CANARD PUSHER

JANUARY 2001 RUTAN AIRCRAFT FACTORY VOL 17, ISSUE 1, NO. 103

MANDATORY Plans Changes

AILERON CONTROL SYSTEM RODEND SIZE

MANDATORY 25 hours: Replace the 8 dash 3 rodends aft of the firewall in the roll control system with 8 new dash 4 rodends.

A long-EZ builder/flyer has reported the failure of one of the dash 3 rodends in the root of his wing. These rodends have 10-32 threads and fit a dash 3 bolt. While these rodends are more than adequate in tension and compression, they cannot tolerate ANY bending in the threaded area.

Since this is a primary control system failure, RAF is recommending that all 8 of these rodends be replaced with 1/4-28 threads and dash 4 bolts. HM-4's replace HM-3's.

We have advised Ken Brock Manufacturing to drill and tap the CS-1 (CS-50) inserts to accept HM-4 rodends.

If you have access to a lathe, and you are very careful not to allow the tap drill to touch the rivets that secure the CS-1 into the control push rod, you can drill the already threaded hole out to a number 3 drill size, and tap new 1/4 -28 threads into it. Another, perhaps safer method would be to drill out the rivets and remove the cs-1 insert. Then drill and tap the new threads into the insert. Clean it thoroughly, and re-install it into the 1/2-inch tube with two new AD rivets. You will also have to drill the #10 holes out to 1/4 inch in each bellhorn, and belcranks. The HM-4 rodends should be installed, using AN-4 bolts everywhere.

CONTACT
Brock Mfg. 11852 Western Ave
Stanton, Ca 90680
(714) 898-4366

Mandatory Roll Over Structure in progress

Burt has designed a composite roll over protection structure, and Mike has been installing it on his own Long-EZ in his spare time. It is now complete, but for final paint, and will then be permanently installed. Mike took a bunch of digital photos of the work in progress, and these, together with some words and sketches will be made into a set of plans that will be available from RAF in about a month.

The RAF plans are free to all owners of VariEze and LongEZs. Send your serial number along with a 9x12 SASE. Also, RAF plans to make the rollover plans available as a downloadable file as soon as website is activated. Check www.rutanaircraftfactory.com after March 15, 2001.

If you can't wait that long, EZ builder Bill Allen of England is offering a second option for sale *(see BOX on page 3)*. Having made the jigs, run one rollbar structure through his engineering shop, and installed it in G-WILY, Bill plans to offer his steel rollover structure to others as either an assembled structure or as a kit. Burt and Mike have looked over Bill's plans and approved the design. To see Bill's version on the web go to www.longeze.com/ then click on preparation and rollbar. Bill said he is working out prices and delivery schedules.

We will do our best to have the RAF composite rollover plans available as soon as possible, but an upcoming Proteus trip will likely delay things some. Mike is very busy preparing the Proteus for a 7-week deployment to the Pacific Rim. They will visit Hawaii, the Marshall Islands, Guam, Hong Kong, Okinawa, Yokota Japan, and Anchorage, before returning to Mojave. This is part of a NASA atmospheric research project, and Mike will be flying the Proteus. Please be patient, Mike will definitely have his EZ on display at Oshkosh, when you will be able to see this roll over design first hand.

see Roll Over Structure pg 3

Briefs

Toll Free Number
Wicks Aircraft have advised us of a change in phone number. They now offer toll-free phone & fax. We have listed the changes on our suppliers page.

ph (800) - 221-9425
Fax 888-440-5727
e-mail:info@ wicksaircraft.com

More sad news to report — Voyager volunteer Walt Massengale passed away on Saturday, January 13th from a heart attack. Walt worked in Mission Control, and was invaluable to the Voyager program. Please take a few minutes and send a card to his wife, Shirley, at the following address below. Shirley Massengale, 20371 Via Marwah, Yorba Linda, CA 92806

Check Out Dick Rutan's Website — www.dickrutan.com

RAF HOURS: Rutan Aircraft is officially open every Wednesday. Please call between 10 am - 2 pm (661) 824-2645 and give your name, serial number and nature of the problem. If you are not in an emergency situation, we ask that you write to Mike.
Note — Sometimes you can catch Tonya at RAF Monday thru Friday. She is in and out. Try and try again.
When writing to RAF, send along a stamped, self addressed envelope, if you have builder's questions that need to be answered. Please put your name and address on the back of any photos you send.

RAF ADDRESS
1654 Flightline, Mojave, CA 93501

RAF PHONE NUMBER
(661) 824-2645

RAF FAX NUMBER
(661) 824-3880

RAF EMAIL ADDRESS
raf@hughes.net

The Canard Pusher
is published quarterly
(January, April, July, October)
by Rutan Aircraft Factory, Inc.
1654 Flightline, Mojave, CA 93501
Editor: Mike Melvill
Publisher: Tonya Rutan

U.S. & Canadian subscriptions
$14; Back issues $3.50
Overseas (Airmail) subscriptions
$16; Back issues $4

RAF is no longer accepting multi-year subscriptions. Please renew only after your current subscription has expired.

If you are building a RAF design, you must have the following newsletters:
VariViggen (1st Ed)
CP 1 to current
VariViggen (2nd Ed)
CP 18 to current
VariEze (1st Ed)
CP 10 to current
VariEze (2nd Ed)
CP 16 to current
Long-EZ
CP 24 to current
Solitaire
CP 37 to current
Defiant
CP 41 to current

