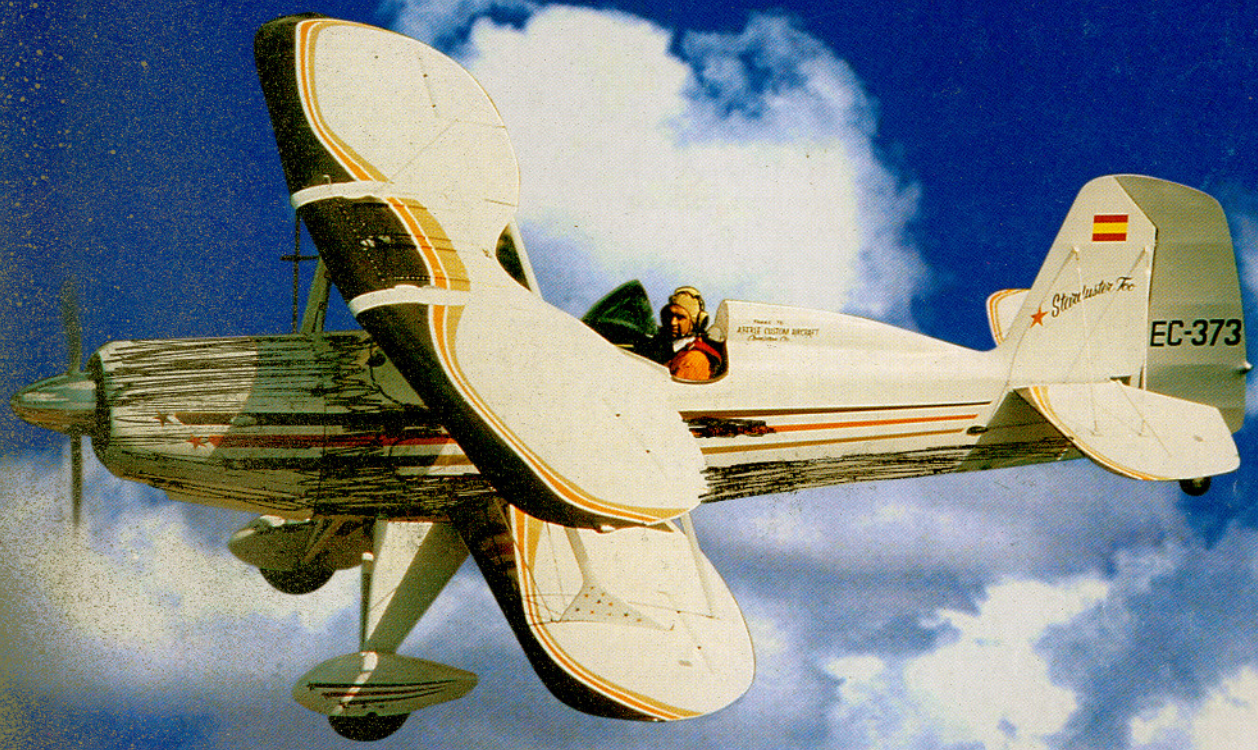
# The Starduster Magazine

*October 2000*

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The Starduster Magazine

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# Presidents message

*Les Homan, President, Starduster Corp.*

Here it is, slightly past time to get the message to Clay so he can get it in the Magazine. I was hoping to get it in on time, at least once.

I hope they do not mind but I am going to borrow a phrase from the National Biplane Association, State of the Biplane Nation. I will change this to State of the Starduster Nation. Has a ring to it, *State of the Starduster Nation.* Maybe it should read *world* in place of *nation*. At any rate it is concerning the rising cost of fuel. The best thought is to flying in sooner, rather than later. In some places we have it good, but in England they are paying over 5 dollars a gallon, if you can get gas. At the present time I am still getting gas at a low $ 2.29 a gallon. What a world away from the 40 cents it cost when I learned how to fly!

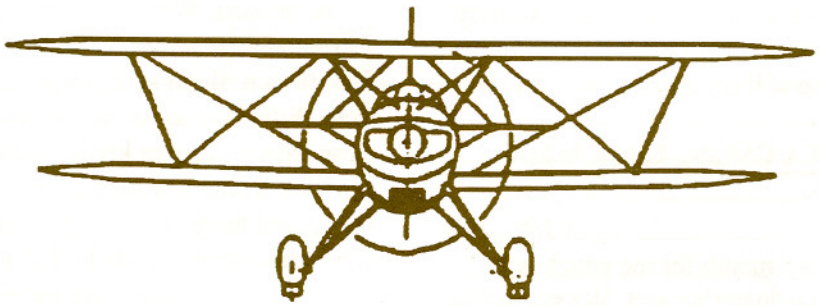
Something to consider about flying relates to the quality of time spent. Lots of flying is to a nearby airport or taking a friend up for a short flight. Think about the experience in an open cockpit biplane as compared to a standard manufactured aircraft. Look inward to your thoughts and see the smile on your face. Look at the passengers' faces light up and hear the joy and enthusiasm. You can get these actions in most aircraft, but in an open cockpit biplane it is maxed out. We need to enjoy and treasure these moments, they last a lifetime. Don't forget the old eagles when thinking of young eagles.

We want to thank Clay Gorton and Glen Olsen for all the hard work they have put in on this magazine. This will be their last issue and I know we will miss them. They will still be involved and we deeply appreciate it. We will be doing the next issue or two of the Starduster Magazine from Oroville. I only hope it can hold a candle to what Clay and Glen have accomplished. Thank You Very Much.

I visited the 75th year rededication of Flabob Airport on August 26th. Flabob was on the very edge of becoming a housing development when the Tom Wathen Foundation saved it. Their goal is to save Flabob and turn it into the Mecca of home built, steel tube, wood, rag and fabric type of aircraft—the things Flabob was famous for. It was a very special event. I was able to talk to many people I have met over the years, people I have only heard of and many new faces. There are some spectacular aircraft at this field.

We will be at the Copper State fly-in on October 6, 7 and 8th. By that time I should have over 300 hours on the V-6.

I once again want to thank Clay Gorton and Glen Olsen for their work on the Magazine and for all future help.



# Correspondence

Hi Clay,

I don't know if I have sent a picture of my Christmas banner towing Starduster Too. So, here is one. I would check my back issues except they are not unpacked from the move last year. I still need to expand my office in the shop. My wife keeps telling me I have more room than "her" house. She's probably right, but some of mine is taken up by the two cars. Gotta go, lots to do, and a new job to find.

Bob Rogers, Villa Grove, Illinois

(See photo, Vol. 28, No. 2, April 1988, p. 21)

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Dear Clay, 29 June, 2000

Gary and I got up this morning at 5:30 and headed down to the airport, scanning the tree-tops as we drove, looking for any hint of wind. Mike Sullivan, our friend, was waiting for us outside the hangar with his camera, ready to snap pictures for the history book (or the FAA investigation). The weather was perfect, and we climbed in the cockpits, started the engine, and began the long taxi out to the end of the runway. Gary had been very nervous about this first flight since restoration. I, on the other hand, figured the little Acroduster had flown before, so it should fly now. Well, throttle to the firewall, the tail came up, and, lo and behold, the thing flew. The wings didn't fall off, the gear didn't collapse, the engine didn't quit, and the pilot didn't go into hysterics. We only flew for 15 minutes. Just enough time to circle the runway a few times, and do a stall or two. We need to make some small adjustments to the horizontal stabilizer because it flies tail heavy, but all in all, it's pretty good. Gary made a pretty good landing, and after the adjustments, we will try it again. We WILL make Oshkosh!

Chris DeBaun, AKA C5Babe, Lakeville MN

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Hi Clay and Glen, 1 July, 2000

June has been a busy month for me which is bad for finishing my Starduster project. We started the month with an 8 day vacation in Chico, CA. Flew the Viking RAP to Twin Falls to Chico in about 7+30. While in Chico I had a great time spending the better part of two days at Starduster in nearby Oroville. I tried to see all the assembly jigs and processes possible and received a great deal of info from Ken and George on the construction processes. Many thanks to everyone there for their patience and understanding. We spent our last day there flying a day trip to Arcata, Ca., land of the Redwoods and IFR weather. The ILS inbound was a piece of cake even with a last-second-directed 1 turn hold at the outer marker. The departure procedure, however, was somewhat nervous since they turn you due west over water for 11 miles. We launched with 200 overcast and drizzle and climbed on top by 7000 feet, somewhat reminiscent of the old days of flying out of Vandenberg AFB aero club. Return to Chico was uneventful taking 1+05. The next day we were homeward bound making Chico to Casper in 4+35 and RAP in another 1+05. I'm putting up a heated 42x48 shop/hangar next to the house and the contractor had finished my retaining wall while I was gone. I spent the next week loading and hauling about 60 dump truckloads of gravel to fill the site. The floor will be poured Monday, assuming no more rain delays. I'm just finishing locating the plastic heat tubing which will heat the concrete slab. My Miracle Truss Bldg is due in about 1 Aug so hope to be complete by mid Sep. Plans are of course subject to change by my employer. As rumor has it I will be working in Oregon July and Aug. I got my cylinders back from ECI and the Cerminil looks great. I did have to buy one replacement cyl. since mine pulled threads when they unscrewed the barrel, something they fail to tell you when they sell you on the process. We just recently put a set on our T210 and they were 79/80 on all cylinders after the first 30 min. flight so I'm hoping mine break in as well. With the state of quality control on new parts these days you never know. We had first hand experience with a main bearing failure at 100 hours, and there is an AD on a large number of Continental crankshafts to drill and check for metal contamination. These days there are a small number of jobbers (3) who manufacture all the bearings and the story is the same for many other parts. I also got my Hartzel aerobatic prop back from a reseal and updated the bulletins. Bottom line is

99.9% of parts are in-house and will get back in formation as soon as the hangar is complete. This week the crisis to slow me down was a hernia repair needed because of a poor closure of last December's surgery. Oh well, like they say, may be next week, month, year? Hope to make Wautoma in the Viking again. Happy flying.
Dan Benkert, Rapid City, South Dakota

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Starduster Corp. July 5, 2000

We wanted to express our sincere thanks to Starduster and EAA Chapter 1112 for a wonderful weekend of 19-20 May! Special thanks go to George Frazier, Les and Mary Homan, Glen Olsen, Dave and Derek Harnacek, Wayne and Craig Ensey, and Ken Nowell.

These people really gave us the royal treatment. George, Les, Mary, Dave, Derek and Ken were wonderful at helping us with all our logistic concerns. George was particularly helpful and gave us a personal tour of Starduster while answering numerous questions. Wayne Ensey and Glen Olsen flew all three of us in their Acrodusters. They were also very patient in answering our questions. It was a particular joy for me to get my new wife up in an Acroduster. Lisa and I are now very excited to get back to work on our own Acroduster. Paul also really enjoyed his flight with Wayne Ensey.

In addition we enjoyed visiting with so many wonderful people from EAA 1112 and pilots from all over the Northwest. Thank you again for a fantastic weekend.

Chris Shearer, Lisa Shearer & Paul Henderson,
Edwards Air Force Base, California.

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To Glen Olsen, 5 July, 2000

We wanted to thank you again for all that you did the weekend of 19-20 May. Lisa, Paul and I had a wonderful time in Oroville. The formation flight with Lisa and Wayne Ensey was fantastic!

I also really appreciated the chance to talk with you so much. I enjoyed hearing your take on stress relieving of TIG welded clusters. Being an engineer, I have looked for a long time on definitive answers to that hotly debated issue.

