T-18 Newsletter Number 27
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VISIT WITH JOHN THORP. March 28, 1969 - Was fortunate to find John home for a few minutes for he has been spending most of his time with his mother who is seriously ill in San Francisco. He requests that T-18ers not contact him for some time if possible because of being tied up with personal problems. So, if you have any problems which can't wait, write to me and I'll try to be of help.

FUSELAGE SKINS - Apparently the aluminum companies have decided to eliminate 15 foot long .025 2024 sheets so they are no longer available. This should be of no concern, however, since there is absolutely no valid reason to not use 12 foot sheets and make a splice near the tail. Everyone who has used a splice is perfectly happy. I was worried that a splice wouldn't look as good so I made a flush splice with 4 rows of rivets. John says I wouldn't need more than two rows of rivets. I have seen one T-18 with a simple lap splice at a frame with only one row of rivets and I really think it looks best. I recommend it. Whatever you do, don't use .040 for skins just because you can get it in 15 foot sheets. Not only will it add many extra pounds of useless weight to kill performance, but it will really throw your cg off.

TAIL MODIFICATIONS - The flight test and shake test programs are now completed and new prints are being mailed out as fast as possible. Four modifications are involved:

1. The tail spar is changed to include an outer full length tube of .049 and a shorter doubler tube inside.

2. Two of the balance weights are removed and new bullet shaped weights are added externally to the tail tips.

3. A little .015 stainless stiffener is wrapped around the inside front corner of the tail tabs.

4. A stiffener is added to the balance weight arm.

BULLETIN - John Thorp urges all T-18 owners to make the No. 3 modification immediately. It had the most significant effect in raising the flutter speed. It simply stiffens the tab by tying in the inside rib with the leading edge and hinge. Note that it does not wrap around from top to bottom but rather from front to side. This is such a simple modification and so important that it should be done immediately.

John is recommending that all four modifications be made to all T-18's, even the 125 hp models, just in case someone forgets the 180 red line for unmodified models. The new red line for modified models is 210 mph.

TEST PROGRAM - John will probably be documenting the test program in a future article, but I know you are anxious to hear about it so here are a few details.

All tests were conducted on Dick Hansen's T-18, N29?V. Shake tests, flight test instrumentation, and consulting engineering were subcontracted to Specialty Testing Services who drew upon some of the most expert talent available in the field of flutter analysis. Sensors were placed on the horizontal tail and balance arm and outputs were recorded in flight.

The procedure used was to make a modification and perform shake tests on the ground which identified the bending frequencies of the various parts. Then flight tests were conducted by John Thorp to verify the predicted in-flight characteristics.

First, a new horizontal tail was built with the new two-peice spar. Tests showed that at about 195 mph, the horizontal tail experienced a bending oscillation at 31 cycles per second with zero damping. This means that the oscillation reached a certain amplitude and got no larger. It was not actual flutter because flutter is defined as a divergent oscillation. That means it gets progressively larger until something gives. The condition was not detectable by the pilot, but showed up on the instrumentation.

The balance weight arm vibrated with a 16 cps frequency. Figuring that this was coupling with the tail bending at twice the frequency, they added a stiffener to the balance weight arm. But tests revealed that this lowered the speed at which oscillations occurred.

Next the three lead weights were removed completely and John flew up to 200 mph with no problems. Now, a word of explanation about the purpose of these weights. They were not intended to give static balance to the horizontal tail to raise the flutter speed. Instead, they serve only to provide dynamic stability augmentation, or damping, to smooth out the ride in rough air. You have all observed how an arrow oscillates back and forth in its flight after being released. The bigger the feathers, the quicker the oscillations will damp out. An airplane acts the very same way with its "tail feathers" providing the damping when gusts disturb it. Now without a balance weight the horizontal tail would fall down at the trailing edge indicating that the cg is aft of the hinge line. When a disturbance swings the tail of the aircraft down in flight, this mass unbalance causes the trailing edge of the tail to swing up. This creates down lift on the tail which rotates the tail end of the airplane down even more. This effect decreases the dynamic stability compared to the conditions with the horizontal tail held fixed. As weight is added to the balance arm, the damping is improved. With the specified amount of lead the tail is nearly statically balanced and the damping is very good, giving a smooth ride in rough air. With the weights all removed, the T-18 flies fine in smooth air but in rough air the ride is not so nice because the damping is poor.

