Forward by Stan Price

The following is a two month long article prepared by Jim Montague ("Monty the Answer Man") who was probably one of the most knowledgeable Swift mechanics ever. This article appeared in the May and June issues (1998) of Vintage magazine and is reprinted with their permission. Thanks Jan. As you read the article "Monty" will occasionally give an idea that yields performance at the risk of long-term safety. An example of this being to remove Cleveland Brakes and go back to original because they are lighter. Not wise. He also mentions this in his article that not all of the ideas mentioned are prudent, only ideas for saving weight and gaining performance. In the end I believe performance is created by aerodynamic and cooling drag reduction, keeping her light and tight, proper rigging, and then – horsepower.

Enjoy this wisdom of the past. Much of it still applies, some of it is more in line with trying to create a Reno Racer, and some of it is possibly not applicable to your current Swift.

I believe that there is a balance between Safety and performance with Safety being the winner. If you are trying for the Reno races you can adjust your ratio but sometimes the results can be catastrophic.

I say again, there are many thoughts in this article that "Monty" admits have been printed in manuals and may be very unwise due to the age of the airplane (example would be the entry speed for snap rolls statement from an approved source. Bad idea.)

Preparing A Swift For Aerobatics/

Or Just Good Performance

a treatise by JIM MONTAGUE (A/C 1310)

Jack and Lea Anne Nagel cruise in Jack's highly modified Swift.

NOT FAA APPROVED

ANY INFORMATION HEREIN DOES NOT CONSTITUTE APPROVED DATA. THIS DOCUMENT EXPRESSES MY OWN OPINIONS AND WHILE I FEEL THEY ARE ACCURATE, OTHERS MAY DISAGREE, AND THEY MAY BE RIGHT, BUT I DOUBT IT.

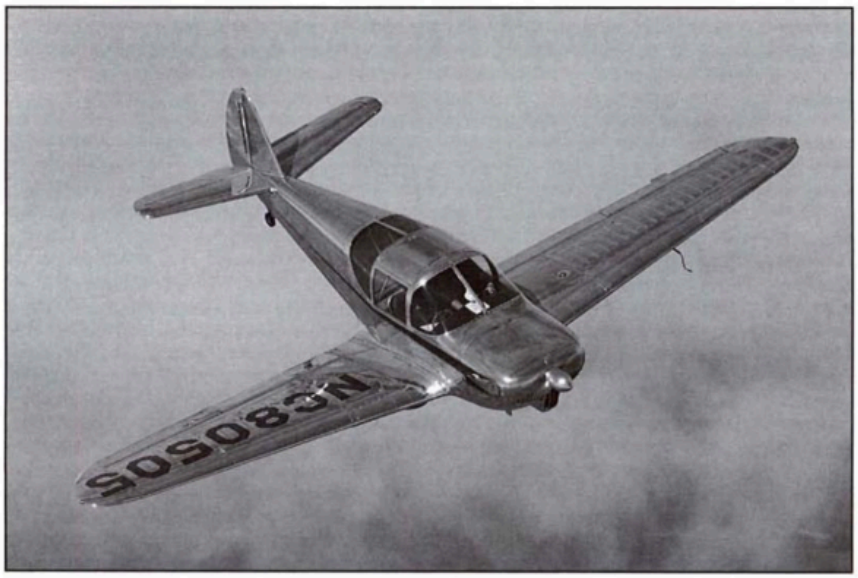
—JIM MONTAGUE

The information herein was learned the hard way over a period of 30 years of Swift ownership. Along the way I obtained a Pilot License, a Mechanics License and an Inspection Authorization. I have belonged to the Swift Association for all of its 25 plus year history,and enjoyed all but a few hours among hundreds of hours spent in these wonderful airplanes.

If you don't yet have a Swift, there are several things you can look for on a pre-purchase inspection which will help you later on. We are only at this time going to consider stock or semi-stock Swifts of l45 hp. Big engine airplanes are a chapter all their own. If you intend to do aerobatics:

1. Don't buy a painted Swift-paint adds weight, 20 to 60 pounds.
2. Don't buy a Swift with an auxiliary fuel tank—it's 14 pounds of extra weight.
3. If the Swift has tube radios, don't pay anything for them; they have to go.
4. If it has a "fully gyro panel," ditto.
5. Have a pre-purchase inspection done by a mechanic who knows Swifts. Remember these wonderful airplanes are old, so be alert for corrosion and bad previous repairs.
6. In particular, inspect the area of the lower spar of the center section.

   If the airplane has been belly-landed, and most have, be alert for cracks from the emergency gear extension bracket at the center of the airplane.
7. If the airplane is a converted GC-LA, make sure it was done according to S.B. #27. In particular, ensure the correct wing fittings are installed.



8. Check the engine mount per A.D. 64-05-06.

THE SWIFT WAS APPROVED UNDER CAR 4A; ANY SWIFT WILL LOOP AND ROLL

Okay, you bought a Swift, but before you do aerobatics I recommend:

1. The empty weight should not exceed 1,200 pounds, preferably less.
2. The ailerons should not be painted for flutter considerations.
3. Do a thorough Annual inspection; inspect all cable runs for frayed cables and rusty cables. Inspect all structure, paying particular attention to the horizontal stabilizer spar at the rivets of the first rib. Later, we'll talk about reinforcing this area. Check any older metal airplane for corrosion.
4. Lighten the airplane where it's easy and practical. Remove all gyros and plumbing and venturis, use an electric turn and bank; if you fly serious IFR you've got the wrong plane.

Remove all tube type (heavy) radios. Retain one comm 760 and transponder, and use a GPS for nav. Use a 20 amp generator—a 35A generator weighs 16 pounds. An alternator can require 2 or 3 hp to turn it.

A quality battery can weigh 27 pounds, a cheapie weighs 16 pounds. Use Slick 6364 mags (10 pounds) or Bendix S6LN-21 (11.5 pounds). The interior upholstery can be heavy. The original seats can weigh 35 pounds. The floor rug can weigh five pounds.

If you get to the air show stage, the ELT can even be removed.

Clean the interior, vacuum out the belly.

If the old D-2 wobble pump is still installed, remove it and install an electric pump. (Two or three pounds lighter.)

Remove landing lights, rotating beacons, unused antennas.

If you don't have the straight stack exhaust, get it.

A Sensenich M74DR-1 prop weighs three pounds less than a McCauley DM739.

