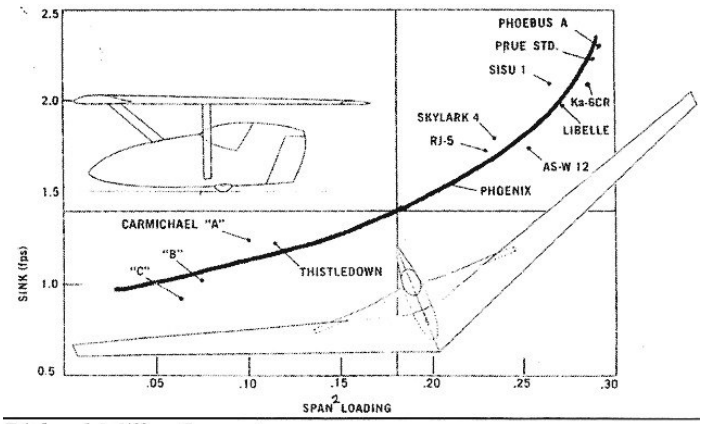
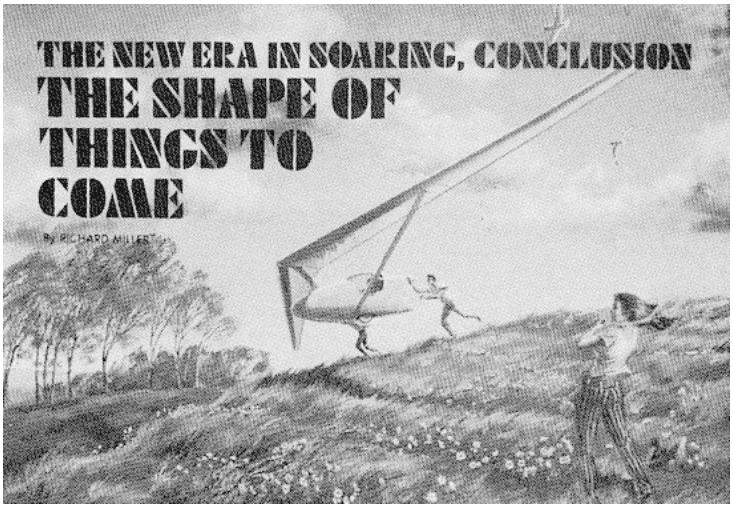
No. 156 **JUNE 1999**

T.W.I.T.T. NEWSLETTER



Richard Miller Concept.

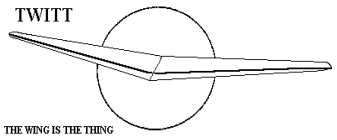
This is the "Thistledown" proposed concept design for a microlight type sailplane. See Bruce Carmichael's Article in the latest addition of *Soaring* magazine.



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., **9906** means this is your last issue unless renewed.

Next TWITT meeting: Saturday, July 17, 1999, beginning at 1:30 pm at hanger A-4, Gillespie Field, El Cajon, CA (first hanger row on Joe Crosson Drive - Southeast side of Gillespie).



THE WING IS THE THING
(T.W.I.T.T.)

T.W.I.T.T. is a non-profit organization whose membership seeks to promote the research and development of flying wings and other tailless aircraft by providing a forum for the exchange of ideas and experiences on an international basis. T.W.I.T.T. is affiliated with The Hunsaker Foundation which is dedicated to furthering education and research in a variety of disciplines.

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

President: Andy Kecskes	**(619) 589-1898**
Vice Pres:	
Secretary: Phillip Burgers	**(619) 279-7901**
Treasurer: Bob Fronius	**(619) 224-1497**
Editor: Andy Kecskes	

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

(619) 596-2518 (10am-5:30pm, PST)
(619) 224-1497 (after 7pm, PST)
E-Mail: twitt@home.com
Internet: http://www.members.home.net/twitt

Subscription Rates: $20 per year (US)
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Information Packages: $3.00 ($4 foreign)
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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).

TABLE OF CONTENTS

PRESIDENT'S CORNER

The minutes from last month's meeting took up so much room this month, I wasn't able to include any letters to the editor, even though there was only one available. I will get it next month. It was obviously more important to get the meeting information to you then editorial type messages.

If you weren't at the meeting you missed another good one. Everyone seemed to really enjoy it, I think partly because we had more than just one subject which kind of had something for everyone. Hopefully, we can have some programs like this in the future, although it will take some effort on the part of our members to find people who have a little bit to say on a subject that is in the flying wing arena.

Although I don't have all the details yet, I want to make sure all of you in the western area know about the Sailplane Homebuilders Association's Western Workshop to be held over Labor Day weekend at Tehachapi. From what I have heard there will be an excellent program of speakers beginning on the Friday afternoon and going through Sunday. I am sure there will be a lot of good soaring, so if you have a glider, make sure to bring it along and take advantage of the area's lift.

