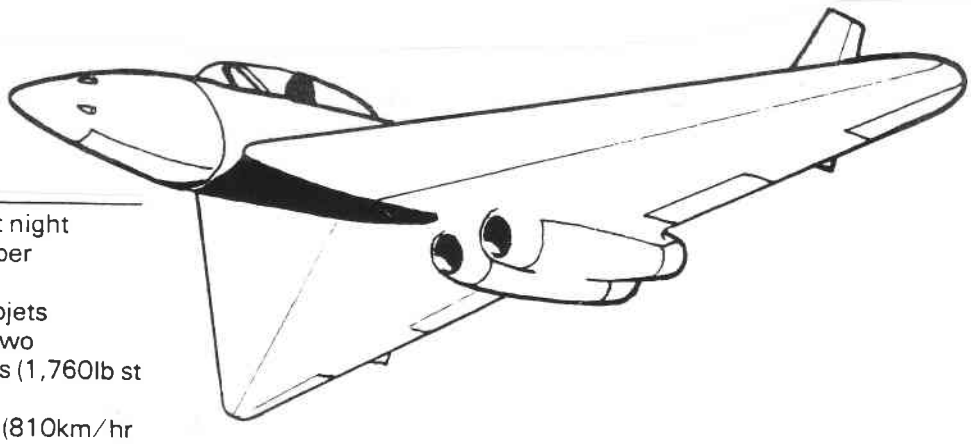
No. 132 JUNE 1997

T.W.I.T.T. NEWSLETTER

Arado Ar I



Arado Ar I data*

Role	Two or three-seat jet night fighter and fast bomber
Ultimate status	Design
Powerplant	Two HeS 011A turbojets (2,866lb st each) or two BMW 003A turbojets (1,760lb st each)
Maximum speed	503mph at 19,670ft (810km/hr at 6,000m)
Endurance	2hr 36min at cruising speed
Weight	27,700lb (12,565kg) loaded, less tail turret.
Span	60ft 4in (18.40m)
Length	42ft 7in (12.96m)
Wing area	710.4ft² (66.0m²) less fuselage section
Armament	Four MG 213 30mm cannon and two 1,102lb (500kg) bombs (plus two 30mm rearward-firing cannon projected)

*With HeS 011A.

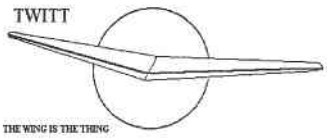
The Ar I was to be a clean 35° delta-wing aircraft with twin fins mounted outboard on the wing tailing edges and the crew of two seated in tandem in a pressurized cockpit. Armament consisted of 4 30mm revolver cannon housed in the sharply pointed nose, along with a centimetric AI radar. A twin-cannon rear turret was mounted,and, as the Ar I was also intended to perform the fast bomber role, allowance was made for a bomb load. Powerplant was to be two turbojets mounted beneath the rear fuselage. Source: David Master's Geman Jet Genesis, contributed by Kevin Renshaw.

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

The number to the right of your name indicates the last issue of your current subscription, e.g., **9706** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, July 19, 1997, beginning at 1330 hrs at hanger A-4, Gillespie Field, El Cajon, CA (first hanger row on Joe Crosson Drive - East side of Gillespie).

TWITT NEWSLETTER JUNE 1997



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, east side of Gillespie).

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PRESIDENT'S CORNER

Just to see how observant everyone is this month, I have changed something on this page and I want to see your reaction to it. If you think you have found it, drop me a line or e-mail and tell what it is. The first person to reach Bob or I with the right answer will get a one month extension on their membership. Good Luck.

Letter traffic has been rather slow for the past month or so, which means I can fill the rest of the newsletter after the minutes with items I have gotten from the nurflugel mailing list. The information flowing through this group is absolutely phenomenal with just about every flying wing subject showing up at one time or another.

With some help from TWITT, Douglas Bullard, the heart of the mailing list and an excellent home page, managed to get a great deal of information from the manufacturers of the PUL-10 which we have shown pictures of in the past. This month I will take some of the material he has included in his Horten section on the PUL-10 and transcribe it for your information pleasure. This will probably have to be a two-parter, since in order to get all of the information they included on the Horten brothers. I am also going to reduce some of the pictures he received from the company and hope that they reproduce adequately enough for you to get a better idea of what this airplane is all about.