Those are the bigger things. To really get the weight down you've got to go a little extreme. Examples:

The early 0-300s used magnesium mount legs, later aluminum-magnesium intake elbows and manifolds.

You may be able to get by with a 12A generator.

Check the B&C starter out; it's lighter and better, but expensive. The ELI landing gear is several pounds lighter than Adel.

Check your gear motor; some are too heavy.

Aluminum screws can be used in nonstructural applications, fairings, windshield retainers, etc.

Removing the oil cooler is not usually recommended, but it's not required legally with a fixed pitch prop.

The fuel tank filler is a steel tube; it could be aluminum. Strip the paint, if it's painted.

Cleveland wheels & brakes are great, but heavier than Goodyear. Aluminum hose ends on all the hoses save a few ounces. McCreary 4-ply tires are recommended, both for low overall weight, and fast gear retraction.

The little wires most Swifts have for gear down indicators are light and simple. But if you properly wire in another "gear down" light, you save a few ounces and some aerodynamic drag.

The brass plugs on the engine can be exchanged for aluminum.

Eat less. Fly with 1/2 full tanks.

Note I haven't mentioned anything in the tail section. First of all, the Swift flies better with an aft C.G.; it's faster and more responsive. There are several things which could be lighter in this area, but it's a Catch-22. Most Swifts have between 9.5 pounds and 15 pounds of ballast in the tail. There are various tail wheels approved on the airplane, with their weight from four to nine pounds. If you remove the ballast, and install a non-steerable tail wheel, you might lighten the airplane by 15 pounds but ruin its flight characteristics and make it hard to land. The tail wheel shock strut is heavy too and could be made lighter. Talking theory, all this could be done and the battery moved aft. The catch is, the heavy battery cable required could negate some of the gain. Also, the existing approvals for battery relocation call for it to be installed behind the baggage compartment. If it were in the aft fuselage an external access door would be required for all but the young and athletic.

The rudder skin is .032" thick, which is ridiculous compared to a Cessna or Piper, which typically use .016" and stiffening beads. The Swift needs the thick skin to avoid oil canning and wrinkles, and as pointed out, they need additional weight in the tail anyway.

Little known facts

The early fuselages are 7.5 pounds lighter than the late ones. In fact, the real early ones with the light skin (.020 and

.025) are probably lighter yet. That's why some GC-l As required 15 pounds ballast when converted.

The early horizontal and vertical stabilizer spars are .050 instead of .063, but this is not a good place to save a few ounces.

The early Swifts with the riveted on center section are structurally superior except a few serial numbers after 1,000 which have 3/32" rivets in the row below the windshield—these should be 1/8" rivets.

Modifications

The stock wing tips should be used.

The slots have been STC'd to be closed, but the method is crude and heavy. There have been field approvals to do it a little more cleanly. Do not remove the stall strips in conjunction with closed slots! Short wing tips, like the modified Bonanza tip don't do much for lift, but stall nice, (but beware the sink rate) and probably are more spin resistant (probably). The angle of incidence on the horizontal stabilizer is different (less) on the later airplanes. This can be duplicated by copying the rear attach fitting from any of the 2300B or 2400B (s/n 3600 through 3760) series of Temco airplanes and comparing it to what you've got. A converted GC-1A probably has a longer fitting. Caution: someone may have changed this previously, check it before you cut any metal. Treat any previous modifications with suspicion, even if STC'd. STC holders continually warn against a combination of modifications which may be incompatible. A modified hatch may be unsuitable for aerobatics since it might not be possible to exit the airplane in flight. A stock hatch cannot be opened at high speeds. Can you get out the window with a parachute? Sticks are a popular modification these days since they make landings and loops easier by changing the ratio of control movement to elevator displacement.

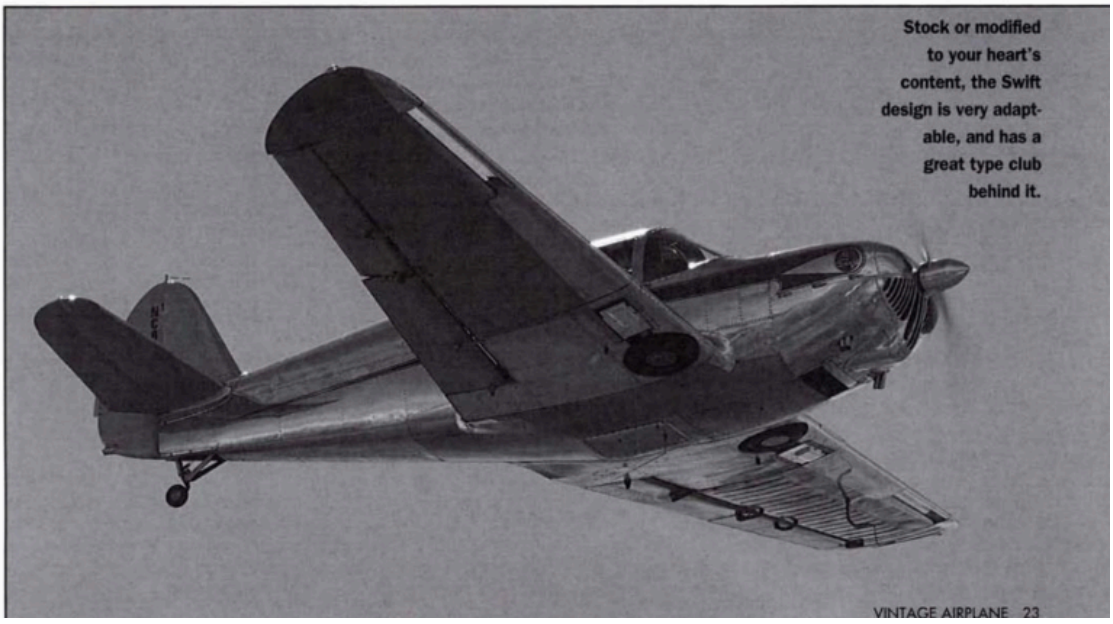
Moving the battery to the back of the baggage compartment is usually a good move, especially when a Merlyn Products access door is installed, although I hate to cut a big hole like that in an airplane. I don't know if I need mention the old Corben tails and wing tips should never be used. The Sensenich M74DR-1 prop is STC'd at a pitch of 62 inches. This is too much pitch. I understand Merlyn has a 145 STC which allows a more sensible 58 inches or thereabouts pitch. The preferred engine is an 0-300A. A C-145-2 is, for all practical purposes, identical if it has a "D" in the serial number. (Denotes dampened crankshaft) The 0-300D can be used if an "A" crankshaft is installed. Continental has an Engineering Deviation on this. The engine should be in good mechanical condition, with no low cylinders or weak mags or bad plugs.