For those of you who have internet capability, I have done some upgrading of the TWITT website, so if you haven't looked lately, please take a new walk around. I will also be adding some more material over the next couple of weeks, so make sure you go back now and then to see what's new. I haven't gotten many comments on it lately, so don't know if you are seeing the sorts of things you expect. If you have any feedback, positive or negative, please drop me a line so I can make the necessary changes or keep moving in the same general direction with new items. Don't forget, it is YOUR website, so let me know what you want it to look like.

Andy

JULY 17, 1999 PROGRAM

At the present time we don't know what the July program will include. We are working on several options, but nothing has been locked up yet.

If you are aware of anyone in the Southern California area that would make a good speaker, please let us know his/her name, phone number and specialty so we can make contact and see what might be possible. We know there is a lot out there that hasn't been covered yet, and that we haven't thought about, so if there is a subject you know others would like to hear about and you know a speaker, please don't hesitate to call us.

MINUTES OF THE MAY 15, 1999 MEETING

It was a bright, warm day in El Cajon as Andy gathered everyone together to make them sit down in the dark hanger. He said it was time to start this month's meeting and that we had an interesting, but slightly mixed, program that would come in three parts. The first part would feature Russ Eckre who would be updating us on the progress, if any, on the Horton "Wingless". The second part would feature Bruce Carmichael letting us know if he has changed his mind on tractor or pusher propellers and their effect on laminar flow. The third part would feature Bob Recks telling us about one of the historic projects being undertaken at the San Diego Aerospace Museum on the 100th anniversary of the Wright Brothers' first flight.

ABOVE: Phil Burgers receiving his recognition award from Bob Fronius.

After going over the regular housekeeping items for the new people in the audience, we had a round-robin set of introductions so everyone knew who they were sitting next too. Andy then informed the group that our own Phillip Burgers' article he told us about in March had now been published in Nature magazine. This publishing had been reported on the front page of the San Diego Union-Tribune along with a nice piece on Phillip's overall theory of how birds really did learn to fly. Phil told us he had mentioned TWITT to the reporter and the role we played in getting him started on this work, but unfortunately it didn't get included in the space allocated by the newspaper. (Oh well, our one shot at public notoriety gone with the stroke of a pen!! I have included selected excerpts from the newspaper article at the end of the minutes section.)

While we were on the subject of Phillip Burgers, Bob Fronius came forward to present Phil with a very nice, porcelain figurine of an eagle with its wings spread. There were a lot of oohs and aahs as Phil showed it to the audience. He then noted that the criticisms have only just begun, with some paleontologists already speaking out about how ridiculous this theory is: birds learning to fly from the ground up versus from the trees down. Phil commented that Newsweek magazine had already received numerous faxes from scientists berating the theory. So now it would seem the shoe is on the other foot, where the paleontologists need to come up with equally convincing statistics to prove the tree down theory. We will keep you up to date as best we can on how this debate progresses.

With all the formalities out of the way, Andy introduced Russ Eckre who would tell us about the Horton "Wingless." He reminded everyone that it had been about a year or so since he had been at TWITT telling us about the wingless. During that time he has come across a book on Howard Hughes that peaked his interest in perhaps writing a book on William Horton's life and design as another phase of Hughes untold story.

Russ began by showing us a short video taken from one of the Las Vegas television stations where William Horton had been interviewed about his airplane. He is now 83 years old and his age is starting to show in his ability to communicate sometimes. There were some clips of the prototype airplane under construction and finally in-flight. It delved into some of the behind the scenes problems Horton had with Howard Hughes and the legal system that resulted in him spending 18 months in jail for selling stock in his Wingless company (which turned out to be illegal even though he was supposedly told to pursue it by the head of the Securities and Exchange Commission).

The news clip also pointed out that Hughes had the press and legal system convinced that the airplane could not fly, this despite the fact there was film footage of it in flight. In fact some of these flights carried the Governor of California, US government officials and Howard Hughes. After his flight Hughes was so enthralled with the aircraft he declared it would now be the Hughes wingless since he

ABOVE: Russ Eckre telling us about the trials and tribulations of William Horton and his Wingless airplane.

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was the major financial backer. This is where the real problems began, since Horton would not agree to having Hughes take all the credit for the aircraft.

When the Joint Chiefs of Staff took an interest in the plane, Horton went to Washington only to be met by Hughes, some of his strong boys and Richard Nixon. Horton came out on the short end of the stick this time, both physically after taking a beating by the boys and from the government (Nixon) nixing any deal without Hughes' involvement. This is also where the Securities and Exchange Commission came in, bringing Horton up on fraud charges. An injunction was issued preventing him form talking about the invention.

Horton recently hired a new attorney who went back through the injunction and found an interesting fact. The only real restriction was that Horton couldn't raise funds for the venture, which meant he could once again start talking about it and trying to get others interested in the concept. Even at 83 Horton still wants to see another prototype built and flown.

Russ felt that the aircraft would be a lot better using today's modern materials for construction, especially since the original prototype was quite heavy. In fact, the original 250 hp engines had to be replaced with 450 hp radials to get closer to the performance anticipated by Horton.

