CANARD PUSHER

OCTOBER 1996 RUTAN AIRCRAFT FACTORY VOL.11, ISSUE 4, NO. 86

Burt & Mike report Boomerang characteristics

The Boomerang, Burt's new high-performance, pressurized light twin, made one of its first appearances during the evening air show at Oshkosh in August after a non-stop flight from Mojave with Tonya and Jeff. Arriving within one minute of the scheduled flight plan, the Boomerang made a couple of runway passes to show off the airplane's unique shape while Dick Rutan narrated from the ground.

The Boomerang was later flown during the show for an evaluation by Jack Cox, editor of Sport Aviation, and for air-to-air photography. (Check out those beautiful photos that are in the cover-story article of the October Sport Aviation).

After Oshkosh Burt flew to St. Louis to visit a customer and then flew non-stop from St. Louis to Mojave into headwinds, arriving at Mojave with an hour-and-a-half of fuel remaining. (see figure 2 for a comparison of the Boom's efficiency and speed to other light aircraft).

The Boomerang holds a total of 1007 pounds of fuel, giving it true coast-to-coast range. In fact when slowed to the Defiant's speed of 180 kts at economy cruise, the Boomerang has less than half the fuel flow of the Defiant and can fly more than 2,400 nautical miles!

Since Oshkosh Boomerang has flown to Colorado twice and on several local trips within California. Additional flight test data was measured after Osh '96 in order to prepare a technical presentation at the Society of Experimental Test Pilot's symposium in Beverly Hills in late September.

The SETP presentation included the design rationale of the Boomerang's configuration and presented much of the stability, control and performance data of the aircraft.

see Boomerang pg 5

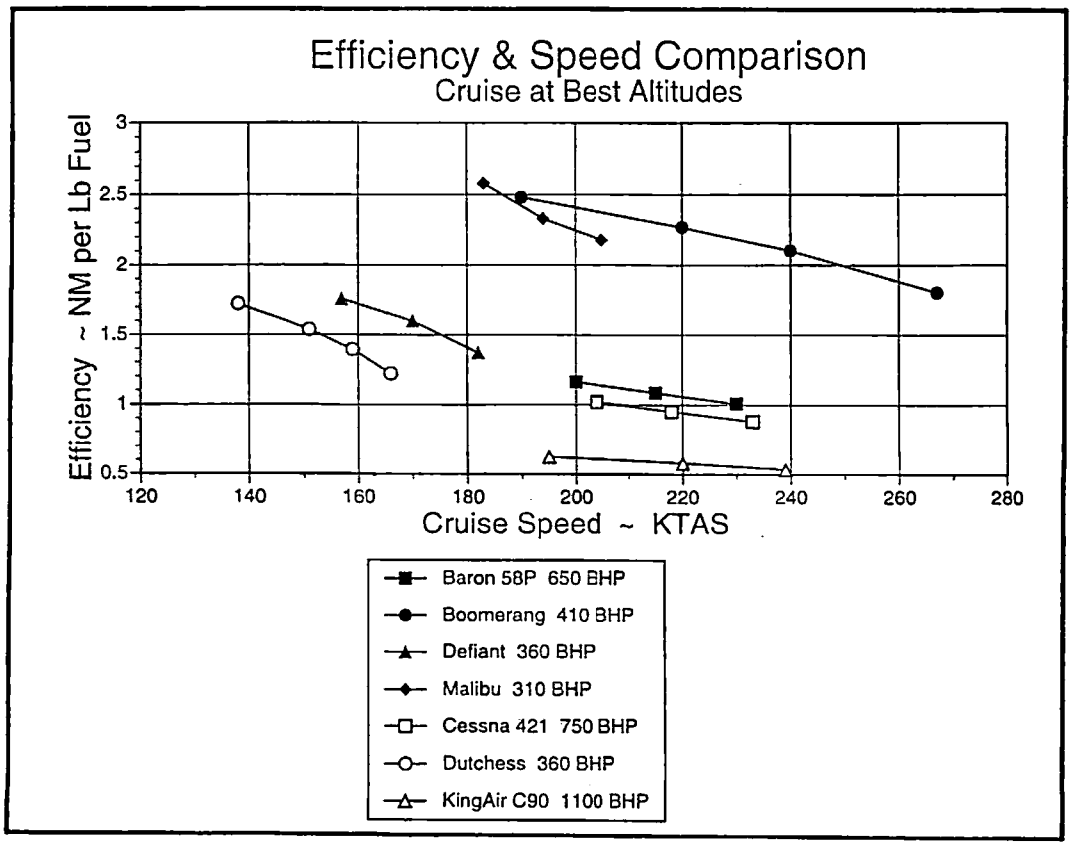

Figure 2

BRIEFS

The Boomerang is well covered

Our one & only Boomerang became quite popular with journalists after its debut at Oshkosh this August. EAA members have already received their October issue of ***Sport Aviation*** which sports a great in-depth article by Jack Cox and beautiful photos by Jim Koepnick. The Boom also made the cover of the November issue of ***Popular Mechanics*** thanks to writer/photographer Jim Sugar. Watch for Peter Lert's expert evaluation of the airplane in November issue of ***Sport Pilot & Ulralights***.

Oshkosh Forums on Video

Now you too can enjoy the thrills, the chills, and the laughs of Burt & friends 1996 Oshkosh Forums right in the comfort of your own home! All forums were recorded on Sony VHS HiFi stereo video tape from a Hi-8 stereo master from the front row center seat by Buzz Talbot. He says he can put any two forums on one Sony T-160 tape, including the Boomerang's Oshkosh flight pattern and a video tour of the inside and outside of the airplane. Copies of the forums are $15 for one or $20 for two, includes all costs and postage.

Forums: *Life, the Universe & Everything Else*
by Burt, John Roncz & Mike Melvill

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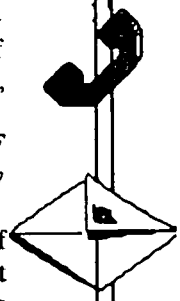
Note — Sometimes you can catch Tonya at RAF Monday thru Friday. She is in and out. Try and try again.
When writing to RAF, send along a stamped, self addressed envelope, if you have builder's questions that need to be answered. Please put your name and address on the back of any photos you send.



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Long-EZ
CP 24 to current
Solitaire
CP 37 to current
Defiant
CP 41 to current

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Long-EZ Cylinder Head Cooling

by Mike Melvill

Here we go again! This has been an on-going nagging problem, that has been by far the most common question I have received here at RAF over the years. Those of you who read the Canard Pusher are well aware that cylinder head cooling, and to some extent, oil cooling, have been on-going problems for many EZ flyers, and we have addressed these problems many times with some of our ideas and some builder-submitted ideas, with varying degrees of success.

I myself have made an amazing number of changes to the cooling system on N26MS, including four complete changes of engine baffling, a bigger NACA inlet, a smaller NACA inlet with larger lip radius, and two small NACA inlets cut into the top cowling cheeks.

I have had my oil cooler in five different locations in the cowling, and it is now back in the plans called-out position, where it works best.

Recently I spent a lot of money on a major engine overhaul, and the uneven cylinder head temperatures (number 4 is always hottest!) really began to bug me. A couple of months ago I was talking to Dave Ronneberg (Berkut designer) and e is cooling a Lycoming IO-540 with two small armpit" inlets and allowing the engine to breathe and the oil to cool through a small "pitot" type inlet on the bottom of the fuselage. I frankly did not believe his cylinder head temperatures! Dave gave me a pair of the small "pitot" type "armpit" inlets and although they did not fit the Long-EZ cowling very well, they were adequate for some flight testing. I flew the airplane at 11,500 feet with an outside air temperature of 9-degree C. I set the RPM at 2660, and leaned it to a fuel flow of 9.6 GPH, and 17.3-inches of manifold pressure. I used these settings for all subsequent test flights.