The latest cylinders have larger 30 degree intake valves and the latest camshafts are considerably different. All the 0-300 camshafts are p/n 530803, but the late ones have the number circling the shaft, and the early ones have it longitudinal. Also the late ones are 530803AN or 530803AU or 530803AT, etc. It's interesting that all these engines are rated at 145 hp. Kenny Maxwell at the Maxwell prop shop once told me no engine varies so much in output as the 0-300, and what was a good prop on one airplane wouldn't turn up on another. Downdraft cooling, and fiberglass cowl are okay mods, I just like a metal cowl.

The Merlyn gross weight increase adds only a few ounces of weight and makes the wings stronger, so it would be desirable for aerobatics. 150 seats—okay. Shoulder harness—absolutely. Bubble Canopy? Personal preference. I like 'em original, but I must admit the canopies are nice. Quieter too. Get an intercom regardless. It only weighs a few ounces.

Adjust the aileron stops. Remove the aileron, locate the coarse threaded #10 aileron stop bolt, take it out first, and move the plain check nut to be next to the bolt head, reinstall. Contact should be made at the wing before the secondary stops under the panel, check the manual.

Check the rudder travel. It should be



Stock or modified to your heart's content, the Swift design is very adaptable, and has a great type club behind it.

adjusted for maximum L-R movement. Check the manual. Tension rudder cables 70 pounds.

The engine should run smoothly, and have minimal mag drop. With the Swift Association STC you are somewhat limited on prop selection and allowable static rpm. The STC limits static rpm to 2,130. The STC was gotten as a paper exercise by Piedmont, and has some strange stuff in it. In effect, you have a 125 hp 0-300. The STC actually requires a placard, "Do not exceed 125 hp, 2,270 rpm at any time." This really shows laziness on the part of whoever issued the STC. Actually, the 0-300 puts out 125 hp at 29 inches of manifold pressure and 2,270 rpm so this is legal, but not wise, to run continuously. If they wanted to restrict the Swift to 125 hp, they should have published the following:

125 hp
Power settings for 0–300 engines

125 hp= 2700 rpm x 25" MP
125 hp= 2500 rpm x 26.7" MP
125 hp= 2450 rpm x 27.2" MP
125 hp= 2300 rpm x 28.7" MP
125 hp= 2270 rpm x 29" MP

125 hp is 86 percent power for a 145 hp engine. Do not cruise continuously with MP over one inch higher than rpm.

Note: 75% power = 108.75 hp
65% power= 94.25 hp

A typical setting with a fixed pitch prop might be 2,450 rpm and 24 inches MP. This is 75 percent power or 108.75 hp, well below 86 percent. As a matter of practicality, at our local airport, elevation 932 feet, full throttle, will yield less than 29 inches MP. With full throttle, we get 27.2 inches MP and 2,270 rpm (which my Swift does, typically) that is about 110 hp available on takeoff per the Continental 0-300 operators manual power chart, with my prop.

I mentioned the Swift was approved under CAR 4a. The current FAR 23 has different categories, Normal, Utility, and Aerobatic. In 4a, all airplanes are aerobatic, limited by placards. The Swift has only two required placards:

(a)"INTERNATIONAL SPINS PROHIBITED"
(b)"DO NOT LOWER LANDING GEAR ABOVE 100 MPH"

A letter was published by Temco in 1949 concerning aerobatics which is copied here:

TEXAS ENGINEERING AND MANUFACTURING CO., INC.
DALLAS,TEXAS
July 18, 1949
FLIGHT CHARACTERISTICS OF SWIFT MODEL CG-1 B

The subject airplane is certified under the requirements of normal category airplanes as specified by U. S. Civil Air Regulations, Part 04, Airplane Airworthiness, dated November 1, 1943.

The flight maneuvers listed below for the subject airplane are itemized to familiarize those not acquainted with the GC-1 B Swift. These maneuvers are essentially aerobatic-type and do not include normal cross-country type of maneuvers.

SLOW ROLL

Obtain approximately 140 mph airspeed before initiating maneuvers.

SNAP ROLL

Obtain 80-85 mph airspeed before initiating maneuvers.

LOOP

Obtain 155-175 mph airspeed before initiating maneuvers. Tight maneuver will result in a high speed stall and inversely a loose maneuver will result in a slow speed stall. In either condition airplane will have tendency to fall off on either side, but will not result in an inverted spin.

CHANDELLE

Obtain 155-175 mph airspeed before initiating maneuver (see loops).

IMMELMANN

Obtain 165-175 mph airspeed before initiating maneuver (see loops).

STEEP CLIMBING TURNS

Obtain 75-85 mph airspeed for short duration (not to exceed five minutes).

DIVE

Do not exceed 185 mph (design speed 210 mph).

INVERTED FLIGHT

Inverted flight maneuvers are prohibited except for very short duration. Oil pressure will drop off due to the particular type of engine oil system.

STALLS

Normal stalls and whip stalls.

SPINS

Airplane is placarded against intentional spins — not because of structural strength, but due to spin characteristics. A two (2) turn spin can be accomplished with a 1-1/2 turns to recover by using opposite ailerons and full forward stick. Above this point speed of turns builds up and airplane has tendency to flatten out. Six (6) turn spins will require approximately four (4) turns to recover by using opposite controls and intermittent throttle blast.

L. A. Childs
Chief Engineer

The statement on spins is self-explanatory and also tells why the Swift is not often entered in competition where spins are important scoring maneuvers. As a personal observation, the Swift does not spin readily, and resumes normal flight immediately if forward yoke is applied immediately. Of course, opposite rudder would be called for, but that would be in a full blown, fully developed spin. A snap roll, which is a horizontal spin, requires about 1.4 times normal stall speed, "G" loading to a stall, and rudder in the direction of the snap. Repeated snap rolls are not recommended. The airplane is now 50 years old, and the tail structure will develop loose rivets and cracks, and perhaps eventually fail.

I do not feel the Swift needs to do spins and snap rolls to be a sport acro airplane.