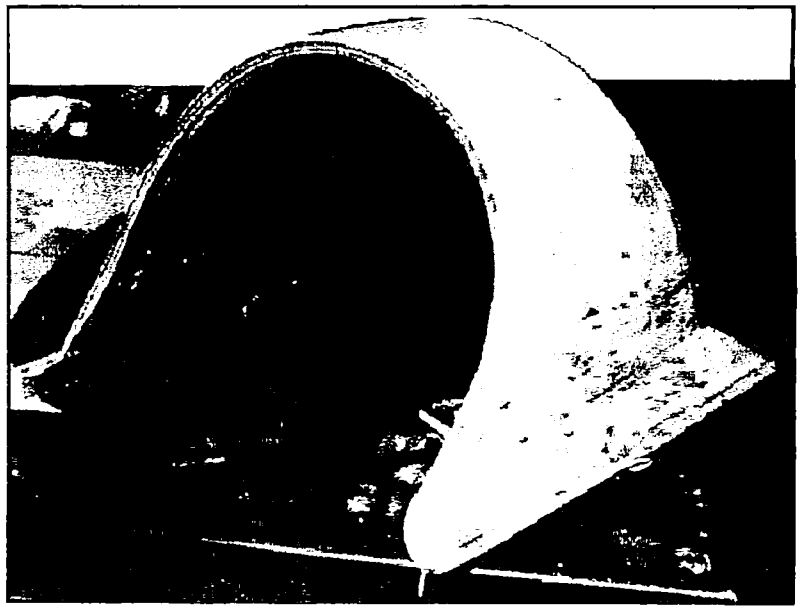
A current subscription of the Canard Pusher is mandatory for builders, as it is the only formal means to distribute mandatory changes.

ROLL OVER Structure

Burt and Mike's basic concept for the composite roll over structure is this: your own finished canopy in its frame is used for a mold, and a glass/foam/glass sandwich structure is laid up into the inside of the canopy (after the canopy is carefully protected and released). There are 6 cure cycles required to complete this part, then it is popped out of the canopy/mold, and finished in whatever color takes your fancy. Then it is bonded into the canopy frame, using Hysol adhesive, where it is positioned between the front seat and the rear cockpit, somewhat like the glass structure that exists between the two canopies on a Berkut. The difference is that this one is inside the canopy.

There is a small gap between the roll over structure and the Plexiglas canopy, so it never touches your canopy at all. It becomes part of the canopy itself, and moves with the canopy when you open and close it. When the canopy is closed and latched, the roll over structure is firmly attached to the top longerons, and is designed to protect against an accident where the airplane may land in such a way as to end up upside down.

The down side is that there is some loss of the fabulous visibility that we have all come to enjoy in an EZ, but it is a small price to pay for the additional safety provided. See Photo. ●



Plans for RAF's composite roll over structure will be mailed to EZ owners as soon as they are complete. Send your SASE today

BILL ALLEN's Roll Over Structure

ANOTHER Option is to contact Bill Allen whose welded-steel tube roll over structure has appeared in the Central States Association Newsletter and on the web.

You can see how Bill Allen's roll over structure was prepared on the web at www.longeze.com/ then click on preparation and rollbar.

Bill plans to have prices and schedule info for an assembled structure and kit by the week of Feb 12

Contact Bill at bill@allenworld.com
or write or call RAF
for more information

We have recently heard from several Defiant flyers regarding problems they are having. The reported trim difficulties include involve a flight condition in which the aircraft requires either an offset rudder or aileron deflection to maintain straight and level flight. Owners have been confused about how to tweak their aircraft to achieve the desired result — wings level, ball-centered flight with neutral ailerons and feet off the petals.

These problems are unusual to us since the Defiant has two unusual features: an engine on the front and a forward all-floating rudder. We do not recall this many problems back in the mid-80's when the first several Defiants began flying.

In this newsletter we are printing the problems as reported and the discussion and recommendations from Burt. Thus, it is hoped that this information will help others. Also, we are attempting to determine how prevalent these problems are so please report your trim issues to RAF (good or bad) so we can continue discussion in future newsletters.

Trimming the Defiant

Information from Randall Winkel

The attahment is a great air-to-air photo of Harry Manvel's Defiant making its first flight. It shows excessive rudder being applied. The flight lasted about 35 minutes and the pilot said it was great except that his leg was numb from holding rudder so hard.

I am quite suspicious that the excessive rudder pressure and angle of the rudder that apparently was needed to hold the Defiant straight is the same thing that gave Don Foreman fits. Namely the cant on the front engine is the culprit.

I assume the original Defiant yawed to the left during climb. I also assume that the reconfigured Defiant was "fixed" with the canted engine, however more rudder trim was needed during straight and level flight. Am I right or wrong?

To Randall Winkel From Burt Rutan

I have reviewed all the information in your answer as well as the attachments from newsletters.

There is clearly a lot of confusion and incorrect information floating about regarding Defiant directional control. What follows should clear the air and help those who are having problems get their aircraft flying well. My Defiant N78RA (now in the Hiller museum in San Carlos, replaced by my Boomerang) is a great flying machine, and one in which I have about half of my flying hours. It has very good safety for crosswind takeoffs and landings. I still remember that 40-knot direct crosswind landing I made at the Reno airport — done while the field was closed to most aircraft without that level of capability.

It was initially flown with fixed pitch props and a front engine that did not have the correct rig of 2 to 4 deg right thrust. Initially, the need for right thrust to correct the P-effect was ignored and, in fact, due to a measurement error, it had about 1 deg of LEFT thrust. This has little effect at high speed (low angle of attack), but at low speeds and high power resulted in a significant left yaw moment. Later, when I upgraded to the180 BHP/Constant-speed props, I built a new front engine mount that had the proper ~ 3 deg right offset. After that mod, the aircraft no longer had the left yaw at high-power/low-speed.

It is important to note that this need for right offset for the P-effect has nothing to do with your yaw control system, Rhino rudder or winglet rudders. It is also important to understand that the Rhino rudder system is a generically different type of control than an aft tail/rudder system. The Rhino is designed in a way so that it does not destabilize the aircraft in yaw, even though it is mounted forward of the cg. It is mass-balanced about its pivot (needed to prevent flutter), but its center of pressure is well aft of the pivot line. Unless it is trimmed away from symmetry by its small tab, or unless the pilot forces it (rudder pedal force) away from its faired float angle, it produces no side force (aircraft yaw moment), REGARDLESS of the aircraft's sideslip angle or direction of the local airflow produced by the front prop. For example, if it were mounted aft, in the normal position of a fin/rudder, it would provide no aircraft yaw stability at all. It would merely float out with the angled flow and the aircraft would not know it would be there. If the aircraft entered a sideslip, the rudder would follow it, the rudder pedals would move a bit (aligned with the local flow), but the aircraft would get no benefit of its stability.