I want to apologize for never sending you a thank you for the ride you gave me at Oshkosh in 1998. Soon after I returned home from that trip I had some serious family issues. But, I have great memories of that flight along with several pictures in my scrapbook. Thanks again for everything!
Sincerely,
Chris Shearer, Edwards Air Force Base, California

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Apreciado Clay: July 14, 2000

He visto tu traducción de mi artículo de la revista VOLAR y me ha gustado mucho. Muchas gracias, espero que los lectores no sean muy críticos conmigo. Tengo algunas fotos en vuelo, si quieres te las mando por correo, dime por e-mail a la dirección que debo mandártelas. Un cordial saludo.
Ángel, Madrid, Spain
(Translation)
Dear Clay,

I have seen the translation of my article from the magazine VOLAR and I liked it very much. Many thanks, I hope that the readers won't be too critical of me. I have some photos in flight, if you wish I will mail them to you. Please send to me by e-mail the address where I should send them. With cordial greetings,
Angel, Madrid, Spain

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Dear Clay,

Enclosed are the photos that I had promised of the Starduster in flight. As you will see, they are not too good because they are copies of transparencies, and have not turned out too well. Also, there are some defects in the paint job, since the builder and former owner, D. Blayse, sent me the airplane in a container very badly secured, with the result that the airplane during its shipment to Spain was banged about in the container and suffered some serious damage, among which was the rudder, which had to be replaced. (As you can see in the photo, it has not yet been painted).

That was really disappointing! I can't understand how someone who has constructed an air-

plane and who supposedly thought a great deal of it, would send it to Madrid by boat under such conditions. In addition, I had to pay the costs of shipping! Incredible!

At any rate, I will have to send you some new photos, now that I have it completely repaired. So, as soon as I get them I'll send them along to you. In the mean time, please accept my cordial greetings.

Angel, Madrid, Spain (See photo, Front Cover)

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Hi, July 30, 2000

My name is 2396X. I'm an Acroduster Too. I was conceived in Southern California in the 70's. My plans are serial number 91 and I think my original builder was named Robert Werth. I have an aircraft logbook that has a fuselage sign off "OK to paint" dated 7-21-77. After that, I believe Mr. Werth passed away. I sat for a long time collecting dust and changing hands, but nobody really worked on me. Finally I ended up in the rafters of a garage in Oakhurst, California.

One day in January of '98 a couple of fellows and a kid came around, looking me over. "Well," I thought, "Great! Here I go again." The next thing I know, I'm in the back of a pickup and then, BAM I'm hanging up again in a darn garage. But as things go, it turned out OK. My new owner started building my wings right there underneath me. The kid helped where he could and things moved along pretty well. Before long, the wings were ready to cover. They went to hanging from the ceiling and I was on the ground on my mains. Boy-O-Boy, was that a good feeling! Next came formers, tabs and all kinds of welding, powder coating, covering, paint, wiring..., the stuff goes on and on. But my new builder hasn't given up. The kid has grown up some. The builder's best friend helps out whenever he can. The wife pays the bills and is getting more nervous by the day. Maybe some day in the not too distant future, I will fly. Good luck to all.

2396X, Madera, California (See photo, p. 20)

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Dear Glen, August 20, 2000

My wife and I are first time builders of a Starduster Too and are really excited about the adventure ahead of us. What really makes it wonderful, (and a lot less scarey), is knowing that there are great people out there, Starduster builders and owners, that are just waiting for the opportunity to share some technical advice, or share a story or two! I've already found Starduster people to be the friendliest and most helpful.

One such couple is Mr. and Mrs. Maynard Ingalls, owner of N38PM. What a wonderful couple! We met them at Oshkosh and after a few moments, felt like I'd known them for years! Mr. Ingalls was so helpful and very encouraging. We spent a very long time going over his Starduster and talking of different options in the building process. Mr. Ingalls and his wonderful wife, Patty, invited us to come sit with them and enjoy his building experience by way of his builder's log and pictures! Man, what an education and eye opener, in just minutes! He also introduced me to another builder/owner, Mr. Gene Hudkins, N88H. Another fine Starduster person, that made my visit great!

We look forward to moving ahead with our project 'til we become active flying members of the wonderful family of Starduster builders. Just can't wait to fly in for an Oroville open house! Save a parking spot for me...mmm... A few years down the road! Thanks to Starduster and all the fine folks out there that fly them! Sincerely,

Gene & Terri Mitchell, Appleton, Wisconsin

(See Photo, p. 20)

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Dear Clay, August 30, 2000

One more entry for the question about landing a Starduster. I think I've finally figured it out, after confronting the issue every time I fly. Stardusters land like all other taildraggers. I first soloed 55 years ago, in a Piper Cub, and I've been flying taildraggers ever since. I know how to land a taildragger. I've been flying Stardusters for 28 years. I know how to land a Starduster. I know all about staying sensitive on the controls, flaring at just the right height, landing straight with the runway, keeping the stick back. All that stuff. I know all that stuff.

Trouble is, the dumb airplanes keep forgetting. My Starduster, for instance. I know exactly what to do, but the dumb airplane keeps forgetting. Every time I go fly it, I have to teach it all over again, and by the time I get it to remember what it's supposed to do, then I have to put it back in the han-

gar, and it forgets before it's time to fly again.

Since I have begun to realize that it isn't **my** fault but a severe learning disability on the part of the aircraft, I've had a lot less guilt, confusion, and concern about what went wrong. I hope this may be helpful to some of the other Starduster pilots who aren't quite sure why their landings seem inconsistent, either. It isn't our fault. Let's put the blame where it belongs—on the dumb airplanes that can't seem to remember what to do from one flight to the next. Cordially,

Veme Reynolds (Starduster 23 Skidoo),
Mt. Vernon, Washington

P.S. Oh, one more thing. I've concluded that airplanes are ground creatures. They like it on the ground. They don't like to fly. When they are forced to fly, they want to get back on the ground as soon as possible. They really don't care if they get bent up getting back on the ground, or whether anybody is hurt, or not. They just want to be back at zero altitude, with zero airspeed. Notice it the next time you're in the air. Turn off the switch that makes the engine run, or try to make it do something it doesn't want to do—like fly upside down a long time, or even fly really, really slow for quite a while with the stick all the way back. You'll find out in a hurry that the airplane tries real hard to get back on the ground as soon as possible. Remember, bent is o.k. with the airplane. Even shedding some skin and having busted-up parts bouncing around the landing area is OK too. They just want to be on the ground.

L.L.R.

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Dear Clay, September 3, 2000

The attached photos are of my Starduster SA100, built by John Snyder of Richardson, TX in 1994 and acquired by me in November, 1999. I left the airplane in Texas over the winter and flew it to my home in Central Michigan in March of 2000. The airplane has a Lycoming 032-E2D with 2028TT 128SMOH on the engine. The airframe has 128TT on it with just over 40 hours flown by me since my bringing it to Michigan. I rebuilt the lower panel in May, 1999 and installed a KY97A and a Terra TXP ACK blind encoder. This small project gave me a real appreciation for the quality of work done by Mr. Snyder and the perseverance that all homebuilders must have to complete their projects. My hat is off to you!

Since getting back in the air after the panel rebuild, I have been concentrating on the IAC "Basic Sequence" and am finding that even without an inverted system the SA100 does a credible job. If there is interest, I would be glad to do an article for the magazine about my ride home from Mesquite, Texas to Mason, Michigan. It was quite a trip!

Joseph Pirch, Okemos, Michigan

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Dear Fellow Building Enthusiasts,
September 11, 2000

This is just a short follow-up report concerning my SA500 Starlet. I was recently (because of Glen Olsen's help) able to rent a hangar at Bountiful Skypark Airport and with the extra room, things are moving along much faster now.

I bought the pre-bent plywood leading edge for the wings from Ken at Starduster, and they have turned out really nice. I should be putting fabric on this week.

I will be using a warp drive three-bladed prop on my O-235 engine, and for the next several months will be installing all the plumbing and electricals.

It's been a really good soaring season, and I have had many super soaring flights to date. I am hoping to have my Starlet flying by next spring, and then maybe I can have the best of both worlds!!!

Happy building—and safe flying to you all.

Richard Bean, Salt Lake City, Utah

(See photo, p. 20)

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Dear Mr. Homan August 19, 2000

Mid July, my wife Terri and I visited Oroville, with a visit to the Starduster Works our prime objective. I was met by Katherine Soudan, and Ken Nowell. I found both to be so very pleasant and helpful I have had in mind to build a Starduster Too for a very long time, but have had many things getting in the way. Now is the time to start and Ken was very gracious in putting up with all my questions and a very good tour guide, as he showed me around the shop. My interest and excitement only grew as Ken showed us the different components and walked us through the steps of the

building process. You have two great people there in the office to take care of "Newbies" such as myself! Thank your folks there, for making our visit better than I could have imagined. My adventure has only begun, but I am even more confident that there will always be someone there to field my silly questions, or to lend a helping hand. Thanks again to Ken and Katherine for their great attitudes and wonderful personalities!

I'm sure I'll be talking to you all very soon. Thanks again, And Let the Adventure Begin! ! !
Sincerely,
Gene & Terri Mitchell

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Ken, August 24, 2000
Do you guys sell any copies of the Starduster History that Dave Baxter wrote? I'd like to get a copy. By the way.. that tailwheel you sent me is GREAT!! much better than the Maule I had on it.. thanks
Gary DeBaun, Lakeville, Minnesota

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Dear Ken, September 22, 2000

It was nice meeting you and given the tour of Starduster. It certainly looked busy. I wish I had a little more time there to look around. I forgot to ask you if you know any Starduster or Acroduster owners that are giving flight instruction in the Southern California area? Good Luck at Oshkosh.
Sincerely;
Carl Robinson

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Ken, September 22, 2000

What a hoot!! Thanks for sending me the pictures from the Fly-In!! I really like your creative angle, shooting down on the wing pattern and at sorted people, including the belly shot! Tell Les he wins, but not by much!! Two more doughnuts, and I'll have the Championship. The picture of the accumulated judges is also neat to have, and I wonder how the judging went for the show. I've not heard anything about the winners, and I could not pull up any news from the www.net If you know any of the particulars, I'd appreciate a note from you.

I have worn my Starduster Golf shirt, the first one I've ever had...and it fits well. I was surrounded by pretty ladies, trying to rip off my clothing, but I was too quick for them... Thank you for your gift. I was happy to have Skidoo on display at your tent, and it was good to get to know you and Les and Mary a little bit better. I look forward to more time in your company. I know you'll be leaving for Oshkosh soon, and I wish you well. Clay Gorton has told me he and Glen are leaving next Monday in the Acroduster. I won't be there this year, but one of these days, I'll suck 'em up and take off cross country.

It looks like I may buy a Creampuff Cessna - 140 tomorrow, which means I'll have to sell my Creampuff Aeronca Champ. Having three airplanes is a little hard to explain to most people, especially to my lovely bride, Carole. She already thinks I'm a tad touched. Thanks again,
Verne Reynolds, Mt. Vernon, Washington.

(See photo, p. 21)

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## Stardusters in the News

Gary and Chris DeBaun have a write-up in the September 2000 issue of *Sport Aviation*, p. 83 about the reconstruction of their classic prototype Super Starduster II. (The ID for this model was later changed to Acroduster Too). Congratulations to Gary and Chris on a great find, a great buy, and a great restoration!

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Among the Arlington 2000 award winners for Custom Built—Plans was Wayne Ensey, of Albany, Oregon, who was awarded Champion 1 for his Acroduster 700. Congratulations Wayne!

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An article appeared in the *Alaska Flyer* on June 9, 2000 showing a picture of the nearly-completed Starduster Too, built by Tom Belleau, an Anchorage resident and retired airline pilot. Tom started the project 30 years ago, but at a mere 74 years old, he'll have plenty of time to enjoy the ultimate in general aviation. Word has it that he may fly the periphery of the lower 48. (He'll probably run into Oscar Bayer going the other way).

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# Oshkosh/Wautoma 2000

by Glen and Clay

Every trip to Oshkosh is a unique adventure. This is the sixth year in a row that Clay and I have traveled together to Oshkosh. This trip, however, was the least adventurous of all—35 MPH tail wind all the way out, and 10-15 MPH tail wind all the way back. We must be living right.

Our route to Wautoma included fuel stops at Rawlins, Wyoming; Ainsworth, Nebraska; and Mason City, Iowa. With the boost from our strong tailwind we landed at Mason City at 2:00 PM, leaving an easy leg of 1 1/2 hours to Wautoma. However, with no hotel reservations in Wautoma for Monday night, we elected to stay the night at Mason City. Mason City, although very hospitable, is not the most exciting place in the world. However, the level of boredom was completely erased when Glen, trying to call Loretta, accidentally dialed 911. All of a sudden our hotel room was swarming with police. We had no idea what we had done or why we felt that we were on the verge of being taken into custody, until the cause of the problem was identified and we were found to be innocent of any major infraction.

