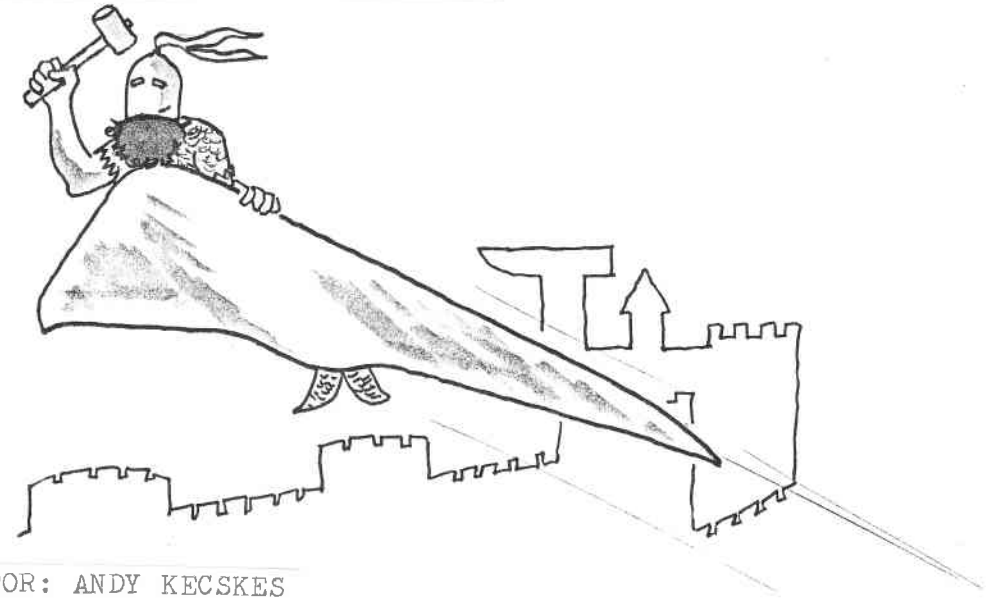
NUMBER 25 JULY 1988

# TWITT NEWSLETTER



NEWSLETTER EDITOR: ANDY KECSKES



TWITT
(The Wing Is The Thing)
PO Box 20430
El Cajon, CA 92021
USA

NEXT TWITT MEETING: Saturday, 16, July 1988, beginning at 1330 hours. As always, the location is Hangar A-4, Gillispie Field, El Cajon, California.

MINUTES OF TWITT MEETING - 18 JUNE 1988

The meeting was opened by Bob Fronius making several general announcements. This was the 24th meeting of TWITT (2nd Anniversary) so there would be a little celebration after the formal meeting. Harold Buettner provided the birthday cake and was also responsible for the design (layout in frosting instead of fiberglass), and June Wiberg provided the ice cream. A bit of history, Amelia Earhart flew the Atlantic on June 17th in a Lockheed Vega. Closing date for the July issue would be 6 July. If you have any articles or advertisements pertaining to wings or other aircraft parts they will be run free in the newsletter so it will be spread around the country to TWITT's many readers. Expiration dates for mailing fees are on the mailing labels. A number of people are overdue, and beginning next month the names of those in arrears will be published in the newsletter as a reminder. Sailplane Home Builders Association will be having their annual workshops in two locations this year. The eastern workshop will be at Dick Schreider's factory in Bryan, Ohio, on August 5 -7. Contact Bruce Weber @ (201) 944-6529. The western workshop will be at Tehachapi, Calif., on September 2 -5 (Labor Day weekend). Contact Jim Mills (805) 669-8944. There will be a lot of homebuilts as well as factory gliders. There will be a lot of information to exchange or absorb, so be sure to try and make the Tehachapi workshop. Last months's raffle took in $20 with the prize going to Marc dePiolenc, who donated it back to TWITT since he already had a battery charger. So the charger will be raffled again this month. Since Reg Finch was not immediately available to begin his talk, the group watched a video provided by Harold Buettner on early aviation that he has been taping.

After the video, Bob introduced Reg Finch, a commercial pilot and aeronautical engineer, who would speak on a series of lectures he attended at General Dynamics on Hypersonic Aerodynamics. Currently we have what is called a Space Race going on with several European countries. The French have designed a shuttle type craft which is about half the size of a U.S. shuttle. The French version, called HERMES, is supposed to be launched aboard an Ariane 5 rocket, which also has not yet been test flown. The British have come out with a more conventional type aircraft called WOTOL which will launch from a runway, flying off a "trolley" using four Rolls Royce air-breathing rocket engines called the Sparrow. They are regular jets within the atmosphere, turning into a pure rocket engine passing through about 85,000' and Mach 5. The Brits are being quite secretive about this technology, fearing other nations (the U.S. in particular) could get one airborne before them if too much information got out. The Germans have recently announced their project called SANGER II. It is comprised of a 747 type aircraft with six turbo ram jets used to carry a smaller version of the aircraft to about 100,000' for launch. The space vehicle would use a cryogenic rocket for the final burst into space. This system could supposedly put a comparable payload into orbit at about one tenth of the cost of the U.S. space shuttle. NASA has now entered the race with the X-30 and NASP (National Aerospace Plane) so the European's don't get too large a lead.

The U.S. plans on having two X-30 prototypes flying by 1992, using liquid hydrogen and oxygen for power using SCRAM jets and rockets. This is the next step from the progress made by the X-15 project. The shuttle program has been somewhat of a detour to what may become a more economical means of transporting payloads into space. By using oxygen already existing in the atmosphere, rather than carrying a liquid supply within the vehicle, and using better aerodynamic principles, the new generation U.S. spacecraft will be more efficient and therefore more competitive with the Europeans.

The X-30 is about the size of a 747, with a crew of three. It is a flying fuel tank with its liquid hydrogen and some liquid oxygen (for space portion). Ed. Note: Bob forgot to flip the tape so a portion of the speaker's comments covering graphs on launch profiles and fuel consumption were lost. As the tape picks up, Reg is discussing the ramifications of using liquid hydrogen as a propellent and the dangers for both ground and flight crews. The engineers are developing ways in which to enhance any indications of fire (within the visual spectrum) so crews would be aware of the hazard before any electronic warning.