This feature allows it to be mounted as it is, in front of the cg without hurting yaw stability. It can, and does provide control . . . if the pilot applies pedal force (or if its tab is deflected) it generates a side force to yaw the aircraft. For a given pedal force this side force is constant and is NOT a function of the aircraft's sideslip angle or local prop-induced flow angle. Thus, we have a yaw controller that does not influence stability.

see Defiant pg 5

Defiant cont.

This feature allows it to be mounted as it is, in front of the cg without hurting yaw stability. It can, and does provide control . . . if the pilot applies pedal force (or if its tab is deflected) it generates a side force to yaw the aircraft. For a given pedal force this side force is constant and is NOT a function of the aircraft's sideslip angle or local prop-induced flow angle. Thus, we have a yaw controller that does not influence stability.

For example, when the local flow angle is changed by lowering the nose gear, the rudder just follows the flow, moves the pedals a bit but does not yaw the aircraft or change the pedal force.

This brings us to an important issue as regards the amount of control available from a Rhino rudder. Its control power each way is proportional to the difference of its float angle and the mechanical stops. That is why there is less yaw power to the right when the gear is down, since the gear floats the rudder to a leading edge-right position. In general, this effect is not large, but you may want to adjust your rudder stops to gain acceptable yaw control both ways for gear up AND down.

. . . if your aircraft is straight (verticals and wings not crooked) and the rudder tab is set at zero and your rudder is built symmetric, not cambered) the aircraft will fly ball-centered at no rudder pedal force.

Now to the important stuff.....if your aircraft is straight (verticals and wings not crooked) and the rudder tab is set at zero and your rudder is built symmetric, not cambered) the aircraft will fly ball-centered at no rudder pedal force. Another way of saying this is that if your rudder trim tab is faired and you are not pushing force on the pedals the aircraft must fly straight, UNLESS the vertical fins are NOT straight.

Looking at the photo of the Defiant flying with an obvious deflected Rhino rudder and the pilot getting tired constantly pushing tells me that the aircraft is crooked. Small changes in the vertical fin incidence or camber will require large Rhino ruder deflections to trim. The big problem here is that the fin incidence is not adjustable. Thus, the first thing I would do to this aircraft is to install a fixed tab on one of the fins to correct the asymmetry. Then, after finding how much fixed tab is needed to fly straight, I would change the camber of a fin near its trailing edge, so I could remove the ugly tab. I would start with a fixed tab that hung aft about 3 inches aft of the TE and extended about 20 % of the span.

For example, if this tab required 10 degrees deflection to correct the aircraft's crookedness, then you could later remove it and camber the entire span by about 2 deg (10 deg times 20%) to achieve the same effect. This correction could also be an added tab of 0.6" chord (3"/20%) along the entire span (not as ugly as the 3" tab).

To summarize . . . you MUST cant the engine right, regardless of if you have winglet or rhino rudder systems . . you MUST have straight, left-right symmetrical fins to get a straight-flying aircraft. An advantage of the winglet rudder system is that it is easy to shim or trim a rudder to correct a crooked aircraft. *Burt*

Please deliver to Mike from Randall Winkel

I took the liberty to send out Defiant Flyer #56 for your enjoyment. It features Harrys' new Defiant. I believe this Defiant is probably the most accurate ever built. From Harrys' writeup you will see that Harry worked very tediously at insuring every dimension was true and every control surface worked exactly to specification.

Harry has made one more flight. He retracted the gear with no improvement in the rudder pressure needed to fly straight. I believe in straight & level flight he needs at least 3/4 of full rudder.

I made sure Harry read the "Don Foreman Story" & as Michigan weather permits I believe Harry will try to determine if engine cant is causing this situation.

We do have another Defiant in the area now owned by Dick MacArthur. This one was built by Charlie Gray with winglet rudders. Looking it over I believe Charlie deflected the pilot side winglet out, probably as rudder compensation, and it now flies with the elevators quite offset. In fact I noticed that the "roll trim" is at the limit and Dick says he only touched it once and it came apart. Dick said the time the roll trim system came apart he was flying. It is the only time he tried to adjust it. Nothing happened and he landed, reassembled it, and does not use it any more. I assume it was already jammed to its stop and stayed there after it came apart until he landed and repaired it. I think he was lucky.

Dick seems to be satisfied with his handling so far except he says he runs out of aileron in the pattern.

Looking forward to hearing from you on this matter. I'm waiting for your input and Harrys' flight experience before I get my mount rewelded with reduced cant. *Randall Winkel*

To RANDALL: Important information follows!

Re "Dick says he only touched it once and it came apart. " Any aircraft with a defect in the trim that could cause a fault in controls MUST BE GROUNDED AND NOT FLOWN until the system is fixed and verified. This is extremely dangerous and can result in a serious accident. An aircraft that takes near full roll trim MUST be fixed by a shim washer in the main wing, and NOT flown with the large split in elevators.

Re "runs out of aileron in the pattern." I assume this means runs out of aileron TRIM. Again, this aircraft should not be flown until it is trimmed properly by getting the main wings straight.

You must fix the crooked wings and fins, and not fly with either large rudder deflections or large trim settings. *Burt*

see Defiant pg 6

Defiant cont.

To Mike from Harry Manvel

Randy Winkel has forwarded both the letter he sent you and your response, with regard to my Defiant being out of rig. First of all I should clarify the symptoms a bit. I have flown it now for 2.1 hours on three flights. The rudder required is nowhere near 3/4, I'm not sure where that came from.

I do however have to keep some right rudder pressure to keep the ball centered, gear down, and very slight, almost none, gear up. The plans-built rudder trim tab is not enough to counter this. There is a built-in roll tendency to the left which I have to fix also. I'm not sure if the rudder problem is related to the roll problem. I flew yesterday with roll trim set to about 1/4" split on the trailing edge of the elevators, didn't have much effect. I won't take that any further.