One of the first questions from the group was, "What happened to this prototype aircraft?" Russ commented that it had been dismantled by Hughes' group and either burned or sent to a scrape yard.

Another question concerned what did the patent cover. Russ indicated it was on the end-plate design and the "airbrake" configuration seen in the video and stills we have shown in the past. Unfortunately, no one seems to have any pictures of it flying with the airbrakes retracted, although Russ said Horton had told him it had been done while flying over Los Angeles at one time.

Bruce asked if the lateral controls were mounted on the airbrakes? Russ said that was correct, but he didn't know for sure if the trailing edge surfaces also acted as elevons when the airbrakes were retracted.

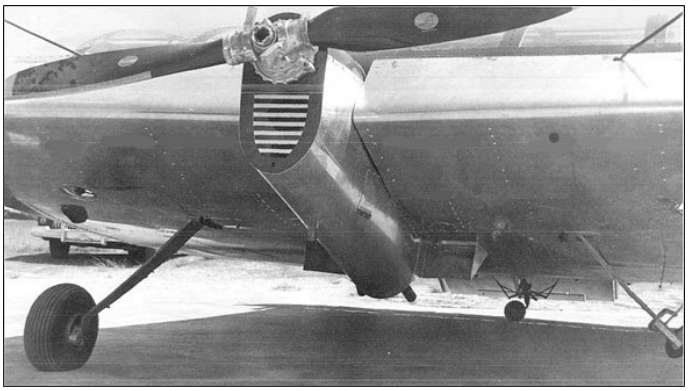
Phil asked Russ when he would be writing his book on William Horton. From the bantering back and forth it would appear Phil has been bugging Russ about such a book, but Russ knows he would have to be very careful on how he approached the sections dealing with Howard Hughes even after all these years. It seems the TV coverage did get some response from the Hughes organization, although Russ didn't know to what extent or in which direction (good or bad).

Andy added a side note here by explaining how this renewed interest in the Horton Wingless came about. It seems that one of the early promotional pieces was put up for sale on e-Bay, an Internet auction house. This got everyone on the Nurflugel bulletin board talking about it and eventually Doug Bullard bought the piece for $8 (high bidder). Andy was able to get Russ' 2 hour video with Horton promoting his airplane and a lot of flight footage, then provided copies to several members of the bulletin board. This, in turn, prompted some more discussion, so Andy asked Russ to come down and bring us up to date.

ABOVE: Original Horton prototype (before the one shown in last month's newsletter and promotional videos) during initial testing. Entry door can be seen in end-plate, with the pilot sitting in the middle of the wing. Source: Al Backstrom.

All of this has at least given the concept some new coverage worldwide, since the bulletin board reaches across the oceans. Andy also mentioned that somehow David Dodge had acquired many of the photos that have been included in the last newsletter and this one. The ones shown here of the original, single-engine POC prototype came from Al Backstrom who, we believe, obtained them from the FAA files.

It was asked why the government would have been interested in such a concept. Russ commented it was because of the proposed lifting power of the wingless which



ABOVE: Front view of the early Horton prototype. The type of engine is unknown at this time. The line just below the propeller blade is the bottom of the leading edge canopy with the rest of the canopy forming the shape of the wing between the end-plates. Source: Al Backstrom.

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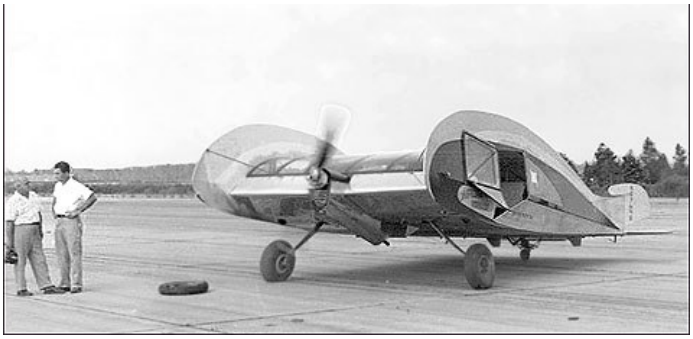
meant it could be used for hauling large numbers of troops or cargo. This was all coming about right around the time of Hughes Spruce Goose which was not working out quite as planned. Apparently at one time when Hughes was on board the wingless flying over the Spruce Goose, he commented that the "goose is cooked" referring to the wingless' lifting capabilities.



ABOVE: Original Horton prototype during an engine runup test. Notice no "airbrakes" as in the later model. Source: Al Backstrom.

Someone asked if there was really any need for such an aircraft in today's aviation market. Andy commented that he thought there was within the short-haul, commuter arena where you want high density seating but have the ability to get into and out of shorter runways. He related it to the current NASA and Boeing research into blended-wing-body aircraft since they will have the capability to carry large loads within the very thick center sections of the wing. One drawback of the wingless would probably be getting the average airline passenger to board something that doesn't resemble the traditional airplane. Even the BWB aircraft will have this problem, as have some of the more unconventional corporate aircraft like the Beech Starship.