The Marquardt SCRAM Jets have been under development for approximately 25 years. SCRAM stands of supersonic ram jet. Ram jets take air in at supersonic speeds and start becoming efficient at about Mach 4. They can operate at lower speeds, but at reduced efficiencies. Whereas, a ram jet burns fuel subsonically, the SCRAM jet burns it supersonically. (Reg drew a diagram of a SCRAM jet to demonstrate how it works at supersonic speeds without the flame pattern being blown out by the high speed airflow.) At this point Fortunato Figueroa offered some insight on his experiences in developing these types of engines when working with Republic Aviation. He commented on the problems associated with injecting the fuel mixture into the airstream and associated shock waves. Unfortunately, there were no ready answers from either gentleman on how engineers are currently solving the injection problems.

Reg then went on to cover the problems of structural cooling, since surface temperatures could reach 3000 degress fahrenheit. The liquid hydrogen is routed through the fuselage nose and wing leading edges to act as a heat exchange mechanism since it would be at -250 degrees. After acting as a cooling agent it would then be burned by the engine. Hydrogen seems to be the best fuel for this type of application. The X-30 would also have two rocket engines for use in deep space.

Vehicle launch would be conventionally down a runway, using a complex countdown procedure. State of the art materials would be used for construction. Materials such as graphic polymids, carbon-carbon, silicon-carbon titanium, and ceramics composites. These types of materials have the capacity to absorb the heat and still maintain structural integrty, and be reuseable through 70 to 100 cycles. Fortunato explained how heat tiles are used on the current shuttle to enable it to re-enter the atmosphere.

Bob Fronius spent a few minutes covering materials testing at a rocket test facility. One such item was a free

swivelling hydrogen value/nozzle that could be used for directional control of a vehicle. The valves were made of stainless steel and used hydralic fluid as a cooling agent. However, it was found that the hydrogen/oxygen mixture burning in the nozzle also burned the steel, with even a 3/4" walled unit burning through in 10 - 15 seconds of run time. He also commented on Convairs early research into finding commonly available materials for use in setting up an emergency launch of the Atlas missle. Metal shielded household electrical cable was found suitable for some attachment applications since it would hold up to the heat long enough. The launch pad could be covered with hydrocal used in putting up plaster, since it too would withstand the heat. He noted that many common materials can stand up to high heat better then the new, more exotic materials due to thermal expansion, and rapid burning in the presence of oxygen.

Karl Sanders commented on some of the problems associated with active cooling (using propellents to cool structure) versus using passive shields. He was also part of the Air Force program Forecast II, which was a study of technology available by the year 2000. From his viewpoint the outlook is not necessarily a good one in terms of the active cooling technology. He also commented on the Air Force's concept of using an aircraft type launch vehicle capable to normal horizontal takeoff and landing, yet still reach space with a useful load. He brought up the point about the high fuel fraction (up to 50% of the aircraft weight) and then the growth factor in structural weight during design and construction, and how it can result in very high gross weights with associated excessive costs to actually construct.

There was further discussion of many of the issues between Karl and Fortunato, but they were unable to come up with a final design concept and provide an answer to all the multiple problems associated with hypersonic flight. If you enjoy this "techy" stuff you should have been there (locals), and for you out-of-towners I apologize for not being able to adequately translate the tape into more explicit details.

Hernan Posnansky introduced Hans "Ueli" Hauser, an aeronautical engineer, who at one time was involved in the early design of composite aircraft like the "White Knight" in Bob's hanger. The idea of building gliders out of composites came about around 1959. Professor Raucher of MIT had come to Switzerland and discussed building a sailboat of composites but was talked into trying the new concepts in a glider. Ueli, fresh in from Switzerland, outlined his involvement with the initial uses of fiberglass and foam sandwich for building ultralight tailplane structures. This work led into building a fuselage as a graduation project from the Switzerland Federal Institute of Technology. The White Knight fuselage with its side mounted control stick resulted. (Ed. Note: part of the talk was lost as the tape stopped, so there is not much else to report on development work. There apparently was some discussion of a new jet powered motorglider, the details of which Hernan has for those who are interested in that aspect of flight.) Ueli went on to invite anyone headed toward Switzerland to contact Hernan who will coordinate getting together with Ueli, if travel plans permit.

## JULY'S SPEAKER

Kermit E. Van Every
Aeronautical Consultant
Vice President
Heinemann Associates

Mr. Van Every has been involved with aviation for over 50 years. After starting with Douglas Aircraft in 1939 as a riveter, he worked his way through numerous engineering positions before becoming the Chief of Technical Sections at the Long Beach facility. Leaving Douglas he became the program manager at Northrop Corporation's Noriar Division for the X-21A laminar flow research airplane and M-2/HL-10 lifting body vehicles. From Northrop he moved on to General Dynamics, becoming Director of Aerospace Program Development at the corporate headquarters, and later the Program Manager - Special Assignment at the Convair Division in San Diego. His assignments at Convair included the Model 84 Tilt Wing aircraft and the cruise missile program. As an aeronautical consultant he has been involved with supercritical flow technology, uses of a variable data base for a flight control management system, and studies of airframe-engine matching for small business jets and trainers.

As of publication time we were not certain of what Mr. Van Every would be presenting to the group, but we are confident it will be most enlightening based on his extensive background in the aeronautical industry.

## TWITT NOTES

RAFFLE: Jim Neiswonger won the June raffle prize, a battery charger with batteries. TWITT took in $16 on this prize donated back after being won last month by Marc dePiolenc.

TID BITS: Professor Karl Nickel of Germany sent TWITT more information on the SB-13. Since this is in German, we are waiting for Editor Marc dePiolenc to return from France and interpret it. More in later newsletters.

"Bungee Cord for Summer of 1988" has a letter regarding the Horten IVc drawings. This flying wing glider was started by a club that is now defunct. More in later newsletters.

Just too much information coming in each month for this limited publication. Come to the meetings to catch up and get the details first-hand.

Due date for the August newsletter is August 10, 1988. If possible, please get it in earlier so the editor can plan spacing.