The first test was with all of my cooling inlets, the normal NACA on the bottom of the fuselage, plus two small NACA inlets in the top cowling, *plus* the two Berkut "armpit" inlets. Cooling was worse!! *(see chart)* My number 4 cylinder really worried me! I was disappointed to say the least, but I persevered and tried a small vane in the right "armpit" inlet. To my amazement this reduced the temperature accoss the board, but especially reduced #4 by 140-degrees! *(see chart)*

I then began a series of iterations of vanes and ducting within the "armpit" inlets and I also sealed up the two small NACA inlets in the top cowl. I still had my original NACA inlet as well as the Berkut armpit inlets and now the cylinders were actually a little too cool!! So I sealed up my NACA inlet and flew with just the two Berkut armpit inlets, which incidentally together had 10 square inches less inlet area than my orignial NACA inlet! The result was a very gratifying 342-degrees; 345-degrees; 344-degrees; and 345-degrees with the oil temperature stable at 185-degrees F. *(see chart)*

I am so impressed with the results of my testing that I am currently building a new cowling, incorporating the Berkut style "armpit" inlets, designed to fit the shape of the Long-EZ cowling. This cowl will be made entirely out of Carbon Fiber saving about 15 lbs, and I will have excellent cylinder head and oil cooling, together with a slightly lower drag cowling. I will report on the results of the new cowling in the next CP (Jan '97), but I thought that this was such a significant improvement over the original NACA inlet that it would be of interest to many of our builder/flyers. ●

Long-EZ N2MS with Lyc 0-360 and Airflow performance fuel injection system
All data obtained at 11500 ft, pressure altitude. Power was set at 2660 RPM and 9.6 GPH fuel flow

		Cylinder #1	Cylinder #2	Cylinder #3	Cylinder #4	Oil temp, deg F
8/30/96	Baseline — 12" Wide NACA inlet plus two small NACA inlets in top cowl	366	390	397	411	188
9/8/96	Original NACA inlet, plus two Berkut "armpit" inlets	363	398	386	429	188
9/10/96	As above, with flow ducted to cylinder #4	357	345	360	287	184
9/13/96	As above, but with ducted flow to all four cylinders	322	334	329	282	185
9/20/96	As above, but with each duct modified to try to even temperature	344	351	355	316	188
9/20/96	As above, with ducts #3 and #4 modified a little more	345	345	353	330	185
9/21/96	NACA inlet glassed shut, only Berkut inlets functional	354	347	340	317	183
9/23/96	Berkut inlets only, with optimized restricter nozzles	1340/342	1335/345	1351/344	1350/345	185

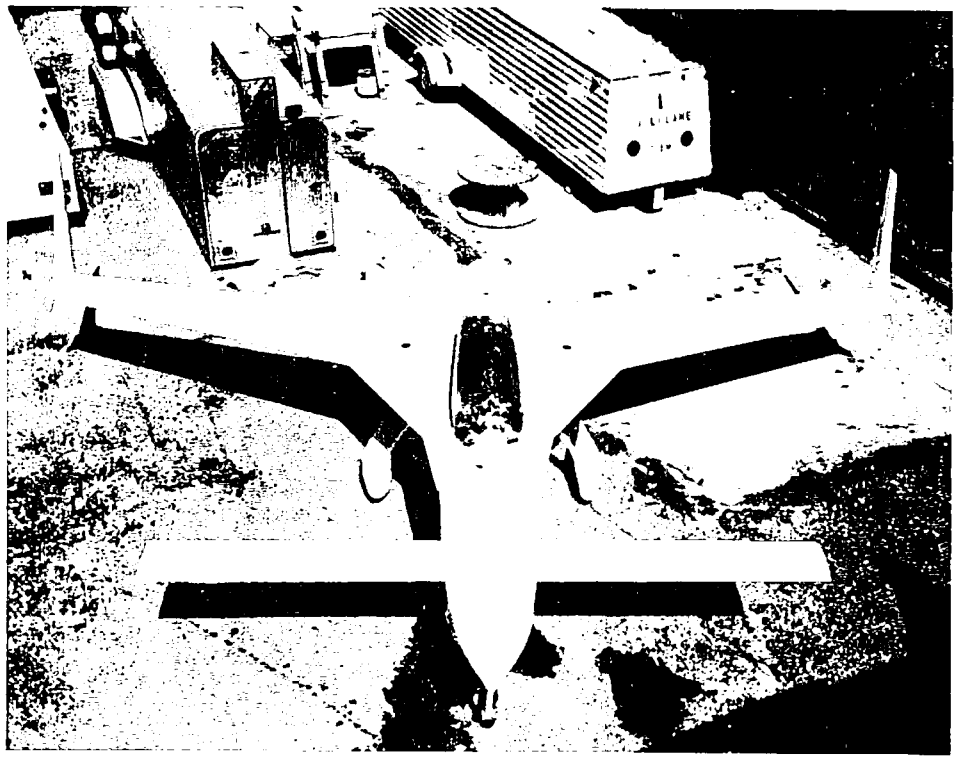
Corrosion discovered in brackets

A Long-EZ pilot has reported finding moderate to severe corrosion in the elevator hinge brackets on his GU canard. He did not build this airplane, and the history of this airplane is not known, but it currently is based on the East Coast in a salt water environment and the corrosion was significant enough to cause this pilot to dig out all of the hinge brackets and replace them.

We have not found anything like this on any of our aircraft, but keep in mind all of the EZ types here in Mojave live in hangars and in a dry desert environment. We will continue to investigate this problem, and will report in future CPs. Every EZ and Defiant owner should make frequent careful inspections of these hinge brackets. Keep in mind that there was little or no evidence visible outside the canard. The corrosion took place inside the canard, where the bracket was floxed into place in the high density foam insert. Probably moisture was "wicked" up into the flox/high density foam and was trapped in close proximity to the 2024-T3 aluminum brackets.

What can be done to prevent such an occurrence? The best thing to do for these brackets, and all other aluminum parts, is to treat the bare aluminum with Alodine 1201, after pre-cleaning with Alumiprep 33, *prior* to installation. They should then be sealed in pure epoxy prior to bonding them into the canard. We plan to do surgery on Burt's Defiant canard, which was built in 1978, and we will report on the findings in CP 87.

We would appreciate hearing from anyone who may find corrosion in this or any other area. Feedback from builder/flyers is extremely important and is our main source of information relating to safety. •



Flyin' is EZ

Congratulations are in order for Al & Jane Fink whose VariEze N33AL (serial# 2096) made its first flight on 4 July 96 with Bill Ortiel at the helm. As of August 18 they have put 25.5 hours on the EZ. Al said thanks are due to his wife, who put up with the many hours he spent with the airplane; Dan Peterson for the help on a great finish; Ron Verderame for wiring help; Chris Wade for great seats; Bill Ortiel, the "Yoda of Chino Airport," and RAF for keeping it alive all these years.

Engine Mounts Cracking

Reports of steel engine mount weldment cracking still occasionally come in to RAF. It is very important to carefully examine your engine mount at regular intervals, at least every 100 hours and better yet at each oil change. Please report any cracks, with a photo if possible, to us here at RAF. If you feel any change in the vibration characteristics of your EZ you should suspect a cracked mount and should conduct a very careful inspection with a bright light.