As we approached Mason City we tuned the radio to 122.8 and heard the familiar voice of Oscar Bayer taking off from a strip in Minnesota enroute to Wautoma. (He probably had a reservation for Monday night).

When we landed at Wautoma on Tuesday morning, the only airplane without training wheels on the field was Oscar's Duster. We were kindly received, as always, by the FBO folks at Wautoma. Improvements continue at Y50; the FBO office has been improved, and Denis Winter, the new proprietor, has a lot of good help. The FBO went the extra mile, providing hamburgers, etc. for their guests each day. Dick Larson again acted as the unofficial Starduster host and opened his hangar, with stocked refrigerator, to all the Starduster people, all of which made our stay most enjoyable.

We spent Wednesday and Friday at Oshkosh, which included a visit to the Air Museum to check out the Joe Ruddy Memorial Starduster Award Trophy, which was displayed inside the back cover of the April 2000 issue of the Starduster Magazine. We would like to assure everyone, especially Hank Schmel, that the trophy is well cared for and is on display in an ideal location in the main entrance to the Museum.

Glen has volunteered to bring the trophy up to date by adding plaques for the Grand Champion winners at Oshkosh and Wautoma each year since the trophy's inception in 1983. Oscar Bayer has volunteered to attempt to identify the previous award winners, and we're sure that he would appreciate any help that he could get. If anyone knows of the award winners for any particular year, please contact either Oscar or Glen.

We stayed at Wautoma on Thursday awaiting the arrival of George Hooper, who, with only 150 hours under his belt, soloed his Starduster N23UT all the way from Salt Lake to some place in Minnesota, where he picked up a college buddy to accompany him to the convention. George received the award this year for the longest distance flown to Wautoma. (He beat us by about five miles).

As opposed to the 90°+ weather of last year, this year was pleasantly cool and cloudy. Not cloudy enough to deter the aerial activities at Oshkosh, but it hampered much of the flying at Wautoma. Steve Niec gave his usual crowd-pleasing performance at Wautoma, laying smoke screens during his graceful barrel rolls over the runway.

Most of Saturday was spent relaxing and telling lies in Dick Larsen's hangar and enjoying the remainder of the Stardusters as they flew in. Bill and Brenda Clouse brought their motor home and joined the Starduster group this year. We talked with Bill for hours; he is a wealth of information and so interesting.

Les and Mary Homan and George Frazier came in from their booth at Oshkosh to prepare for and conduct the Starduster Awards Banquet. This year the banquet was held on Saturday and prepared by the FBO folks at the airport—a cook-your-own one-pound steak dinner!

The award winners recognized at the banquet were Galan Michael, Edwardsburg, MI, Grand

Champion; Bud Fritchley & Gene Glackman, Evansville, IN, First Place; Glen Olsen, Salt Lake City, UT, Second Place; and Max Bennett, Buffalo, NY, Third Place. (See photos p. 19).

Additional awards were given to Denis Winter, Wautoma Airport FBO Mgr., Starduster Support Person; Farthest Distance Travelled, George Hooper, Salt Lake City, Utah; True Grit, Clay Gorton, Bountiful, Utah.

In addition to the above award winners, the following pilots flew into Wautoma Y50 for the Starduster fly-in—Oscar Bayer from Arroyo Grande, CA, and his son, Tim, from Boise, ID; Gary and Chris DeBaun, from Lakeville, MN; Galen Michael, Edwardsburg, MI; Phil Miller, Thorpe, WI; Steve Niec, Clio, MI; Gregg Reinoehl, Reelsville, IN.

In addition, Les Homan flew his Chevy-powered Starduster in from Oshkosh for the Saturday banquet. In addition to Les, others who flew their Stardusters into Oshkosh for judging and display were Gene Hudkins, Navaire Beach, FL; Maynard and Patty Ingalls; and Don Mather, Sandusky, OH.

Our plan was to fly Young Eagles on Sunday. However, on the first flight of the day, while doing some aerobatics with one of the FBO guys, I lost the alternator, regulator and ammeter, which ended our plans to fly Young Eagles. Being Sunday, all we could do was to charge the battery, acquire a spare battery charger to take along, and leave for home. We turned the master switch on only for takeoffs and landings, and used hand signals for communication en route.

The return route of flight was Mason City, Iowa; O'Neal, Nebraska; Alliance, Nebraska, where we spent the night, recharged the battery and visited an antique shop, where I discovered that a small mirror that I have, which has a picture on the back of a lady drinking a Coke, is valued at from $500 to $1000.

On the leg from Alliance to Rawlins, we tried an experiment of instrument flight in a VFR airplane. We found it possible to maintain direction and level flight by using only the GPS and the altimeter. Keeping the altitude constant, along with keeping the CDI centered and maintaining the bearing and track constant, we were able to maintain stability under the hood for as long as twenty minutes, or until we got bored, whichever came first. We caution that this is not something that you should practice in IMR conditions. (Just having fun). (If anyone wants to know what we used for a hood, we used our hat—with the bill forward in the conventional way—and ducked down below the edge of the cockpit).

After landing at Rawlins for fuel we had an easy flight following Highway 80 between the mountains to Salt Lake City. Home at last!

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## Fools Rush In—

By Verne Reynolds, Mt. Vernon, Washington

"O.K. You own it. Again. Now what?" With a tangle of emotions, I had just signed the check and had the keys again. My airplane. Starduster Too, Two Three Sierra. Santa Paula. A low overcast morning with no prediction of rain, but an hour's flight and a mountain pass to cross before I could touch down at the Santa Ynez airport, where my hangar waited for the homecoming.

I had owned 23 Sierra before. Then, five years ago, I sold it to a low-time pilot who had his own dream of goggles and scarf and the rush of wind. He learned to fly it and enjoyed his ownership, right up to the frightening moment when he blew a prop seal on downwind at Santa Paula. His windshield covered with oil, he leaned into the slipstream to see the runway. Suddenly his goggles were covered, too. He struggled to maintain control and got it on the ground, all in one piece. The airplane had no major damage, and he had no broken bones, but he had just run out of cope. With rubbery legs, he stumbled down from the cockpit and vowed to never fly it again. He called me, with his offer to sell.

And now I had just repurchased my old friend, 23 Sierra. It had been cleaned up, with a new prop seal, and I was anxious to get the bird back to

Santa Ynez. My window of opportunity was narrow. Today was the day, even though I had hoped for better weather. The winds were stiff, out of the north. I had not flown the Duster for five years, even though I was current in a Cessna 120. 1 didn't like the idea of landing at Santa Ynez for the first time in a strong crosswind, so I planned to shoot a couple of landings at Camarillo where they had wide runways, before heading up the coast and over the 3,000 foot San Marcos pass.

A full tank of gas gave me a comfortable margin of safety, and my takeoff seemed a little rusty, but close to normal after all these years. Then, Murphy's Law kicked in. I turned on the radio. Silence. Something was dead, and I had no way to fix it—no way to communicate. That ruled out my practice landings.at Camarillo, so I picked up some altitude and headed for Santa Barbara. From there, I could turn inland, but the overcast had a bunch of low clouds at 3,000 feet, and I had to get above that to clear San Marcos before I could lower down over Lake Cachuma. I knew the territory well. I knew what was under me, even as I flew above the broken cloud layer. Safely on the valley side, I was grateful for familiar landmarks to show up, pointing me toward the lake. I breathed a glad "Amen," and turned my attention to the next episode.

The static system had been replumbed since I last owned the bird, and I had been informed that it flew much faster with new fairings. True enough, the airspeed indicator read 140 instead of the 120 that I remembered from my previous time in the same cockpit. "So," I thought, "that's fast enough for a loop from straight and level...let's go for it!" I had enough altitude, so I cinched up my shoulder straps and pulled back on the stick. WOW! Way to go! Up we went—and over on its back—and then we ran out of steam in a hurry. Mush...stall... flop...get the nose down...recover...try to figure out why 140 wasn't enough, anymore. Had I gained that much more weight? Let's try it again. This time with a little more airspeed, and a little more attention to detail, and a little better loop, but still too soft at the top. We're not flying through it...we're mushing through it. O.K. At least we still remember what ought to happen. I began to wonder if the airspeed was right, after all. But that could wait. Right now, we have to land this beast at Santa Ynez and it's pretty turbulent out here at 2,000 feet. "I wonder what it's like at the airport...?

In the pattern, I thought it a little strange that I saw no other traffic. And then I noticed two things that didn't make me happy. First of all, a right hand pattern for runway 8 was called for instead of the customary 26, where I would have been much more comfortable. The second jolt came with the condition of the windsock. It stuck straight out like a piece of stove-pipe, with nearly gale force winds blowing straight across the runway, and there's only one runway at Santa Ynez. No chance to land any direction except East, with that heavy wind from the North. At least it meant a left wing low approach, and I usually slipped to the left, if I had a choice.

So I set up my approach with a long final and flew down the runway at about 10 or 15 feet, with that left wing down and full top rudder—and I was still drifting to the right. My puckering string really tightened up, and I figured I'd best go fly around a while, hoping for the wind to die down, believing it couldn't get much worse. It just **had** to get better!

I left the pattern and went out to the usual practice area, testing the airspeeds I had been wondering about. I flew straight and level, did some stalls, rehearsed landing with that giant slip I knew I'd need pretty quick, watched the airspeed and figured I was getting some false readings. But the Duster was flying the way it used to, and I was getting more and more confident that we were still on good terms, even though I knew an airplane will kill you without hesitation if you provoke it or abuse it. Like a performing circus cat, it can revert to wildness in an instant of distraction. I knew that. And I went back to the runway to test the winds.

Still strong. Gusting. I didn't know the speed of the wind, but it was dancing a garbage can down a row of hangars. I kept thinking of a great line from the movie, Waldo Pepper, when Waldo's friend described his reaction to some trial wing-walking with the memorable phrase..."I didn't like it. Much." Well, I didn't like the cross wind much, either, so I made another pass at the runway. And then I went back to the practice area and made up some pilot prayers about getting on the ground alive and without having to rebuild an airplane that I had now owned about an hour and a half. So I

flew around, sucking up my resolve. I knew I was getting low on fuel. Not out yet, but I never liked the feeling of being out of fuel unless I was tied down inside a hangar. I figured I had two more passes left before I was dry, so I flew the pattern and knew it had to be a landing, either this time... or the next time for sure.

I made a long final, dipped the wing, held top rudder, angled across the runway into the wind as much as I dared. It settled, drifted, settled, then plop, squeak, bump, bump, squeak, squeal. We were down! Straining to stay straight, we turned off at the first taxi way and headed for the hangar. Turned off the switch and coasted to the hangar door.

Sometimes, in jest, I had crouched and kissed the ground at the end of a flight. But that was to amuse other people. This time, I crouched and kissed in simple gratitude. By the time I had wiped the sweat from my upper lip and steadied my nervous kneecaps, a small cluster of pilots arrived to announce they had been watching the airshow (and probably making bets on the outcome). They helped me put the bird away, then straggled off to other duties, leaving me with the Starduster and the young fuel truck attendant, who with wide-eyed astonishment asked me if I knew what the winds were when I landed. I told him I had no way of knowing and asked if he knew. He said he was in the airport office when I landed and had looked at the wind guage.

He reported that the wind was steady at 30 knots, with gusts to 35. Maybe he lied. I don't know. But I know I haven't duplicated that landing since then. I don't even want to try.

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## First Flight - Super Starduster II N5462

by Gary DeBaun, Lakeville, Minnesota

Well, it's been 11 months since that gal drove thru Wautoma with that smashed-up Acroduster II tied down on the back of a trailer. She'd bought it at the junkyard in Oshkosh for $2000 cash. She said she'd be back next year... and she would fly in with that same airplane. Most of you there probably said "Yeh, right lady, hehehe... no way." The wings were toast, the gear was broken, there was lots of fabric and sheetmetal damage and there was no engine or propeller. One year? I don't think so...