REMINDER: You will note a number after your name on the address label. This represents your paid-to month for newsletter mailing fees. If you have an 8807 (July 1988) or earlier date this will be your last newsletter until receipt of your $15 or more contribution towards administrative, printing and mailing costs. A list is included below, so if you disagree with whether or not you have paid, please contact June Wiberg at this month's meeting.

April through June fees:

| | |
|---|---|
| Ives Able | Dr. George Baibek |
| Thomas Biercher | Philip Burgers |
| Henry Cherry | Tuto Figueroa |
| Billy Gray | Bernard Gross |
| James Houfek | Ray Johnsen |
| Wayne Kaufman | Jim Neiswonger |
| Richard Papenguth | Bob Peck |
| Don Selveno | Alex Strojnik |
| William Wainwright | Don Webb |
| Ralph Wilcox | |

FOR SAILING (or SALE)

Horten HIV Flying Wing. Incomplete original drawings on 18" x 24" blueline, 21 sheets. $25 per page. Airfoil coordinates, 44 pages, $10 pp. Manuscript, 223 pages, $50 pp. Write: Flight Engineering & Development, P.O. Box 667, Dallas, GA 30132

Marske Pioneer Model P-11-C kit. Have plans, fuselage and metal parts. Kits with all welding completed. Rudder and skid complete and installed. Also hve landing gear, tow hooks and leading edge wing ribs. Well over $3000 worth of parts all for $1000. Reason for sale: I have two kits and only plan to build one ship. Call Lew Johnson, (301) 495-5757

Marske Pioneer Project Wing, ready to assemble. Fiberglass fuselage and enough wood to finish. $1500 Call: (216) 234-2069 OH

John Chalmers on left
and Hans "Ueli" Hauser

Dear Bob: May 28, 1988

Thank you for sending out your newsletter (#23) so promptly. I really enjoyed looking through it.

Please find enclosed a check for $17.50 for your last 22 back issues - if a dollar for postage isn't enough let me know...

I am sending for Dr. Lippisch's book which is translated by Gertrude Lippisch. The book is out of print - but I can get a photocopy out of Michigan. I'm hopeful the illustrations are reasonably clear.

I noticed the new T-Craft airplane is about $40,000 (new Tri-gear model). Its really sad the "cheap" aircraft cost so much. As I indicated in my first letter I've got an hour or two now and have seen a number of aircraft come and go that were suppose to put us into the air at affordable prices. There are a lot of hard headed people in aviation and are probably the root cuase of so littel progress in so many areas (I was with the ICAO list of experts for a few years and find it went clear to the top). Big ego and hot air really abound and its shooting us in the foot. So many ideas, designs and talents are not utilized - or dismissed. For example, while in New Guinea I found a Ki-61 fighter and a man in Wewak that had a 61 engine (Kawasaki copy of the German DB) that he'd give me for the EAA. I wrote them twice, but they never believed I'd found one - or had an engine to donate - too much hot air over the years. I know a state of the art aircraft can be put out - and at a reasonable price - and yes, your group has a lot of talent unused and waiting. I really hope you will organize and look ahead into the flying wing for people to build or buy built and fly safely. In any case I hope you will somehow put some wings in the shy in quantity.

Thanks
Dave Laney
7700 Whispering Palms, Sacaramento, CA

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Tasso Proppe
1786 Eldore St
Lemon Grove, CA 92045
June 15, 1988

TWITT Newsletter

The rather heated response to my speech March 19, "The Pitfalls of Bright Ideas in New Designs" proves one thing to me; if you are not actively participating anymore in the development of aeronautical machinery, you are outdated in very short notice, and you should shut up and be quiet.

I had no knowledge of folding propellers developed in Germany - let alone licensed by the LBA (Luftfahrt Bundes Amt) as reported by Alex Strojnik. My first reaction was, that he got his information from the magazines, and my experience was, that there were many inventions and technical novelties that were praised as the solutions to age-old problems; they never made it into serviceable hardware. But then, he says some of these devices have turned up in technically advanced Phoenix and have not reached our aeronautically retarded shores of the Pacific. I wonder what I will find, if I take a closer look when they finally reach our third world primitive camps....

I still don't believe it.

But I also remember a similar situation: tailless airplanes could not be flown other than in wind tunnels or from a catapult; there was just no ground control at take-off, neither in yaw nor in pitch; that was an absolute truth. Until somebody invented the tricycle landing gear with a steerable nose wheel. It gave the wing a finite angle of attack (of best climb) and you could keep it straight down the pike. So, the experts were wrong - again.

Don Mitchell's statements are too general to argue. Sure: most of the power plants of World War II machines were geared down by spur gears, and V-belts are "o.k." if you replace the pulleys frequently (how often is frequently?). We solved some of that problem by hard-anodizing the pulley surfaces to reduce the wear due to slippage. It depends on a number of factors which, on the ultra light type airplanes that we tried to use as motorgliders (self-launching sailplanes) added up quite unfavorably.

My observations in regard to adverse yaw are derived from practical flight experience, i.e. soaring (engine dead) for extended periods of time (generally 1 hr at a time) in normal turbulence ("normal" in a light aircraft sometimes means "terrifying") when an automatic reflex reaction to excessive banking causes a full deflection of the "ailerons" by the pilot: the airplane noses straight down. This is not a spin. It can be easily recovered from this dive, providing you have enough space between you and the ground.

The B-10 accident I was referring to was termed "pilot error" because film coverage revealed the up-wing flap was full "up".
The investigators considered that "full elevator" = extreme high angle of attack, hence triggering a spin. I stick to my belief. I have not seen the film. Unless I can find out what the bottom wing flap did, can I not prove my conviction to be right; I only deduct that from my own experience in the same type.

I do have another input however from Bratt White, Mitchell Aircraft's original test pilot who attempted an altitude record out of Bishop along the White Mountains. In probing his memory, he told me he "got disoriented" in the turbulence (White Mountains!) and found himself in a dive (not spin!). In the process of recovering from the dive, he lost a wing. A recovery system retrieved the pilot and the rest of the airplane, but Bratt retained only a fuzzy recollection of the details and the sequence of the individual events. Nevertheless, what he did remember, to me sound very much like my own observations: "adverse yaw into a dive, after a strong aileron input."