We recently heard, for the first time of a cracked aluminum extrusion in the engine mount to fuselage interface on a VariEze. The top left extrusion, a 1/8" x 7/8" x 7/8" aluminum angle was cracked part-way through at the firewall, and was not easy to find. This builder has since replaced all of his aluminum extrusions with formed 4130 steel angle. This was a high-time EZ, with a very powerful engine well beyond the plans called out horsepower, but it is still cause for all of us to keep a close eye on these extrusions as well as the steel weldment.

On the positive side, the engine mount in my Long-EZ N26MS, is still the original, installed in 1980, and has never developed a crack in more than 2500 hours of flight. •

During the SETP talk, Burt presented the design rationale by showing that by making incremental improvements to a pressurized Barron the aircraft a designer could arrive at the Boomerang configuration. Space does not permit the Canard Pusher to publish that rationale, however the adjacent summary comparison shows the dramatic differences.

Note that the Boomerang has less powerful engines than a pressurized Barron, but considerably more speed, range and safety from minimum single engine controllable airspeed type accidents.

Space doesn't permit presenting all the Boomerang data. In this newsletter we'll present the airplane's engine-out flying qualities, i.e. the characteristics of the Boomerang with one engine inoperative.

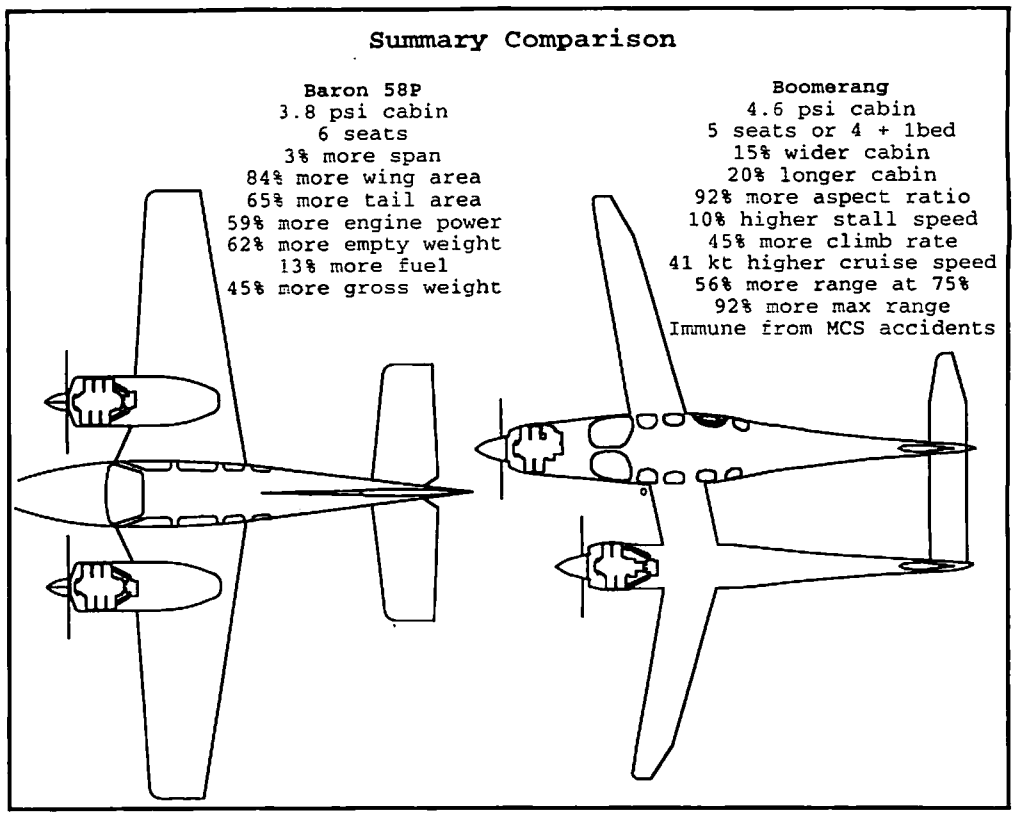
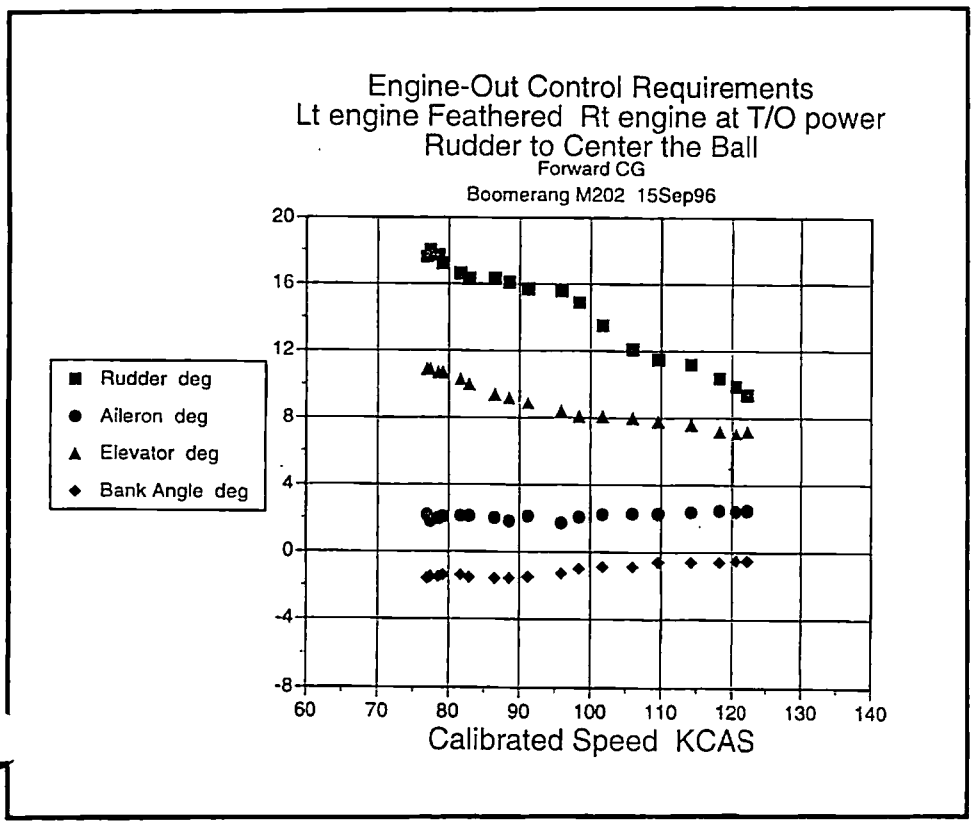


Figure 3



Figures 4 - 7 illustrate the complete data for the Boomerang when flown with one engine inoperative. Note that if the pilot centers the ball, more than twice as much rudder is required to handle an engine-out if the left engine is failed than to handle an engine-out if the right engine is failed. This appears backwards since the Boomerang's left engine is at buttline -56 and the right engine is at buttline only +32. The reason for this is primarily the P-effect which causes a thrustline of engines to move to the right as angle-of-attack increases. Thus, even though the Boomerang looks geometrically asymmetric, it is not geometrically asymmetric enough in order to make its engine-out control symmetric. In other words, to make the airplane symmetric at minimum speed you would have to move the left engine even further from the fuselage.

Actually this is all academic since the airplane can be controlled quite easily at its minimum speed with a margin of rudder remaining.