Barney Vincelette, who hasn't been having must success trying to get the Davis wing project back into the air, has now begun to champion the introduction of the PUL-10 into the US. The manufacturers are seem to be very interested in this marketing prospect, so there is every indication Barney may be successful in at least making kits available. Only time will tell.

I am very pleased that TWITT has begun to grow again to a membership of about 145 flying wing enthusiasts. The renewal rate has been outstanding, which we take as a vote of confidence that we are doing the right things to keep your interest's alive. With the approach of our 11th anniversary, it's good to know that we will be able to carry on for another 11. Thanks, to all of you.

Andy

JULY 20, 1996 PROGRAM

As of our publication time we didn't have a formal program lined up for the meeting. It will be our 11th Anniversary meeting so of course there will cake and ice cream (especially welcome on a hot July day in El Cajon) for everyone to celebrate TWITT's continued success.

We will continue to search for a program, but don't let the lack of one stop you from coming down and enjoying an afternoon with your fellow flying wing nuts. We know several of our regular attendees will be at the SHA Eastern Workshop and Flying Wing Symposium (see the announcement below for more information) so we can sure use the everyone else to help fill the chairs.

MINUTES OF THE MAY 17, 1997 MEETING

Andy opened the meeting by thanking everyone for coming out on a warm and sunny day to sit in a hot hanger. He welcomed Bob Chase back after he missed the last meeting due to a mild heart attack. He looked good and was a spry as ever. Bob thanked the group for their get well card (we had everyone at the May meeting sign it) noting that it lifted his spirits.

Bruce Carmichael gave the group a run down of the program for the Flying Wing Symposium to be held on July 17, 1997, at the National Soaring Museum at Harris Hill, New York, to be followed on the 18-20 with the SHA Eastern Workshop (see the announcement below for all the details). Of course Bruce will be in attendence as the President of SHA, and Bob Chase will be representing TWITT (as well as satisfying his own curiosity). We think there are several other TWITT members from the western area attending, and it looks like some of our eastern members have already planned to going to the symposium.

Andy mentioned that we had a bibliograpgy addendum from Serge Krauss that he wanted everyone to look at and help him determine if it is something worth pursuing further. Bruce had already reviewed it and commented there was a lot of interesting material but there were no source references to let you know where to obtain a particular work. If that could somehow be added it would make the listing a lot more useful than just being another bibliography type document. *(ed. -By the end of the meeting there had been no other comments to pass along to Serge.)*

Bob Fronius showed a short video on Formula One racers at the Reno Air Races featuring the winning ways of Ray Cote.

Bob Chase told us a little bit about what he had found at the recent Paso Robles ultralight fly-in. Among the aircraft there were a number of flying wing type tri-cycle geared powered planes that seem to have become one of the prime choices for pilots who need a portable machine. He had also run across new 4-cycle engine that produces about 80 hp. Bob is going to pass this information along to Barney Vincelette who he thinks is looking for this type of powerplant to put in a PUL-10 kit he hopes to import from Europe. This would replace the Rotax being used in the aircraft now. Bob finished by mentioning Bruce Carmichael had two different articles in this month's (May) Sport Aviation explaining how to get air to flow correctly over wing and fuselage surfaces.

For the break today, Andy announced that Chris and Connie had three types of ice cream (always good on a hot day), several types of toppings for everyone's enjoyment and tons of good cookies.