The Swift, flown by competent pilots, is an excellent airshow airplane. The flight performance is more enjoyable for many, because of its smoothness, not snap-snap maneuvers. Bob Hoover never snapped the P-51 either! With the smaller engines, aerobatics in the Swift is an energy management process, if done in an airshow environment. Several very good pilots have done relatively low-G airshows, some with engines as big as the IO-360 Continental and Lycoming. Ironically, the bigger (heavier) engines require lower "G" maneuvers. Not too many people have seen Mark Holliday perform in the GC-1A, but he, at 1,100 pounds empty weight, has the most margin of all. I believe Mark was first to perform a gear down loop at an airshow with a Swift.

I see where unlimited acrobatic airplanes now weigh 1,170 pounds with 310 hp. We're in a different world here.

—Continued in next month's issue of VINTAGE AIRPLANE—

If you're interested in Swifts, you can contact the International Swift Association at:

Charlie Nelson
P.O. Box 644, Athens, TN 37371

Phone: 423/745-9547

Email: swiftlychs@alo.com

Or look at their Web Site at: http://www.napanet.net/~arbeau/swift/

Preparing A Swift For Aerobatics/ Or Just Good Performance — Part II

a treatise by Jim Montague (A/C 1310)

BIG ENGINES, ETC.

As long as I mentioned big engines I might as well elaborate. The Swift has had almost every engine from 85 hp to 210 hp installed. Plus the 220 Franklin and even several 250 Turbo-Franklins!

Others may disagree with some of my opinions, but here they are: A GC-1A with a C-85 or C-90, for those who want an original CG-1A. The C-90 will outperform an 85 to a greater extent than 5 hp might suggest. The C-90 peaks at 98 hp on the power chart. The C-90 is actually an 0-200, with a slightly different cam. The 0-200 has been installed in a few Swifts, but is not a good engine for this application. The Lord mounts position the engine forward an inch or so, and the engine does not fit perfectly in the cowl. The C-90 actually may have more effective horsepower than the 100 hp 0-200, due to the cam profile. Avoid a C-90 without through studs. C-90-12 engines made before about 1960 don't have through studs. The through studs can be identified by a "center" on the end of the two center studs in the engine (two forward studs on #2 cylinder and two aft studs on #3 cylinder). All C-90-16 engines have through studs. The C-90-14 mounts like an 0-200, and has through studs.

C-125—If you want a really original GC-1B, or a really economical (cheap) engine, stick with the C-125. It is a smooth running but not gutsy power plant that doesn't burn much gas. Be sure it has the "heavy" case. This can be readily seen by the three through studs in the area of the fuel pump. With an Aeromatic prop, don't count on more than 120 mph. With a Sensenich M74DR-1/56, maybe 130 mph.

C-145-2, C-145-2H—These can be used same as an 0-300A, a C-145-2H can accommodate a hydraulic controllable prop. The only two props that are available are rare and not very good. The Hi-Cruise Aeromatic is not too bad but rare, and expensive. McCauley made a prop for Cessna 170 Seaplanes, commonly called a "baby" McCauley. It's a 60 pound prop and not approved for the Swift. They have been field approved, but the results aren't worth it.

0-300B, same application as C-145-2H.

The 0-300A is the STC'd engine for the Swift Association STC. The 0-300C is not desirable. It uses the old pull type starter, does not provide a vacuum pump, and has the wrong crankshaft flange.

The 0-300D has several good features. It uses a key or push button starter. It does provide a vacuum pump pad. It has the wrong crankshaft flange. McCauley EM series props have been field approved or Sensenich DC series. The Sensenich is found on the Beech Musketeer with the IA-346 engine. Continental has an engineering variance to install an "A" crankshaft in the "D" engine. This allows use of the "good" eight bolt props.

The book lists an 0-300E, but I don't think they ever made any, I've never seen one. The IO-360 Continental is the way to go if you want super performance, and are willing to pay for it. Remember the prop alone lists for $7,500.00.

I forgot the IO-346? Forget it. And anything bigger than the IA-360 is too big. The 0-470 and 0-520 are just too much iron.

LYCOMINGS

0–235—too small.

0–290—no longer feasible, but several were done years ago and are still around. A very early O-290 had the accessories (starter, generator) at the rear of the engine, and fit an 85 cowl. One of these might be worth retaining. 0-320—This was the first "big" engine STC'd for the Swift. It uses a fairly heavy (59 pound) Hartzell HC-82XL prop, same as an early Mooney. This is s nice conversion, but no ball of fire. The advantage over a C-145 is all the constant speed prop. The engine actually weighs about the same. Several 145s were faster than my 0-320 Swift. No longer feasible, it's just as much work and expense to install as an 0-360. It's okay if you buy a converted airplane at the right price.

0-360—the regular O-360 of 180 hp makes a nice conversion. The approvals are many and varied, as also are the props and other details, such as cowlings, engine mounts, etc. Many have a 125 hp power restriction. Most O-360 powered Swifts have an empty weight of over 1,300 pounds. Due to the vast array of mods on these airplanes performance varies considerably.

IO-360—the fuel injected 200 hp engine can make the Swift into a real hot rod, capable of exceeding red line airspeed. The STC is held by Merlyn Products, and uses current technology props etc. A variable conversion, even though the empty weight is on the high side, Merlyn has a gross weight increase available. I personally don't like such an output from a 4-cylinder engine, but this makes a fantastic performer. O-540 or any six cylinder Lycoming—no. Too much iron.

FRANKLINS

6A-350, 220 hp, a smooth powerful engine. If the new engines coming into this country from Poland turn out to be good, and lower priced than TCM or Lycoming, this may be the engine of the future. Merlyn has the STC. The only negative I noted in several flights with several 220 hp airplanes was that they were heavy. The flew great, went fast, were very smooth, but landed fast and left no doubt these were heavy airplanes.

6A-350 Turbo—250 hp—Several of these were flying, at least one was STC'd for one airplane only. Unbelievable performance, considering the empty weight of the aircraft. The one airplane eventually actually had the firewall moved aft several inches to help the weight and balance. This is not a casual modification! It's strictly for the person who wants ultimate Swift performance, and is willing to pay for it. Another similar Swift, with a stock appearing airframe, but highly modified structurally, and operating in the experimental category, suffered a structural failure and crashed. Perhaps this indicates the upper limit for Swift modifications.

STRUCTURAL MODIFICATIONS

There are several desirable modifications for a Swift that is to be flown in aerobatics. The vertical stabilizer can have two nicely formed doublers installed at the rear attach point. These pick up the four each 1/4" attach bolts. These doublers were designed by the late Carl Weddle and were intended to be STC'd, but due to his unfortunate death the process was never completed. I have gotten a field approval on this.