I have heard from Charlie Sims that he installed fixed trim tabs on his wing and his rudder, he had similar symptoms to me. While it's not as clean a solution as shimming the wings, I would prefer this route for now, my plane is all painted and looks too good to tear into it! I'd like to know your thoughts on this, i.e. putting a fixed bendable tab out on the left wing, and on the rhino rudder. (note - gear up, when I hold aileron against the roll to level the wings, the ball is very nearly centered.)

Just as an FYI, I modified my ailerons, moving them outboard on the wing, with a roll control system similar to the Long-EZ. So far it seems to work great. It is very responsive when landing, light forces, real nice. Obviously with 2.1 hours I haven't expanded the envelope yet, but the early results are impressive.

I would appreciate your response regarding trim tabs, and any alternate ideas you might have.

Best Regards, Harry Manvel Defiant #146

MORE FROM BURT

There certainly seems to be a lot of confusion on the lateral/directional trimming of the Defiant. I do not remember this being an issue in the mid-80s when the first homebuilts flew. Let me offer more to hopefully clear the air.

First of all, my comments about the rudder floating are true, but remember that, without a pilot input, the rudder does not produce a side force unless it has some camber. Camber (a nonsymmetrical airfoil on the rudder) is produced by the rudder's trim tab, or inadvertently by the rudder not made symmetric. If you noticed a difference from one rhino rudder to another it must be because one of them was not symmetrical (I am assuming, of course, that the planform and pivot location is per the plans resulting in the pivot being well forward of the rudder center-of pressure).

If a cambered rudder is installed it will produce a sideforce, thus will yaw the aircraft. However, this sideforce will be about the same regardless of the position of the nosegear. On N78RA, when the nosegear was extended, the rudder pedals moved a bit but the aircraft did not yaw. This resulted in a small loss of rudder authority in one direction (less travel to the stop), but not a trim change due to gear position.

However, there is one possibility that could cause a yaw due gear . . . if you have friction in the system that keeps the rudder from floating. Like all other control systems, a Rhino rudder system must have low friction so it does not stick.

Next, lets cover trimming in yaw. You must not trim the aircraft by varying the engine cant. The cant is there to remove the prop's left moment from p-effect. Do not mess with the cant.

True, there is some cross-talk between yaw trim and roll trim through the basic dihedral effect but the main effect of a rudder tab or winglet camber is to produce a yaw moment. Anyone with a crooked airplane should FIRST shim a wing to get rid of a rolling tendency (at zero aileron and elevators not split), THEN correct crooked winglets (symptom being a ball-out of center when flying wings-level roll) with a tab or winglet camber mod. I suspect that you were trying to fix the out-of-trim by first adjusting yaw, then roll.

It is not a good idea to fly with a large split elevator (more than 5 deg left vs right). This not only puts the trim close to the stop, but limits full elevator travel. If you require split elevators to fly level at zero aileron, then shim a wing (one thin washer at a time) to fix roll asymmetry.

The following is very important, as it deals with engine cant and effects of P-factor

1. Engine cant yaws the aircraft as a function of propeller thrust: at high power there is a right yaw caused by cant, at low power (descent, or even the power during approach) the yaw due to cant is very low and not noticeable. In general, the yaw due to cant and power is there regardless of aircraft speed, i.e. about the same yaw occurs at low speed as high speed.

2. P-effect is a function of thrust (power) AND angle of attack. When generating thrust a prop sees different in-coming air when the blades are descending on the right than when ascending on the left. The easiest way to think about this is that if air is coming from below the right side blades advance into the flow and retreat when on the left. Thus, P-effect is seen because the right blades have more thrust than the left. It is best to think of this as the thrust line being moved to the right of the crankshaft . . . at stall and high power the thrust line is about 8 inches to right, and that is what causes the aircraft to yaw to the left. There is little P-effect at high speed because the angle of attack is low. P-effect is zero at zero AOA. Thus, P-effect is only in play at low speed and high power.

3. Read this carefully — here is where your understanding is confused. While we say an aircraft has a certain level of yaw stability and so much yaw control (aerodynamicists refer to stability coefficients that are independent with speed), the

see Defiant pg 7

Defiant cont.

amount of real yaw stability (restoring moments when displaced from zero sideslip) varies greatly with speed. The fins have 6 to 8 times the restoring force and the rhino has 6 to 8 times the power at cruise as compared to stall.

With that in mind, FIRST, just think about LOW SPEED. Cant is needed to offset the p-effect at low speed only. There is no yaw due to the power if the power is low (P-effect and cant are both there only at high power). If you do not cant the engine, the aircraft will yaw left when you apply power.

You MUST have cant to offset the left yaw with power at low speed. My original Defiant did not have cant (my oversight) and it was dangerous at high power and low speed. I fixed it with cant later, and tested its good handling before the plans were drawn.

Now, you might ask what happens at HIGH SPEED, where there is little P-effect, but there is still a right yaw due to high thrust (high power). You would expect that the aircraft would yaw right when high power is applied when at high speed (low angle of attack). What happens is almost nothing. An aircraft that has right engine cant can cycle power on-off at cruise speed and little yaw is observed. The reason is that the yaw due to cant-thrust is now small as compared to the aircraft's high basic stability (6 to 8 times that of stall speed).

The Defiant is no different on these issues than any other aircraft with a prop on the front. Check the singles, a high power one like a Lance has as much as 4 to 6 deg right thrust.

The bottom line — You must have a straight aircraft before you consider the propeller. With power off (glide) it must be trimmed straight, roll and yaw . . . shim a wing to trim roll, and warp or tab a winglet to straighten yaw. Then, with power on, the P-effect is offset by cant at low speed and the cant is offset by high basic aircraft stability at high speed.

Any attempt to deal with this any other way is fraught with problems and dangers. For example, if your aircraft flies straight at low speed with no cant and power on, it WILL be very crooked with power off and very crooked at high speed, power on or off.

Burt

Dear Burt & Mike from Harry Manvel

Last night I received a forwarded copy of Burt's response to Randy Winkel regarding rigging and the rhino rudder. This information was enlightening, and I have to admit I had a few misconceptions about the rhino. Armed with this information, I went for a flight this morning specifically to research the trim.