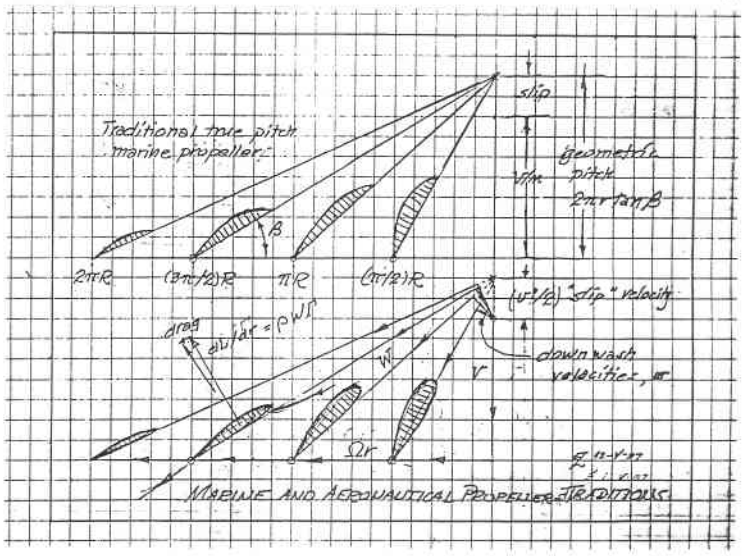
Andy then introduced **Gene Larrabee**, whose presentation today was going to be a layman's description of propeller theory and design. *(ed. - our primary tape recorder refused to cooperate and record properly, so the backup was pressed into service. The tape quality is not as good, so I know some of the material will be hard to transcribe, so please bear with me in how some of the information might flow or if there seem to be gaps in the text.)*

Gene began with a slide show of the early human powered activity at MIT which apparently depended largely on the performance of the propellers. As he went through the slides the theme became one of what was a good propeller and what was not. He started with a Super Marine S6B racing airplane from England with what would be called a minimum induced loss propeller which was probably based on the theory by Sydney Goldstein in about 1929.

The slides went on to show the various aberrations of the man powered machines which started with a propeller that didn't work. They decided to try one of Gene's propeller theories on their electric powered

test bed, thinking that it probably wouldn't work either and they could dismiss the idea once and for all. However, the design work and the aircraft was able to fly two and a half figure eight patterns before the batteries died, where before it could barely maintain sustained level flight.

With this success they built one for the man powered bi-plane. It had a small hub attachment area then styrofoam riblets, was covered with kevlar cloth, and ended up being 14' in diameter but only weighed three and a half pounds. The aircraft flew



successfully with this rather unconventional looking propeller.

Gene's design was then used to replace the windmill style propeller on the Gossamer Albatross that was proving to be rather inefficent. This was due to the squared tip format that was not suitable for the tip speeds at which the propeller needed to turn. The Larabee design allowed the pilot to fly for over an hour and still have energy to spare, whereas with older style he was exhausted after about 19 minutes. This also was the propeller it used to cross the English Channel.

The next set of slides covered the Chrysalis bi-plane. It never flew real well since it didn't have the necessary wing span for a man powered aircraft.

The propeller design program was rewritten into what became HELICE and they then used it to produce windmill propellers for the generation of electricity. They were 56' in diameter and would produce 50 kilowatts of power in a 22 mph wind.

The rest of the slides went through a series of various applications for propellers including a number of different kinds of man powered high-speed water craft. After this segment, we took a short break for ice cream and toppings while the slide projector was replaced with the overhead view-graph projector.

When Gene resumed after the break he explained he was going to try and make this simple without a lot of higher mathematics so everyone can understand what it is all about. He started with an analysis of marine and aircraft propellers. Marine propellers were first built with geometric true pitch with the idea that they would screw their way through the water. Experience found this was not the case. This would lead to an explanation of the slip of propellers through the air. (ed. - the view-graph of this explanation has been included below.) Propellers develop a drag and lift component, and the induced velocities contain a swirl component as well as an axial component.

The next slide went into actuator disk theory. In the marine world this involved the relationships of a fluid passing through the propeller where it has a lower pressure just ahead of it, the pressure increases as it moves through the rotational forces of the prop, and then eventually reaches zero downstream. From this can be derived three formulas for slip velocity, power coefficient and the efficiency.

