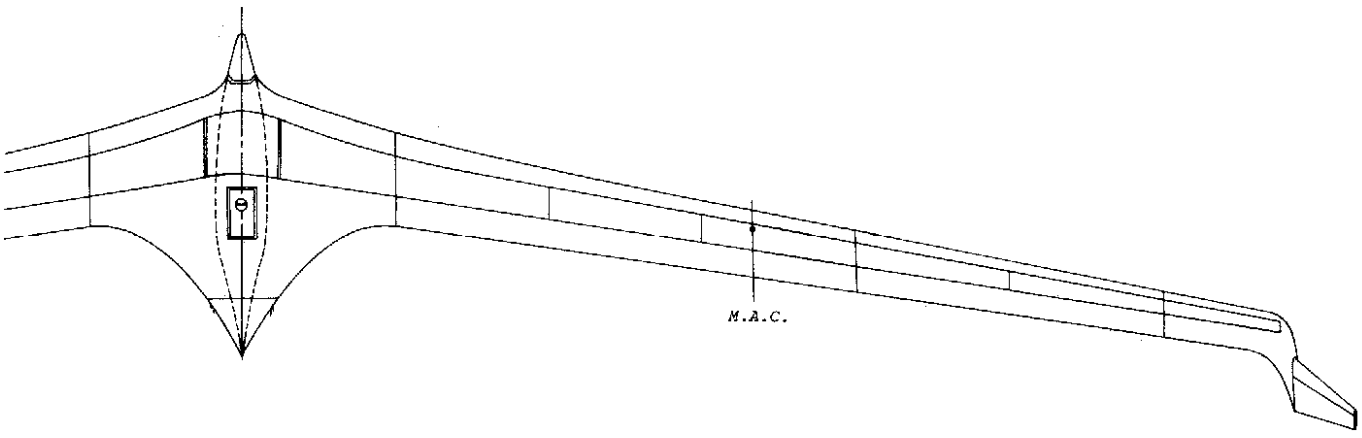
Bob went on to say he had met Jim Theis several times at the Oshkosh air show and found he had never lost his enthusiasm for the Nighthawk even though a crash in the first version resulted in him spending the rest of his life in a wheelchair. He always had new ideas of how to improve the design of the airframe and systems for the flapping mechanisms. Bob noted that Jim's work had been taken over by others and waxed philosophic by postulating that we need to make sure our projects are documented so others can continue them as we pass along to a better life.

Andy took this opportunity to say that Jim Wixson, a member in Portland, Oregon, had mentioned almost the same thing in a recent phone call. Jim had expressed the thought that we need to ensure that the design ideas and theoretical papers of leaders in the field need to be preserved for future generations. He went on to suggest that perhaps TWITT could be a repository for at least copies of these documents and with the owner's permission make them available to those interested. This would also allow for discussions with the owner before it's "too late."

Bruce Carmichael wanted to make sure the group was making plans for the SHA Western Workshop over the Labor Day holiday in 2002. This year is special because it will involve both US and European speakers since the international sailplane design competition will be going on at the same time. One such speaker will be Gerhardt Weibel *(sp.)*, of sailplane design fame, who is also giving the Ralph Barnaby lecture this year. We will have more on the programs as Bruce and his committee put everything together. But make sure to reserve the Labor Day weekend for a trip to Techachapi.

Bob Chase mentioned that in early February there would be one big aviation exhibition in Ontario California that represented all the different aspects of flying from R/C models to high performance sailplanes.

With all that out of the way, Andy introduced Gary Fogel who was going to tell us how he got involved in the Altostratus project and where it was today.