Figure 4

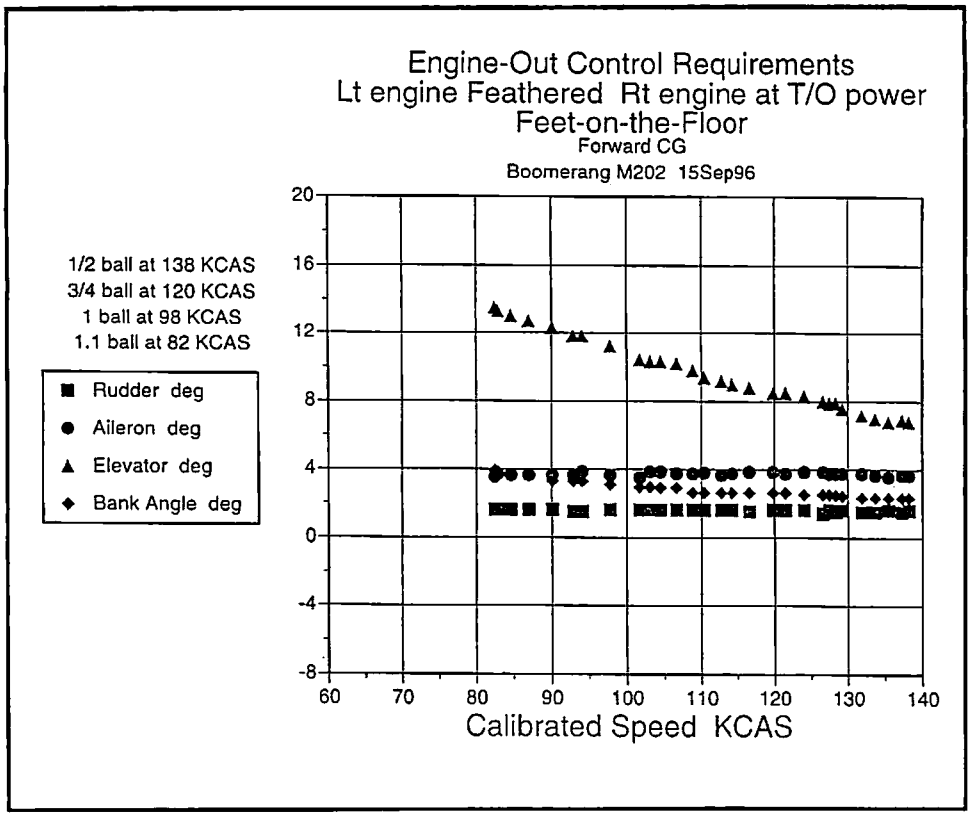


Figure 5

The most interesting data, though, are figures 5, and 7, showing the control authority needed to handle engine-out if the pilot merely places his feet on the floor rather than tries to center the ball. Surprisingly, very little aileron is required. Boomerang handles engine-out very nicely down to minimum speed with no rudder at all!