There is another type of stability called static longitudinal stability. This relates to the ability of an airplane to fly hands off. If it gets disturbed and later, on its own, returns to trim conditions it is said to be statically stable. But, when disturbed upward, for instance, if it continues to pitch up until it does a loop or stalls it is statically unstable. That is, if the cg is forward of the neutral point it has positive stability and if it is aft of the neutral point it is unstable. The balance weight affects static stability also. More weight decreases static stability and less weight increases it (moves the neutral point aft). This has nothing to do with flutter but is only noted for your information.

Back to the flight tests. Since John felt that the balance weight was needed for a good ride in rough air he had to put the weights back on. The tests indicated that the weight was causing a flutter problem since there was considerable flexure between it and the tail tips. So, to get the weight more rigidly connected to the tail tips, the two side weights were removed from the balance arm and streamlined weights were added ahead of the tail leading

edge at the outboard ribs. Flight tests were run up to 220 mph with this configuration, but they still weren't out of the woods. A tail oscillation would still occur at 25 to 30 cps.

Next the little stainless steel stiffeners were added to the corners of the tail tabs and the frequency went way up giving the biggest single improvement. Flight tests were then run up to 231 mph with perfect results. The damping from stick bumps was just as good at that speed as at 150 mph. John now thinks the tail would go all the way up to near sonic speed without flutter. However, his experts would not let him fly any faster because other surfaces like fin, rudder and ailerons were not instrumented and there was no way to tell whether they were approaching flutter conditions. Since the FAA requires flight demonstration tests to be run at 10% above red line, that sets the red line at 210 mph. This is valid only for the flight tested configuration which included all of the above listed four modifications.

Some people have asked whether a slab tail is more susceptible to flutter than a conventional tail. This is a fair question for the layman and let's face it, almost everybody is a layman when it comes to flutter. The answer is a definite NO. Conventional tails have the same problem as slab tails and one can be made just as safe as the other. If you don't believe this, just take a look at all of the supersonic airplanes. Nearly all have slab tails.

So what conclusions can be drawn? What caused the two accidents There has been no official announcement and we do not know for certain, however, there is evidence that they were caused by flutter of the horizontal tail. In one case there was strong evidence that the aircraft had flown much in excess of the 229 mph redline. In the other case there was evidence that not only had the aircraft been flown at high speed, but that the tail had not been built in compliance with the plans.

T-18 owners can now have the confidence that their airplane has been through perhaps the most extensive flutter test program of any homebuilt.

AEROBATCIS IN MY T-18 BY DON CARTER - Vestal, N.Y. - The keynote of this article is "Be Prepared". It is important that both pilot and aircraft are properly readied for aerobatics. Another important consideration is that just as no two pilots have the same experience and capability, there are no two T-18's exactly alike, This is expecially true of power plants and CG locations, both of which are significant factors in aerobatic performance. The reader therefore, should understand that the aerobatic performance to be discussed is not for all T-18's but only for Serial Number 96 with the conditions as specified. It is powered with a 125 hp O-290-G engine.

Is The Aircraft Prepared? - The red line restriction should be considered in detail. The first question to be asked is "what is the accuracy of my airspeed systems?" John Thorp advises that the red line has a known 10% margin of safety. From what I've seen and heard about pitot-static systems of home builts, errors greater than 10% are not uncommon. Serial No. 96 was checked on a ground course and verified against a factory job that had a high confidence level.

The red line has additional significance because with a cruise CAS in the neighborhood of 150 mph, the red line represents only a small percentage increase. Since these T-18's are clean ships, that increase can come mighty fast. For example, entering a Split-S from cruise would invite exceeding the red line. That manuever is conspicuous in its absence from those which No. 96 has performed.

Is The Pilot Prepared? - It is never wise for a pilot inexperienced in aerobatics to experiment on his own. This is especially true in the "Tiger" for reasons outlined above. Therefore, if the T-18 pilot is not an experienced aerobatic pilot, he should buy himself some insurance in the form of a good course in aerobatics. Such courses are offered by many local flying schools.

Aerobatics in Number 96 - Although I had handled a number of T-18's in flight and Lu Sunderland generously let me do some airwork and make four circuits around the field as preparation for my first flight, I did not appreciate the beautiful handling characteristics of the T-18 until I was on my own in No. 96. Although I've flown a number of aircraft from the WACO INF to F-51's and F-80's, I have never flown a sweeter handling aircraft than the T-18. This statement comes from a pilot who prefers a very responsive aircraft.

Number 96 began aerobatics with an empty weight of 730 lbs (bathroom scale accuracy) and a pilot weighing 175 lbs with chute. Depending on fuel, cg would vary between 20% and 22%. A GPU was up front. There is no tendency for either wing to consistently drop off in stall maneuvers.