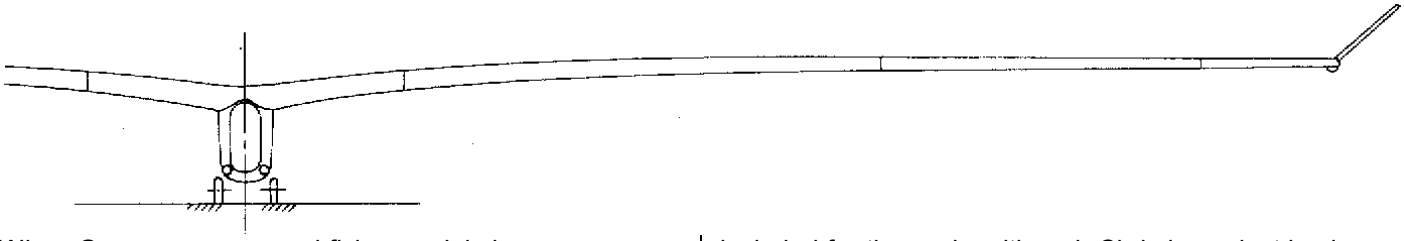
Gary began by saying the idea for Altostratus was originally formulated by John McMasters in 1981 as a tongue-in-cheek prediction of what sailplane competition would be like in the future. In short the concept involved one sailplane in essence electronically "shooting down" the competition so the last one flying was the winner. Altostratus was McMasters' answer and he produced a 3-view drawing of the concept claiming it would be flying before the end of 2001. So Gary and his team, Chris Silva and his father and, Dave Hall, went to work to produce a SCALE model with only the 3-view *(next page)* as a source of information. So this is the basis for Gary's, and it turns out Chris' presentation. (The burning question is, "did it fly before the turn of the century?" Keep reading.)

Gary prefaced his part of the presentation by explaining he was primarily the test pilot for the project and that Chris actually built and refined the aircraft to make it flyable. Once Gary got through with his introduction he would turn the floor over to Chris for the technical part and questions.

Getting back to the Altostratus, they decided on a fifth scale model since the 3-view showed a 25 meter span and this seemed like a workable span for the model. At this point Gary introduced Chris Silva to continue with the slide show. Chris has since graduated with a masters degree in aeronautical engineering from UCLA and is working at the Lawrence Livermoore National Laboratory which is associated with UC Berkeley. We all thanked Chris for coming down to help with the presentation.

They decided to go with the original McMasters' design shown in Soaring rather than another variation that included a movable tail cone that could be extended rearward to help stabilize the aircraft in the event of trouble. The original plan showed a prone pilot in a pressure suit, nose and tail radar units, escape capsules and all kinds of other "gadgets". It had boundary layer control since McMasters thought this would be allowed in future contests. All this was powered by solar cells so was really using thermal energy just like any other glider.

The aspect ratio for the sailplane was 25:1 with an average chord of 1 meter. The model ended up with a 25" root chord to a 4.125" yielding a great deal of taper and a thin wing which took a long time to figure out a method for achieving it in the span they had settled on. It has multiple sweep and multiple taper along the first part and also a slight gull shape in the center section area. The model doesn't have quite as much as the original plans, but this is what they decided on during project planning. The pilot pod was



When Gary was young and flying models he came across the Altostratus design in Soaring magazine. Although the story was quite intriguing what peaked his interest was the aircraft McMasters proposed to win the contest. For about 20 years he had forgotten about it until he became involved with Chris in a 1991 AIAA student competition at UCLA. Chris had contacted Gary about being the pilot for their student project since no one on the team was an experienced R/C flyer. They built a flying wing and took it to Wichita, Kansas for the contest and through this project Gary and Chris became good friends.

After the competition it was obvious Chris was interested in building another flying wing and the most gorgeous one Gary had ever seen was the Altostratus. He planted the seed in Chris' mind and they started working on the project plan that resulted in the aircraft on display.

While working on the project they discovered the Zagi model line of R/C flying wings. They are all foam and are excellent of flying combat since they don't get hurt much during the collision. From the Zagi they decided to build something of their own Gary referred to as a Horten IV ripoff but with winglets (didn't handle well without them). (See next page.)

included for the scale, although Chris is against having a pod especially for a non man-carrying model. The original also had relaxed stability meaning that the center of gravity is behind the aerodynamic center.

The model was made to be stable since they didn't have a sophisticated feedback control system to keep the sailplane under control. They compromised by moving the CG forward and changing the trim settings for washout in the wing.

They wanted to know if the model would fly before they actually started construction. To accomplish this they loaded the full size aircraft's parameters into X-Plane Flight Simulator which can be purchased for around $30. It will analyze the forces based on wing geometry and will give an idea of how the plane will behave and what kind of performance to expect based on general engineering curve fits. Some of the items reported by the program are L/D, TAS, GS, IAS, AOA, pitch angles and yaw. They really liked the yaw factor since it told them the impact of having small winglets, very little sweep (about 11 degrees), a small amount of dihedral and the pod sticking out in front. He explained that the aerodynamic center in the yaw plain is ahead of the CG, which would make it unstable in yaw. They wanted to know how the dihedral and sweep would

straighten out the aircraft in comparison to Chris' calculated values.