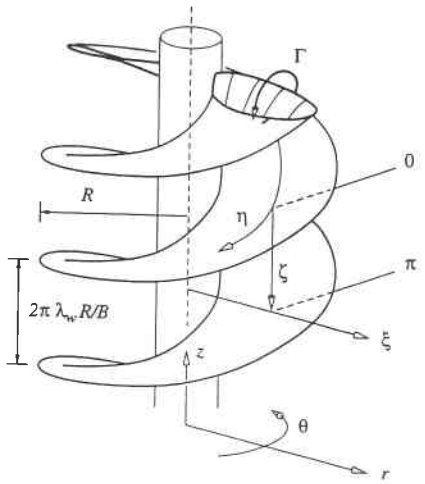


Figure 2: Helical vortex sheet system

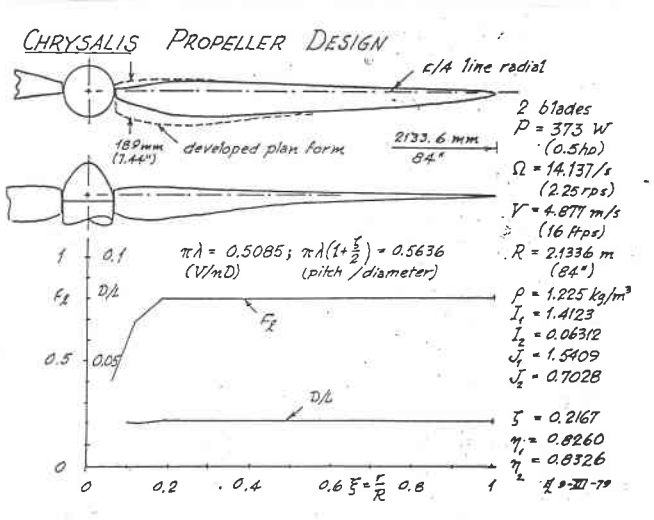
Gene then moved on to what was called the Betz Condition of M.I.L. propellers where you look at a particular section of a blade and analyze its efficiency. *(ed. - Unfortunately, he got into a lot more math than I am capable of passing along in this forum.)* The Betz Condition means that the vortex sheets that are shed by the propeller appear to remove axially the apparent velocity V¹. Now what we have is the wing equivalent of minimum induced

loss of the propeller equivalent. The question becomes what kind of radial thrust distribution do you need to have inorder to make V^1 radially constant (or the slip velocity).

The next graph showed a three-bladed propeller and the tube of slipstream of radius r which corresponds to the point where we are going to specify the point of circulation on the individual blade.

(ed. - At this point I was unable to transcribe most of the material since it was comprised mostly of explanations of how the mathematical equations describe the flow of air in relation to the number of blades. The intermixing of the equational material and how it interfaced with what it was he was trying to relate to the group got beyond what I could effectively reproduce here. Therefore, if there is anyone really interested in this typeof technical analysis of propellers and slipstream velocities, we will keep the tape of this talk for several months and put into a package with copies of the view-graphs. The whole thing, including a copy of Mark Drela, "Lifting-Line Formulation for Counter Rotating Rotors" article that combines much of what Gene was talking about, will be available for a price of $6.00 postage paid US ($7.00 foreign).

I apoligize for having to do it this way, but I simply found it extremely difficult to take what he was saying and put into non-technical words that would make any sense to those of you who have the capability to fully understand it.)



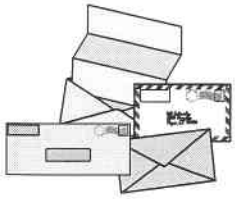
The slide for the Chrysalis propeller has been included above to give you an idea of its plan-form. You can see it has a very pointed tip which goes back to the original statement about having the right tip for the speeds you want it to travel and still be efficient. In the case of the slow-speed type, the squared, blunt end was not right.

Also included on page 3 is a copy of the Helical vortex sheet system that was briefly discussed above. It is from Drela's article which includes the liberal use of formulas to explain this theory.

Gene wrapped up with an overview of what he had just covered and that his computer analysis program had been successful in designing propellers for aircraft like the Gossamer Albatross, Chrysalis, and Barnaby Wainfan's Facetmobile. He emphasized that propeller design must be compatible with the aircraft's design in order to work in the most efficient manner with the airframe.

There was a short question and answer period that wasn't all quite caught on tape and couldn't be easily transcribed.

After the questioning session, Andy adjourned the meeting.



LETTERS TO THE EDITOR

5/21/97

TWITT:

I have the outer panels and the center section almost complete for an Mitchell wing B-10. I'll be designing and building the under-carriage as well.

After I get current with the ship, than I will try to market a materials/components kit, along with complete aircraft.

If anyone is building or comtemplating building the B-10, please feel free to call or write me.

Keep up the good work.