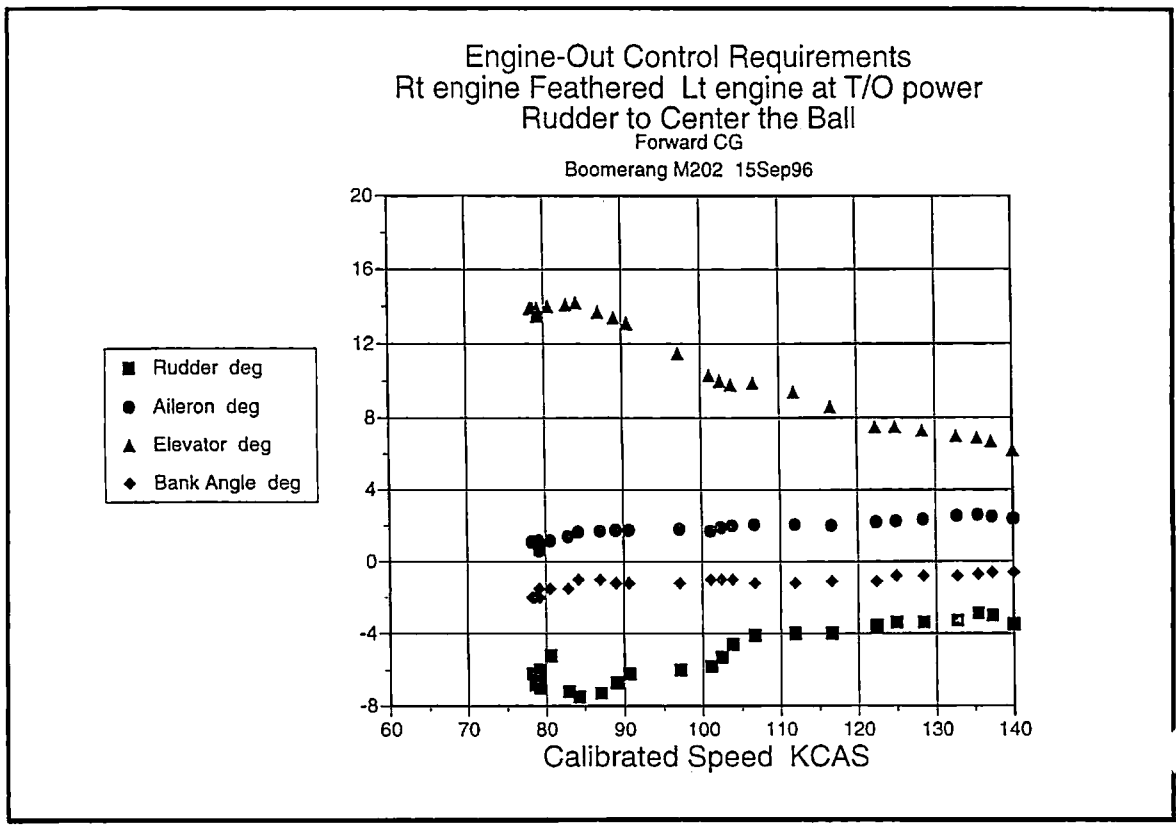


Figure 6

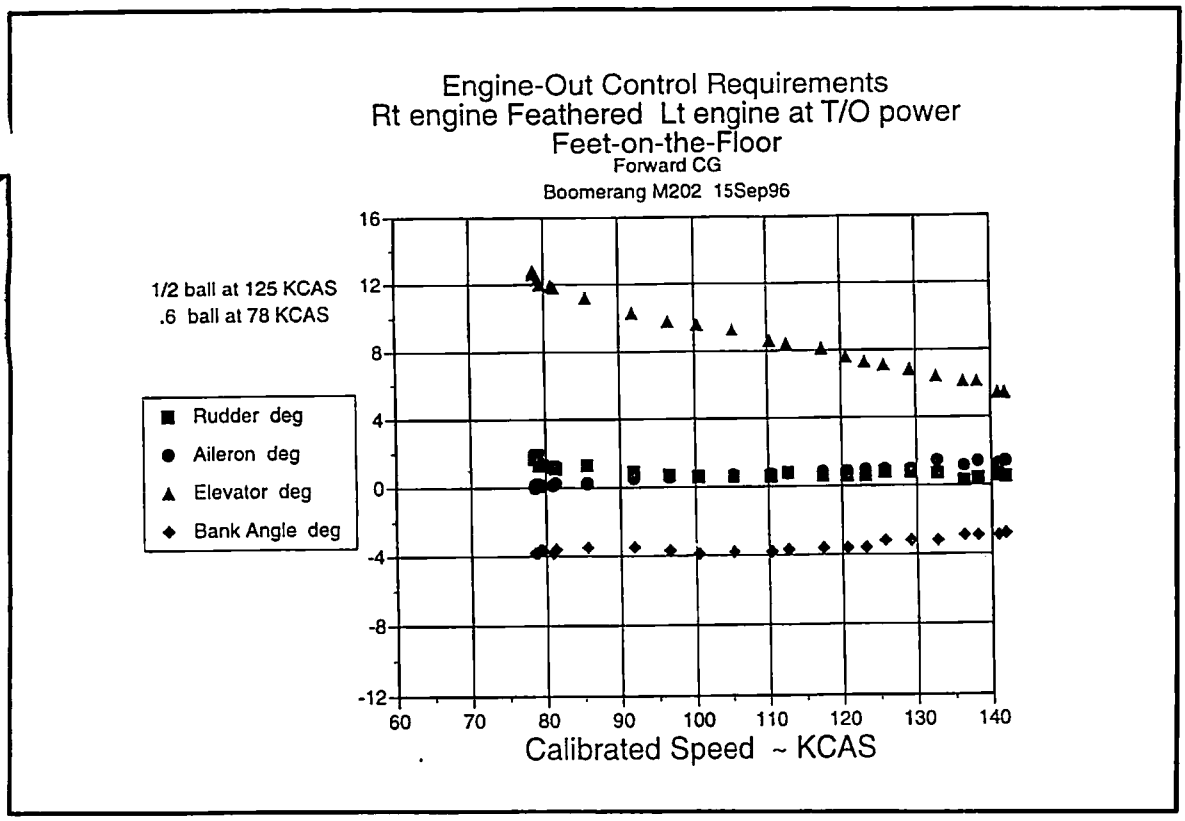


Figure 7

Figure 8 summarizes the rudder requirements for all four maneuvers.

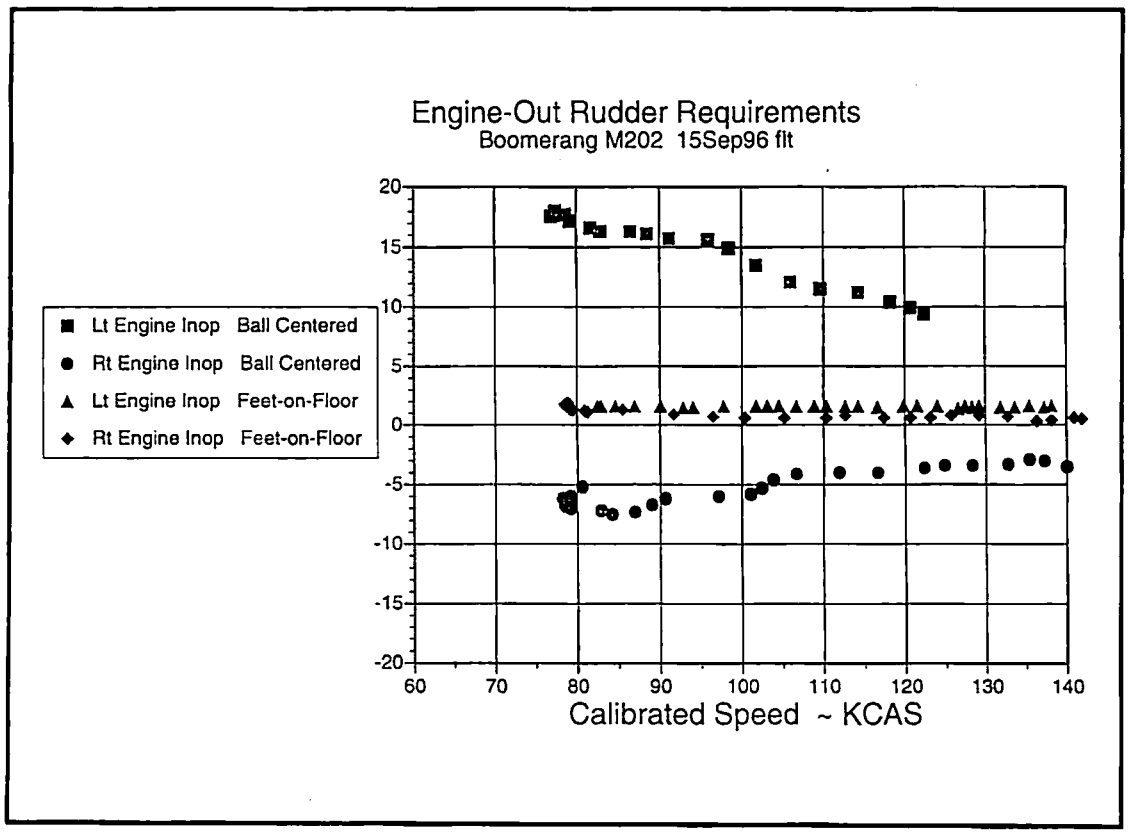


Figure 8

Figure 9 summarizes the aileron requirements for all four maneuvers. Note that if the pilot does nothing with the rudder petals and lets the rudders float near zero, only about two degrees of aileron are required to maintain course. This was a surprising result and in order to determine how unusual this characteristic is, Mike and Burt went out and did engine-out testing with a Beechcraft Duchess, one of the safest light twins for engine-out flight. The results of the Duchess and the Boomerang are presented on figure 10. Note that if the Duchess pilot uses a normal technique of 5 degrees bank into the operating engine and the Boomerang pilot tries to center the ball, there's not a tremendous difference in the rudder requirements. The Duchess has its min-control speed about 12 percent above stall, and the Boomerang has some rudder remaining at stall. However, if both airplanes are flown with the feet on the floor, with the critical engine failed,

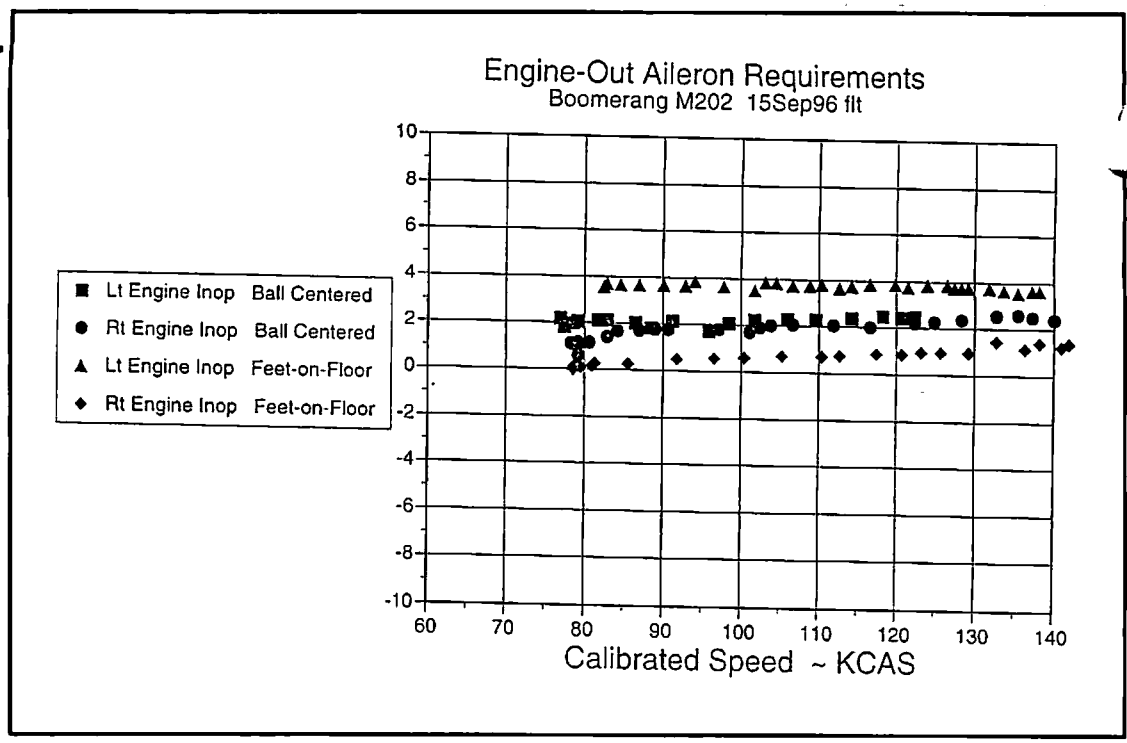


Figure 9

there's a dramatic difference. The Duchess ends up at 22 percent above stall speed with full aileron into the operating engine and a large bank angle. The Boomerang, on the other hand, can be slowed to stall speed using only a modest proportion of the available aileron and very little bank.