Since first flight, I have had to maintain right aileron to keep wings level. Based upon numerous stories of existing Defiants flying with the rhino, I was mentally prepared on first flight to add right rudder. Because of the wing heaviness, I assumed that was related to the gear down/rhino rudder interaction. Probably wrong on my part. I commented that my foot was asleep by the end of the flight due to rudder application. I didn't need it. All I needed was right aileron.

For todays flight, I relied on my Navaid wing leveler to handle the heavy wing. I made note of the rudder pedal positions, relative to each other, and back on the ground re-created this to see where the rhino was positioned. Here's the results; with the nosegear down, and full trim to the right, (again, wings level due to the Navaid) the ball was less than 1/4 out of the center, to the right. Very light pressure on the right pedal centers it. This was noted at 110 knots.

Immediately after I retracted the gear the ball shifted to roughly 1/4 out, this time to the left. I was able to trim this to the center with a little left rudder trim.

Rhino positions noted on the ground: Gear down, several degrees leading edge left, Gear up, maybe half that but still a little left. The difference between the two positions was approx. 1" at the top of the leading edge.

Based upon all this, I feel that my main problem is related to wings rather than winglets. If I were to shim (or unshim, really) a wing, would it be recommended to do just one, or both, opposite one another of course. If I did just one, I would lower the incidence of the right wing.

One final note, after 4 flights, close to 3 hours total, I love this airplane even though it wants to go in circles. Landings are a blast.

Best Regards, Harry Manvel

Defiant N2HM, RAF Serial number #146

To Harry from Burt

First, do not assume you are out of yaw trim in one direction because of the position of the LE of the Rhino. Remember, it just floats to the local flow angle (if its trim tab is zero), and that float angle is effected by fuselage, prop swirl and nose gear.

I would — ONE washer at a time — change one wing incidence until you have a straight aircraft ROLL-wise. This may be the only thing you should have to do. If your winglet incidence is not symmetrical then you will need a winglet tab. *Burt*

MORE from Burt

Do not fly an aircraft with a large roll trim setting. I would, starting with a thin washer at one of the wing mounts, change the incidence of one wing until it flies hands-off in roll with the elevators at about the same deflection.

To determine which wing to shim, evaluate what your trim elevator position (average, left to right) is. At 130 knots the elevators should be at about zero. If they are TE down, then it is desirable to get more TE UP incidence of the back wing. This will tell you which wing to shim when you are fixing the roll. *Burt*

see Defiant pg 8

Defiant cont.

From Randall Winkel

I need to clarify what Dick said about his "running out of aileron." Dick told me that he thought his ailerons were designed for higher speeds. He said he has learned to fly a very large low landing pattern at Port Huron airport because his ailerons are very slow to respond at pattern speeds. I had no tools with me to accurately measure aileron deflection, however, to my eye they appear to be "wimpy" i.e. possibly deflecting too little.

From Burt Rutan

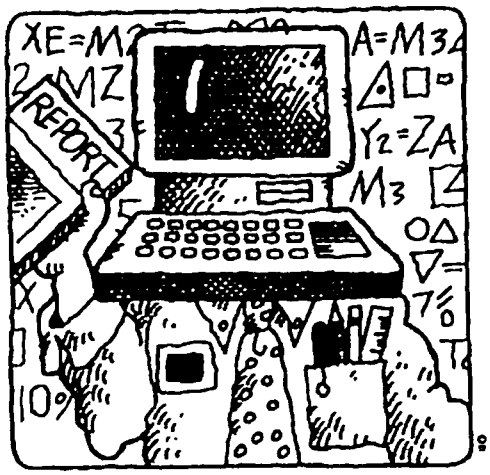
Randall.....The Defiant ailerons should (must!) be rigged to have at least the travel shown in the plans and checked to be sure there is nothing in the control loop to make them "wimpy" or excessively stretchy.

The Defiant ailerons are NOT just for high speed.....they are very effective at minimum speed. If anyone's aircraft has sluggish ailerons at low speeds they should ground the aircraft until the system is fixed . . . check for full deflection and no slop.

From Burt Rutan

A properly-built Defiant (mine and the homebuilt prototype built by Fred Keller) has very good roll control even at the minimum speed (full-aft-stick). I would not fly one that had inadequate aileron throws or improper, heavy ailerons that need extra balance weights. Flight control systems and flight control surfaces must be done with good quality. Some people's best possible work is just good enough. If the ailerons are not light enough so the standard balance weight does the job, then new ailerons must be built. Do not fly an aircraft unless the surfaces are perfect. *Burt* •

On the Web



Check out Dick's new website www.dickrutan.com

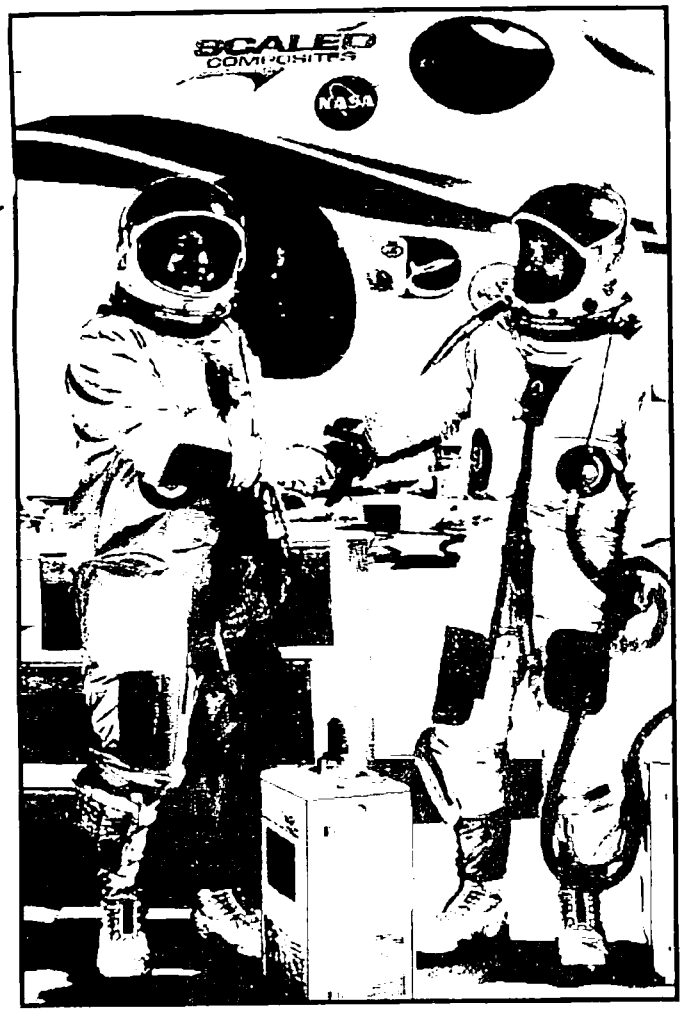
Dick's 11-page website cronicles his record-breaking flights as well as the crash & burns. Read stories about the Voyager; Mike Melvill's 1997 World Tour; the Global Hilton and much more!