From all that, you also can conclude that very often, there is no black-and-white answer. Most of these assumptions would have to be confirmed by measured values under controlled conditions (one of which is flap (elevator) position on the airplane to be measured, due to weight distribution).

It still is worthwhile to discuss it - but I am basically out. This is only written in defense.

Alex is wrong when he calls California "backwards". It's me who is retracking my steps back to the cave where I come from....

Yours, Tasso

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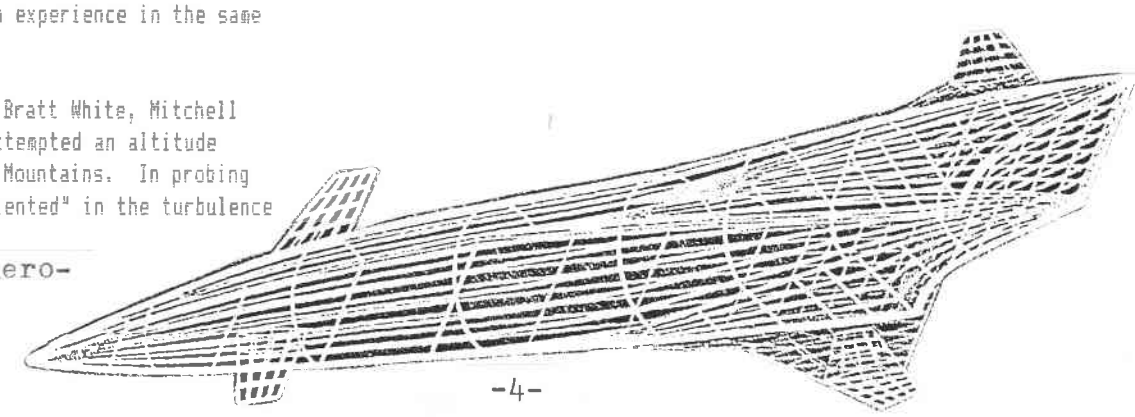
Cost of cake and decoration
by Harald Buettner



The X-30 or National Aero-Space Plane (NASP)

Bill and Bunny (B2) Kuhlman
P.O. Box 975
Olalla, WA 98359-0975

08 June 1988

Dear Marc,

We attended a meeting of the Flight Research Institue on the 24th of May, their featured speaker was Ilan Kroo of Stanford University. Ilan's expertise is unconventional aircraft designs, and in addition to teaching at Stanford, he's acted as consultant to NASA as well as Boeing and other aerospace firms.

As you know, our interest area is model aircraft, and we were quite eager to learn something new that could be applied to our endeavors. Unfortunately, the topic of flying wings and other tailless designs was at the end of the schedule, Ilan ran short of time, etc., etc., and so the discussion of this topic was cut very short and there was no time for audience questions.

We felt that the topics that Ilan presented would be of interest to other TWITT members; enclosed you'll find a condensation of Ilan's talk. Please feel free to include any/all of it in the newsletter. There were numerous graphs and charts in slide form which were used for illustration purposes, and we wish that we could somehow have managed prints of some of those.

We have no idea if Ilan ever makes it down to the San Diego area, but thought might be given to inviting him to speak at a TWITT meeting in the future. From what we've read in the newsletter, you folks don't have the time constraints on your meeting place. FRI uses the facilities of the Museum of Flight, and so we must adhere to their schedules.

Last weekend was spent in Richland, Washington, attending a modeling event - a scale slope soaring event. We took our 1/4 scale Pioneer II-D and it flew extremely well. Also there were a semi-scale Horton IV which failed to do anything but tumble (bad CG location and interference) and a magnificent 14 foot span model of the Northrop YB-49 which flew VERY realistically. We took pictures, and a fellow in California is in the process of producing a video of the entire three day affair. We've written a letter to Bernie Gross describing all this in much more detail and we're sure that he's already shared it with you.

The newsletter always makes for fascinating reading, and we look forward to each issue.

B2

P.S.: Could you direct us toward a source of coordinates for the Eppler 630 series of airfoils (these were the sections used on the Schwaibe II, Issue #1)?

## THE DESIGN OF UNCONVENTIONAL AIRCRAFT

Ilan Kroo, Stanford University

This presentation was given at the May 24th meeting of the Flight Research Institute, held at the Museum of Flight in Seattle, Washington, and covered three related topics: 1) the range of prossible designs, 2) a look at conventional design (survival of the fittest?), and 3) some promising alternatives. The range of unconventional designs discussed included oblique wings; canards, tandems, and three surface designs; joined wings; and tailless.

### OBLIQUE WINGS

Oblique wings (the "scissor" planforms) are a means of making variable geometry less expensive in both monetary and functional terms, but the techique is not applicable to aircraft with flight regimes in the subsonic range. Oblique wings have very definite advantages over variable sweep wings at supersonic speeds, because the designer, for efficiency, desires to increase the length of an object that travels at supersonic speeds. The Concorde is an example of this, and the problems of inefficiency at subsonic speeds, pilot visibility, etc., are obvious for this design. One way of getting around these problems is to utilize variable geometry, but the designer must then contend with a shifting CG location, and a large motive force to swing the wings. Wings which swing in opposite directions not only solve the problems outlined above, but also have definite structural advantages over swing wing designs.

Oblique wings offer what Ilan termed "challenges" to designers: control methods must take into account the inherent rolling motion that occurs when elevator is applied; aeroelasticity can present ever changing asymetrical angles of attack; there are nonlinear stability derivatives; and airfoil design is difficult. One of the more interesting

situations that Ilan described has to do with the low pressure area at the lower surface of the leading edge of a wing. A wing is pulled forward by this small pressure gradient, and for an oblique wing this translates into a diagonal force which tries to pull the whole airplane sideways! In sum, oblique wings offer improved performance, mission flexibility, and structural efficiency, but more work needs to be done in the area of active controls.