This dramatic difference is not entirely due to the Boomerang's unusual configuration. It's mainly a result of having ample directional stability and low dihedral effect. Thus the ample directional stability handles the engine asymmetry without application of rudder, resulting in a small side-slip angle. And because the dihedral effect is low, a small amount of aileron is required to trim that resultant side-slip angle.

The Boomerang thus represents an enormous improvement in safety over other high-performance light twins.

Articles on the Boomerang also appear in the November issues of Popular Mechanics, the November issue of Sport Pilot & Ultralights, an up-coming Air Progress, and other publications. ●

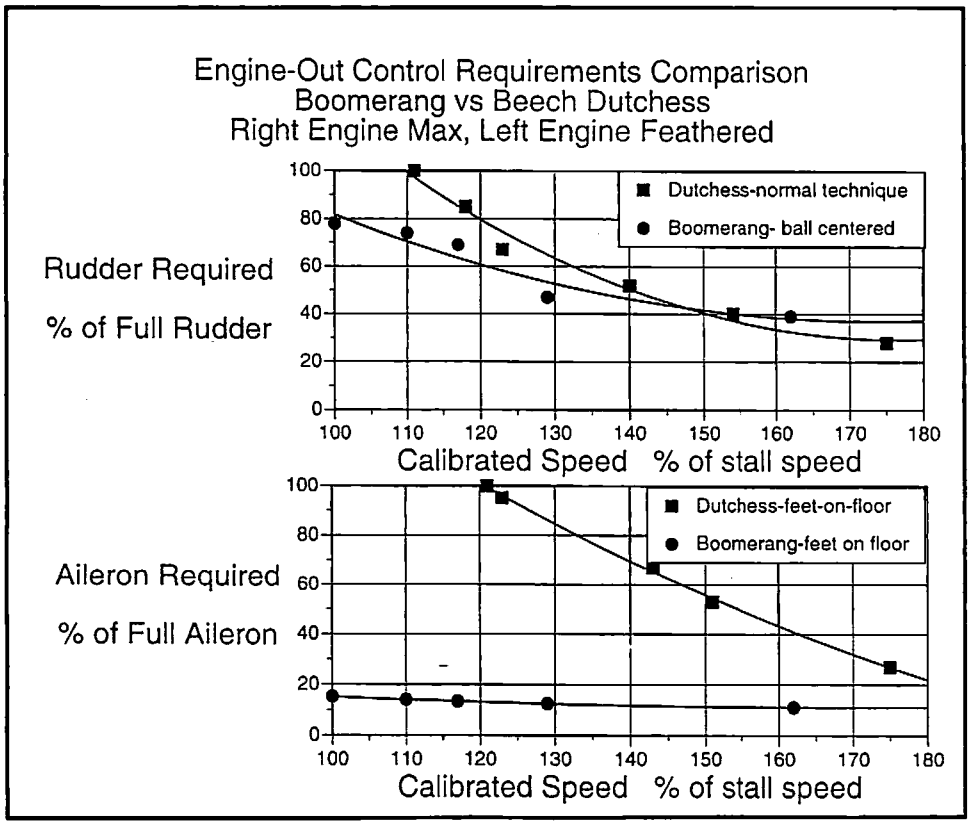


Figure 10

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EZ count, Oshkosh '96

By David Orr

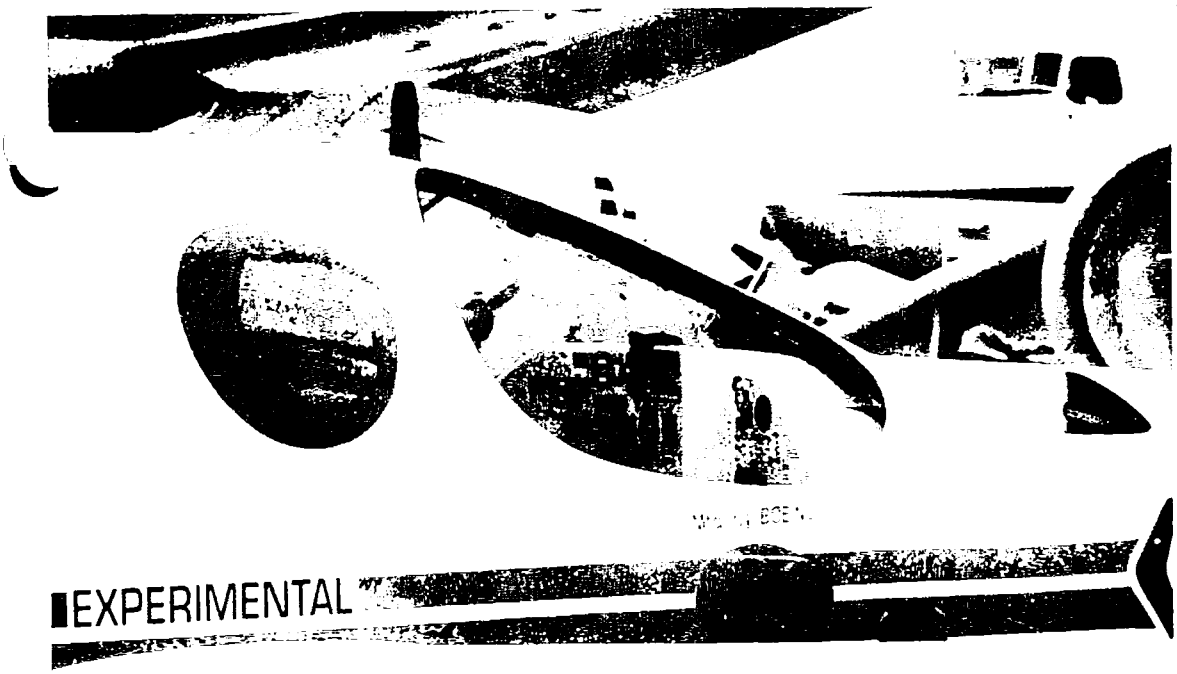
Every year we see a lot of airplanes from all over the United States — I always presumed the local states dominated the thing and maybe that is very true for the spam cans. However, for the long-legged Rutan types it is interesting to see the states from which they came this year. I thought you'd like to see how the gross tally of Rutan aircraft at Oshkosh '96 as spotted by Phil Chase:

AK — Long EZ N73BR (Brent Bristow)
AR — Long EZ N63EZ (Dan Worley)
AZ — Long-EZ N7HJ (Harry Bawcom)
AZ — Long EZ N24ND (Norm Dodge)
AZ — VariEze N130BE (Bob Eckes)
AZ — Varieze N99VE (Gary Hertzler)
CA — Long EZ N600TD (Dave Dent)
CA — Long EZ N818KD (Steve Drybread)
CA — Varieze N23FF (Fergus Fay)
CA — Long-EZ N87KJ (Ken Flaig)
CA — VariEze N47LG (Dave Kilbourne)
CA — Long-EZ N26MS (Mike Melvill)
CA — Long EZ N776LE (Lew Miller)
CA — Long-EZ N97JD (JD Moore)
CA — Long EZ N169SH (Dick Rutan)
CA — BoomN24BT (Burt Rutan)
CA — Varieze N57LG (Klaus Savier)
CA — Long-EZ N316DB (Doug Shane)
CA — VariEze N118SJ (Steve Sorensen)
CA — Varieze N15CJ (Carroll Stephens)
CA — Long-EZ N24DT (Dave Trudell)
CA — Long EZ N199BW (Barry Weber)
CO — Long EZ N45FC (Ron Cothern)
CO — VariEze N6LK (Rob Martinson)
CO — VariEze N9091A (Gary Mowad)
CO — VariEze N8037T (Jim Willer)
CO — Long EZ N82BJ (Bob Wilson)
CT — Long-EZ N295JF (John Faulkner)
FL — Long-EZ N617LE (Ed Ferriell)
FL — Long-EZ N83BT (Bill Odum)
FL — Varieze N617VF (Irvin Smith)
IL — Long-EZ N82TZ (Jake Bach)
IL — Long-EZ N5E (Colin Koebel)
IL — VariEze N12BN (Bernard Nitz)
IL — Defiant N27EZ (Jahn Steichen)
IL — VariEze N4ZZ (Ken Swain)
IN — Long-EZ N85KW (Walter Gee)
IN — VariEze N500EZ (Victor Mondary)
IN — VariEze N50EP (Edra Parker)
IN — VariViggen N212RS (Ron Smith)
KS — Long EZ N454BC (Brad Carter)
KS — VariEze N392EZ (William Freeman)
KS — Long EZ N412DM (David Haggard)
KS — Long-EZ N12NC (Jerry Peck)
KY — Long-EZ N4568Q (Barry Meacham)
LA — Varieze N17RL (David Myers)

LA — Long-EZ N33WT (William Taylor)
MD — Varieze N508OK (Chuck Alresman)
MI — Long-EZ N57AM (Alex Baker)
MI — Long-EZ N83GC (Gary Crandell)
MI — Long-EZ N3260K (Doug Kouri)
MI — Long EZ N510PG (Darryl Nelson)
MI — Long EZ N57JP (James Price)
MN — Long EZ N52CA (Chuck Allison)
MN — VariEze N9FJ (Jon Gabrick)
MN — Long-EZ N3293V (David Gisy)
MN — Long EZ N83JM (James Madsen)
MN — Long EZ N407MN (McCumber Nickman Corp.)
MN — VariEze N829WJ (Dave Nelson)
MN — Long-EZ N23X (Greg Strove)
MO — Long EZ N83DT (David Adams)
MO — VariEze N83HR (Harry Robbins)
MO — VariEze N44VE (Joe Rosa)
NE — Long EZ N729RA (Rolland Sturtevant)
NH — Varieze N93EC (Jan Eggenfellner)
NM — Long EZ N28KM (Erik Stolle)
NJ — Long-EZ N31JJ (James Roberts)
NY — Long-EZ N88LE (Wm French)
OH — Long EZ N775AM (Sam Chambers)
OH — VariViggen N915D (Dennis Jacobs)
OH — VariEze N60HZ (Bruce Leonard)
OH — Long EZ N9TS (Terry Schubert)
PA — Long-EZ N91RA (Herb Rutter)
PA — Long-EZ N989LE (Allen Silberman)
TN — Long-EZ N569LZ (Don Hansen)
TN — VariEze N7AH (Larry Hoepfinger)
TN — Long EZ N99HM (Herb Sanders)
TN — Defiant N143PS (Bill Sattler)
TN — Long-EZ N390EZ (Tom Smith)
TN — VariEze N83EZ (Terry Sweat)
TX — VariEze N12VE (Joe Bennight)
TX — Long EZ N158TG (Tom Garrison)
TX — Long EZ N111DH (Darryl Hensingfeld)
VA — Long EZ N339E (Jim Evans)
WA — Long-EZ N444MR (Mark Buxbaum)
WA — Long EZ N35RS (Bob Sudderth)
WI — Long-EZ N1947 (Isaac Solomon)
WI — Long EZ N424RW (R.G.Westphal)
Canada — Long-EZ C-GFBB (Bruce Bolton)
Canada — VariEze C-GMEZ (Nigel Field)
Long-EZ N9EC (Ron Pads) ?

Summary of RAF Types

Long-EZ:	60
Varieze:	27
VariViggen:	3
Defiant:	2
Boomerang:	1



Okay, who's the wise guy?

The Boomerang was vandalized by taggers during its stay at Oshkosh with profanity of the ***worst kind!*** (see photo on left) Fortunately fast-acting Jeff Rutan peeled the graffiti from under the cockpit window before it could be read by children and small animals.

Accident Report

On August 6, 1996 after departing Oshkosh for a scheduled fuel stop in Cedar Rapids, a Long-EZ pilot experienced a vibration that rapidly became very severe.

Suspecting a propeller failure, the pilot shut the engine down and pulled the nose up to bleed off airspeed in order to stop the propeller from wind milling while establishing a safe place to land.

On the ground the pilot discovered damage to the right side exhaust system where about 6 inches of the tailpipe was missing plus damage to one blade of the propeller. It was broken chordwise at a point behind where the exhaust pipe exited the cowling, approximately 6" from the tip. This break was about 2" wide and from that point a tapering break toward the back of the prop running toward the hub for about 12". Everything outboard and aft was missing.

The pilot believes that the exhaust pipe broke and exited the cowling, striking and breaking one blade of the propeller. The first break set up a vibration that caused the second break.

After close inspections of the engine and mountings and a dial indicator check of the crankshaft flange for runout which indicated only about .0003 radial runout with Lycoming calling for .0005 or less, the pilot had a spare propeller shipped from home, installed it and ran the airplane up on the ground. He reinspected the engine, mount and airframe and found no descrepanices. An additional inspection followed a 15 minute test flight, and a 30 minute test flight. Additional problems were not found.

On July 27, 1996 a Long-EZ pilot experienced an engine failure immediately after takeoff, causing the airplane to crash into a wash and overturn. According to the pilot, engine start and run-ups were normal. His Long-EZ has a two-tank, right or left, system with an engine-driven fuel pump and an electric boost pump. Because his Ellison throttle body injector doesn't like air bubbles in the fuel, he turns on the fuel pump and listens until he hears fuel running into the left tank and sees fuel pressure on the gauge before starting the engine, he said.

Fuel flow checks were later run on the engine and leveled fuselage. The pilot found that there was 1/3 gallon in the right tank and 2-1/4 gallons in the left tank. The tank vents were unobstructed. Fuel flowed freely at the gascolator outlet. No fuel would flow to the throttle body even with the electric pump running. He disconnected the outlet line from the electric pump and got no fuel even with it running only about one drop per second. He removed the inlet line and got good fuel flow. He fueled each tank to one gallon and timed the flow. The left side drained the gallon in 4 min 53 sec and the right in 4 min 43 seconds. He removed the electric fuel pump and attached to outlet of the gascolater with a flex line and positioned it lower than the electric pump running only one ounce per minute would come out of the pump.