Best regards,

Richard Avalon
892 Jenevein Avenue
San Bruno, CA 94066-4234
(415) 583-3665 (phone/fax)

(ed. - Thanks for the update on your construction project. Richard also sent along a picture of the wing in his workshop, but the contrast was not very good for reproducing it in the newsletter.

Richard spent time with Don Mitchell, and I believe obtained the original plans for much of Don's work, so if you have any questions he is probably one of the best sources around. Thanks, Richard, for volunteering the help others.)

SHA EASTERN WORKSHOP AND FLYING WING SYMPOSIUM

The Sailplane Homebuilders Association (SHA), in conjuction with the National Soaring Museum (NSM) at Harris Hill, New York, will be having their annual Eastern Workshop on July 17-18 at Harris Hill.

July 17 will be a program at the NSM devoted entirely to flying wings. As you can see from the scheduled speakers, it will be a packed day of everything you ever wanted to know about flying wings, especially gliders.

If you can only make one day of the workshop, make sure it is Thrusday, the 17th. There have been some rumors that the flying wing discussions might bleed over onto Friday, and from what I have seen in the Nurflugel messages there is a lot of interest being generated this year on the flying wing program.

The latest (tentative) list of speakers is:

Welcome & Intro	Jim Swinnich
History of the Hortens	Jan Scott
Flying the Horten IV	Rudi Opitz
Horten IV & Kasper Bekas	Dezso Georgyfalvy
Overview of Flying Wing Design	Al Bowers/David Lednicer
Present & Future of Flying Wings	Paul MacCready
Creation of the Flying Plank	Al Backstrom
Development of Genesis	Jim Marske
Flying Wings of Fauvel	Jack Lambie
Discussion	Bruce Carmichael

(Note: There is also a projected slot under consideration for Don Mitchell designs.)

Bob Chase, TWITT Vice President, will be attending for his own interests and as a representative of TWITT. We are planning on him making TWITT information handouts available to the group, as well as, some of the video and audio material we have collected over the years.

This is a don't miss opportunity if you can get away for a day or two. There is a move in the works to try and get the proceedings video taped and a package made up that would include copies of the various papers presented at the symposium. It might be a little pricey if it happens, but it will probably be worth it since this type of event isn't going to happen again for a number of years.

For those of you in the northeast area, use the March issue of the newletter and see if you can find someone to carpool with. It will reduce the cost and make the travel time go much faster while you hanger fly about flying wings and things.

I'm hoping we will get a first hand recount of the event from Bob and Bruce when they return so you would have it in the August newsletter. Keep your eyes open.

THE PUL-10

(Note: The following information was extracted from the Nurflugel website maintained by Douglas Bullard. He obtained the data from the factory and has included it under his Horten Wings section for all to take advantage of and learn more about this latest Horten derived design. If you want to see the full series of photos included by the factory you can access them at:
http:/www.teleport.com/~dbullard/nurflugel)

Introduction

Usually airplanes consist of a fuselage, wings and a tail-section. Professor Reimar Horten envisioned an airplane consisting only of a wing, containing all systems, passengers, and cargo. Throughout the 1930s' and 1940s' several flying wings of his design were built and successfully tested under his supervision, but after World War II ended, Germany was prohibited from developing aircraft. In 1948, Dr. Horten emigrated to Argentina where he could continue his work. When we met him forty years later, he became our friend and teacher. Over the years he taught us the principles of flying wing construction as he continued to design flying wings, including the two seat PUL-10. On March 14, 1993 Reimar Horten passed away. We will always remember him with gratitude, for without him, this project could never have existed. He was decades ahead of his time.

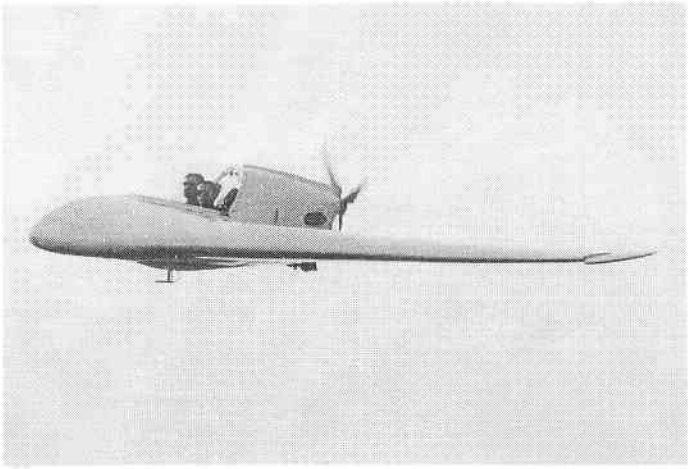
We would like to thank the following people who also have helped us to develop the PUL-10.