Apple Computer is hosting a series of websites that spotlight people who use their products. You can find a site featuring Burt called *Ideas that Take Flight* at www.apple.com/creative/stories/rutan. The website also features photographer Jim Sugar at www.apple.com/creative/stories/sugar. Jim Sugar is the creative mind behind the lens of many of the Rutan aviation photos.

Tim LoDolce of Truckee, Tahoe is counting canards. He and others have created a website for registration at the following address:

http://www.kgarden.com/cozy/ezform.htm

This includes any type of canard and in any condition.



Mike sets altitude record

The NAA recently ratified as official U.S. National Altitude records set by Mike Melvill and Bob Waldmiller in the Proteus.

Class C-1.e, Group III

> Altitude: 63,245 ft
> Altitude in Horizontal Flight: 62,385 ft
> Altitude with 1,000 Kilogram Payload: 55,994 ft

This breaks a 13 year old record held by a Lear 28 of 54,570 feet.

The information has been submitted to the FAI for ratification as World records, and the awards will be made at Oshkosh 2001.

Left — Proteus Chief Pilot Mike Melvill congratulates Flight Engineer Bob Waldmiller on a job well done.

Flyin' with Friends

The dates are subject to change but we'll go with this for now. Please encourage others to come on out and participate or just watch the racing.

Thanks to all of you for your support.
Shirl & Dorothy

R.A.C.E. Schedule for 2001

Wendover, NV
May 26, 27, 28 . . . . . Racing on May 27th

Jackpot, NV
July 7 & 8 . . . . . Racing on July 8th

Kanab, UT
September 1, 2, 3 . . . . Racing on Sept. 2

Mesquite, NV
October 27, 28 . . . . . Racing on October 28

Kilo Trials
Buckeye, AZ . . . . . November 24th

Kanab, Utah - Aikins Lodge 435-644-2625
Jackpot, Nevada - Cacuts Petes Casino 800-821-1103

Mesquite, Nevada - Virgin River Casino 800-346-7721 or
Oasis Resort & Casino 800-621-0187

Wendover, Nevada - State Line Inn (Specify the State Line Inn) 800-848-7300

Accident Report

NTSB Identification: FTW01LA034

Accident occurred Saturday, December 09, 2000 at INGLESIDE, TX
Aircraft: VARIEZE, registration: N64592
Injuries: 1 Minor.

This is preliminary information, subject to change, and may contain errors. Any errors in this report will be corrected when the final report has been completed.

On December 9, 2000, at 1800 central standard time, an Evans Varieze homebuilt experimental airplane, N64592, was destroyed when the airplane entered an uncommanded left roll while in the traffic pattern at the T P McCambell Airport, near Ingleside, Texas. The airplane was owned and operated by the pilot under 14 Code of Federal Regulations Part 91. The commercial pilot, sole occupant, received minor injuries. Visual meteorological conditions prevailed for the personal flight, and a flight plan was not filed. The flight originated from the Corpus Christi International Airport, Corpus Christi, Texas, at an unknown time.

The pilot reported to local authorities and the FAA inspector who responded to the site, that during the traffic pattern turn from upwind to crosswind, full opposite rudder would not overcome an uncommanded roll to the left, during which the left wing struck the ground. The airplane came to rest in brushy terrain, approximately 100 yards east of runway 13.

The FAA inspector examined the aircraft and found extensive structural damage throughout the airplane. He found flight control continuity with all linkages, push/pull rods, and bellcranks. He observed that paint was missing from the rear edge of the rudder control arm, manual movement of the rudder against the centering spring resulted in the cable eye hooking itself behind the rudder control arm.

The last condition inspection was performed on September 8, 2000, at a total airframe time of 2,173.6 hours. The pilot estimated that the airplane had accumulated a total flight time of 2,200 hours on the date of the accident.

Lightening Strike Report

Dear Burt & Mike,

I recently received a Canard Pusher (no.102) and this made me write this letter. I owned the Long EZ together with Maarten de Vries. He paid for the aircraft and I built it. Maarten is familie from Jan, Hans and Tirsa van Noord who are living in L.A. and are known by the Rutans. Jan van Noord built a Long EZ also (reg. N7VN).

In 1991 after the Long EZ was test-flown we flew in it for 5 years without problems. On July 17th 1996 something terrible happened. A couple of days before Maarten had taken the Long EZ to his house at the island of Ibiza (Spain). When he flew back that day it was beautiful weather at Ibiza but over the south of France a squalline developed on his route to Holland. Maarten was on a VFR flight at 9000 feet and flew into the squalline. The airplane was hit by lightning and crashed killing Maarten and destroying the LongEZ. The lightening found its way to the steering rods of the flight control system and creating so much heat that the threadends of the balljoints were melted and the airplane was not steerable anymore. Also one aileron was thorned off and some delamination occurred.