The horizontal stabilizer center area, under the fairings which is normally unskinned, can be skinned using .025" or.032" aluminum. This only adds a few ounces, but increases the strength greatly. Not STC'd, there are various approval methods.

Outer wing panel attach fittings—Merlyn holds an STC for a gross weight increase to 170 pounds for the big engined airplanes. It seems logical that the additional fitting would increase the margin of any acrobatic Swift. This actually has not been a problem area, and the only failures I know of were far above normal speeds and "G" loads. Some owners have installed the 3554 fitting originally intended for converting a GC-l A to a GC-1B at the lower attach point.

Several Swifts have been dropped in extremely hard on bad landings, and have actually split at the lap joint rivet row below the aft corner of the windshield. I am not aware of any in flight failures of this point. To my knowledge, the failures have all been in a few serial numbers of 1000 and above, no more than ten or so (N80600 up). Yes, I know, there were five GC-1Bs previous to N80600. My solution to this, and I'm not the only one who's done it, is to skin a piece of .032" from the firewall back to the sta. 62.5. This can be signed off as a repair, rather than an alteration, and can be approved by your I.A. according to AC 43.13-1A. Some have used .040" skin, which is stiffer, but harder to cut, and is going up on the gage of metal, which may technically be an alteration. This would require a field approval. I talked to the FAA on this, and they have not given me any grief using .032". The weight difference in either case is negligible.

If the engine mount is in good serviceable condition it is okay for any reasonable aerobatics. The original mounts are now 50 years old. A.D. 64-05-06 details inspection and also repair procedures. It might be a good idea to reinforce the upper aft cluster or weld in a new tube per the A.D. procedure. Anytime the engine is removed, the engine mount should also be removed from the firewall and shaken. If there is internal rust it will sound like sand is inside the tubing.

SPEED MODS

Owners have been trying to increase the speed of their Swifts ever since 1946. Perhaps no other production airplane has had as many STCs, field approvals or quasi-legal modifications performed on it.

Back the 1940s, I'm told (hey, I'm not THAT old) the hot trick was to rig the flaps so the trailing edge was up about 1/2" above wing chord plane. Then the Aeromatic prop was overweighted so it operated in higher pitch. I don't think either item did any good.

Reflexing the flaps might be okay on a big engine airplane. I talked to an aircraft engineer, who ran the numbers, and determined he could gain 12 mph by changing the angle of incidence of the wing by raising the rear center section attach point, or lowering the front, I forget which. He did, and got it approved. In a later conversation, he told me, "Wide open, it did go 12 mph faster, in cruise it didn't make much difference." I flew in a Swift that had the wings re-skinned in a jig. While they were at it the wings were washed out several degrees at the tips. This was also approved. It worked out okay and stalled nice, but ruined the "on the step" feel of the Swift in normal cruise flight. It felt like it was mushing through the air. One nice thing, it landed three point, at speeds where my Swift is just taxiing fast!

About 30 years ago, I was flying along in my CG-LA Swift. It was a hot day, I was over gross, and about at the service ceiling of the aircraft (like 5,000 feet, that day). Turning off the flap circuit breaker, I put the flap selector "down" then bumped the circuit breaker until the trailing edge of the flaps was down an inch or so. The airplane then flew a little nose down, tail up. I could find a "sweet spot" where the airspeed increased three mph. Please understand all these conditions. My point is, reflexing the flaps doesn't always work.

The Aeromatic prop developed a bad reputation from guys who put too much counterweight on them. They would install a few extra washers thinking with more pitch they would go faster. Apparently years ago they didn't consider manifold pressure. They also used to run low rpm, like 2,350 for a 125. A 125 won't go very fast at that rpm unless you're pulling 26 inches of manifold pressure. Then, when takeoff power as needed, the rpm wouldn't increase enough for a go around.

Toward 1960 the Corben-Fette mods started appearing. I used to have an old brochure with all the mods Corben-Fette offered. They had modified wing tips, "lift tips" and dummy wing tip tanks. They offered two types of dorsal fins, for the vertical stabilizer, and a modified hatch entry. First, they had a downdraft cowl and cooling baffle setup for the 125/145, then the 150 Lycoming conversion. Later, they sold nine gallon auxiliary fuel tanks that fit in the belly area, and a 180 Lycoming Dynafocal engine mount. I never knew "Ace" Corben, but I got to know Vince Fette quite well. Vince, God bless his soul, worked on Swifts up till 1994, when his eyesight failed. He was a fine mechanic, not too big on paperwork or engineering. He died in November of '94.

Before 1970 the Swift mods were the Corben-Fette STCs, the Bubble windshield, the various 145 hp STCs, the Bonanza wing tips, and a few others. The fact is, NONE made the airplane any faster than a stock clean 145 with a good Sensenich prop.

I remember in 1966 there was a Swift with a 180 Lycoming on the front cover of Private Pilot Magazine. I saw the airplane at the Reno races that year. Wow! 180 hp! I drooled over that airplane. It had a big modified rudder that I thought was really neat. Now, I think its semi-ugly. It had extended wings and must have rolled like a truck. I apologize to Thaddeus Zimney if he still owns it, but the "Polomar Thunderbird" was a 1960s creation and not my idea of a Swift today.

About this time I converted my CG-1A to a Lycoming. I really wanted a 180 but there weren't any STCs yet, and after a talk with the "Friendly Airplane Association" about the requirements for a STC I decided not to go that route. What made my decision

for me was, while discussing the subject with the FAA, the inspector excused himself for a moment, then returned with a very thick file for an airplane that had been approved at the Minneapolis GADO with an 0-290 (125 hp) Lycoming. What a lot of work for a zero gain from a 125 Continental! That airplane, N80796, resides in my barn today while being rebuilt. Bob and Deb Bailey saved it from oblivion. After flying the 150 Lycoming Swift a year or so I got the urge for more speed. I made up a list of things I wanted to do and again talked to the FAA. They suggested I license it in the experimental category, research and development, and try out all the mods I had in mind. They agreed to approve whatever I would sign for. At that time there was a saying, "A Swift is as swift as a Swift will be." In other words, it won't go any faster.