ABOVE: A view of the fuselage pod and the gull shape of the center section. The red glider in front is the Zagi they used for initial testing of some ideas.

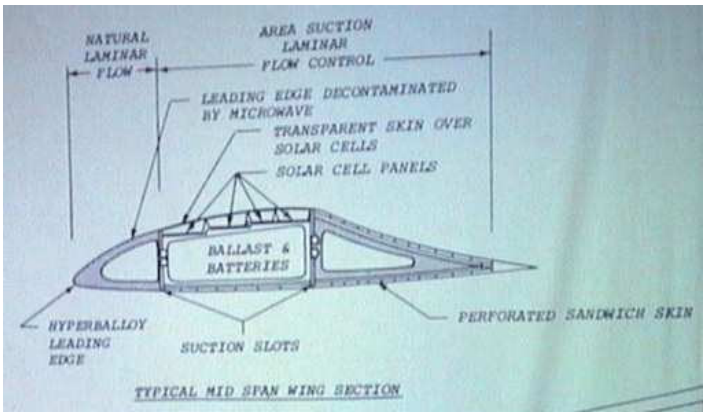
They tried different control configurations in the simulator like flaps and ailerons, but didn't try rudders since the program couldn't handle split rudders. They felt this type would be the most effective based on the large span of the original concept. Chris commented they might try split rudders on a subsequent model. The simulator stall was more or less okay but the nose would start to hunt left to right very badly. At high speed it turned into a Dutch roll and would swap ends really fast.

Gary commented that the simulator would actually do an aero tow, which turned out to be very exciting with the Altostratus. The sailplane would start yawing and slide to the outside when the tow plane began turning. By the time a correction is made the tow plane is headed in the other direction. They adapted and learned what to expect when flying the model. One thing was to pitch up when the yawing started which they feel increases the dihedral effect and tries to stabilize the aircraft. They have now confirmed this through the actual flight-testing.

The model was built out of white foam and fiberglass because it was cheap and Chris knew how to use it. He knew this would make the wings a little on the flimsy side but he figured he could make them torsionally stiff and wasn't worried about the spanwise bending (this turned out to not necessarily be the case as we will see later). This aeroelasticity was something the simulator program didn't offer so the model yielded their first experience with this condition.

There were seventeen airfoil templates for the root, main portion of the wing and the tips. This ended up being one of the longest parts of the project. It has a five-piece wing comprised of the pod center section, two wing panels and two winglet plugs. He used carbon wing rods rather than steel since he could.

The control configuration ended up having inboard flap/elevons and outer elevons. The inboard controls were given some coupling so when you pitch up the inboards will go with the outboards and if you roll they will go opposite. The inboard ones can also be used as flaps. Although they had experimented with flaps in the simulator, they could rig it for the elevon portion. The simulator flaps worked really well to slow it down and land in a short distance. However, they produced too much nose down pitch on the flying model so haven't been used as flaps.



ABOVE: This is John McMasters' concept wing profile. Note all the gadgetry he had like boundary layer control and a leading edge decontaminated by microwave.

The first flight (which occurred in July of 2001) lasted 16 minutes with Gary figuring that if it was flying okay there was no sense in risking damage by trying a landing. They found that they could calm down the yaw oscillations by pitching up just like in the simulator to increase the angle of attack. The flying site was a hill west of Tehachapi that has lots of tall grass to help absorb any bad launches or landings. In fact within seconds of the first launch the model could be heard swishing through the grass just below the ridgeline as Gary fought to control it. As noted the flight lasted sixteen minutes so obviously he managed to pull it out.

The lessons they learned were to make a stiffer wing which they sort of already knew, but had built light to control the CG due to the short moment arm offered by the front of the pod for balancing weight. They knew there would be some yaw problems but the simulator testing prepared them and they were able to overcome it during the flight. They want to look into some type of rudder or feedback control system with a yaw sensor to help the pilot and reduce the

stall tendency in a turn. If this hadn't been a scale model, Chris would have brought the winglets into a more vertical position (they are at a 45 degree angle on Altostrataus).