On June 29, my wife, Chrissy, tightened her seat belt/shoulder harness up in the front cockpit and said "Hey! Let's Fly! We only got three weeks left." I slid into the back, strapped myself in and fired her up. 212 horses were roaring to go. It was 5:30 am.

At the end of the runway we did a short run-up, checked the controls one last time, flipped on the boost pump and pulled onto the active. Power up, on the roll, stick forward, tail up... tracking straight as an arrow... 50-60-70- there goes my headset... there goes my hat... 80, she's off... a little forward stick here... hmmm, a little left aileron.. 120 mph IAS, all engine instruments looking good, no time to find the headset but I know its still in the airplane cause I had it plugged into the panel. Shallow turns in the pattern, climb to 3000 AGL. Watch the instruments, all OK except oil temp which is already 190 F. Check the wings, flying wires, look at the tail.. check the fuel vents... look thru the bottom lexan panel for signs of oil leakage. Listen to the engine, the wind... feel the airplane... feel the airplane... listen to her.

I see Chrissy turn around, she is wondering why I am not talking to her, then she realizes my headset has blown off. After leveling off at 3000, I scan the instruments again. The oil temp has pegged out. I checked the CHT, she's only at 350 degrees and the oil pressure is a steady 70 psi.. I'm sure it is a gauge problem but do not want to take any chances. I do a quick stall check and a little slow flight to feel the little biplane... talk to me babe, tell me you are not going to smash us in the ground unexpectedly on landing. She feels pretty good. Descend into the pattern, oil temp back to normal, fly the downwind leg at 120, onto base at 110 and roll into final at 100 IAS. Get your head over, Chrissy, I can't see... Hey! I yell above the

noise! Get your head out of the way!! Finally I poke her in the sides and she understands. Over the fence at 100, slow to 90 and that's it... now just feel her... the mains touch, a little forward stick to keep them there, dance with the rudder, power back, tail down... don't touch the brakes... WOW, I can't believe it... almost like speed brakes when the power comes off. We turn off the active at the second turn-off at mid-field. Just like riding a bike, you never forget... It's been 10 years since I sold my Miniplane, but I never lost the feel...

She did not fly hands-off, as a matter-of-fact she was WAY out of trim. On opening the engine cowling there was no smell of hot oil, only the normal gurgling of fuel in the nozzle lines. No oil leaks, no fuel leaks. We got us a biplane!! We WILL make Oshkosh/Wautoma.

Over the next few hours we tinkered, we had some scares along the way, and still have a wing tank that will not drain into the main tank. She now flys with only light finger pressure, the oil temp runs a nice 215 on a hot day and everything seems to be a GO and we are looking forward to seeing everyone at Wautoma.

A few notes here: you will notice on the side of the airplane it reads "Super Starduster II." Most of you will say hey! It's an Acroduster II. This was the prototype, built back in '72 by Morgan Schrank out in Calif. Morgan and Lou Stolp designated this aircraft as *the Super Starduster II,* or SS2. I felt obligated to keep the name and the N-number original although we elected to go with a different paint scheme.

My heartfelt thanks to Ken and Les at Starduster, and to all the guys who frequent the Starduster Website Forum (too many to list, but you know who you are). My biggest Thanks goes to Chrissy, my wife who's motto is "You can never have too many aeroplanes"... what a gal!, eat your hearts out guys... (See photo, p. 21)

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## Engine Installation Procedure

by Ron Powers

from *The Starduster Magazine*, April 1977

When I built my Acroduster Too, there was one area in which very little information was available to the builder. That is the engine installation. With that in mind, I will attempt to describe my methods.

The engine installed on my Acroduster Too is a Lycoming AEIO 360 AID. This is a special 200 H.P. acrobatic engine with a forward facing fuel injector on the front of a special oil sump with all the necessary fittings to install the Christen inverted oil system. Essentially a normal 200 H.P. with a hollow crank for a constant speed prop.

The first step is to install the firewall. Be sure to get the firewall centered, and to get a straight line along the top from the aft instrument panel to the nose.

The engine mount was purchased from Stolp Starduster. The engine is offset for torque, and it looks as though building the mount might have been a little complex and time consuming. I also bought the Lord mount rubbers and bolts from them.

Next, the engine was bolted to the mount. If the fuel injector is installed on the engine, the fuel line to the fuel pump will have to be disconnected in order to get the engine on the mount.

Now the nose cowl can be centered on the prop flange. Use wooden blocks, and tape, or wire, to hold it. Always remember as the cowl is built that the left rear cylinder sticks out a lot farther than the right rear because of engine offset. Also remember to leave about an inch clearance between the cowl and the engine all around, because the engine will move a lot when running.

It is a good idea to have the intake and exhaust stacks installed during engine hookup and cowl installation; also the starter and alternator, if they are to be used, and the fuel injector.

The aluminum channels can now be installed to hold the nose bowl. Keep the two top rails high

enough to be able to get at the top plugs, and the bottom two low enough to get at the bottom plugs, To get a nice smooth curve you'll have to run the side cowl down to the bottom of the firewall, which is about at the bottom engine mount attach point.

Builders' cardboard can be used to make the patterns for the cowling. The total product should look very much like the plans sheet no. 41. The screw spacing can be 4" on the top and bottom cowls, with 6" spacing for the DZUS fasteners. No screws are required in the front of the side cowl. The Dzus fasteners should be strong enough if installed thru the bottom channel aluminum. A piece of 3/8 aluminum tube should be riveted to the inside of the bottom cowl for strength. Install the tube about halfway between the nose bowl and the firewall, and from one bottom channel to the other. This will prevent the bottom cowling from buckling during some snap maneuvers.

A flange at the aft side of the bottom cowl is recommended to help prevent any overheating problems.

To help strengthen the nose cowl at the attach point of the bottom cowl, and to make installation easier, pop rivet the nut plate to a 1/2" strip of aluminum, and pop rivet the aluminum to the inside of the nose bowl.

When the cowling is complete, remove it, and begin the engine hookup.

First, install the engine baffling. Starduster makes up an excellent set which only needs trimming to clear the cowl. Here again, make about an inch clearance.

Then pop rivet a two inch strip of baffling material to the baffling. This is to seal the baffling to the cowl.

The baffling was designed to accommodate the oil cooler at the left front, but this is also an excellent place to install an air cleaner, such as is installed on a Cessna 180. Use flex duct down to the fuel injector. The oil cooler can later be installed on the engine mount to the left rear.

In some areas of the country the FAA may want an alternate air source. One solution is to build a box. I installed a door on the outside, to prevent any accidental air blockages. A spring can be installed in the cockpit to help hold the door shut.

Next, the engine controls should be installed, because the fuel lines and inverted oil lines are more flexible, and can be routed around the engine controls. I used a CHAMP type throttle and carb heat set. With this type of installation no reversers are required between the throttle, mixture, and carb heat and the engine.

Starduster sells a very nice throttle linkage cable. Remember to clamp the throttle cable to each tube it passes, and no sharp bends. Two brackets will have to be made to hold the engine controls to the sump.

Now the inverted oil lines can be installed. Be sure to use the Christen instructions while assembling the inverted system. The oil separator can be installed on the firewall for a cleaner installation than if attached to the engine mount. Remember again when installing all lines that the engine moves a lot when running. Leave room for the lines to flex. Also clamp all hoses to prevent chaffing where they may touch some metal.

The fuel lines can next be installed. If you have a Lycoming Operators Manual, forget the picture in the back of the book showing the RSA-5AD1 fuel injector. The fuel inlet and outlet holes are mislabeled. The fuel pressure connector should be on the top, and the idle cutoff is backwards.

The main fuel line should run from the flop tube in the fuel tank to the tank selector #1 side of the Christen pump, then from the pump outlet to the engine driven fuel pump, and from the engine pump to the fuel injector. The fuel pressure line is taken from the top of the fuel injector for a manual instrument, and not from the fuel distribution manifold on the top of the engine. A line must also be run from the engine fuel pump to the fuel tank return, as illustrated in the April '75 Starduster Magazine.

Be sure to use bulkhead fittings going thru the firewall with all fuel and oil lines. Stainless steel is very sharp if a hole is just drilled in it. So drill about a 3/8 and then take a rotary file in a drill and file the hole to the correct size. The hole will be neat, and much smoother. Again, use plenty of Adel Clamps with rubber cushions to make sure the lines don't chaff.

When planning the location of the firewall for the gas and oil lines, keep in mind that these lines

may have to be replaced in the future, and they should be installed in a location where they can be reached without removing a lot of other equipment.

The instrument hookup can be next. I used a combination oil pressure and temp and fuel pressure guage to save space. The fuel pressure line can be run parallel to the fuel line to keep all fuel in one location. The oil pressure attach point on the engine is hidden near the right upper engine lord mount. A hose can be used to the firewall, with aluminum tubing back to the instrument, in all pressure lines. The oil temp bulb is too long to fit in the back on the engine. So either take three oil temperature bulb adapters and ream the hole large enough for the bulb, or build an adapter as Pitts does. The oil temp line will still be too long, so coil it behind the front instrument panel out of sight, instead of behind the engine on the firewall. The tachometer cable will have to be made to order, and should be run as straight as possible, which is difficult with the gas tank directly behind the firewall.

The mags can be wired next. The newer mags have an automatic ground when the terminal is removed from the back. If shielded wire is used and installed on the terminal to the mag, the clearance is so close that it will probably still ground the mag. So use the shielded wire from the mag switch to just in back of the mag to prevent chaffing in the fuselage; but use only the wire into the mag terminal. One wire is required from each mag to the switch, with a short ground wire at the switch.

The oil cooler installation was saved for last because it blocks a large area of the left side of the engine mount, and it would have been difficult to install some of the lines with it in place. Some left over aluminum angle can be used to make a bracket to attach the oil cooler to the engine mount. A 2-1/2" can be cut in the left rear engine baffling. A flange to hold the flex duct to be used to rout air to the oil cooler can be made by cutting about a 10"x2" piece of .025 aluminum. About 1/2" from one side drill 1/2" spaced 1/8" holes the full length. Then wrap the strip around a can and pop rivet together. Then flange to the drilled holes. Make a box over the oil cooler. This will insure that all possible air will be directed over the oil cooler. Now the two rubber hoses can be connected from the cooler to the engine. The Lycoming Operators Manual is correct on the illustration of the oil cooler hookup. The line to the cooler connects directly below the oil temp hole, and the other above and to the left. I've noticed that many Lycoming engine installations have the cooler on the left rear engine baffle. It would make for a cleaner installation. However, I don't know how well they cool the oil.

If no electrical system is installed, it is still possible to have the convenience of a starter for those days you want to fly alone. An external plug can be installed at the rear cockpit. Then, when the engine is started, there will be no need to get out to disconnect the plug.

A Ford type solenoid can be mounted on the firewall near the right bottom cowling channel. One battery cable is run from the external plug to the solenoid, and from the other post of the solenoid to the starter. Be sure to use grommets when passing the wire through the firewall. One post of the external plug is a ground, and can be grounded to the fuselage near the plug. Next, a wire, about the same as the mag wire, is connected from the external plug to the B post on the mag "START" switch. Then from the S post a wire is run to the starter solenoid. Now you have a starter without the weight of the battery, alternator, and extra wire.

Sometimes electrical problems are encountered if the engine isn't grounded. So remember to run a ground strap from the engine to the engine mount or firewall.

This engine installation has been run about 100 hours, trouble free. There have been no overheating problems despite flying 4-6 hours a day in 100 degree weather.

# Open Cockpit Biplanes

Jerry A. Smith, Rhinelander, Wisconsin

There was something missing in my flying history. My father had often talked about his first plane ride—in a Jenny. He also talked about Wacos and Stearmans. I had a lot of tailwheel time in T-Crafts, J-3s, 180s and a few more unusual planes, such as a Warner-powered Fairchild 24 and Beech 18-S, flying sky divers. I own a Maule M-7 235B, but had never experienced the enjoyment my father talked about in his memories of open cockpit biplanes.