## CANARDS, TANDEMS, 3 SURFACE DESIGNS

While it is easy to design an aft tailed airplane, it is not so easy to design a canard. That doesn't seem to stop engineers from designing them, however, and there are MANY canard designs. One of the big problems with canards is the downwash from the canard and its effect on the lift distribution, and as a generalization, the best canards therefore have small spans and small areas. But to maximize lift the canard must have a large span and large area. It is this contradiction of design principles that is at the core of the canard's problems. Canrads do have some positive qualities, and it is these that drive canard designers. When properly designed, the canard has excellent stalling characteristics, the layout of the airframe eliminates the wing spar from the cabin area, and performance can be excellent, especially with active control systems. The problems of balance, limited control power and directional stability can be overcome, but sizing of the surfaces is critical and if the designer does something wrong the canard that results is a bad airplane.

Ilan mentioned that three surface designs have an advantage over canards and conventional airplanes - the canard surface negates the vortex wake from the tail and thus cancels, theoretically at least, the induced drag. But even this can be accomplished by other means.

A number of charts and graphs were presented during the section on canards, tandems and three surface designs. One showed a definite advantage for the tandem wing layout, in which the two surfaces are of equal size. Another showed that when flying at static margin all designs are equal, with one exception - the flying wing is superior to all others.

## JOINED WINGS

Joined wings, in which the leading edge of the tail is joined to the trailing edge of the main wing, offer some structural advantages in terms of bending moments, but they tend to have nonlinear rolling moments and sideslip. Research has shown that aerodynamic interference at the joint is not a problem, but the mechanical structure of the joint itself is a difficulty.

## FLYING WINGS & TAILLESS

Flying wings and tailless designs were the last topic discussed and unfortunately time was running short, so Ilan was not able to devote much time to this topic. Achieving trim with stability is usually accomplished with wing twist, but there are various methods of control. Ilan leans toward inboard flaps for pitch control rather than elevons, as the use of inboard flaps avoids loss of lift and changes the wings camber in the desired direction.

As modelers, we were impressed with the videotape that Ilan had brought with him and that was shown at the end of his presentation. It showed an unstable flying wing model of "plank" design being flown by radio control with the assistance of an onboard computer. The computer was a Macintosh motherboard which controlled high speed servos connected to the control surfaces and which also served as a data acquisition and storage device (20 cps sampling rate). The video first showed the wing mounted to a moving vehicle by means of a gimbal. This served to test the computer and the associated control systems. The same model was then shown being glided from a hilltop. The picture was clear enough that the control surface movement was visible as the computer controlled the pitch attitude during a turn. The final segment showed the wing flying and turning successfully in a grossly unstable mode with a very rearward CG position.

## CONCLUSIONS

Ilan ended by stating that unconventional designs are being seen more often because of the availabilty of analysis tools, and improvements in active control technologies. They have the advantages of efficiency, maneuverability, low visibility, and improved performance in certain applications.

As Ilan had to leave immediately following his presentation, there was no opportunity for questions from the audience. However, he does come to the Seattly area often as a consultant to Boeing, and the Flight Research Institute is planning on a return engagement.

MILESTONES IN THE HISTORY OF ULTRA LIGHT
DESIGN AND ASSOCIATED THOUGHTS

By Tasso Proppe
(Reprinted from "Wind & Wings")

Do not expect this to be a complete history of human flight. I am a technical sort, and I am looking at the design features as they evolved from the early history into the present - and whether anything could be learned from that.

Of course, those machines and the events around them are not clearly described by the Media of their time (come to think of it, this is still the case with today's Media reporting). So, I have to take what's available and try to interpret it into technical substance as far as approaches and concepts go.

There is nothing reported in the Bible. It can be safely assumed that the design and/or construction of flying machines was considered an immoral meddling in the Lord's creation, and there is good reason to believe it should have remained that way. Even today, the construction of Ultra Lights is considered by a great number of laymen and experts as an activity inspired by the Devil.

The first design reported in history was a father and son project by Deadalus and Icarus, respectively, some Greek engineers who, at first, resorted to conventional technology and moderate performance objectives - like bird feathers, and go low-and-slow.

But as things go: a little success breeds ambition - which still holds in our days, everybody wanting to buy an ever more expensive machine to beat somebody else to distance, altitude, and speed.

So this youngster had his mind set at altitude records, and, at the same time, experimented with new adhesives. What he did not realize was that he should have looked for a better heat shield. This cannot be held against him as technical incompetence. NASA is still looking for a heat shield for the Space Shuttle. In the case of Icarus, he met the performance objectives, got too close to the Sun, and for the lack of a good heat shield, his adhesives melted before the re-entry phase. So he re-entered in disarray. The Media must have blown up this mishap, as usual, and this discouraged any further Ultra Light design attempts in Greece.

The next milestone in the history of Ultra Light design is reported in a collection of German/Swiss medieval Sagas. Now don't brush that off as mere fairytale. This type of communication was at the time (and still is today) muddled and impaired by political pressure and, of course, by the Nielsen Ratings (or something equivalent in that age). There just had to be some bloodcurdling horror and violence in the story to make it appealling. The political aspect was probably a socio-critical exposure of the existing society of ruling class noblemen vs serfdom. The technical content of the story has to be extracted out of this socio-economical background.

There was this Count or Baron sitting in a castle on top of a mountain, with a water well, a draw bridge, open fireplace kitchen, outdoor facilities with a sewer system (down the mountain slope), defense machinery, and a lot of other technical requirements that had to be maintained and engineered. At those times, it was the Blacksmith who served as Systems Engineer to take care of not only maintenance but also constructing and inventing things for the pleasure and needs of the boss. This may have included chastity belts as well as other pieces of art, goldsmithing beautiful cups and candlelabras.

Wieland, the resident Blacksmith, was so dear and indispensable to his boss that the Count simply cut the main tendons of Wieland's feet to prevent him from wandering off someplace else. This may be construed as employment guarantees - at least, the Russians would call it that.