One of the interesting things to come out of the talk about flying inside a wing this size, is how to keep passengers from becoming claustrophobic. A proposed solution would be to have large LCD displays at the front of the cabin showing pictures from forward looking cameras. Everyone would probably have a better view than they do now. For Horton's sport flying and business versions this wouldn't be so big a problem since the leading edge would be clear and the passengers would be sitting along the leading edge.

Phil mentioned that Junkers had looked into flying wings during WWII for carrying large numbers of troops, and more recently Zimmerman had developed low aspect ratio designs for higher lift capabilities.

There was a general discussion on the reason birds use a diffuser tip type feather arrangement. Phil had talked to Jeremy Rheinhart (sp?) who is an expert on bird flight and he said this tip creates a ring of tip vortices. However, it has also been said this analysis may be wishful thinking on the part of man trying to explain something we don't really fully understand. Jeremy's theory is that this tubular shaped vortices has less induced drag on the bird than a single vortex at the tip. Phil sort of thought the tubular vortex would require more energy on the part of the bird to produce than the single vortex, and this is the subject of on-going discussion.

From this point Andy introduced Bruce Carmichael who would be putting on the next portion of the program.

(ed. - The material below was furnished by Bruce and I have just gone through to add whatever additional comments came up during the presentation rather than fully transcribe the audio tape. This made it much easier for me and sure do thank Bruce for the text. The only downside to this is that I can't include all the Figure slides he showed.)

WHERE TO PUT THE PROPELLER? PUSHER VS. TRACTOR

By Bruce H Carmichael

INTRODUCTION

The argument on propeller placement is older than the airplane. When steam power replaced sail on vessels, it was soon found that the stern position was markedly better than the bow position. Part of this might have been due to the inflow into the propeller cleaning up poor flow about the blunt stern. The major effect was that the propeller efficiency expressed as the ratio of the thrust

ABOVE: Bruce Carmichael emphasising one of his points on laminar flow relative to propeller positions.

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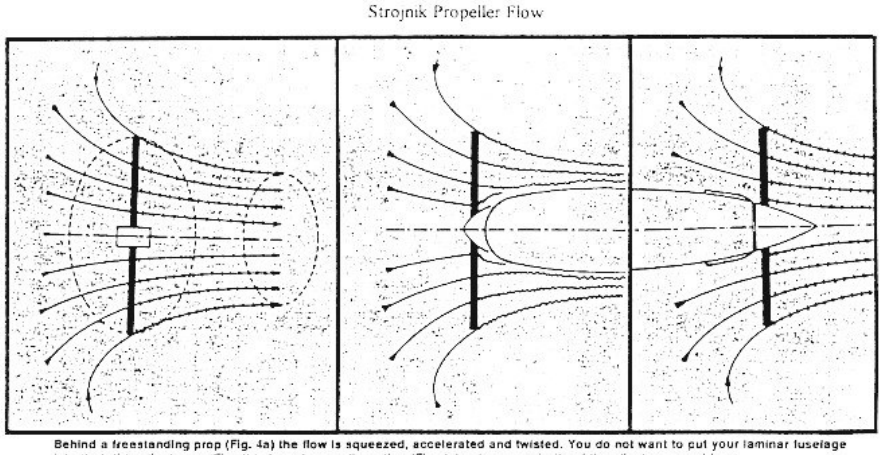
times speed divided by the installed brake horsepower was improved by accelerating fluid through the propeller that had already been slowed down by friction as compared to starting with fluid moving at vehicle velocity as at the bow. This effect was large on ships with their small diameter props immersed in the thick slowed down boundary layer. A more recent example is shown by the counter rotating small diameter many bladed props on a low drag underwater body, Figure 1. (This laminar flow body produced a 42 kts speed on the same power as a standard torpedo which could only do 30 kts.) On aircraft only the inner portion of the large diameter prop is affected, and the gain is much less.



Behind a freestanding prop (Fig. 4a) the flow is squeezed, accelerated and twisted. You do not want to put your laminar fuselage into that dirty slipstream (Fig. 4b). A pusher configuration (Fig. 4c) solves a majority of the slipstream problems.