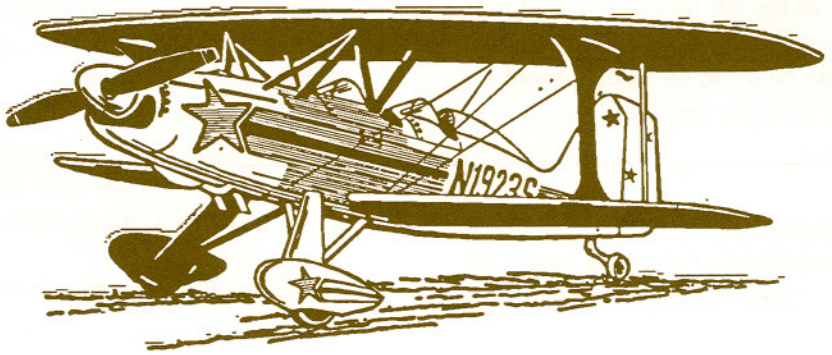
In March of this year my father-in-law called and told me about a friend of his who needed to sell just such a plane down in Kansas. In April we drove down from northern Wisconsin and had our first look at N78TK. The owner, in Riverton, Kansas, seemed quite attached to the white biplane with the big green shamrock on the side, but for personal reasons he needed to sell it. He readily demonstrated the plane's flying capabilities with loops and rolls, and seemed a part of the plane as he glided through the maneuvers. We then looked over the plane and discovered the unique lines of the nicely built and maintanined 1978 Starduster Too with the name "Irish Too" adjacent to the shamrock.

The biplane was built by a Delta Airline pilot in Altanta, Georgia named Tom Kilkelly, who won an award for workmanship in 1979 at Tullahoma. A picture of the biplane was published in the January, 1980 *Sport Aviation* for that honor. As far as I can tell from the records, Tom Kilkelly kept the plane until 1991, when it was sold to Bill McConnell in Salem, North Carolina, who then sold it to Jon Mason in Mt. Vernon, Missouri, in 1992. Jon then sold N78TK to Chet Morton in Riverton, Kansas in 1997, who added about 150 hours to the craft, leaving a total of just over 500 hours as of April, 2000.

Well, you guessed it—we bought the biplane and prepared to fly it home to Rhinelander, Wisconsin. Chet spent the insurance-required hours with me and we practiced takeoffs and landings on his little grass strip near his home. My wife and children headed on for Wisconsin as I practiced and that night we met in Ames, Iowa. From there we re-met at Owatonna, Minnesota for a respite at Cabellas and from there on home. It was a little chilly as the trip progressed northward, but it was a truly unique and marvelous experience—just as my father had described.

After taking out the old inoperative Val radio and Flybuddy Loran, I put in a KX155 with VOR. It was then time to head back South in July for my first fly-in over Ripon and Fisk to Oshkosh. Once again my wonderful wife and children drove in, and we met representatives of the Starduster Magazine. We missed the fun of building N78TK, but we aren't missing the fun of flying it! It is still in original condition, well maintanied and upgraded a little, as needed. Thanks, Tom Kilkelly.
(The Smiths are keeping the beautiful little Starduster Too pointed to the sky and exciting others with an open cockpit biplane).

(See photo, p. 21)



## From the Cover of *AIR NEWS, New England*, Autumn 1999

Cover and Title Page Photographs are from Homebuilder Phil Hax, originally from Wallingford, CT and show Young Eagles Flights performed in his 1974 Starduster II on skis from his home in West Burke, Vermont.— **Congratulations Phil !!**

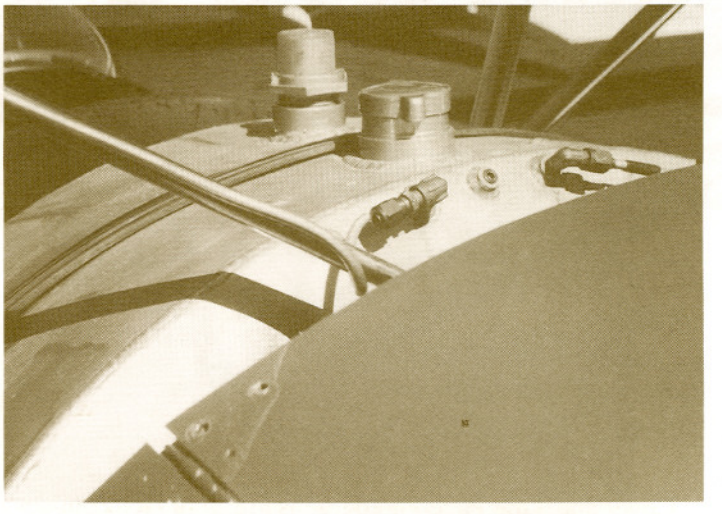
# Emergency Landing

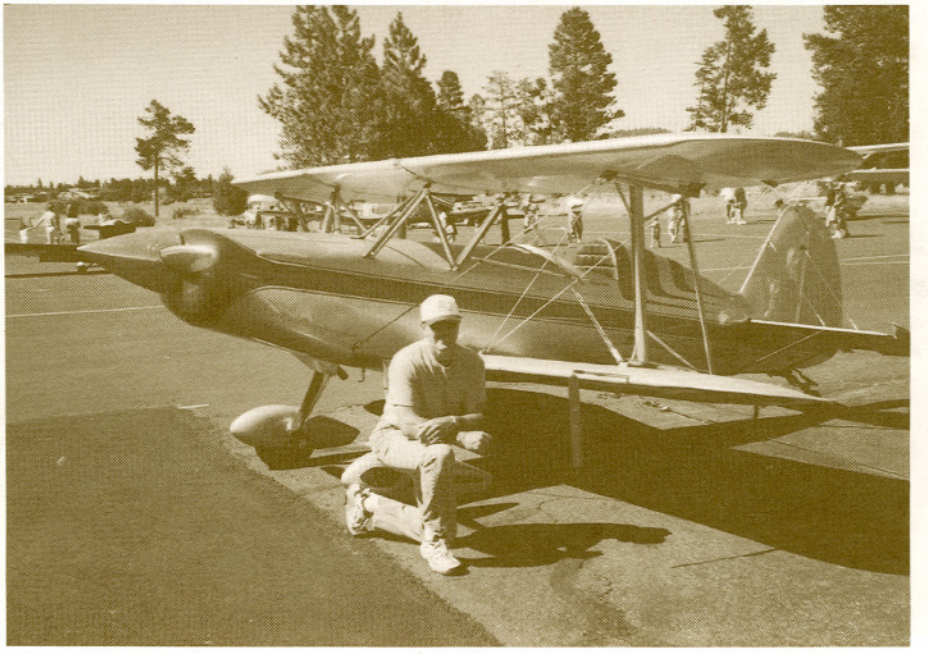
by Mike Mattei, Bend, Oregon

The reason why I am writing is to share an emergency landing I made at Sun River, OR on July 1. After flying over a car show at the city's request, I did a sharp pull-up and banked to the right. The sudden odor of fuel filled my nostrils. As I began to look for the problem, my cockpit began to fill with fuel. I looked down at Hwy 97, but too much traffic. So I decided to try for Sun River. A lot of fuel on my floor boards now. Called Sun River and explained the situation. I dead-sticked 'er in to Sun River, made the runway, and to my surprise, every emergency vehicle was present.

After breathing a mist of oxygen for about half an hour my lungs and throat opened. Enclosed are some photos of what I found—A broken inverted upper vent line. It snapped at the fitting, creating a pressure difference which pushed the fuel over the tank and into the cockpit—a lot of fuel! So please check your vent lines for vibration and tight bends or any wear.

I fixed it on Sunday and flew—you know, you've got to get back in the saddle.





# Award Winners - Oshkosh/Wautoma 2000

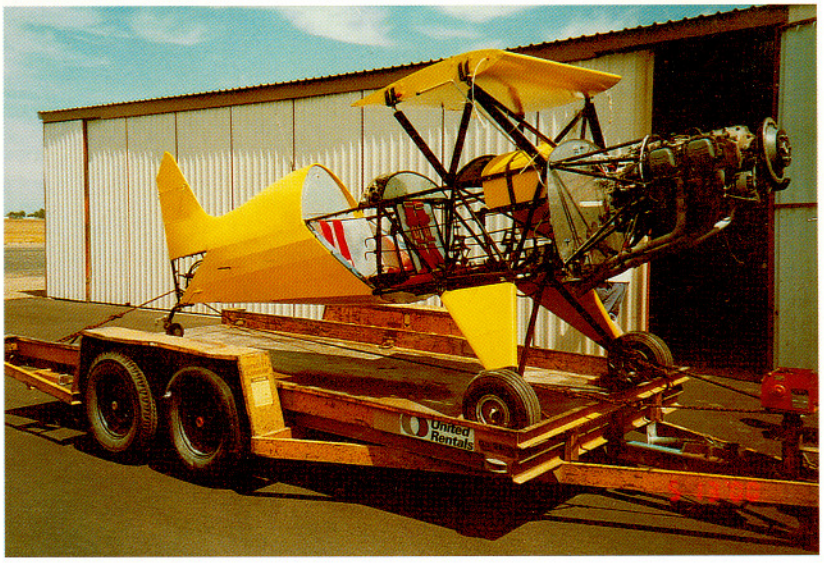

**Grand Champion N54GM**
**Galen Michael**
**Edwardsburg, MI**

**First Place N54MM**
**Bud Fritchley & Gene Glackman**
**Evansville, IN**


**Second Place N34LG**
**Glen Olsen**
**Salt Lake City, UT**

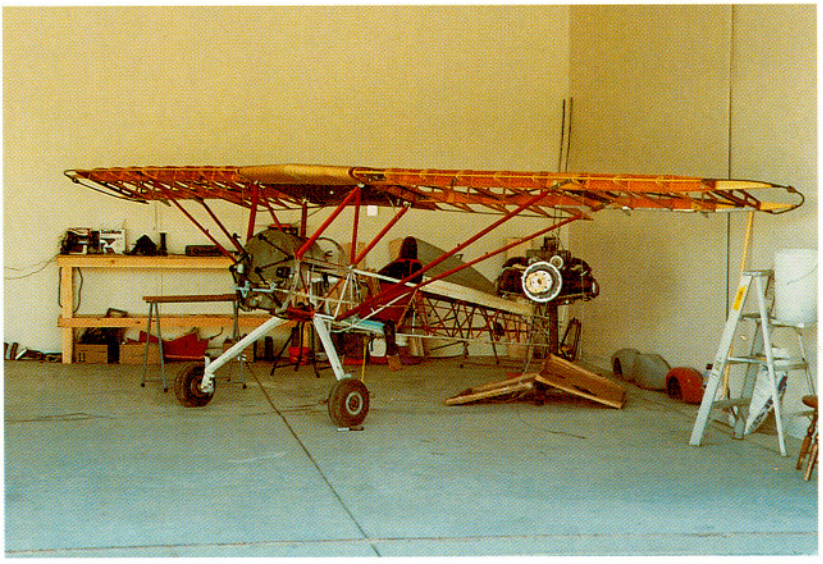
**Third Place N76GS**
**Max Bennett**
**Buffalo, NY**

**M2396X**
**Madera, CA**




**Maynard & Patty Ingalls**
**with**
**Gene & Terri Mitchell**

**Starlet SA500**
**Richard Bean**
**Salt Lake City, UT**



**Verne Reynolds**
**& Les Homan**
**N1923S at the**
**Arlington Fly-In**

**Gary & Chris DeBaun**
**The "Original"**
**Super Starduster Too**


**SA300 N8TK**
**Jerry Smith,**
**Rhinelander, WI**

**"The Gang"**
**Oshkosh 2000**


**"The Weather"**
**Wautoma 2000**

**"The Toy's"**
**Joe Wiegand**
**Santa Rosa Airport**

## Where Do You Put Your Eyes When You Land a Starduster? Cont'.

*Is there anyone we haven't heard from?*

Hiya Clay and Glen,

I've enjoyed reading the "How I Land My Starduster" series over the last several issues. Thought I'd put in my two cents worth of limited experience (30 hours in her at this point).