However, Wieland did not appreciate this kind of job security, and, being of resourceful and creative mind, he lured the Count's two children into his shop to show them a large box full of all kinds of artifacts, and when they bent over to look into it, he slammed the heavy lid of this footlocker shut, guillotining their heads off. He subsequently shrunk their little heads (this makes for high Nielsen ratings), gold-plated the bone and fashioned two beautiful goblets out of them to present to the Count without - yet - telling him what they were made of. Then he secluded himself in this shop and forged himself two wings out of whatever iron scraps he must have had around. This was to be strictly a one-purpose design: escape

His legs being useless as a landing gear to run on, he had to rely on his chest muscles and arms for initial propulsion, and he must have looked like the Incredible Hulk of our days. After take-off, he circled the castle once, hollered farewell to the Count and explained the origin of those goblets, and from then on, the flight was strictly downhill. With him gone, there was nobody around who could operate any anti-aircraft artillery, so he got away into the blue yonder - or rather the German fog.

There are several "firsts" to this report: it was the first all metal airborne vehicle; not until Junkers and the Ford Trimotor did they appear again, and certainly not in the Ultra Light category.

Also the purpose of a flying machine as a transport vehicle: there is still a wide ranging belief that (airliners exempted) aircraft have no purpose. This story mentions for the first time an air-to-ground communication set-up that might have been quite effective. World War I air-to-air communication was restricted to fist shaking only.

The next step in the development brought fabric materials into airplane design. Fabrics dominated the technology from then on well into W.W.I and the beginning of W.W. II. Even the B-17s had fabric covered control surfaces.

So, this had to be a tailor. He was not only familiar with the material but had the then usual light weight build of tailors: he lived in the German town of Ulm on the Danube, had a very strong sense of Media communication and public relations, and did not have much knowledge about stability

and flight mechanics at his command. However, he had enough sense to select the river Danube itself for a possible landing site.

He literally "tailored" himself this flying machine and, without any test program and resulting ECPs, he invited the entire population of the township, including the dignitaries, to watch him drop off the bridge. The town erected bleachers for the dignitaries, and I am convinced that he collected a fee from everybody and probably had a contract with the local bookmaker to get a cut on his proceeds too.

He hopped off the bridge alright. This was a zero velocity launch. There was no ramp to take a running start. The craft, then, leaves the platform stalled, and the next thing to do is "stall recovery", according to the FAA which brings me into a terrible controversy with the FAA. This chap would have been much better off mushing down from the altitude available. Stall recovery needs a lot of altitude and is extremely useless, even dangerous, at altitudes where stalls mostly occur: turning in from base to final on approach, or at engine failure during take-off. Training should be concentrating on stall prevention, i.e. recognizing the approach of stall conditions. During my bi-annual proficiency flights that I have to endure to keep my license, I have run into FAA certified instructors who knew as much about this subject as my Tailor of Ulm.

He (the Tailor) was in a recovery dive when he impacted the water: the craft disintegrated and he had to get the hell out of there to escape the wrath of the towns folk who felt cheated, it says.

This part of the story sounds strange to me. Most people go to airshows to see just that, somebody crash, and come home disappointed if nobody did. The story does not report whether he managed to run with the money. To say, he was all wet, is true: but I'm sure his stunt paidoff quite well.

The next milestone in the Ultra Light design evolution is something VERY light, indeed, lighter-than-air: Hot Air Balloons.

The phenomenon here is, that they found their way immediately into the defense budget to become military equipment. During the Franco-Prussian War, 1870-71, they were used not only as observation platforms, but also as escape vehicles for the politicians of Paris, when the Prussians had the city surrounded. Today, the air is heated by bottled propane gas. At that time, the heat was provided by burning straw and newsprint: so, newsprint DID serve a useful purpose once upon a time.

Rumors have it that the politicians generated enough hot air to operate the balloons without either straw, paper, nor propane. This might be an interesting technology to be looked into.

We do not hear much of actual heavier than air Ultra Light vehicle development since the tailor's stunt in Ulm. Lilienthal in Germany and the Wright Brothers over here played only a brief appearance as Ultra Lights on the skies (or slopes) of both continents.

Oh yes, there was Leonardo DaVinci who sketched out ideas how he thought it could be done - but he knew better and, instead, devoted his time to creating sculptures for the church. The chruch always has more money than any R & D department around. They don't have to pay taxes.

Lilienthal died early in his test program, trying out a new pitch control system: an elevator with cables tied to his forehead. He SHOULD have known better. Nobody continued his development. I am tempted to blame the Media here again but I found no evidence to that fact.

The Wright Brothers started off with a CANARD! I keep predicting that the future Ultra Light design will be based on that configuration. The Wright Brothers, however, abandoned everything. They installed power and produced just ordinary airplanes. Their's and everybody else's airplanes became military hardware, and WW I, with the Fokker, Spads, Nieuports, and Pfalz's might well have been the conclusion of the entire Utlra Light idea. If it were not for Germany having lost that war.

This created the Wasserkuppe era, beginning with Ultra Lights which eventually developed over the years into sailplanes and later into fiberglass monstrocities. You see, you have to loose a war once in a while, like going on a diet. I don't have to elaborate on the design features of that phase - it is well known history: but again, the Ultra Lights were destined to disappear from the scene like the pre-historic Pteradactils.

But, sure enough, there appears another war to help them along - at least "the moral equivalent of a war."