SOME PREVIOUS THOUGHTS ON AIRCRAFT PROP LOCATION

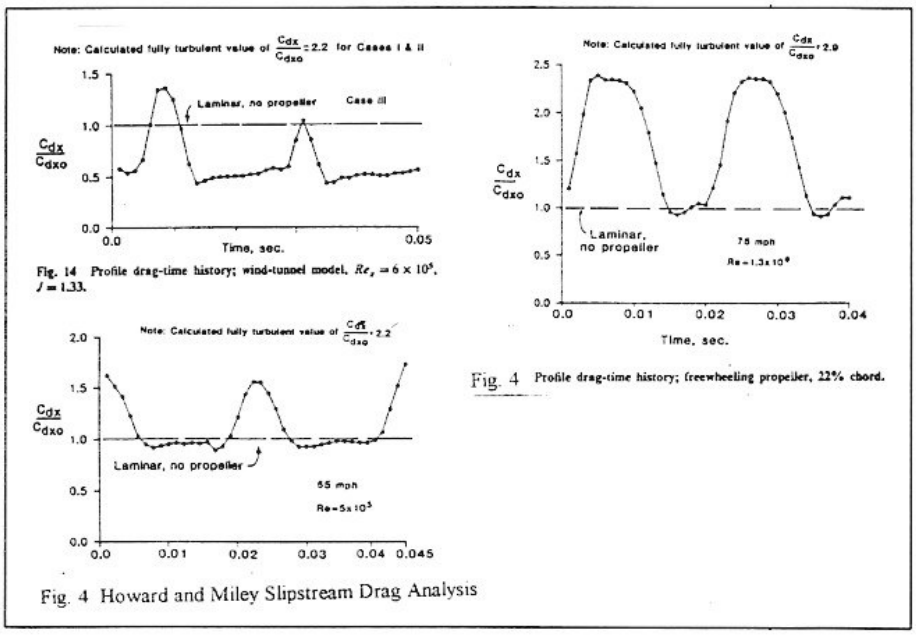
The author published Reference 1 in 1976, reviewing the R & D background of extensive laminar flow on air-craft. A pusher prop behind fuselage pod, and a jet light plane version were shown in Figure 2. Both were con-figured to permit natural laminar flow over the highest possible percentage of wetted area under ideal condi-tions. The laminar extent is shown by the light color and the turbulent extent by the black color in Figure 3. At that time the author believed that laminar flow would be completely eliminated by a propeller slipstream based on some early NACA work. Even the tail surfaces were therefore configured to remain outside the slipstream.

The cry for pusher propellers on laminar aircraft was taken up by the late Alex Strojnik in 1982 in describing the design of his self launching sailplane the S-2 in Reference 2. Alex showed the flow through a freestanding propeller, a tractor propeller and a pusher propeller, shown here as upper Figure 4. He pointed out that the full acceleration of the fluid has been accomplished behind the propeller. The fuselage of the tractor thus has about 10% higher velocity and thus 20% higher friction than the glider or propeller off case. The pusher has only half of the velocity increase ahead of the prop affecting the fuselage in this case. Even so, a negative normal pressure is induced on the afterbody which has a drag increasing component.

Bruce Holmes of NASA conducted flight tests of a wing section in the slipstream compared to a laminar wing glove outside the slipstream in Reference 3. Figure 5 shows the test setup and also the type of flow using surface mounted hot film detectors. A comparison of the signals of both laminar and turbulent flow on the wing glove are compared with the same signals taken at several locations in the slipstream. The horizontal scale is time. We see that the signal is turbulent only when the prop blade wake passes over, and is laminar a good portion of the time in between.

The extensive boundary layer measurements of Howard and Miley, Reference 4, are shown in lower Figure 4. The horizontal scale is time and the vertical scale is the ratio of the drag compared to the propeller off drag. Two cases are shown. With free wheeling prop, at both 10% chord and 22% chord, the drag increases 60% as the blade wake passes and comes back to the prop off value in between. In the power on case, the drag increase at prop wake passage was 40% and in between the drag had dropped to half the prop off case! For the first time we had actual drag

measurements to explain why the slipstream was not such a problem as we had thought.



LESSONS FROM THE REAL WORLD

An old time test pilot was being checked out before take off in an early jet at Edwards. The aerodynamicist was up on one wing root briefing him and the structures engineer was doing likewise from the other wing root. After a half hour, the pilot who was a war survivor and General said, "Never mind the theory, where is the throttle".

Since you have already heard more theory than you really wanted we will now look at the real world. This was brought to my attention when I read about Mike Arnold taking the world speed record with the AR-5. It is a tractor, low wing monoplane with a fixed faired landing gear. (Figure 6 and 7) Mike let me examine the airplane which resulted in the AR-5 articles of References 5, 6, and 7. This in turn led me to investigate the world speed records in the next 2 weight categories. The Nemesis in the Formula 1 size shows very extensive laminar regions in Figure 8, and the Smith AJ-2, Figure 9, in the next higher weight category, are likewise tractor, monoplanes with fixed faired landing gear. Nemesis is midwing and AJ-2 is low wing. Although Miller and Bohannon have made mighty efforts to refine Formula 1 pushers, Nemesis continues to dominate the field. Is this trying to tell us something?