Of course the accident was a pilot error because you shouldn't be IMC in a squalline at 9000ft (7000 ft AGL) with a VFR license in a Long EZ. I always had the plan to inform RAF about this accident but somehow I didn't do it until now. Maybe you have heard from the accident by other people. Reading the canard pusher and safety-related modifications I realized again that this accident might interest you. Lightening protection on "plastic" airplanes is a hot item.

I have a complete report of this accident written in French. When you are interested I can provide you with a copy of this report. Let me know if you are.

With regards,
Cyril Sars
Netherlands

EDITOR's NOTE: RAF thanks Cyril for reporting this incident of lightening strike. Cyril is also going to help us find a translator. We will publish the report after it is translated into English.

Night Engine Failure

by
Phillip K. Camarda
Long EZ N747HG

I thought I would share a story with you regarding a recent engine failure in my LongEZ. On Wednesday night, 22 Nov 2000, 8:00 PM eastern I experienced my first Night Time Engine Failure. Let me say that I have flown military and civilian aircraft in all kinds of conditions. I have approximately 2000 hours of combined single engine, multi engine fixed wing and rotary wing time. Several emergencies under my belt. But nothing as attention-getting as a Night Engine failure. You don't want this kind of excitement in your life. The engine just shut-down! No warning at all!

I live in Michigan and the plane is based out of PTK (Pontiac). Everything that night was done by the book. Engine was pre-heated for 45 minutes due to the 30 degree F temperatures. I conducted a thorough pre-flight, fuel, oil, airframe, controls, etc. After the engine was pre-heated and I had given my passenger brief to my friend (also a pilot) we pushed the aircraft from the hangar. I did the standard cold start routine, three racks of the throttle, engine primer, mixture rich, electric fuel pump on, ignition switch on impulse coupled mag (Left). The engine started in about 3 seconds of cranking, then mags on both.

Everything sounded good, oil pressure was at 75 psi, EGTs were coming up, CHT's started to come alive, Vacuum pressure was up, Electric fuel pump off to check mechanical pressure of 5 psi. Everything looked good.

After listening to ATIS I taxied to the main taxiway and called ground for clearance to Runway 27 Right. I did the standard before take-off run-up: carb heat, mag check, oil temp & pressure. Gyros set, vacuum pressure, etc... Everything was a GO! Called tower and asked for a departure off 27 Right straight out WEST. Once the clearance was received we took-off and climbed out at about 1500 fpm to 6500 MSL. (5500 AGL). About 10 minutes into the flight I turned the controls over to the rear seat and looked at the map for Battle Creeks identifier to plug into the GPS. The flight was going to be a 150-mile round-robbin trip past Detroit and back up the Canadian Detroit river corridor to Pontiac.

I only had my head down in the map for about 30 seconds when I heard the engine sound change. We had been cruising at 2550 RPM 140 kts indicated. Vince asked if I had done anything with the engine, I said NO, I have the controls! By the time I took back the controls the engine became deathly silent. I immediately started trying to figure out the problem. Speed was traded for 95 kts and some altitude, electric fuel pump was turned on, mixture Rich, carb heat pulled (although there was no visible moisture in the air that night). I switched from left to right fuel tank. Still no response, I reached for the Mag switch, trying left and right mags independently and then back to both. All this is going on while I am talking on 121.5 and trying to dial up 7700 on the transponder, which they made me change to 0113 during the emergency, go figure? Like I wasn't busy enough . . .

Needless to say there was a lot going on, I was busier than usual! The GPS Nearest button really helped out (Garmin 250 XL). The nearest airport popped up as Howell (Livingston County) 7.2 miles behind me bearing 73 degrees.

I turned the aircraft 10 degrees right of the heading the GPS showed and had Vince look out to locate the airport off the 11:00 position. During all this I had been still trying to get the engine restarted with no luck. I started racking the throttle and the engine fired up for about 1 second and became silent again. The prop was windmilling. I could see 70 psi of pressure on the oil gage, yet the engine was dead. I kept glancing at my fuel pressure gage (1.25 inch mechanical gage). It looked as though the needle was at zero pressure, but after several times looking back at it during the descent it appeared to be completely pinned out as though the needle was resting on the back of the stop pin. It was dark, under red lighting and I was trying to fly the aircraft so I didn't spend too much time trying to figure it out.

Anyway, the airport was coming up. Vince said it was 5 miles at 1100. I started heading for the airport direct. We were about 1000 feet high when the aircraft was abeam the field about 1/2 mile out to the south. Everything went good — gear down; seat belts tightened; landing light on; speed brake deployed. We made a hard left turn and hit directly on the numbers with about a 2500 ft roll-out down the center of the runway. Turned off at the first taxi-way and rolled down a 2-to-3-degree grade taxiway until we had to push the LongEZ to the uncontrolled airport FBO.

I contacted flight service as soon as we were able to. Told them we were down with no damage or injuries. I used a flashlight to look at the plane. There was oil every place — in and out of the rear cowls. I decided to call it a night and worry about it later. It was the evening before Thanksgiving day, I was tired, cold, shook-up and pissed-off at the aircraft.

The gentleman at the FBO was nice enough to give us a ride back to Pontiac Airport, he said he lived about 15 miles from there and it wouldn't be a problem.

On Friday Nov 24th I called the mechanic who had overhauled my engine. He asked to see the aircraft and root cause of the failure. We removed the upper and lower cowls from the plane and started trying to find out where all the oil had come from. It came from the crank seal and a magneto seal. It seems what had

NIGHT ENGINE FAILURE

happened was the engine breather vent line had iced up. The moisture in the engine breather line had froze due to the cold air and caused excess crank case pressure. The extra pressure in the crankcase affected the mechanical fuel pump by adding additional pressure to the top of the diaphragm. The extra pressure caused the pump to increase fuel pressure beyond the carbs needle and seats' ability to stop it from entering the float bowl. Once the float bowl became filled it would run out the float bowl breather port directly into the venturi throat.

This caused the engine to become flooded with fuel and drowned out the plugs. The exhaust pipes were filled with black soot and the plugs were as black as coal. The fuel pump pressure had increased to over 10 psi. Don't know how much more due to the fact that my gage is only a 10 psi gage.