The Private Pilot Magazine article told the airflow from the aft wing fairings was vertical. A local Swift owner told me the "break" in the fuselage at sta. 62.5 presented tremendous drag. I was determined to find out the truth, and applied yarn tufts all over the airframe. I wish now I had taken a lot more photographs, I think I have a few around somewhere. The airflow at sta. 62.5 was actually quite good, I thought, and the aft wing fairings weren't too bad either. I taped the slots closed, and could not detect any speed increase. The stall seemed about the same also, with good aileron control into the stall. It seemed to fly a little slower before the break, but speed is what I was after. Several things must be remembered at this point: this was not done in a real scientific mode, and I was a fairly low time pilot at the time I was doing this. I had made up some gap seals between the flaps and wing trailing edge, and the ailerons and the wing trailing edge. These don't do any good, but I left them on, because it would have been too much work to remove them. I also made up some trailing edge fairings similar to today's "frog fairings." The FAA would have approved them, but any advantage seemed to be on the low end, not in the speed gain. Everyone seemed to think the Swift wing tips were no good, because that's one of the most common changes to the airplane. I think it's just done because it's easy!

When I purchased this Swift it already had the standard tips replaced with spill plates. I always wondered if they were any good, so I resolved to find out in a positive manner. I retained the left spill plate and installed a standard tip on the right. Below 80 mph IAS, almost full aileron deflection was required to hold the wings level. Even wide open, the ailerons were deflected about one inch. Releasing the controls initiated a slow roll toward the spill plate side. I had yarn tufts taped to both tips and the spill plate's airflow was simply awful, while the standard tip was amazingly laminar and smooth. Needless to say, I installed a pair of standard wing tips. The rate of climb increased and I could approach slower. After all this I relicensed the airplane in the standard category, with a 337 approval for the mods I retained. Net speed gain? "Zero!" I didn't gain a mile an hour.

After five years of ownership I had changed the engine from 90 hp to 150 hp and increased the speed from 120 to 140 miles an hour. Soon I developed a want for a polished Swift, and purchased, sight unseen, a GC-l A from Vince Fette, which he hadn't seen either! The airplane was in St. Louis, MO and retrieving it on a ferry permit was an adventure which could take pages to tell! Vince had force landed N2373B in the Everglades, and was not in position to go after another airplane just yet. After an adventurous flight home, I removed the C-85 engine and installed an 0-300D and 74x61 prop. The speed of my now GC-1B was about the same as my previous 150 hp airplane. At a fly-in that fall I had the opportunity to run side by side with some of the faster Swifts and to my chagrin, realized they were faster than I was. I had computed the weight and balance, and thought it was neat that this airplane didn't require any weight in the tail to stay in the C.G. envelope. I know now why it was always hard to land that airplane, and why it wouldn't "go." It needed at least 9.5 pounds of lead in the tail and a shorter prop.

Eventually I bought N2344B, a completely stock 125 Swift. A year or two later I installed an O-300A which had been given a good top overhaul. Then I got a Sensenich M74-DR-1-62 propeller from Charlie Nelson which had been shaved down by a noted racing pilot. I was finally getting some speed! This airplane, with a completely stock airframe, would indicate 165 mph at full throttle and usually make 150 mph over the ground cross-country. The first 23 other airplanes I raced against, I beat. This included several downdraft cowling, fiberglass cowl Swifts. When the O-300 got a little tired at 1,700 hours, Charlie Nelson, Porter Houston and Mark Holliday convinced me I needed to retire from Swift racing, or overhaul the engine (they beat me).

If you've heard of August Rasput, you know he wrote an engineering paper in the late 1940s in which he determined the cooling drag of three common airplanes of that period was one-third of the total parasite drag. This included the Navion, the Culver, and the Swift. These airplanes all had updraft cooling. Perhaps his figures were inaccurate, or the Corben cowl wasn't as efficient as it should have been, but I did manage to get by quite a few of them.

I conducted an interesting experiment. I had accumulated a collection of five props: an Aeromatic, two McCauley DM7359s and two Sensenich 74DR props. On a Saturday morning, changing the props in quick succession, I tested them by simply running wide open at 2,000 feet msl. My favorite Sensenich indicated 167 mph at 2,900 rpm. The best McCauley, narrowed to the service limit, with rounded tips, and a sharp trailing edge (so sharp you couldn't hand prop it without gloves), indicated 164 mph at about the same rpm. The Aeromatic indicated 135 mph at 2,700 rpm. The "full dimension" Sensenich indicated 155 mph at 2,650 rpm. The other McCauley, simply cut down from a 76 inch diameter blade with very wide tips, indicated 145 mph at 2,650 rpm.

I found this very interesting. It indicated for speed, the prop tips should be narrowed in chord to the repair limit. In later years, I found a Sensenich M74DR-1-59, and a McCauley 1A17ODM7359 are approximately equals, if the tip chord is equal. Props vary from one to another, even with the same numbers. The McCauley might have a slight edge in climb, and the Sensenich a slightly higher speed. A fixed pitch wood prop is not worth any consideration for speed. The rare Beech-Roby for a C-125-1 (spline shaft) engine? Ditto. So does that cover all the fixed pitch props? Not quite. For an 0-300D the best prop is a Sensenich 740C series. It must be field approved. McCauley EM props are also used on 0-30ODs but are not known to be good performers. A prop which is not approved on the Swift, is the McCauley "Jet Flow" 76 inch diameter, 51 inch pitch. This prop could be used on an "airshow and exhibition" airplane and might offer climb performance comparable to the 150 hp airplanes with constant speed props. Many people think a constant speed propeller will out perform a fixed pitch all the way. Actually, the fixed pitch prop can be optimized to do one thing really well, and the constant speed is a compromise for all flight regimes. The thing I like best about my fixed pitch prop is low cost and NO moving parts.

When it comes to constant speed props for the big engines, you are limited to what the STC for your conversion calls out. Some owners, working in conjunction with the propeller manufacturer, have gotten approvals on many different models. Here are some examples: A lightweight Hartzell for the 150 hp Lycoming, another more modern and lightweight Hartzell for the 180 Lycoming, a

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Preparing A Swift For Aerobatics

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3-bladed Hartzell for the 200 hp Lycoming, and even a counter-rotating prop for a 160 hp Swift with a twin Comanche engine!

Quasi-legal modifications. After 50 years hardly any Swift is factory stock original. Many early "improvements" improved the airplane only when they were removed! Little things, like a heat sink for oil cooling can help—they're light, weigh less than a pound, and according to my FAA inspector, are a minor alteration.