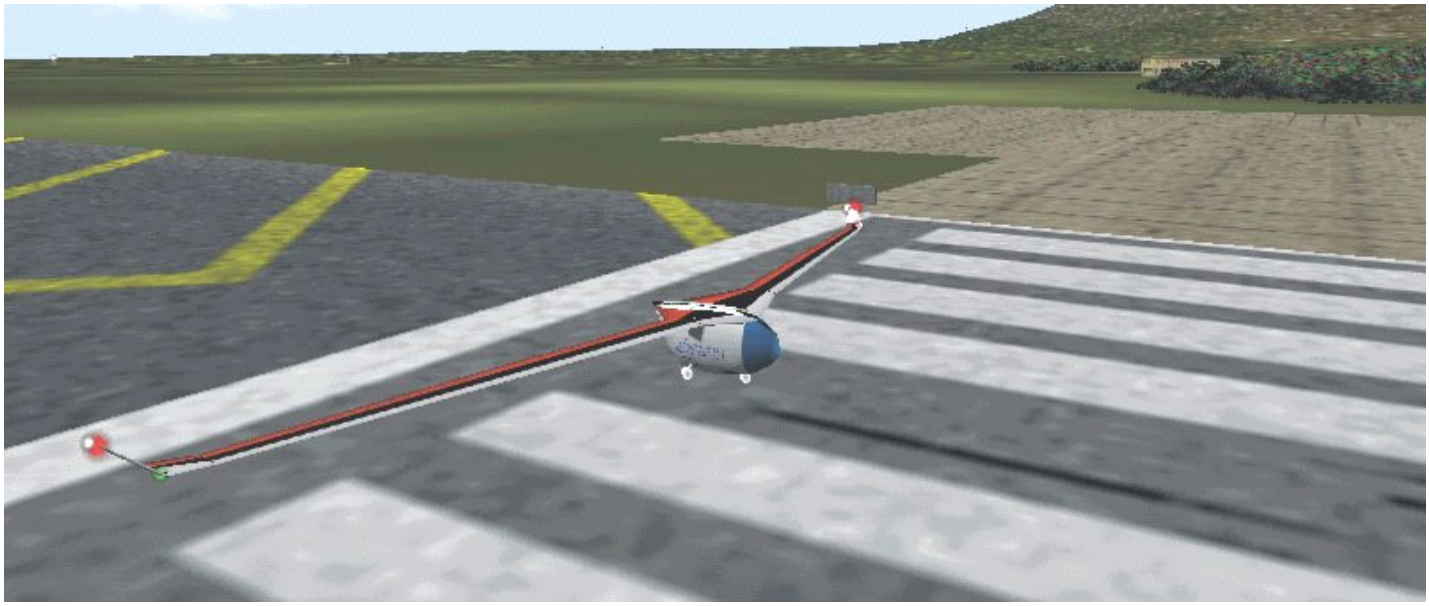
BOTTOM LEFT: Bruce Carmichael, Chris Silva & Joe Lones looking at the new, stiffer wing panel for the next series of flight tests.

Future changes include stiffer wings while maintaining the weight (the model weighed 5 pounds). They will use carbon fiber and Kevlar to accomplish both these goals.

Gary and Chris have both talked with John McMasters since the flight tests. He had all but forgotten about the concept and was quite amazed that anyone had actually built a model and got it to fly. After all, it was just a concept attached to a purely fictional tale about future contest flying.

ABOVE: Top view of Gerry's Skyler. It still needs the tow attachment harness and small windscreen just behind the dark Vee at the front. BELOW: The underside showing there is a slight step to help it break the water.

At this point we took a break for donuts and coffee *(ed. – after all it is winter in Southern California)* and to go outside to see Gerry's "surfing" flying wing. It is designed (designer is Speed Hauber) to be towed behind a boat, lift off the water with the pilot crouched or kneeling on top and be controlled like a surfboard only being airborne. The prototype had a set of vertical fins with an elevator, but the latest vehicle has eliminated them. The bottom has a small step to assist in breaking free of the surface. Gerry has promised to come



ABOVE: This is what the Altostratus looked like in the X-Plane simulator. Chris added the paint scheme to give it a little more realism.

BELOW: Chris and his dad displaying the Altostratus in the tall grass of the Tehachapi hills before it was launched for the first time.

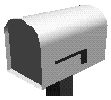
ABOVE: A good shot of the Altostratus coming at the camera during the first test flight. BELOW: Chris preparing for the launch with Dave Hall taking the pictures for future reference if it didn't go well.

back after the initial "flight" testing to tell us more about how it all went.

After the break, Chris narrated a video of Altostratus' first test flight. *(ed. – This section will kind of hit the highlights of the comments made by the audience, Chris and Gary.)* The video showed the sailplane dipping right after launch and you hear it scrapping through the grass. The first few moments showed it was a very elastic airframe and it demonstrated some pod bouncing. Gary finally found the right control inputs to offset it to some degree, but later footage showed sometimes it got quite severe.