THE LARS GIERTZ VMAX PROBE A MAXIMUM LAMINAR ATTEMPT

Lars Giertz, a most skilled composite aircraft builder set himself a goal of building a small low powered laminar aircraft to take the worlds speed record in both the minimum weight and the Formula 1 weight categories, Reference 8. Encouraged by the records obtained earlier by Prof. Ed Lesher in the Teal, Figure I 0, Lars not only put the prop behind the tail but built the entire forward fuselage shell in one piece to obtain extensive laminar fuselage wetted area. The author had previously written an article on Minimizing Fuselage Drag, Reference 9. Lars also employed the lowest drag wing and tail section available and used low drag contours on the landing gear legs and wheel pants, Figure 11 and 12. The author presents a detailed drag breakdown of this plane in a book, Reference 10. The pressure distribution is shown in Figure 13, while the streamlines and friction values are indicated in Figure 14. This 90HP plane was expected to reach 300 m.p.h. Unfortunately, Lars was killed in a landing accident during test flight. The very short chord wing resulting in low Reynolds number was suspected of contributing to the accident due to flow separation. The design principles applied to a slightly larger aircraft should prove the superiority of this configuration for speed record attempts.

AN AIRCRAFT DESIGNERS VIEW OF PUSHER PROPS AND LAMINAR FUSELAGES

In May of 1997, Jim Terri published an article, “Laminar Flow Fuselages, Do They Pay or Cost?" (Reference 11) He mentioned the many pusher design studies he had done in industry on multi-place personal airplanes. Each time the study came out in favor of the tractor configuration. The reason was that by the time they got the center of gravity variations due to variable payload within acceptable bounds, the wetted area of the fuselage had increased to where any gain would have been canceled. (Figure 15) He also mentioned other practical problems associated with pusher configurations while conceding that in the case of a powered sailplane or special purpose personal aircraft with small payload variations, it would be well to re-examine the problem. The all moving laminar nose on a Swiss sailplane which preceded the Giertz Vmax Probe is shown in upper Figure l 6. The extent of laminar fuselage flow measured in flight on high performance sailplanes is shown in lower Figure 16.

ADVANTAGES OF THE PUSHER PROPELLER

Propellers generate a lifting force when placed at an angle of attack similar to a wing. The pusher propeller, being behind the center of gravity produces a restoring moment at angle of attack in both pitch and yaw. The required static stability and damping in both planes can therefore be obtained with smaller tail surfaces In the tractor propeller case, the tail surfaces must be increased in size to take out the unstable moments of the propeller which is ahead of the center of gravity. (Phil made the comparison between the Northrop B-35 & 49 in that the jet version needed vertical surfaces to offset the loss of stabilization from the propellers.)

There is a tendency particularly from sailplane pilots to not want the esthetics of flight marred by an engine and propeller out ahead of them. Cockpit noise level is also reduced.

The pusher arrangement makes possible a low drag forward fuselage, possibly with extensive laminar flow when all requirements are met. On the other hand, it has been found, since the influence of the slipstream upon the forward fuselage is periodic, that the drag is not nearly as high as if the boundary layer were fully turbulent.

There is a theoretical increase in propulsive efficiency from accelerating fluid already slowed down by friction. This is a small effect due to the small portion of the propeller actually immersed in the boundary layer or wake.