Gear indicators—I once was ramp checked by two FAA inspectors. One asked if the little wires on the gear doors were factory equipment. I replied, "No, but I wouldn't consider the airplane safe to fly without them." He didn't push the subject any further.

Elevator trim tab—I now trim for landing so this wouldn't work for me, but some guys tape their tabs with flexible tape, eliminating a possible source of flutter, and increasing the speed by about .001 mph.

Tail wheel fairing—The center of the cutout for the tail wheel can be faired in with a piece of .020 aluminum. This also increases the speed about .001 mph. I don't think a retractable tail wheel is worth the effort, but it has been done.

Small main gear tires—The 15:600:6 have been approved, and with some metal work in the wheel well area, they actually do increase the speed slightly. I tried the small tires once, and didn't like them. It was like landing with the tires full of concrete. If you make perfect smooth landings 100 out of 100 attempts, well okay, go ahead.

Vertical fin offset—This has been partially removed by some, the justification being the later airplanes were built that way. If you are using a Serv-Aero engine mount it probably works out okay because the thrust is offset to the right. With a standard engine mount you're kidding yourself. Those old boys in 1946 knew what they were doing.

Horizontal stabilizer incidence—This can be changed to the same amount of incidence as the last series of Swifts built (s/n 3600–3700). This allows cruise flight with no elevator or tab deflection. The C.G. should be near the aft limit for best cruise speed.

Aileron and flap rigging—I have previously mentioned reflexing the flaps. The ailerons have somewhat different characteristics; if rigged slightly up the speed may increase slightly, if rigged down, the roll rate may increase. Up may also tame the stall somewhat. Down may make the airplane approach and land nicer. Don't tension the cables over the recommended 20 pounds. Don't rig anything out of book recommendations.

Gear motors—The stock 1946 gear motor is not much good. The 35 amp is not much better (it just has slightly wider brushes). Just about any modern motor is better. The mistake people make, and it really doesn't hurt anything, is they use too large (and heavy) a motor. Various Honda motorcycle and Mercury outboard motor starters have been used. Of course, the best is the STC'd Bosch motor that Merlyn offers.

In the past, I heard of using Navion gears in the hydraulic pump. I feel this is nonsensical because the woodruff keys in the gear actuators are marginal anyway. And if hardened keys are used, the keyway can be damaged with higher than normal pressure.

Pitot tubes—The stock pitot tube may not be esthetically the most pleasing but it does work pretty well. Piper and other pitot tubes have been used with success. A pitot tube extending forward from the wing leading edge should not be used. If there is a problem, it's with the static port location. If relocated, the static port should be located at fuselage station 122, slightly above the center line of the fuselage, with a balance tube to a similar port on the opposite side.

Tape—A clear but not real easy speed secret is to tape under the gap strips, and over the lightening holes in the flap coves and ahead of the ailerons. Harder, but also effective is to tape up the lightening holes in the rear spars of the horizontal and vertical stabilizers. This must be removed at least annually for inspection.

Cooling Drag—Much improvement can be obtained by sealing up leaks, for both better cooling and more speed. The oil cooler may "rob" #2 cylinder of some cooling air and cause it to run hot. #2 and #5 tend to run hottest due to unequal fuel distribution. Hanlon-Wilson mufflers are not ideal for the updraft cooling system. Make sure you have a dump tube on your carb air box, otherwise you're dumping hot air from the right side heat muff inside the cowling whenever you're not using carb heat. Some "improvements" in this area actually increase cylinder head temperatures. Make sure you have adequate instrumentation before you change anything.

Bonanza wing tips—The reason I include them under quasi-legal mods is very few actually are installed strictly by the STC. The STC limits the aft C.G. of the airplane. This may be just a technicality, because it eliminated some spin tests for the granting of the STC. These tips increase roll rate. That's it. The airplane will lose rate of climb, lose speed when loaded heavy, and approach faster and use more runway.

Stall strip removal—The entire stall strip should never be removed.

Various approvals have been attained for removing the outboard or inboard half, or installing a section of extruded aluminum about half the length of the original. The consensus seems to be, the inboard 1/2 should be removed. I heard the CAA test pilot from 1945 talk once, and he thought the factory should have experimented with shortening the stall strips. The only Swift I ever flew which I considered dangerous, had Buckaroo wing tips, closed slots, and no stall strips.

Closed slots—This is another modification which is seldom done per the STC. Most slot closures are done in a manner which exceeds the sheet metal procedures of the STC, but details such as a stall warner are ignored. This may only be a technicality since the airplane doesn't need one, but it's still part of the STC. I haven't seen the STC for years but I seem to recall it called for partial stall strip removal also. To my mind, the airplane stalls okay with the slots closed, but I have not investigated spin characteristics, etc. like the FAA would do.

Entry hatch—The entry hatch has been modified in many, sometimes bizarre ways. If the window still slides up and down as it did originally, a piano hinged top section may be easier to exit than a stock tip up hatch. Canopies are the neatest! But expensive!

Dangerous airplanes? Some years ago the Swift developed a bad reputation. We now know that most problems are pilot related, not the airplane. But the Swift is not for everyone. If flown within its limitations, it is a fine sport aircraft. The 85 hp Swift GC-LA started the bad reputation. Admittedly, it is an underpowered airplane, but so is everything else up to the F-16. The gross weight of any airplane should not be exceeded. The gross weight of a GC-l A is 1,570 pounds. Some airplanes can handle operations over gross weight better than others. The GC-1A is a low powered airplane, with a sturdy structure and corresponding empty weight, and not a great deal of wing area. The airplane was originally approved with just two props, both variable pitch. The Aeromatic and its characteristics have been mentioned previously. The Beech-Roby prop also has limitations, and must be operated accordingly. The GC-l A is often converted with a C-90 engine and a fixed pitch prop. The fixed pitch prop gives trouble free service, and the C-90 will give acceptable takeoff and climb performance and cruise about 125 mph. At Oshkosh, I remember lying under the wing of my Swift and having a spectator approach. "What engine you got in that Swift?" they would ask, a typical question. I would answer, "A 145." This was always followed by a solemn shaking of heads and the comment, "Well, that's okay

but that 85 will hardly get off the ground." I usually didn't mention the five GC-LA Swifts I'd owned at one time or another.