The sailplane showed it was quite capable of climbing very nicely in the available lift with it sometimes below the ridge line and other times being well above the pilot's position on the hill. While it was flying Chris commented he would build another, stiffer wing since it was obviously a flyable aircraft. Gavin asked is they were getting both bending and twisting action in the wing. Gary said that while flying level they were only getting bending but when in a turn you see there also some twisting going on. With a successful landing there was a round of applause from the audience at a job well done.

Andy thanked Chris from coming all the way down to help Gary with the presentation. Dave Hall had also come along but was staying quite at the back of the room. He was responsible for some of the fine photographs published in the magazines. If you don't get Soaring magazine but know someone who has one, you can find a nice article by Gary in the November 2001 issue. The February and May issues of 1981 have John McMasters original story.



LETTERS TO THE EDITOR

January 22, 2002

TWITT:

I am sending in my renewal for another year of the newsletter.

I will soon send you a lengthy summarization of part of the book, for which I claim no authorship, but which pertains directly to Mr. T. Bircher's LEA 23, as well as, Mr. Hoey's excellent study of wing tip feathers, and also his threat of further bird study. (And, I might add, to my forthcoming study, which should get me thrown out of TWITT, since it deals with bird's tails and a control system that I plan to incorporate in my next glider, if I live so long.)

Since I anticipate that you (TWITT) will not publish it, I intend to send it to Bruce Carmichael who has helped me so often in the past and let him evaluate it and try to consolidate into your pages. I think it will do you all good (and get me thrown out).

Birds, quite evidently, have been evolving for longer than we and their more perfected mechanisms are better suited to flight than the crude productions that we force through the air with ever more power and pollution. Out main claim to success derives from our thought process and, while we are able to think through problems birds to it by nature and evolution.

Sincerely,

Syd Hall
Nevada City, CA

(ed. – Not to worry about being thrown out of TWITT. We are open to all kinds of ideas. We have had material more far afield than what you describe and those authors are still active members. This is also a good lead-in to Al Bowers March talk, which will include how birds have impacted our current design philosophies and what more they have to offer. Jim Theis Nighthawk used a bird like tail that twisted to assist the wing warping for roll control and, acted as an elevator very much like the birds. I don't think you will find many members that would argue birds are not some type of flying wing. Besides how many birds have you seen that have a fuselage with a conventional or T-tail at its end.

You can send us the same material you send Bruce and I will see what can be published. I am sure there would be a lot of relevant information that people could use in one form or another.)

February 1, 2002

TWITT:

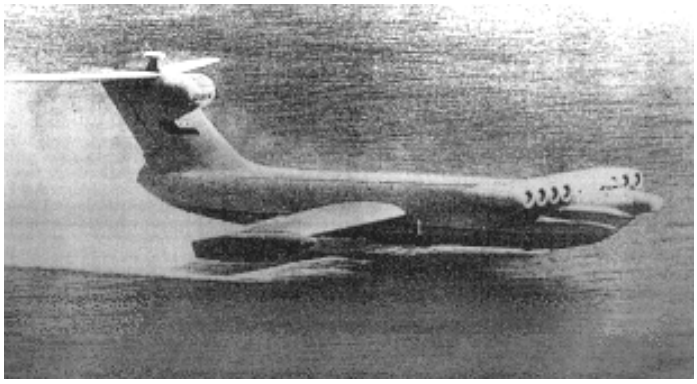
Thanks for the offer *(ed. – In response to my query if he wanted this material)*. I believe I have most of Steve Hookers WIG (wing in ground effect) schemes and propaganda but not the Department of the Navy's, Literature Search and Comprehensive Bibliography of Wing in Ground Effect and Related Phenomena, by Willam Foshag, Aerodynamics Laboratory, Research and Development, March 1966, Report 2179, 104 pages. I would dearly appreciate a copy of same or where it may obtained, if its not too much trouble. I would also appreciate a couple more copies of the Jan, 2002 newsletter.