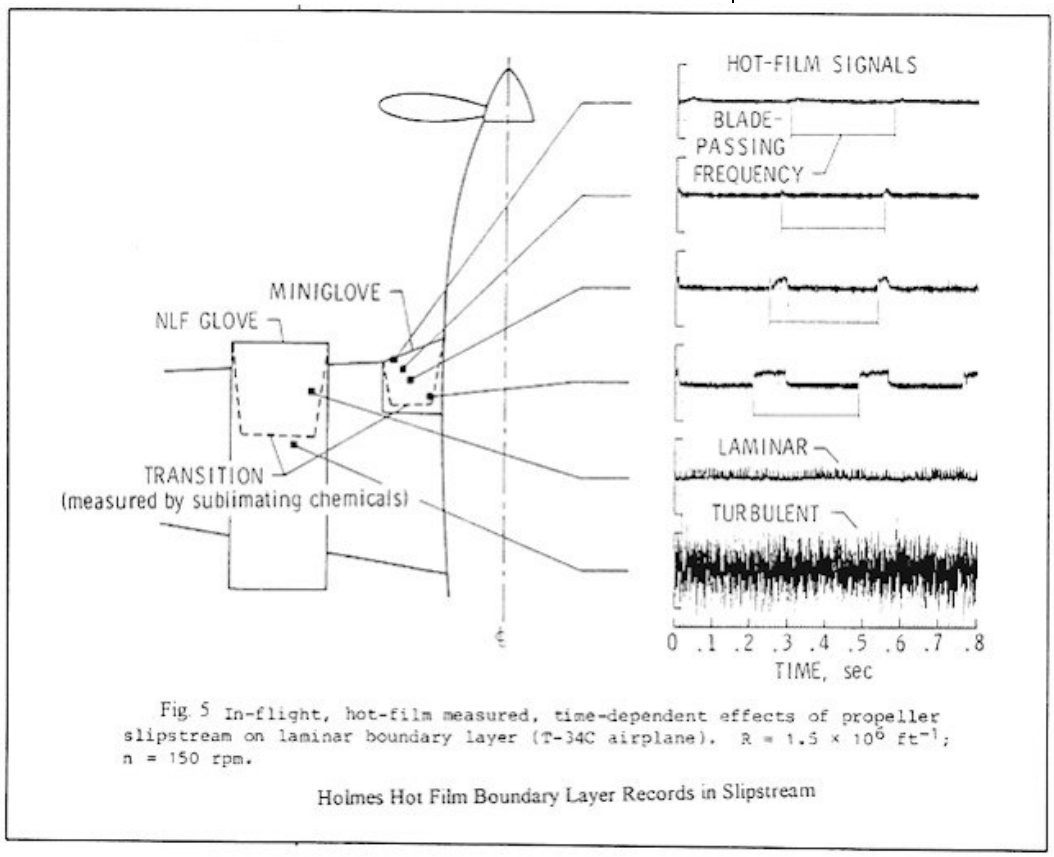


Fig. 5 In-flight, hot-film measured, time-dependent effects of propeller slipstream on laminar boundary layer (T-34C airplane). R = 1.5 x 10^6 ft^{-1}; n = 150 rpm.

Holmes Hot Film Boundary Layer Records in Slipstream

DISADVANTAGES OF THE PUSHER PROPELLER

The landing gear becomes longer to provide the same take off and landing angle as a tractor design. This is an even greater disadvantage when the propeller is placed behind the tail compared to a prop behind the pod or a pod and boom configuration. Powerful flaps reduce this problem.

With the propeller behind a blunt pod, the flow into the propeller may he uneven resulting in poor propeller efficiency. A shaft extension will improve the aft pod lines but adds weight and complexity.

A propeller behind the tail (a la Molt Taylor and Ed Lesher), gives the best chance for pusher propeller efficiency but at an additional cost in weight and complexity.

The tractor's slip stream benefit to rudder power when taxiing is reduced or lost. In restricting the center of gravity travel due to variable payload to values similar to a tractor configuration, added weight and wetted area may more than overcome any advantage due to a laminar forward fuselage.

A pusher propeller is more likely to suffer abrasion by ground objects kicked up by propeller blast and wheel strikes. Any item lost in flight goes through the prop. A pusher prop may suffer fatigue due to beating through an uneven wing and/or tail wake.

Most people would rather have the engine precede them rather than follow them in a crash situation

The external noise level of a pusher is greater than a tractor. Pushers may not fly faster than sound but they sure as hell sound faster than they fly.

CONCLUSION

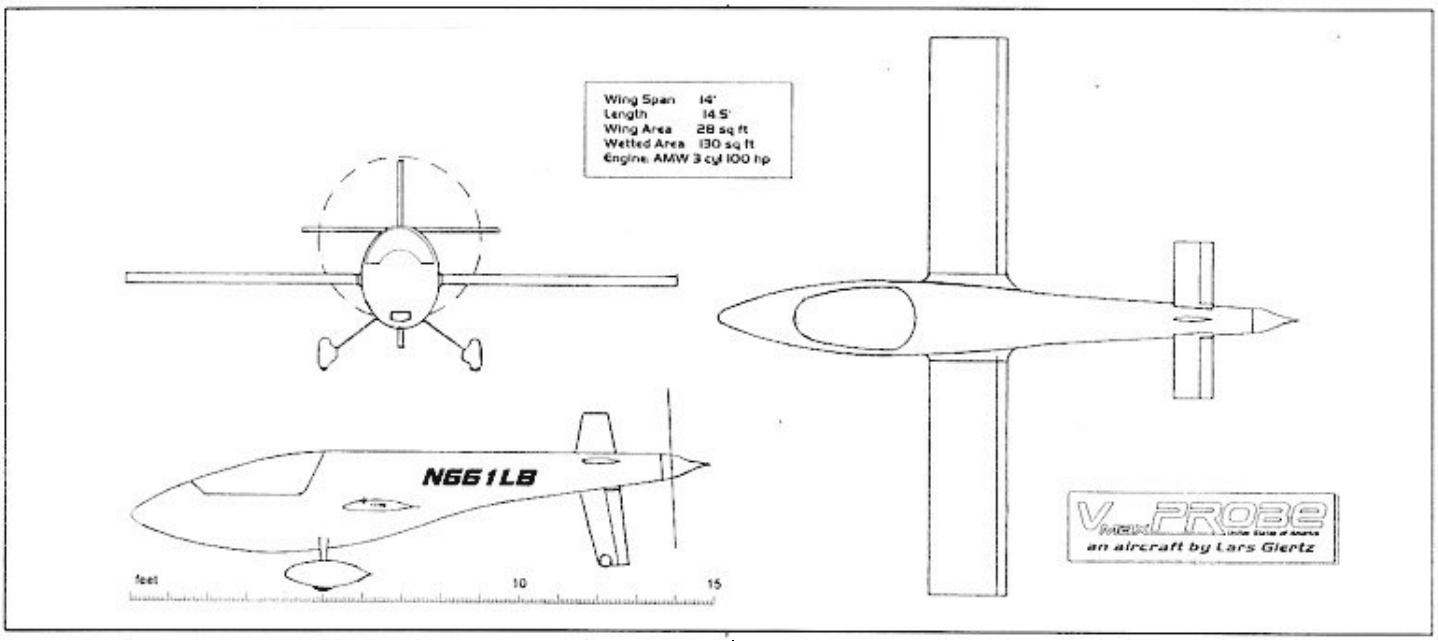
The majority of propeller driven aircraft are tractors for good reason. This is the way they work best. Almost all of the safety and practical considerations favor the tractor. Weight and balance considerations and landing gear design are much easier for the tractor. The net result of all aspects affecting flight efficiency also seem to favor the tractor in most cases.