The pilot feels the electric pump failing right after liftoff caused enough restriction to the fuel flow to cause the fuel to vaporize between the electric pump and the engine-driven pump. ●

NOTE: We are not familiar with the details of this aircraft's fuel system. In order to help prevent accidents RAF reports in the CP information received from EZ pilots, even though it relates to non-approved modifications or non-approved equipment. However, RAF does not recommend or endorse configurations we have not tested, i.e., we can recommend and support only what is in the plans or in a CP mandatory plans change.

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.

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PO Box 424
Fullerton, Ca 92632
(714) 870-7551

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

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

Wicks Aircraft
410 Pine Street
Highland, IL 62249
(618) 654-7447

Prop Manufacturer
600 Superior St
Concrete, Wa 98237
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MOLDED VORTEX GENERATORS

These pre-molded generators are specially engineered for aircraft application. Available in white, they can also be custom molded in quantity to match specific paint colors for aircraft manufacturers and OEM suppliers. After installation, the sail appears to be molded an integral part, rather than and "add-on". The final result not only looks better, it performs better than typical hand-made aluminum fences. Molded vortex generators adhere better, do not corrode, require no painting and are easy to install: one Long-EZ canard can be equipped with a full span of generators in less than 90 minutes.

A kit containing fifty generators is available for a price of $25.00 plus $2.00 shipping and handling per kit. Two kits are sufficient to equip the full span of a typical canard (i.e. Long-EZ, Dragon-Fly, et al) or both ailerons on either canard or conventional planforms. Documentation is included. Please send check or money order to:

CCI, PO Box 607, Plainfield, NJ 07061-2318
Please allow 2-3 weeks for delivery, Sorry, no COD's.
For more information 6:00-10:00pm EST, Mon.-Fri.
908-757-9573 908-755-9639 FAX

Note: These vortex generators are not TSO'd for use on type-certificated aircraft.

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, Advanced Aircraft Electronics, PO Box 4111, Florissant, MO 63032
800-758-8632

To report accidents and incidents

Write: Rutan Aircraft Factory
1654 Flightline
Mojave, Ca 93501

or Fax: (805) 824-4174

NOSE GEAR RATCHET

Dr. Curtis Smith's nose gear crank ratchet is available for $40.00 which includes postage and packaging. No need to call, just send check or money order. This little device should be considered a "must" by all Long-EZ and VariEze builder/flyers. Once you have flown with it you will wonder how you ever did without it.

Curtis Smith, 1846 Sextant Dr.
Worden, IL 62097
618-656-8209

Feather Lite

LONG-EZ PARTS PRICE LIST

Main gear strut	$349.00		
Nose gear strut	$58.00		
Engine cowls, pr. (glass)		$329.00	
Engine cowls, pr. (Kevlar)		$480.00	
Cowl inlet	$48.00		
Wheel pants (3.5x5)		$150.00	
Wheel pants (500x5)		$180.00	
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NG 30 cover	$21.00		
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Pre-cut wing & winglets			$1199.00
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Nose wheel cover NB	$19.50		
Sump blister	$19.50		
NACA inlet		$47.00	
3" extended nose gear		$70.00	

Feather Lite, Inc. is proud to announce another product to re-introduce to EZ builders: The original Space Saver Panel by the late Rusty Foster. This is a bare fiberglass panel with a molded recess for builder installation of an aluminum flat stock electrical panel. $40.00

Contact Michael Dilley or Larry Lombard (both former RAF employees and EZ builders and flyers)

Feather Lite, Inc., PO Box 781
Boonville, CA 95415
707-895-2718

TITANIUM ACCESSORIES AVAILABLE!

Custom anodized to any of 15 different colors, shades of copper, purples, blues, greens, yellow/gold, even rainbow effect. Rudder and aileron gustlocks - $20.00-30.00.

GU canard full span vortex generators with layout template - $170,00. These are very exciting! Rudder horn CS-301L&R replacements, $25/pair. Shipping inc.

Ti Specialties, PO Box 1052
Grover Beach, CA 93483-1052
805-489-8155

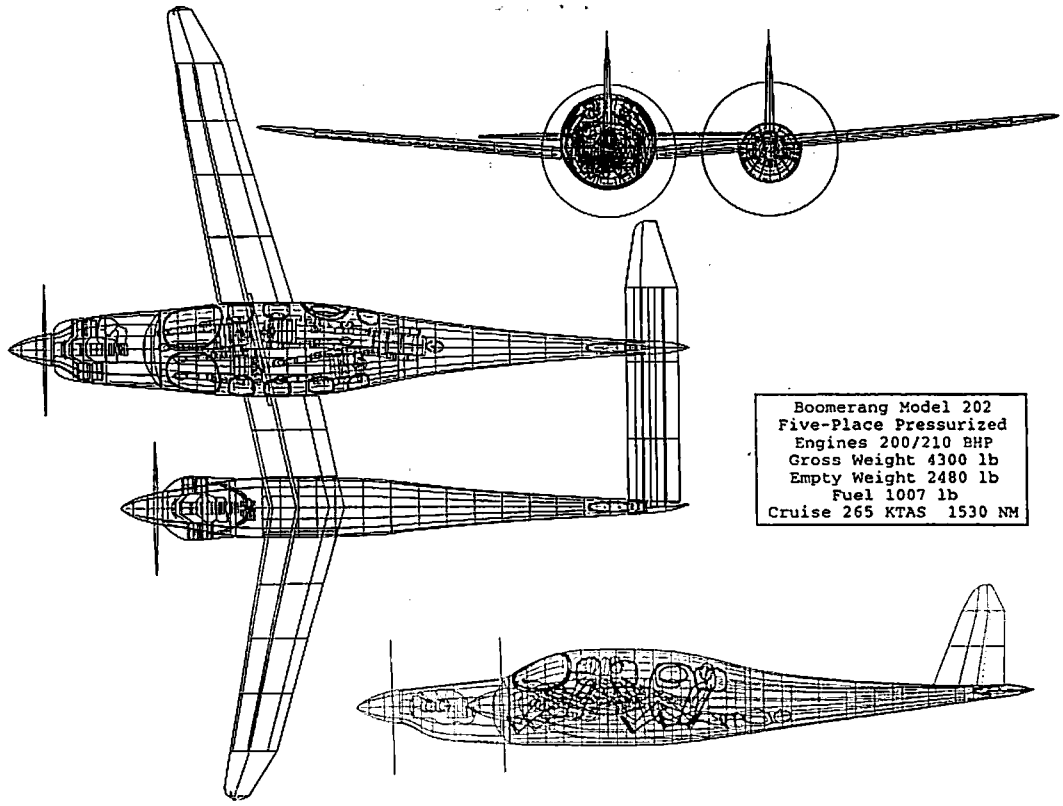
STARTER FOR 0-200 CONTINENTALS

B&C Specialty has introduced a beautifully made, 12 volt starter specifically designed to be installed into the accessory housing on a Continental 0-200 engine, or on an 0-240.

This starter has been thoroughly tested at Teledyne Continental (more than 5000 start cycles without a single problem!).

Bill Bainbridge has these starters available for immediate delivery and they can be had STC'd or for homebuilts.

Contact: B&C Specialty Products, Inc.
123 East 4th Street, Newton, KS 67114
316-283-8662



Straight from the drawing board — Burt writes about what he and Mike have learned about flight characteristics of the Boomerang so far.

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