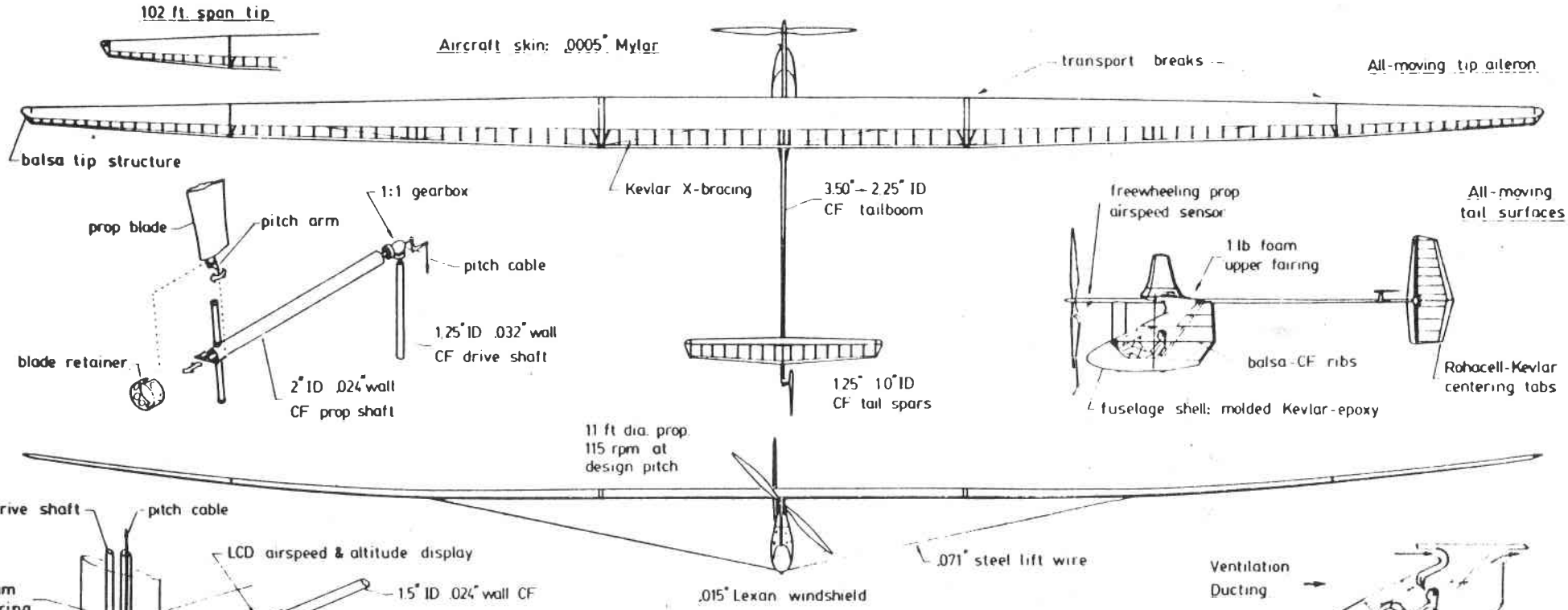
Whatever OPEC, the Oil Sheiks, or the FAA are up to is not yet clear, but, so far, they deserve credit for the resurrection of the Ultra Lights. These have an amazing resilience which might justify the assumption that they are, in fact, a creation of the Devils (OPEC, Sheiks, etc...).

Having been a part of this development for a considerable span of time, I became a pessimist: I can foresee already what will happen next: the present Ultra Light movement will develop into two catagories, there will be a few who want to go back to the Wasserkuppe days with the idea of launching those light sailplanes with a minimum of on-board power. (This failed in the twenties for the lack of suitable engines - it just MIGHT work this time, I hope.)

And there will be thousands, backed by a whole industry (I heard one expert quote "the most profitable business these days is selling Hashish and motorized Hanggliders"), who will just buzz around and ask for more and more power (they, too, just have to beat somebody), until the FAA gets hold of them. The FAA will most likely lump the self launching sailplanes with the buzzers because it wouldn't know the difference.

Did you learn anything from this?

I didn't. I am still hanging in there making a fool of myself - and I really SHOULD know better by now.




**FAI WORLD RECORD**
**Closed course distance**
**37.2 miles 2 hr. 14 min.**

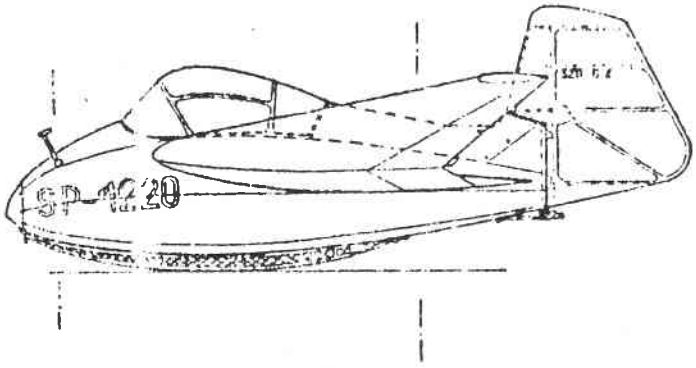
| | |
|---|---|
| Empty weight | 92 lb. |
| Gross weight | 242 lb. |
| Span | 114 ft. |
| Wing area | 330 sq ft. |
| Cruise speed | 14 - 18 mph |
| Pilot power | ~0.30 hp |

0 5 10 20 ft.