- Siegfried Panek
- Dr. Giampiero Fabri
- Engineering office of Rheinhold Stadler (Munchen)
- Aeronautical engineer Otto Bartsch

- Aeronautical engineer Hermann Stutzle
- Engineer Ernst Kurri
- Hans Werner Kruger (inspector)
- Gustav Winter (inspector)
- Oskar-Ursinus Association
- The Ministry of Civil Aviation for the speedy registration.

Acknowledgments

We may never understand civil aviation's failure to accept the flying wing with all it's advantages; simplicity, economy, efficiency, and safety. In the 1940's these advantages were well known by scientists and engineers throughout the world. In Germany, Junkers, Messerschmidt, BMW, Heinkel and Focke-Wulf were submitting flying wing proposals to the Ministry of Aviation. In America, Northrop was breaking records with the YB-49.



ABOVE: PUL-10 in flight. Note the configuration of the wing tip and the center section wing/nose section just forward of the canopy. This should give you some idea of the airfoil shape.

In the decades that followed the war, fortunes were invested in improving the efficiency of the airplane. Most of these improvements have been in propulsion systems. Improvements in the aerodynamics of the conventional general aviation airplane have been disappointingly inconsequential. Revolutionary improvements in efficiency, economy, and simplicity can only be achieved by departing from the mainstream and building a radically different airplane, a flying wing.

The PUL-10 has proven itself far easier and cheaper to build and more efficient to operate than any competitor of comparable size. And the two place PUL-10 is not the only flying wing we can build. We have construction plans for a four place flying wing, along with plans for several gliders, all designed by Prof. Horten.

Our experience with flying wings has convinced us that if the flying wing had gone through half a century of development, the conventional airplane would have been obsolete long ago. The flying wing which can carry more cargo with 30 to 60% less fuel will be a success in a future of possibly limited resources.

The help and the feedback we get during our work with the project encourage us:

- Journalists from many countries ask for information about the stage of development.
- Universities in Germany, France and Netherlands offer their help.
- The government offers financial support.

The various contacts and relations that we have established during the past seven years are of great help for us. So far we have achieved much with limited means. On one hand, we have often had to improvise and the development was slowed down. On the other hand, we are financially independent. The development of the flying wing is still in its infancy but it has the potential to change aviation. Investors can calculate their risk because we can demonstrate the advantages of our concept. This is why we are intending to establish a public limited company as a basis for further development. We would appreciate your ideas, critiques collaboration or investment in our future company.

by: Bernhard Mattlener, the Nürflugel team

Advantages

Economy

Low fuel consumption

Because the PUL-10 is reduced to a flying wing it does not suffer the drag of a fuselage and tail section. Therefore it consumes less fuel. Even though we use a fixed pitch propeller, the PUL-10 cruises at 97 knots while burning only 2.9 gallons per hour. This is 30% to 60% less fuel than a conventional airplane of approximately the same size and speed.

The decreased wing loading of the PUL-10 reduces induced drag while the elimination of fuselage and tail reduces parasite drag (See

"calculations to PUL-10" by engineering office of Stadler.)

Cheaper fuel

While most Continental and all Lycoming engines require AVGAS 100 LL, the PUL-10 is equipped with am engine that can use automobile fuel.

Large Usable Volume

The thicker and longer profile of the wing achieves more usable volume than a comparable plane with a fuselage.

Longer Range

640 nautical miles with 45 minutes reserve. (The 23.8 gallon fuel capacity still leaves room for more luggage than a comparable size conventional airplane can offer.) The fuel tanks of the prototype are placed within the 2.45 m wide center section. The space inside the wing parts has not yet been used.