The lesson here is, make sure your breather line is routed in an area that is in warm air flow, or it has a tee cut in it to allow venting near the engine should the exposed line-end freeze-up during cold weather flights.

Thought I would pass this experience along. ●

Spin-On Oil Filter Adapter for Lycomings

B & C Specialty Products' latest product is the neatest idea I have seen in a long time. It is a 90-degree, spin-on oil filter adapter for Lycoming engines. It is beautifully made by CNC milling out of a solid aluminum billet and bolts onto the accessory case in place of your oil screen housing or AC spin on filter adaptor. It fits perfectly, does not interfere with the magnetos, the vacuum pump or even the mechanical tachometer drive. It also has plenty of clearance on your engine mount and firewall, important considerations when you operate an EZ!

I installed one on N26MS and now have a full flow, spin on champion oil filter, with no high pressure hoses to a remote mounted filter which could leak. It comes with everything you need to install it: a new gasket, new aluminum washer for the vernatherm, and new copper washer for the oil temperature sensor. They even send a small container of the proper sealant for the gaskets. Of course it comes with new Lycoming bolts to mount it.

It is fairly expensive at $395 but is available to EZ flyers until the end of 1996 for $350. I am extremely pleased with mine and I heartily recommend it for anyone running a Lycoming engine on an EZ. A fuel flow spin-on filter allows 50 hours between oil changes and prolongs the life of your engine.

Give B&C a **call at (316) 283-8662 or fax (316) 283-8000.** You'll be glad you did! ***Mike***

RAF Recommended Suppliers

These suppliers are still the only authorized RAF dealers for all your various aircraft materials and components.

Brock Mfg.
11852 Western Ave
Stanton, Ca 90680
(714) 898-4366

Aircraft Spruce East
PO Box 909
Griffin, GA 30224
(770) 228-3901
(800) 831-2949

Aircraft Spruce West
PO Box 4000
Corona, Ca 91718-9961
(909) 372-9555
Fax (909) 372-0555

Wicks Aircraft
410 Pine Street
Highland, IL 62249
(800) - 221-9425
Fax 888-440-5727
e-mail:info@
wicksaircraft.com

Feather Lite
PO Box 781
Boonville, Ca 95415
(707) 895-2718

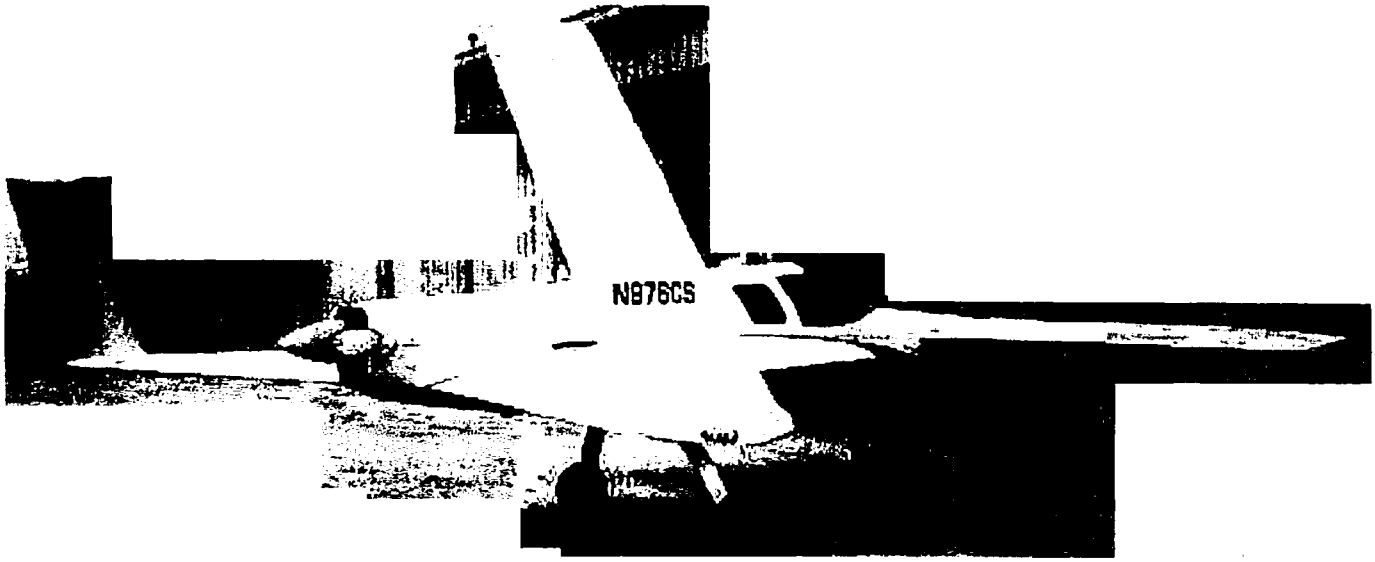
Hendrickson-Rowbear
Custom Wood Propellers
PO Box 997
Woodstock, IL 60098
Toll Free 877HR PROPS

FLUSH, INTERNALLY MOUNTED ANTENNAS

A complete line of antennas, specifically designed for, and flight tested on, composite aircraft. The antennas are tuned for maximum performance and in general those who have used them so far report reception is doubled over standard external antennas.

VariEze builder/flyer Bill Butters has started a company to develop a full range of buried antennas. These are normally supplied with a BNC connector built into the actual antenna, but can be supplied without connectors to include enough length of co-ax cable to facilitate easy installation with minimum weight and bulk.

Call Bill Butters ***800-758-8632*** Advanced Aircraft Electronics, PO Box 4111, Florissant, MO 63032



Charlie and Marilyn Sims recently sent RAF a picture of their Defiant 976CS.
This month the Canard Pusher highlights Defiant trim.

RUTAN AIRCRAFT FACTORY
1654 Flight Line
Mojave, CA 93501

PRSRT STD
U.S. Postage Paid
Mojave, CA
Permit No. 75

Inside

January 2001
CP 103

If your label says **LAST ISSUE CP 103**, this is your last issue and you need to renew.