We're usually doing about 140 on the 45 to downwind, when we hit the 45/downwind intersection I rack her around pretty tight to establish the downwind. This showboat maneuver makes the engine roar and forces everyone to look up. (Ah, I'm just a showoff at heart). Turning on the boost pump, I slow her to 120 on the downwind, always looking for traffic, when I am 90 degrees to the end of the runway I reduce power and slow to 100 IAS. At this point we are still at pattern altitude (1000 ft AGL). Using a sweeping turn and a couple of swivel heads (me & Chrissy) (traffic ya know) I hold 100 until established on final while every now and then glancing through our lexan panel in the belly so's we don't land on top of some high wing airplane that we didn't initially see.

Upon rollout to final, I tell Chrissy to move her head to the right... so's I can see the runway. I hold 100 until I cross the threshold, then slightly reduce the power keeping the tail up and simply "playing with and feeling the airspeed." As soon as I feel the mains touch I pull power all the way off and dance a little with the rudder to maintain a straight tack down the centerline, all the time repeating to myself "power is your friend, power is your friend" (in reference to if anything goes wrong...add power to straighten her out or go around). MAN, when you pull the power off on this baby it's like speed brakes. I continue pushing forward on the stick as airspeed quickly bleeds off and the tail gently comes down on its own. With your new tailwheel installed, it's such a nice soft feeling! At this point I simply use peripheral vision to keep her straight. No brakes are applied until we are ready to turn off runway. I never 3-point. I feel I have MUCH better visibility and CONTROL of the airplane on landing when I wheel her on. I still am able to stop in about 1800 feet on concrete. We should point out that our airfoil is 100% symmetrical, thus a little speedier on landings.

Well, that's it..she's a real THRILL RIDE!! Chrissy & I love it and we'll keep her till the day we die.

Gary & Chrissy DeBaun, Lakeville, Minnesota

## Eric Shilling Joins "STARDUSTER"

From *The Starduster Magazine*, April 1975

One of the nicest things about being in the homebuilt aircraft business is the high quality of the people you come in contact with. This holds true for our STARDUSTER employees, as well and for our customers.

Coming to us as General Manager direct from Flying Tiger Airlines, is a gentleman from Virginia, Eric Shilling by name, who is extremely well qualified to assist our customers with any problems they may have. In June of 1941, after 4 years as a fighter pilot with the U.S. Air Corps, Eric joined the American Volunteer Group, under General Claire Chennault, and thus became one of the original Flying Tigers. In fact, Eric was the first "Tiger" to paint a shark's mouth on his P-40. General Chennault saw the design, liked it, and made it into a group insignia.

After serving with distinction in the Flying Tigers, Eric flew the Hump from India to China for the remainder of WW 2. After the war, he flew as airline captain for Civil Air Transport (China), Swissair (Zurich, Switzerland), and as chief pilot for Bird & Sons, Inc.

In the field of sport aviation, Eric has built and raced at Reno a Cassutt racer and is currently finishing up a Steen Skybolt. He has done an extensive amount of test flying, including the complete flight test program on the Acroduster 1. The results of this program was an article by Eric, in the March 1974 issue of "Sport Flying." He has had extensive acrobatic experience, and is the only pilot currently qualified to fly airshows in the Acroduster 1. His airshow routine includes Lomcevaks, and he is proficient in entering and recovering from flat spins, either upright or inverted.

Eric is a veteran pilot of 23,000 hours, and holder of a commercial license with an airline transport rating, for C-47, C-46, DC-4, & DC-7. He also holds a SMEL helicopter roter craft rating and a commercial instructors rating.

"STARDUSTER" is very glad to welcome Eric Shilling to our organization. His knowledge and experience will be a valuable asset to our business and to our customers.

**Eric Shilling and P-40, Kun Ming, China, April 1942**

*Photo by Clare Booth Luce*

# Acrobatics in the Acroduster Too

By Eric Shilling
from *The Starduster Magazine*, January, 1977

Several Acroduster Too builders have asked about entry speeds for various acrobatic maneuvers. I have flown Gaff Mueller's Acroduster Too, which is one of the original prototypes. I might point out that, first of all, Gaff's airplane has wings with a slightly different airfoil than those built from the plans. It is more of a high speed laminar flow airfoil than the airfoils used on subsequent ones. This, and weight, will probably account for whatever differences you may find between my numbers and yours. Here they are.

I have found that 140 MPH was the lowest entry speed at which a decent loop could be accomplished. At 140 MPH, and using a 3g pull up, a nice round loop could be accomplished. More or less g's result in a sloppy or incomplete loop. At higher entry speeds 4g's appeared to give the best results. 6g's caused a speed bleed-off more rapidly than when using the 4g pull. I therefore think that the 4g pull is optimum up to 180 MPH.

Induced drag is a function of angle of attack. For speeds higher than 180 MPH a higher g loading may be used to attain a higher speed in a vertical roll, or increased speed at the top of a loop. One must always keep in mind, however, the envelope in which the plane was designed to operate, and NOT EXCEED IT.

In regard to buffet, the wires on this airplane were slightly loose, and would vibrate when pulling high g's. Check for this, and tighten, if necessary. It would buffet when pulling too much g's, such as one may do at the top of a loop and when descending in the vertical position. You must relax back pressure approaching the top of a loop, and also not pull it in too much at the start of the down vertical.

If you do pull too tight you will get buffet, and it goes without saying that your loop would not be round.

On the min entry speed, it means that it is just barely acceptable, but will give a good idea as to the envelope, or starting point for the maneuvers.

Some pilots have suggested that the buffet may have been due to the large canopy. I am more inclined to think that it is associated with the high speed stall warning on aircraft with this type of airfoil.

As more Acroduster Toos begin flying, I hope to be able to compare figures with other builders, and thus accumulate more accurate data for this model airplane.

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# Microbursts And Other Thunderstorm Nastiness

By Linda D. Pendleton, Manager of Computer Graphics and Animation for King Schools
from www.AVweb.com

*Even though fall is fast approaching, thunderstorms are still lurking out there over the horizon. They bring with them some of the nastiest weather a pilot and an aircraft can ever confront, including the sometimes-mysterious microburst. As AVweb's Linda Pendleton writes, we can't stay on the ground every time a thunderstorm pops up. But we can learn how to avoid their nastiest characteristics, including the microburst.*

I cut my teeth as a pilot in the Midwest—the Chicago area to be exact—and I learned lots about weather during those days.

Among the things I learned is that 97 percent of weather is safely navigable (by a qualified and current pilot in a properly-equipped airplane, but that's another subject for another article), and the important part is staying away from the other 3 percent because it's definitely going to turn you into a statistic. The obvious safe way to approach this subject is to never fly when there is a chance of unpleasantness in the forecast, but as those of you in the Chicago area know, had I done that I'd probably still have about 300 hours.

From March through October there were usually thunderstorms somewhere in the Midwest and although most of those tended to be of the isolated-to-scattered air mass type, they can still pack a punch. I've seen the isolated magnificent specimen climb 60,000 feet into the sky and just dare any puny airplane to come visit. One of the best things about thunderstorms, though, is that they don't sneak up on you like other nastiness such as airframe icing and fog can do. It's pretty hard to be stealthy when you're 10 miles tall and putting on a light show that can be seen for miles!

**Where Do Microbursts Hang Out?**

We've all been taught not to fly into cumulonimbus clouds and I can't imagine any pilot among us who would do that—at least not willingly! True, some are suckered in by embedded thunderstorms, but that's not common since most try to remain VFR around the larger TRWs so we can see what we're flying into. You can encounter plenty of unpleasantness outside of the main cloud of a thunderstorm, however, and one of the most sinister of these is the downburst or microburst. Some refer to this as wind shear and, when I taught at Flight Safety, we used to refer to it as wind shear training, but wind shear is a bit too general and a bit too benign a term for the airplane-slapped-out-of-the-sky chain of events unleashed in a microburst.

**What Are Microbursts, Anyway?**

So, what is a microburst, anyhow, and what causes it?

Basically, microbursts are just parcels of cold air rocketing down out of a thunderstorm. The late Dr. Theodore Fujita of the University of Chicago defined microbursts as downbursts from a thunderstorm that are 2.2 nm (4 km) across or smaller and are from five to seven minutes in duration. Dr. Fujita studied the 1975 Eastern Airlines (EAL) Flight 66 crash at JFK and determined that it was a microburst that had downed that flight. The EAL 66 accident and an Allegheny crash at Philadelphia in 1976 were the beginning of the recognition by the aviation community that thunderstorms might pack a far more powerful punch than was previously appreciated.

The FAA responded to this threat by developing the Low Level Wind Shear Alert System (LLWAS) in the late 1970s. LLWAS consists of a network of anemometers (wind sensors), which are strategically located on and around the vicinity of an airport to measure the speed and direction of wind. The data collected by the anemometers is transmitted to a master station (typically located in the control tower) which detects wind shear or microburst conditions. Once the system detects a wind shear or microburst, warnings are presented to controllers who in turn relay the messages to pilots approaching or departing the airport.

**The Holes In The Net Are Too Big...**

The LLWAS is still in use today, but microburst encounter events have shown that, although we built a net to catch these little devils, we made the holes too big! On a July day in 1988, there were several thunderstorms in the area of the Denver Staple Airport. This is not an uncommon event in the summer in Denver. Also, there were several United Airlines flights in the area. This also is a rather common event in Denver. The airport was equipped with a LLWAS. Also, the FAA was testing the new Doppler radar at an Air Force base southeast of the airport.

Several flights operating in the area that day reported some pretty scary microburst-related events. One pilot reported that he had initiated a go-around and had takeoff power established for 55 seconds before the aircraft began to climb. (That HAD to be the longest 55 seconds of his life). Another pilot reported a 65-knot airspeed change. Now during the whole time these incidents were going on, the LLWAS reported a maximum of 15-knot gusts. The sensor towers were far enough apart that the microbursts snuck in and were not detected. The Doppler radar being tested, however, recorded the 65-knot speed difference across the core of one microburst. Clearly, LLWAS is not a panacea and, while it does work in the area immediately near and on the airport, the system does little for planes and crews on approach or maneuvering in the terminal area.

**...But, What Causes A Microburst?**

The short answer is: thunderstorms. You're already aware that there are severe up- and

downdrafts associated with cumulonimbus clouds. It's this air movement that allows hail to form. The warmer water droplets from below are swept above the freezing level by the updrafts. As the water freezes, it begins to fall again until caught in another strong updraft. The size of hailstones reaching the ground is a pretty direct indicator of the strength of the thunderstorm. It takes some pretty strong updrafts to lift pieces of ice the size of tennis balls back into the upper levels to let them accumulate another layer of ice.

Once the thunderstorm reaches the mature stage and the rain begins to fall, the stage is set for a microburst. As the rain falls it is usually accompanied by a downdraft. As this rain-laden air begins to fall, the rain begins to evaporate. This evaporation cools the air further. The colder and denser air now accelerates towards the ground. Upon ground contact, the air spreads out in all directions. Characteristic patterns can sometimes be found in vegetation struck by a microburst—the plants will be flattened out away from the center of the ground strike as though a bomb had burst in the center.

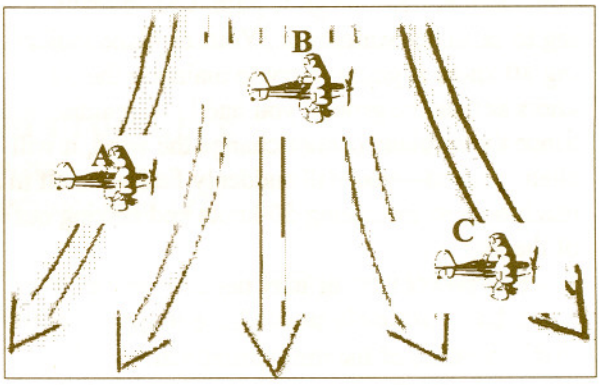
**So, What Makes These Things So Dangerous?**

What makes microbursts so dangerous? Many things, not the least of which is that they have the potential to swat airplanes out of the sky. Piston-powered airplanes seem to have a slight advantage since they do not experience a power-lag or spin-up time on the engines as do turbine-powered machines, but they usually also have less power and less inertia to start with than does turbine equipment.