Hangaring and transport

Since the flying wing does not have fuselage or tail-section, it needs less space in the hangar. Even in an occupied hangar there is space for the PUL-10. Because of its low wings it can be placed underneath the wings of a high wing plane. In addition, the PUL-10 cam be disassembled unto three parts within half an hour. It is easily transported on a 6.5 x 2.5 m trailer.

Production costs

The production costs for a flying wing are lower than for conventional planes because its shape is more compact and the steering mechanics are simpler (no rudder and elevator).

Safety

Minimum spin danger

No airplane is absolutely incapable of spinning. Even an "Ercoupe", if the controls are modified and the center of gravity is too far aft could be made to spin. But Dr. Horten calculated a spanwise lift distribution that eliminates the danger of spinning (so long as the center of gravity is within prescribed limits.) Upon flight testing the Horten II on November 12, 1938 the celebrated test pilot Hanna Reitsch had this to say: "through no possible move of the stick could I get the H II to start spinning or to fall over one of its wings. When I pulled the stick back and to the right, the plane pitched slightly forward and started sinking without accelerating to more them 90 km/hr. This is of great help while flying in clouds with frozen instruments."   Dr. Horten achieved these flying characteristics through airfoil design and wing twist that concentrate most of the lift in the center of the plane. He succeeded in keeping the air flow attached to the elevons even at minimum speeds. This air flow characteristic can be most impressively demonstrated by attaching pieces of yarn to the top of the wing and flying it in slow flight. At 40 knots the yarns show air flow separation from the middle of the wing but it never separates out near the elevons. The nose lowers slightly as the plane accelerates without any compromise of control.

Lower minimum speed

Flying wings have light wing loading. Consequently they can fly very slowly. The PUL-10 can fly at 38 knots without sinking. touchdown speed is only 30 knots, which greatly reduces takeoff and landing distances and the risk of accidents, especially in a short field.

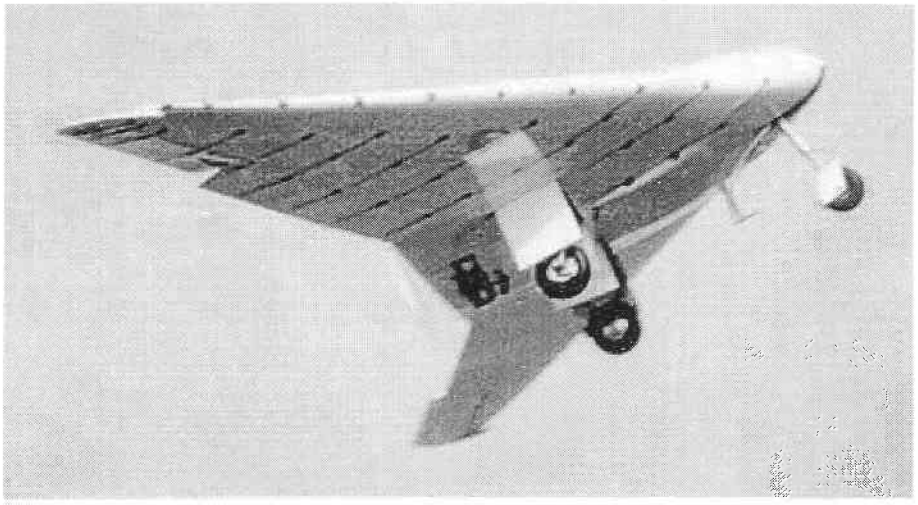
Integrated parachute

In case of emergency, a parachute can be fired out instantly. The parachute lowers the plane and its passengers. The installation of such a parachute is possible for all small planes today, unfortunately it is not standard yet.

History of the PUL-10

In 1987, we met Prof. Dr. Reimar Horten in Argentina. In the following years we built a number of radio controlled models according to his construction plans. The models flew so successfully we built a single seat prototype. In the winter of 1989-1990, Siegfried Panek, one of the main builders of the PUL 10 worked with Dr. Horten on construction detail plans. In January 1990, in a little village near Frankfurt we began construction of the PUL-9 (Panek Ultra-Light 9 meter wing span). In

April we took it to Italy where Nike Aeronautica helped us finish building it and it made its first flight



ABOVE: Prototype PUL-10 in flight with gear extended. Note the trailing edge lines and overall shape of the wing.