FAA mandated dangerous conditions—The only items I feel which are dangerous are so because of FAA mandated conditions. The static rpm conditions for both the 125 and the 145 hp engines are too low. The rpm limits are from 1,950 to 2,250 for various fixed pitch props on a 125. At these rpms the engine will barely develop 100 hp for takeoff. The 145 STC limits static rpm to not over 2,130, not under 2,080. If flown intelligently, the Swift can operate within these limits safely, but experience and historical fact have shown that short field takeoff and departure accidents have happened many times over the years, and while decreasing, will probably happen again. When the C-125 was certified, it was at 2,550 rpm. Those props are intended to keep from exceeding that limit. With most of these engines converted to the "heavy" case they are near "bullet proof" and can operate at 2,700 rpm and even higher safety. The Swift Museum Foundation STC for the 0-300A as previously mentioned, actually limits the engine to 125 hp of output. I believe Merlyn Products has an STC which allows full power for the 145. Interesting, that the 200, 210 and 220 hp engines are certified for continuous full power output.

The McCauley prop D2A34C67/76-2 that is used on the IO-360 Continental has a built-in booby trap in Swift applications. This prop was originally intended for a slower airplane, such as a Maule. It has a high pitch stop ring installed. When operating at altitude, the prop effectively is a fixed pitch propeller because the stop limits the blades from twisting any further, thus the rpm goes up. Ordinarily, this only limits the speed and/or manifold pressure that can be attained without excessive rpm and fuel consumption. Where the safety problem comes in, and we know that buzzing is Illegal, is when a Swift pilot drops the nose and applies full throttle, the rpm will easily climb to 3,200 and the airspeed will indicate in excess of 235 mph. I don't think I need mention these figures are over red line. Add a "show" paint job with heavy glossy ailerons and disaster is imminent. At 29 inches and 3,200 rpm an IO-360 probably is producing over 230 hp. Some owners have removed the pitch stop, I don't know if that's FAA legal or not, but I think it's a very good idea.

Perhaps you've noticed I've not mentioned much about routine maintenance. That subject is covered quite well in a book available from the Swift Association so I'll not elaborate on what they cover.

I have started to receive some feedback from Swift owners on what I have written. Some expressed surprise at my recommendation the ailerons not be painted. After all, there are a lot of painted Swifts, and no one knew of any problems. This started out with the idea of preparing a Swift for doing aerobatics. The red line airspeed of a Swift is 185 mph IAS. The design speed is 210 mph. The ailerons are balanced 100 percent at the hinge line, so it stands to reason any paint at all will adversely affect the balance, i.e. make them tail heavy. If the red line is never exceeded, there is enough margin whereby a painted aileron will never be a problem. When performing aerobatics, a blown maneuver can result in an inadvertent overspeed. Or some owners have deliberately used higher than red line airspeeds for entry into vertical maneuvers. With the advent of the big engined Swift, many are cruising near red line. An acrobatic maneuver or simply dropping the nose can result in exceeding red line. Read the previous subject on pitch stops on 210 Swifts. I can tell you from experience the airspeed gets out of hand in a hurry. My idea of aerobatics in the Swift is 3.4 gs and entry speeds for loops etc. not exceeding 175 mph. I had a Swift that would not loop at 3.5 gs; checking revealed the "g" meter read "5" at that number.

For years it seemed aerobatics were only to be done in biplanes. Biplanes have a unique safety factor. No matter how steeply they dive, they won't go very fast. Some of the "Ace" biplane pilots might have problems doing acro in the Swift, then say the airplane was no good. I talked to the late Art Scholl at Oshkosh while Mark Holliday was performing, and he made the statement the Swift was the most responsive production U.S. built airplane ever. He actually started his airshow career in a Swift. His complaints with the airplane were 1) lack of power, 2) he was concerned about the tail structure. Today, we agree, but we can do something about both items. However we can never recommend a snap-snap high "g" performance such as Art Scholl might have performed. If you are at an airshow and see a performance in a Swift, be reminded the pilot is maybe just a cut above the average Pitts pilot.

One last item on exceeding red line. Due to the wing slots, the Swift does not stabilize at a relatively low airspeed in a spin. In a fully developed spin, after the nose tucks under it is virtually impossible to recover without pulling excess "g" or airspeed. Case example? My own Swift. Do I practice what I preach? First of all, I don't do aerobatics, unless you count an occasional roll. My physical condition makes "g" loads very uncomfortable. A lot of guys have spent $100,000 on a Christen Eagle and then found out they really didn't like doing aerobatics. I do feel my Swift performs well.

Did I make the figure of 1,200 pounds empty? Well, not quite. My Swift weighs 1,224 pounds. It's not painted, but has the belly auxiliary tanks. They were installed when I bought the airplane, and I'm not going to remove them unless they leak, or present some other problem. I did remove the "boat anchor" radio and installed a three pound 760 channel comm. The "full gyro panel" was removed, and an electric turn and bank installed. I also removed the venturis and plumbing, and a lot of wire installed by previous owners. I have Bendix S6LN-21 magnetos and a 25 amp. generator. I don't have any landing lights or rotating beacon. I do have Cleveland wheels and brakes, which is the only thing I've added to the airplane which is heavier than what was removed. I'm not running an oil cooler, but I may be forced to install one, because it does run hot on hot days. The only real weight savings I could realize (further) is to install a lighter interior. Mine is a generic "not quite original" of unknown weight (the seats are fairly light) and a lighter O-300A with the B&C starter. And some of the little ounce things I talked about early on.

I keep a file on the airplanes I've done a weight and balance check on, and I only find two GC-1Bs lighter than my N2431B and they both have C-125 engines. I believe Porter Houston's N78171 is lighter, but I can't find it in my records. Sorry, Porter but I accidentally erased my computer file. There may be lighter 145s out there, but I haven't weighed them.

By now it should be clear I believe in the lightest Swift possible. The airplane is built strong in most areas (and heavy) with a few spots that could use improvement. Also, in my opinion, if you want to go fast, you need 220+hp. I feel all the 200+hp airplanes need the gross weight increase. These are cross-country airplanes by the time they have 56 gallons of fuel and full panels with fancy navigation equipment installed. Even by today's standards, these are fast airplanes. But they are fast semi-aerobatic airplanes. It's kind of ironic that when a big enough engine is installed, the weight of the Swift is such that acrobatics are somewhat limited. That is a compliment to the Swift Magic Aerobatic Team. They do a good job with their big engined airplanes. In years past, Chuck Lischer did nice airshows in his 150 hp Swift at a gross of about 1600 pounds. Maybe, that was the most compromise of weight and power.