One of the sneaky things about microbursts is that if you're a little short on situational awareness, the apparent performance increase that can be the first sign of a microburst in progress is sometimes ignored and the flight presses on to further danger.

Take a look at the graphic to the right. This is the classic microburst diagram we've all seen. Notice the airplane at position A. It's just beginning to feel the effects of the outflow from the microburst. This sudden increase in headwind will cause an apparent increase in performance. The airspeed will increase, the rate of descent will decrease and the almost overwhelming urge of a pilot at this point is to pull the throttles back and push the nose over. Bad mistake. This is the time to get out of Dodge. Microbursts are like everything else associated with thunderstorms—there's no way to judge how bad they are from looking at them and by the time you find out just how bad it is, it's too late. The proper action at this point is to push up the power and abandon the approach.

If you press on, you will find yourself at position B in the graphic. You will fly out of the headwind and into the tailwind. The suddenly decreasing headwind and increasing tailwind will cause degradation in performance equal in magnitude to the increase experienced at point A. You can see that if the headwind portion of the microburst caused a 30-knot jump in airspeed you're now going to lose 30 knots. If you pulled the throttles back in response to the headwind increase, you'll be in real trouble now. This is quickly becoming an unrecoverable situation




When all the talk about wind shear started in the late 70s, I had a real problem understanding how this happens. After all, we've all had it drilled into our heads since that first hour of dual that airplanes only "feel" wind on the ground and that once you're airborne the airplane moves in concert with the air mass it's in. We've been taught to apply windspeed to airspeed to arrive at a groundspeed figure. The thought that wind could have an effect on airspeed was a hard one to swallow—and still is for many

**Oh, No, Not A Physics Lesson...**

The physics of wind shear can be a bit daunting, but if you just get it into your mind that in this instance the response of your airspeed and groundspeed is going to be the reverse of what you would

normally expect, I think you'll see why these localized phenomena are so dangerous

If you fly into a microburst the first indication, as we discussed above, can be an apparent increase in performance. To put it simply, the airplane tries to maintain its same speed across the ground. Inertia keeps it from adjusting quickly so the increasing headwind calls for an increase in airspeed to maintain the ground speed. So far this doesn't sound too dangerous, and it isn't—unless you press on. Then things get pretty scary pretty quickly.

If you fly through the headwind portion of the microburst you come to the point (position C in the graphic) where the headwind decreases and quickly becomes a tailwind. Now your airplane, not knowing this is a wind shear, just tries to keep its speed across the ground from changing. If you have responded to the headwind portion of the shear by reducing power and pushing the nose down to maintain the glide path, you're really going to be in hot water now. Your airplane indicating 80 knots is going to try to maintain the 50 knots across the ground you had been maintaining. Since the airplane cannot change the wind, it will change speed—you will suddenly find yourself in a machine now indicating 50 knots and sinking out of the sky.

Full power may or may not save you at this point, but it probably would have if applied at the first indication of the microburst activity.

**...Escape Maneuvers...**

Once you are in the grips of a microburst, the maneuvers required for escape may seem extreme, but they are your only hope. Apply full throttle IMMEDIATELY and pitch up to a climb attitude—or an attitude that will arrest your rate of descent. You may have to fly on the edge of a stall—in a jet, you should pitch up to the point of stick-shaker activation—to escape. It's best to think of this maneuver as an escape maneuver so you don't confuse it with a normal go-around or missed approach. This is a far different and more critical maneuver and you are trying to escape danger, not simply abandon an approach. This is not the time to be "smooth and gradual" in your application of power—firewall it! If you escape the microburst you can worry about your engine later!

**...The Key Is Avoidance**

The key to successfully dealing with microbursts is awareness and avoidance. Be aware of the weather conditions that can cause these powerful phenomena and avoid them at all costs. Remember, an escape maneuver may or may not work. Luckily, thunderstorms are not too stealthy and there are usually ample warnings that they are in the area. **Some Tips**

Here are some DOs and DON'Ts that may help you deal with this weather:

- DO get a thorough weather briefing including the possibility of convective activity.
- DO watch the temperature/dew point spread. Microburst activity is more common and more severe with large temperature/dew point spreads. (The falling rain has more opportunity to evaporate and cool the descending air.)
- DO maintain visual conditions any time thunderstorms are in the area.
- DO perform an escape maneuver any time you think you may be dealing with a microburst.
- DON'T fly under ANY thunderstorm any time for any reason!
- DON'T fly under the overhang of any thunderstorm. • DON'T fly into or near a rain shaft.
- DON'T fly under virga—that's a built-in microburst

DON'T depend on the fact that the flight that landed before you didn't report any problems. Remember, microbursts have a short life span and it may not have been there when he passed by. Also, they're relatively small—his flight path may have been offset enough to miss it. Also, he may just be too scared to talk!

Thunderstorms put out some of the most dangerous flying weather that can be found, but luckily we are able to see and avoid them also!

# All About Streamline Tie Rods

by Bob Whittier, EAA 1234, Duxbury, Mass

Reprinted from *The Starduster Magazine,* Jan. 1992

Our daily lives are full of commonplace items—paper clips, sandpaper, steel wool and thousands of other things we take for granted. How are they manufactured in such quantities and with such uniformity? You can lie awake for many nights on end trying to figure out how some of these common items are made, and not come close to the correct answer!

Then when you have an opportunity to visit a factory in which such a product is made, you discover that the process used is basically very simple. So simple that you are a little disgusted with yourself for not having guessed at how it is done! Nevertheless, although the methods are simple in principle, on talking to factory people you discover that a great deal of effort went into devising the methods and perfecting the processes involved. It's like that with the streamlined tie rods used in the rigging of biplane wings. I learned recently upon visiting the Macwhyte wire products factory in Kenosha, Wis. Basically the operation is about as simple as putting wet clothes through a wringer. But the more I saw and the more I talked with the gentleman who guided me through the plant, the more I realized that I had stumbled upon a fascinating story. Since small biplanes are of such great interest to EAA members, here it is!

About a dozen years ago, the manufacture of streamlined tie rods was in danger of slipping into the realm inhabited by the making of buggy whips and wooden automobile wheels. Nobody was manufacturing biplanes anymore and the business had dropped off to the point where there was only a small demand for short tie rods used to brace tail surfaces and sometimes wing tip floats on flying boats. The advent of the cantilever monoplane further reduced the market. The Macwhyte Company, a division of AMSTED Industries, was seriously considering phasing out the tie rod operation.

Fortunately at just about that time, Grumman came out with its AgCat crop dusting biplane and Macwhyte decided to hang on for a while longer. Then something else happened that nobody could really have foreseen—the biplane came to life again! Not factory-built ones, to be sure, but small ones built by individuals in their garages and basements for sport flying. More and more, the Mac-Whyte people found themselves receiving orders from all parts of the country for tie rod sets for a variety of popular small biplanes. It was the importance of streamlined tie rods to sport aviation that led me to visit this factory to see what tie rods are all about.

Kenosha is a medium-sized manufacturing city of 78,700 persons on the shore of Lake Michigan. The Macwhyte establishment consists of several buildings on both sides of 14th Ave. On the east side of the avenue are several large buildings which house the firm's wire rope manufacturing division—representing by far the largest bulk of their business. On the west side of the avenue and in the center of the block is the firm's office building, flanked by parking lots. I entered this and presented myself to the receptionist. I had an appointment with Robert B. Whyte, Jr., superintendent of the company"s Fabricated Products Division.

As Mr. Whyte and I walked one hundred yards south to a building on the corner of the block, I noticed the name "Macomber and Whyte Wire Rope Company" carved in the stone arch above the doorway to one of the wire rope buildings. To make small talk, I asked if the name "Macwhyte" was coined from those two. Mr. Whyte confirmed this and gave an interesting account of how the company was started and how it found itself in the business of making, among other things, streamlined tie rods.

According to him, streamlined tie rods were first made in Europe during World War I. In those days the European aircraft industry was somewhat ahead of our own, and when we got into the war, representatives of our aviation industry were sent over there to learn as much as they could in order to help increase the output and quality of warplanes we planned to build in large numbers. This state of affairs affected one member of the Macomber and Whyte staff.

Mr. Whyte explained that his uncle, George S.

Whyte, came to this country in 1883 from Crossgates, Scotland, with his parents and seven younger brothers and sisters when he was 16 years old. By 1896 he was a young man and together with F. B. Macomber, founded a small sales agency for wire rope. The business grew and by 1901 they were manufacturing wire rope themselves. Macomber left the company in 1915, after which the firm name was changed to Macwhyte in 1920. When the United States entered the war, the company began selling wire rope to the booming aircraft industry.

The Whyte family had kept in contact with people back in Scotland, including persons associated with Bruntons, Ltd., a wire rope manufacturer in Musselburgh, Scotland. They learned that Bruntons had developed streamlined tie rods for British military aircraft.

Realizing that such rods would be of great value to the fledgling U.S. aircraft industry, a brother, Robert Burns Whyte, Sr., went to Scotland in 1917 to see for himself how this new product was made. Tests showed that a streamlined tie rod had one-sixth the air drag of a round one, and one-seventh that of a stranded cable. This reduction in drag could add as much as 10 percent to the speed of an airplane.

As an interesting historical sidelight, Mr. Whyte added, his father's notes showed that in the winter of 1917-18 the Brunton firm employed 77 men, 327 women and 59 youths on streamlined tie rod production alone. The elder Whyte brought back from Scotland not only knowledge of how to make the rods, but also at least one of the three special rolling machines I was soon to see.

The building we presently entered was about the size of a fairly large airplane hangar, and my first impression on glancing around inside was that it looked a lot like a general purpose machine shop. And in a way that is what it is, for this part of the Fabricated Products Division makes many things, especially products using the wire rope made across the street. Products include control cable assemblies with swaged terminals for the aircraft industry, stainless steel rigging cable for yachts, streamlined tie rods for mast stays on large racing sailboats, and a wide variety of harnesses, slings, operating cables and bracings for automotive, agricultural, mining and industrial uses. Mr. Whyte stressed that aircraft tie rod production is but a small part of the show here, and the company might not continue this operation indefinitely. There are factors such as overhead and specialized labor to be taken into consideration—much will depend on the trend of the demand for streamlined tie rods in coming years The side door through which we had entered put us right in the area of the building where streamlined tie rods are rolled. Within a score of feet of one another stood the shop's three rolling machines—a small one and two larger ones. In over-all bulk and appearance they reminded me of milling machines, but where the cutter and table of a milling machine would be, they had a pair of matched steel rollers.

Each pair of rollers, I quickly saw, had about six grooves cut in the highly polished surface. Imagine a pair of large size "Hawaiian Punch" tin cans that have stiffening grooves rolled in their sides. Transform these into solid steel and mount a pair of them like the rollers in a clothes wringer and you have the set-up visualized quite well.

The smaller machine has rollers 5 in. in diameter and 7 in. long, and the two bigger ones have rollers a few inches larger. Each of the grooves is of a size appropriate to the task of rolling raw material of various sizes into streamlined tie rods. The small machine handles raw stock to produce finished rods ranging in size from 6-32 to 1/4 in. thread size, and the larger ones can handle raw material up to 3/4 in. in diameter. In answer to my question, Mr. Whyte said, "Yes, it can truthfully be said that the single smaller machine has turned out an overwhelming majority of the streamlined tie rods used on small airplanes in this country from 1918 to this very day!"

Standing by the smaller machine, I saw electric motor controls which reminded me of those on an old-time electric streetcar, and assorted knobs and wheels which were used in raising and lowering the upper roller during the process. Reaching a dozen feet or more to each side of the rollers was a long, narrow table to support the rod material as it passed back and forth between the rollers.

One of the skilled workmen demonstrated the process. The upper roller is raised by its jack screws enough to allow the raw material—a length of round steel rod—to be inserted and positioned in the appropriate set of roller grooves. The roller is

then lowered with enough force to pinch the rod a trifle. The rollers begin to revolve and the rod feeds between them, being partially flattened by their pressure.