on June 22, 1990. The PUL 9 was thoroughly tested under many different flight conditions. We were highly impressed by its easy handling and stability in the air. In 1991 we decided to build a two seater. In the winter of 1991-1992, Siegfried Panek and Reimar Horten built a wooden model which was called the PUL-10. In February 1992, we started construction of the first PUL-10. We made the molds out of 3-dimensional fiberglass from the Parabeam company. We used this material for the body of this plane too. Even though the first PUL-10 turned out to be much heavier than we expected, it demonstrated very good flying characteristics in its September 1992 test flight. Satisfied with its aerodynamics, we began construction of the second PUL-10. This second plane took more time to build because we reworked some of the molds for later mass production. We began testing it in Italy in the summer of 1994 and in the spring of 1995 we registered it in France and continued testing it at Sarrebourg airfield.

In 1995 we replaced the 2-stroke Rotax 582 with a 4-stroke Rotax 912. Unfortunately, in making this change we mis-estimated the center of gravity and this caused an in flight emergency which forced the pilot to use the built-in parachute. The landing damaged the airframe beyond repair. But by now we had gained enough knowledge to begin construction of the third PUL-10 in the fall of 1995. This PUL-10 differs from predecessors only in equipment and engine mounts. The shape of the plane was not changed. We finished it in the fall of 1996 and received an experimental registration for it in Germany.

In spring 1995, the PUL-10 was given a preliminary recitation in France and the testing was continued at the Sarrebourg airfield.

In 1995 the 2-stroke-engine Rotax 582 was replaced by the 4-stroke engine Rotax 912. A false estimation of the center of gravity led to an accident in June 1995 near Satrebourg. Though the pilot used the built-in parachute the plane was damaged beyond repair. Using the knowledge gained, we slarted to build the PUL-10/3 in the fall of 1995. The PUL-10/3 differs from its predecessors only in equipment and engine mounting. The shape of the plane was not changed. It was finished in the fall of 1996 and received experimental registration in Germany.

Actual pictures from the engine-mount you can find in the Internet:

http://www.cso.net /kurri /flucr/pul10.htm

Final modifications before mass production

For serial production two details have to be modified principally:

Drag rudders

During flight a flying wing does not need drag rudders because slightly raised elevons do not produce adverse yaw. However, for landing with a strong crosswind some sort of rudder is needed for proper runway alignment. Drag rudders near the front of the wing tip have worked well during test flights, but we need to improve the mechanics of our rudder system so that it will require less operating forces.

Easier C.G. control:

Depending upon how it is loaded the PUL-10 has to be balanced with weights. For normal category registration a simple way of balancing which excludes mistakes might be necessary. We might include a scale in the front landing gear which displays the current weight and balance im the cockpit. We are considering an ignition switch cutout which prevents the engine from starting if the center of gravity is not within limits. We might pump liquid between tanks.

Feedback

The interest in the new plane is great. We received more than 2000 letters and phone-calls without having made any advertisements. This is amazing since the PUL-10 has never been officially presented or offered for sale. Nevertheless the rumor about the rebirth of the flying wing has spread like wildfire. Accounts of it have been published on almost every continent. Some interested people said they had worked on flying wing development under Reimar Horten. They were enthusiastic about the flying wings characteristics and wondered why the development had not been continued over the past 45 years. Many inquiries came from America and many from Australia. In these countries private aviation is of great importance. In Australia the enormous distances between cities and small settlements would make life difficult if it were not for small private aircraft.

In these countries many aviation companies have shown interest in the project. We have been contacted by people in America and Australia who have offered help in marketing. The various offers include the writing of a kit manual and a the location for production of the PUL 10. Some flying wing enthusiasts have visited us to see the PUL-10 in action. Some clubs such as "TWITT" (The Wing Is The Thing) have contacted us too.

Many of the people we talked to were dissatisfied with the lack of progress in conventional airplane design. Some were willing to wait until the flying wing is available before buying a plane.

One prestigious organization, the Oskar-Ursinus-Association awarded the makers of the PUL-10 a prize for the most progressive design.

(ed. - The remainder of this story from the PUL-10 factory, along with some Horten history that they also included in their promotional material will appear in the July 1997 newsletter.)

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