During the late sixties and early seventies Dr. Lippisch, a grand master of early Flying Wing designs patented several WIG design concepts envisioned to increase an aircraft's flight efficiency. He designed and constructed a plausible appearing wing design for capturing the WIG, Ram Air, GE (ground effect) phenomenon. He called the little Ultra -Light seaplane craft the X-112 (next page). The short-coupled low aspect ratio anhedral wing design formed an inverted air scoop for increased Ram Air capture potential. The X-112's flight tests came to naught, most saying its airspeeds of only thirty to forty mph were insufficient to produce any measurable GE forces. The good Doctor's follow on WIG patents obviously didn't warrant building prototypes. Unfortunately, his full life span ran out before solving the WIG flight problems and, he traveled west hopefully, to better days with old comrades.

ABOVE: Lippisch's 1963 X-112. Photo courtesy of The WIG Page, http://www.se-technology.com/wig/

Some who heard of the famous Doctors interest in GE flight and, pondered the old aviators tales of ground effect screwing up a good landing by floating too far down the runway or, even permitting an aircraft to stay airborne using the GE cushion to supplement its wings aerodynamically deficient lift capability, took to writing journalistic papers and editorials on the wonderful untapped benefits from flying in GE. These fanciful tales grew step by step, year by year, in variety and substance, providing grist for science fiction magazines.

Steve Hookers 1989 inventive, but farfetched for ground effect flight, article in Popular Mechanics with its shrouded implications that the advanced Russian EKRANOPLAN (below) programs producing GE flight were so far ahead of the US. that, they were capable of producing a great technology coup d'état. Steve's article provided many visionaries with dreams of new and cheap super efficient water toys and taxis whisking people about major harbors in high-speed comfort.



Its disconcerting for me to just come out and say that most of the WIG entrepreneurs and theoreticians expounding their fantasies on the dynamics of super efficient WIG flight, are misguided. I have never seen a single article written by an experienced commercial or military aviator on the plausible benefits of Ground Effect flight. The few aviation practitioners with real airplane/ seaplane piloting experience, operational aviation backgrounds, and a rational under-standing of the basics of flight, upon investigating the subject, quickly disappeared, returning to more positive means of making a buck. During the last twenty years I have closely followed the numerous publicized WIG programs of parties, committees, and governments. All were attempting to modify the standardized aircraft design to reap the theoretical benefits from GE Flight. It seems that none of the promoters or theoreticians understand that modifying an optimized airplane design can only degrade its performance, and aircraft with standard wing area and wing loading cannot increase its aerodynamic lift capability just by flying close to the surface. For whatever strange and unusual reason it seems that, Mother Nature only provides just enough supplemental ground effect lift for aerodynamically lift deficient wings to remain airborne.

(ed. – I asked Chuck about publishing his e-mail by relating WIG and GE to the water skimming delta shaped craft that had been tested by the Russians. He offered the following.)

I personally believe, Sir Isaac's' 3rd. law of Physics explains GE flight best, " FOR EVERY ACTION THERE IS AN OPPOSITE AND EQUAL REACTION", and that the GE forces are more akin to Architectural wing load formulas than aeronautical design formulas. To produce GE reactions a downward force must be applied to the trapped Ram Air cushion to achieve an opposing reaction. Airspeeds over 100 kts are required before substantial GE reactions can occur. The poor Ram Air capture characteristics of conventional aircraft. wing designs leaves the super efficiency GE flight stories about riding on a cushion of GE air in doubt.

When an aircraft is flying in GE, the contained or captured ram air force is felt on the wings lower surface as lift and on the water surface directly below the wing as a vertical downward force. This downward force disturbs the water surface sufficiently to indicate if the craft is, or is not producing a GE reaction. Most published photo's and video's of the test craft supposedly flying in GE show no water disturbance beneath their wings, leading me to believe they are just flying around dangerously close to the waters surface.

Chuck Bixel
Ft. Walton Beach, Florida

(ed. – I recall the Ekranoplane did leave a trail of disturbed water behind it in the video shown on television a number of years ago. However, now that you mention it, the smaller delta wasn't leaving the same type of trail other than perhaps something from the tip vortices.

Since I didn't know of a source for the Navy study document I determined it would cost about $10 for reproduction and mailing in the US and offered such to Chuck.)

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Tailless Tale, by Dr. Ing. Ferdinando Gale'

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On The Wing...the book, by Bill and Bunny Kuhlman (B^2) A compilation of their monthly column that appears in RC Soaring Digest magazine. More than 50 articles on a wide range of topics of interest to enthusiasts of tailless configurations. 234 pages of technical and non-technical articles, plus coding for computer programs to determine twist and other design parameters. 250 pp. US$28.00

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