At the end of the first pass the rollers are stopped and moved closer together by the jack screws. The rod is then fed back through the rollers. About four passes through the rollers transforms the round raw material into the familiar streamlined shape.

Simple enough—until some of the fine points of the operation are pointed out! Then the realization comes that a very substantial amount of experience and skill is required to manufacture streamlined tie rods.

With each pass through the rollers, the rod becomes longer. Mr. Whyte explained that this feature of the process is both valuable and tricky. By the time the round rod has been given full streamlined shape, it has become about twice as long as it was in the beginning. Taking into account the unrolled sections at each end where terminals are threaded onto a finished rod, experience is needed to decide what length of raw material to start with so that after rolling, the tie rod length ordered by customers will be achieved.

The cold-working of the metal as a result of the rolling operation increases its tensile strength from approximately 150,000 lbs. per sq. in. to approximately 215,000 lbs. per sq/ in. Technically speaking, it is a cold-working operation since no external heat is applied, but the metal does become quite hot as a result of internal friction that accompanies the rolling. As a rod passed back and forth in front of me, I could see wisps of smoke rise from it.

The upper roller has to be moved down an appropriate distance for each pass so that at the end of the usual numbers of passes, the two rollers will be in contact with each other and the grooves in them will have brought the rod metal down to finished size.

Operator skill is put to its most severe test in the matter of controlling the rotation of the rollers. The operator cannot slow down the rollers near the end of a pass and then rotate them bit by bit to the end of the pass, for to do so would leave roll marks in the metal. With each succeeding pass these would be worked into the metal and would constitute flaws. So it's like making a spot landing in an airplane with power off—you touch down just right the first time, or it's no go! The rod passes through the rollers at a speed that I judged to be comparable to the speed of clothing going through a wringer or perhaps a trifle faster. A nice eye and hand are needed to shut the motor off just at the right moment at the end of each pass.

After about four passes through the rollers, the new streamlined tie rod is quite wavy as a result of molecular flow during the cold working. So after the last pass the rollers are raised a few thousandths of an inch and the rod is passed through again as a preliminary straightening operation. Also, the leading and trailing edges are not perfectly smooth and later in the finishing operation they are rotated by hand against a very fine abrasive belt to smooth and round them off.

Surplus round material left on the ends is trimmed off before the threading operation. The length of finished rods is measured from extreme end to extreme end of the threaded ends at this stage. If several rods of identical finished length are laid side by side you'll see a slight variation in the places where the streamlined sections taper into the round ends. This is an outcome of each rod having been rolled "by eye" and is not a defect in manufacture. The practice of measuring rods from extreme end to extreme end of the threaded portions rather than by the length of the streamlined section is for the purpose of assuring correct fit when rods are installed on an airplane.

It is rather widely assumed among aircraft people in the field that streamlined tie rods are made of 4130 chrome-molybdenum steel as are many items of hardware such as steel tubing. But this is not so, Mr. Whyte pointed out. The first consideration is to choose a steel that is adaptable to the rolling process. Originally these rods were made of nothing more exotic than carbon steel, protected from the elements by cadmium plating. Between the two World Wars, stainless steel came into use and today all Macwhyte streamlined and round-drawn tie rods are of this material.

Its better resistance to corrosion is valuable, of course, but in most cases exclusive use of stainless steel is because it is not economical to stock two kinds. Because stainless steel for tie rods is made to order to Macwhyte's specifications, it must be

ordered directly from the steel mill. This requires that the volume must be large enough to be economically produced at the mill. Macwhyte orders as much raw stock as possible at one time for this reason, as it would not be feasible to split orders between carbon and stainless steel.

Material for streamlined tie rods is made for Macwhyte by Allegheny-Ludlum and is 18.8, type 316 stainless, developed for the purpose. The specifications assure proper ductility for the rolling process, good fatigue resistance, high tensile strength and certain stretching characteristics under prescribed loads.

The material's surface finish is very important, too, for any flaws would be rolled into tie rods and would create weak spots. In his business, Mr. Whyte noted, they are as particular about terminology as we are in aviation. The raw material is referred to as bars. After the rolling process, they are called rods. This is because a material that is drawn through a die is correctly called a wire; anything that is rolled from billets is called rod, and bars are short rods that have been ground all over to remove all mill rolling marks. Aircraft tie rod raw material is therefore called bars, carefully ground to uniform diameter and then highly polished.

Another widespread belief in the field is that tie rod ends are threaded by the rolling process, by which is meant the threads are rolled into the metal with a suitable wheel. This is definitely untrue insofar as the widely used Macwhyte tie rods are concerned. Threads on these tie rods are **chased**.

We walked over to a battery of squat, square machines, their tops covered with moving parts. Landis thread cutting machines, Mr. Whyte explained. I saw that each one was fitted with two "heads" which generally resembled lathe chucks, but which were designed to hold four "chasers" each. The machines are geared so that their heads could be made to rotate in either direction as desired, to cut right or left hand threads.

As far as the actual cutting action is concerned, the process called "chasing" is no different than using hand dies, but the equipment is more sophisticated. Each block is made of high grade steel and, for the task at hand, is about the size of a domino. On one side of each chasing block there are many parallel "V" grooves, each as wide and deep as the tread to be cut. The working end of each chasing block is ground to a blunt chisel point, the over-all effect being comparable to many miniature lathe cutting tools lined up and fused together.

The working ends are also ground with a slight rake as seen from the top, so that the first tiny cutting point to contact a tie rod end just "wipes" the rod's surface. The second cuts a trifle deeper, and so on. So instead of ripping a single large shaving out of the tie rod metal in one course cut, the chasing process cuts the thread a little at a time and produces a clean, vibration-resistant thread.

My guide pointed out that Macwhyte tie rods are given an American National Fine Thread, class three medium fit. To achieve this the chasing blocks have to be expertly adjusted in the heads to get the correct cut. While the cutting operation is going on, lubricant flows copiously over the work.

The belief that tie rod threads are rolled is so wide spread that this is an appropriate time to say something about that method. The Landis machine can perform many tasks and when desired can be fitted with thread-rolling heads. The working tools are three small steel rollers having the desired threads cut on their faces. As they press in on the work the threads on the rollers form the metal into threads in a manner that can be compared to the way a common tube cutter's wheel presses into copper tubing.

When threads are being rolled, some of the material being worked is displaced up into the grooves of the rollers. Thus the diameter of the resulting threads can be greater than that of the base stock. When for any reason it is desired to have rolled threads, it is necessary to start with stock of some specific smaller diameter, depending on the rolling process to bring the threads up to size to properly fit whatever standard thread diameter is used in the related nuts or terminals.

This would open the door to quality control and production problems in the case of streamlined tie rods. Without going into detail, it can be said that all things considered, Macwhyte has found the chasing process to be the better, more reliable way of threading streamlined tie rods. Rolling has its applications in other products, but you can take it from Mr. Whyte, who has been around tie rods all his life, that the threads on Macwhyte tie rods are

**not** rolled—they are chased!

Here another point of confusion might well be cleared up. When assembling an airplane, many mechanics have wondered about the threads on the ends of streamlined tie rods. It looks as though they have taken material out of the rod material and thereby reduced its effective working diameter. I asked Mr. Whyte about this. He began his reply by asking me to remember how the raw material had been elongated when it passed through the grooved rollers that formed it to streamlined cross-section. This elongation quite understandably also reduces the cross-section of the streamlined section. This is compensated for by the increase in tensile strength that results from the cold working. The round ends which are threaded for terminals have somewhat greater cross-sectional area than the streamlined section, so even when threads are cut in them they still have ample metal left.

Mr. Whyte explained that published breaking strength figures for streamlined tie rods give the minimum breaking strength. If you were to test a batch of these rods, you would find that a majority of them would withstand more pull before breaking. Since there is a well-reasoned and proven safety margin here, all hands can stop worrying about streamlined tie rods breaking—at the threads or anywhere else! Use the correct size for the loads to be encountered and the airplane will be a safe one.

We watched one of the Landis machines in action. Its gears were set to rotate two heads in opposite directions. The operator fed the ends of two tie rods into clamps which held them securely. The whirring heads went to work and in a very short time left and right hand threads were put onto appropriate ends of two more tie rods.

At this stage, Mr. Whyte commented, basic forming and machining was finished. To show me remaining steps in the manufacture of the rods, he led me to a room on the far side of the main shop. There I saw the two strangest tables imaginable. Made of hardwood planks cross-bolted together, they were perhaps a foot wide and many feet long. One end of each was at eye level and the other end at waist level. On these tables final straightening work was done.

One of the workmen laid a streamlined tie rod on his table and squinted along its length. Observing a wave in it at a certain place, he walked along the table to that point and carefully tapped the wavy area with a bronze hammer. Then he squinted along the rod again and repeated the process. Once in a while he applied a special tool to the rod and gave it an expert twist to supplement the hammering. Bit by bit, he got the rod to lie flat and straight on the table.

The final step was polishing and finishing. As mentioned earlier, leading and trailing edges of the streamlined rods are smoothed off with a fine belt sander. Some nice wrist action was displayed by the man performing this operation! Nearby, two other men were running rods under some large cloth polishing wheels to impart the final, mirror-like finish. Stainless Steel tie rods are not chrome-plated; the brightness they exhibit is produced by this polishing operation. If an airplane owner wipes them with an oily cloth once in a while, they will stay that way for years.

Mr. Whyte also showed me how they make the type of small, round tie rods used for internal wing bracing and similar applications. The round rod which is the raw material is swaged to provide a starting place and a split die is clamped around it at this point. A powerful machine grips the rod by one end and pulls it through the die, reducing its diameter and at the same time cold-working the metal to increase its strength. When working around small airplanes you may notice quite a difference in tie rod diameter within the wings. It will usually turn out to be that the thin ones have been made this way, and they are quite comparable in strength to thicker, undrawn ones, in addition to being lighter.

I thought to ask Mr. Whyte about the matter of reconditioning rusted, kinked streamlined tie rods from antique airplanes in process of restoration. His reply was that he supposed some of those rods could be prettied up, but they don't do it, and for good reasons. They could not give a customer a firm cost estimate, for there is no way to tell how things will go until the work is actually being done. More important, there is no reliable way to tell how assorted kinks, scratches and rust spots might affect the strength and fatigue resistance of assorted rods. In fact, after being subjected to the

necessary working-over, it could happen that a conditioned rod would be less dependable than it was before being cleaned up. In view of all this, the sensible thing to do is to use a set of old rods as a guide for making up a new set, for a firm price and with assurance of dependability in flight.

By now it was quite clear to me that the manufacture of streamlined tie rods is a highly specialized form of custom machine work, requiring a high degree of skill and experience. As we walked toward the doorway, I saw a table on which were spread out several dozen shiny new streamlined tie rods, ready for shipment. Each set of rods was accompanied by a work order inside a protective frame, each order setting forth precisely what each customer wanted and having spaces for each operation to be checked off. On some of these work orders I recognized the names of people and companies familiar to everyone in EAA and I smiled, for I knew I would probably see those same rods again at a Rockford Fly-In!

I thanked Mr. Whyte for the most interesting tour he had given me, and all the way home my thoughts revolved around how many people, how much experience and what a variety of special materials are involved in the construction of safe airplanes!

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1984 Starduster Too for sale with Cont. IO470F 260 hp, TT 1600 hrs. King KY 97a, KT-76a Transponder, intercom, Scott 3200 tailwheel, Morrow 604 loran, one piece spring main gear. Price reduced to $23,950. Great Airplane for the summer. Bill Wyse 310 822-2442 email: flier11@earthlink.net 9/25/00

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1971 SA-300 Starduster Too. 300 TTSN. AF&E. Lyc. O360A2A 180 hp. Hartzell C/S Prop. TX-720 Com. Intercom. Loran. Aux fuel tank. Scott T/W. Open cockpit. Bendix mags (O/H 5/97) carb O/H 5/98. Hooker harnesses. Price: 38.5K. Phone: 262-652-7043. Email: STRDSTR@pitnet.net Will consider trade toward DHC-1 Chipmunk. 6/1/00

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