# The Daedalus Project

Mark DeLo 28 Feb 87

*Light Eagle*

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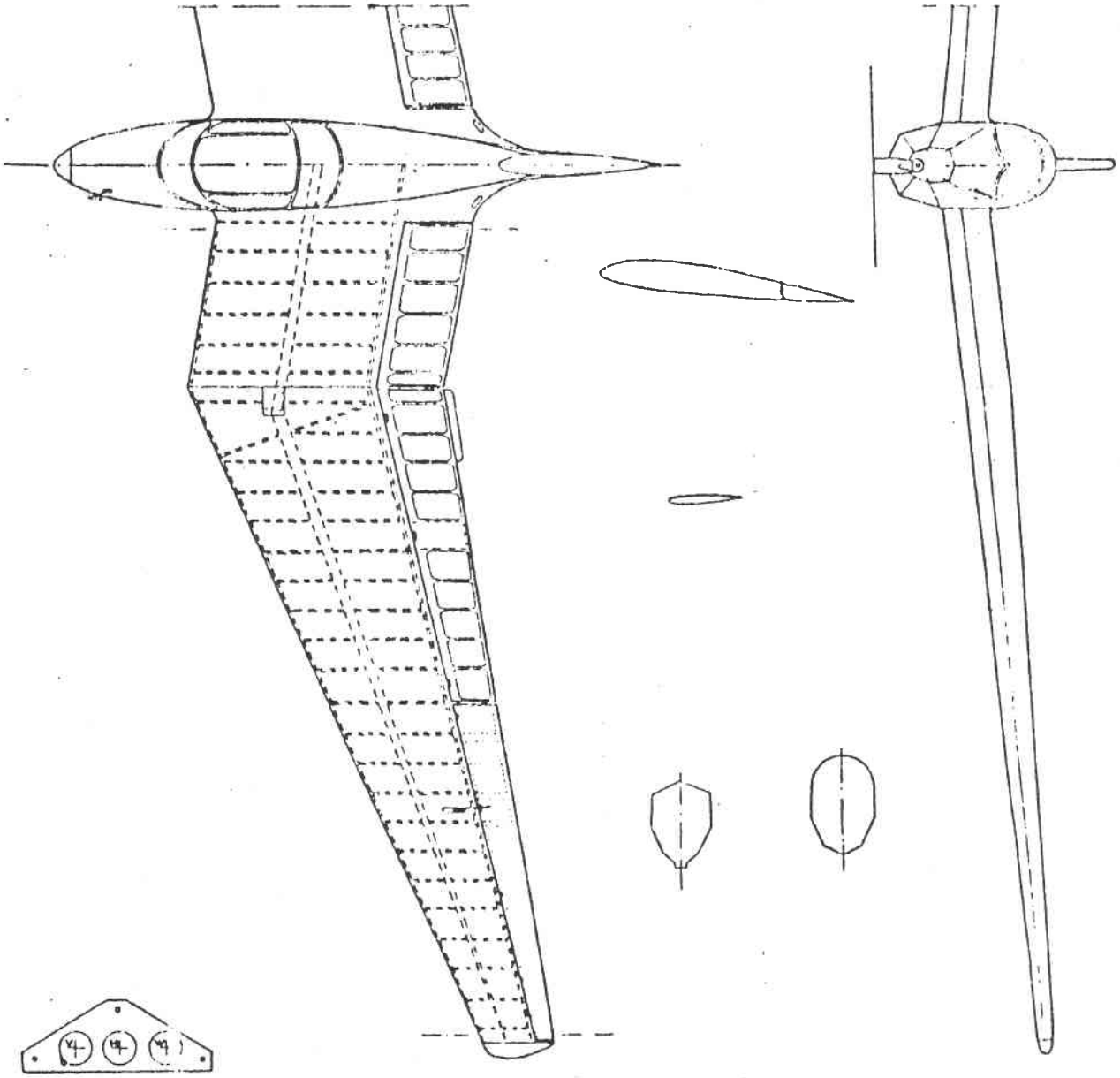

## Flying Wings For SAM Events, By Eut Tilcston

There have been more than just a few flying wing models built in the old time/antique era. Some of these were flown in competition but most were built to satisfy a whim of the designer.

I have built three of these old timers (one an antique) and have flown two of them in major SAM contests including the SAM Champs. Both of these were 1/2A Texaco models -- the "Li'L Misery" is the original size, the Tex Rickard Flying Wing was scaled down. The Li'L Misery placed Third at the Plainsmen's Regional Championships at Fort Worth, Texas in 1986, flying against some of the best competitors in SAM. This model flies well but has very poor take-off characteristics. It, like others of it's type, has a glide that is not up to that of a conventional model. The climb is good. Control (elevons) is poor but satisfactory. It tends to nose over on landing because it is so short and does not want to flair (ground effect).

The Tex Rickard Flying Wing is a better flyer and more controllable. Its take-off characteristics are unexcelled -- it was the only 1/2A to ROG in the wind at Saguin. It has won several SAM contests including the SAM 41 Annual at San Diego and the SAM 26 Annual at Taft. It placed second at Seguin. It's main drawback is that it is hard to see at a distance as it does not have a fuselage. This limits the distance that one can "chase" lift. It is an easy model to build and to build light. The engine is far aft of the CG so it is not suitable for heavy engines, such as, the 4-cycles (not important now that they have been rendered useless for SAM competition by the new rules). Robin Pharris, of SAM 51, has built a full sized one and powered it with several engines including a Torp 29 on ignition. It proved to have a very good climb but was a little hard to control as it got higher, due in part, because there is not much to see to give the pilot attitude reference. The Rickard Wing does have the potential to win SAM contests. Scaled up it would make an interesting Texaco model.

My newest "Tailless" was not named. It was designed and built by Bernard Gross, in 1941, and is the best looking of all the "tailless" models. The original had a wingspan of six feet and was powered with a Brown Jr. A picture of his model appeared in the January 1942 issue of *"Air Trails."* My version is scaled up slightly for an Enya 46, 4-cycle (not legal under the new rules). It has the best glide of the three -- as good as many conventional models. It's climb is outstanding but not consistent, because I loose directional control about 15 seconds into the climb (which is vertical). The control is by elevons (no rudder) and this is part of the problem. I am sure that by incorporating rudders this problem can be overcome; but with the new rules outlawing it's engine, I do not have the incentive to work out the bugs. This is the first "tailless" that I have flown that spins -- a situation encountered more than once while circling too tight in a small thermal! Recovery is normal and no problem has been encountered in landing. Roll control is poor (surprising for a tailless). Pitch is sensitive, unlike the other two.

It can be concluded that some of the old time "tailless" models may be competitive in some SAM events. They do pose a challenge, as in general their glide is poor, but their climbs are good. Most, if not all, are pushers which make prop selection more difficult if the rotation of the engine cannot be reversed (no problem in 1/2A Texaco). For 1/2 A Texaco, control by elevons seems to be best. High-powered models, which climb steeply, may need rudders.

**Summing Up:**

The advantages may be:

1. Good climb
2. Easy to build and light
3. Unique

The disadvantages are:

1. Poor glide
2. Hard to see
3. Control problems
4. Limited selection

The following old time "tailless" models come to mind:

1. Tex Rickard Flying Wing*
2. Li'L Misery*
3. Borysko Tailless*
4. Bob Tail Contender*
5. Sky Car*
6. Gross Tailless*
7. Several by Ed Manning -- no plans as far as I know*

* John Pond has plans.

Very successful tailless design by Tex Rickard from *1938 Frank Zaic* year book. This ship is powered by Cox .049 and flown in 1/2A Texaco.