Still, the possibility for increased flight efficiency with propeller behind the tail and more extensive laminar flow keeps the question open for a special single place record attempt aircraft. Someone will eventually build an aircraft closely resembling Lars Giertz's Vmax Probe and prove the point.

REFERENCES

1. Carmichael, B.H., “Laminar Lightplane-The Difficult Dream”, Sport Aviation, Aug./Sept. 1976.
2. Strojnik, A., “The S-2 Self Launching Sailplane”, Sport Aviation, April 1982.
3. Holmes, B., Obara, J., and Yip, L., “Natural Laminar Flow Experiments on Modern Aircraft Surfaces”, NASA Technical Paper 2256, June 1984.
4. Howard, R.M. and Miley, S.J., “Time Dependent Boundary Layer Response in a Propeller System”, Journal Of Aircraft, Vol 26, No 9, Sept. 1989.
5. Carmichael, B.H., “Meeting Mike Arnold and the AR-5”, Sport Aviation, August 1993.

6. Carmichael, B.H., "Getting to Know the AR-5", Kitplanes, October 1993.
7.Carmichael, B.H., "Drag Analysis of the AR-5", Contact Magazine, February 1994. Also republished in French Experimental Magazine, April 1995.
8. Giertz, L., "VmaxProbe", Sport Aviation, March 1997.
9. Carmichael, B.H., "Minimizing Fuselage Drag", Sport Aviation, August 1996.
10. Carmichael, B.H., Personal Aircraft Drag Reduction, 1996. For sale by author $25.
11. Terri, J., "Laminar Flow Fuselages, Do They Pay or Cost?", Sport Aviation, May 1997.



The group took a short break to stretch and have coffee and donuts, while Andy sold some raffle tickets.

When the group rejoined, Joe Lones told us about his experience with the government taking over one of his inventions a-la what happened to William Horton. Joe had patented a fire control system for the F-4 Phantom that would increase their kill probably over the MIGs. The patent was classified top secret, he was paid to launch the system and then all of a sudden the patent got published. Then the Navy said they can't use it now, but about 2 months later Honeywell got a contract to do the same thing Joe was doing. Unfortunately, Honeywell's system didn't work and never became operational. It turns out this came out during the Watergate investigation and it was disclosed the patent had been published at the direction of Richard Nixon after an under the counter campaign contribution by Honeywell.

Andy then introduced Bob Recks who had some information on low speed propellers like those used in the Gossamer Albatross and the Wright Brothers 1903 Flyer. Bob had come up with a print of the Flyer's propeller, but it doesn't have the specifications necessary for reproducing a duplicate. A group in Los Angeles is now testing a replica of the Flyer and this has spurred the San Diego Aerospace Museum to come up with their own replica and the subject of the propellers came up.

Since the museum wanted to make it an exact replica, including the propellers, Bob told them the aircraft wouldn't get off the ground with the heavier pilot due to the inefficiencies of the Wright designed props. So they now want to know how to find out how to make it more efficient while still retaining its original shape.

Since the aircraft used propellers that turned in opposite directions, the project will require making two master blanks for them reproducing a sufficient number of blades for the inevitable accidents. So now Bob is looking for someone in the San Diego to Los Angeles area that has a machine capable of producing blanks that are at least 51" in length. Once they get the blanks, there is someone in the local area who can then do the reproductions.

Bruce mentioned that Mississippi State probably had a machine, but it would cost some bucks to get the job done. Bob noted the museum doesn't have a lot of funds at this time to take such a route. Gene Larrabee noted that MIT had developed some propellers at about this length, but they were hand built versus using a milling system.

There was some more general discussion of different techniques for producing propeller blades, but none of them were really what Bob was looking for. So if there is anyone out there that knows of a machine that can handle making a blank of this size at a reasonable price (free preferred), please let Bob know. He can be contacted through the TWITT mail box.

With the meeting now almost over, the raffle tickets were drawn and Bob Chase left with a big bag of new, clean shop rags, Floyd Fronius took away a case of Penzoil 10W-40 oil for his leaking truck, and Bruce Carmichael was left with the personal alarm unit (fortunately batteries were not included so we didn't have to hear any test runs of the loud squeal it lets out). Now that this was done, the meeting was officially adjourned.