Number 96's pilot has been through the formal aerobatic programs of CPT and Aviation Cadet training. In recent months he had made a number of aerobatic flights in an EAA Bipe. Therefore, both pilot and aircraft were reasonably prepared for aerobatics.

I will discuss the aerobatic maneuvers in the order that I progressed through them. In general, I started with the positive "G" maneuver first. I would like to point out that my interest in aerobatics is generated by the desire to increase my skill in controlling my airplane and the pure enjoyment derived from them. I am not a contest pilot nor am I even familiar with current standard techniques.

Barrel Rolls - I dive to 160 mph and pull nose up 5-10° above the horizon at the same time banking about 20° opposite to direction of roll. Then almost full aileron with lots of rudder with the roll and a little back pressure to keep you comfortably in your seat and hopefully the ball in the center. If the roll rate is relatively high, the nose won't deviate more than about 5 degrees during the roll. With full aileron, No. 96 will roll 180° per second. I have done double and triple rolls by raising the nose proportionately higher at entry. I like this maneuver because it's comfortable, fast, and presents a real challenge in keeping it coordinated through recovery. One word of caution. Start with nose high, up to 30°, on first attempts to avoid excessive speed in event you dish out. This roll could be entered at a slower speed but it would not be nearly as tight.

Loops - I enter my loops at 160 mph with full throttle. Because of the wide range of speed in this clean aircraft, back pressure will vary considerably if the loop is to be round. Use lots of it in the first quarter gradually letting off to a very light pressure as you go over the top. Remember that red line and throttle back in the third quarter. Biggest problems will probably be not enough back pressure in the beginning and too much going over the top. There is a natural tendancy to pull too much back pressure at the top of the loop to hurry it up but this is at the point where the aircraft is going the slowest and a stall or even a snap roll can be induced. Remember to pull those g's (2.5-3) in the beginning.

Immelmanns -- Enter a tight loop at 170 mph using even more back pressure in the beginning so that enough speed to roll will be available at the top. Roll out at the top can be either barrel roll type or slow roll. For maximum comfort I like to barrel roll which should be started just before going over the top. Full aileron and lots of rudder for the roll with back pressure gradually increasing. Perhaps the more proper method is the half roll at the top. When reaching the top apply forward stick to keep the nose on the horizon. Immediately start the roll with aileron and rudder and add lots of top rudder as the wings go vertical decreasing as they approach level.

Spins - Spin entry is normal and recovery occurs immediately upon releasing back pressure and neutralizing rudder. No. 96's roll slows slightly about every half turn with the forward cg. No difference in right and left spins.

Snap Rolls - As a precautionary measure to keep stick forces light, I have only performed snap rolls at 80 and 90 mph. I use stick full back and full rudder (no aileron). There is a slight hesitation as in a spin and roll rate is average (whatever that means). Recovery is instant with forward stick and opposite rudder.

Snap on Top of Loop - Enter at 170 mph and start snap about 10° before reaching the top. Nose should be about 10° down at recovery after 360° of roll. Complete loop normally. Keep first half of loop tight as in an Immelmann.

Slow Rolls and Half Rolls - Start by vacuum cleaning the office. A tight seat belt and shoulder harness will also help keep you from standing on your head on the canopy. Start your slow roll, after a shallow dive to 160 mph, with your nose slightly above the horizon. Begin your roll with stick and rudder together. From then on you're completely uncoordinated trying to keep your nose on a point. Top rudder is maximum when the wings are vertical and forward stick maximum when on your back. I find that I need all the rudder I have and then some to keep the nose up. Except for lacking rudder, the Tiger rolls nicely. The only difference in the half roll is that all action is stopped on your back and then you go back to the way you came. If you get into trouble just apply full aileron and you'll be right side up in jig time. Avoid recovering in a split S.

I wanted an inverted fuel system so I could keep the engine going when I roll slowly. Number 96 has a poor man's inverted carburetor system and so I have to adjust the mixture when I go inverted. This makes things a little busy at this point.

Hammerhead Stall - If physical sensation is whatyou like, this is the maneuver for you. Dive to 160 mph, pull nose up as in a loop to vertical and hold here there until the airspeed approaches stall. Then apply full rudder and fall away. Your airplane will weather vane around to nose down vertically. Then quickly reduce power and recover to level flight.

Conclusion - The high performance and superb handling characteristics of the Tiger make it a fine aircraft for aerobatic flight. The light control pressures also reduce the fatigue factor. However, I am sure some of the pro's would have some recommendations if the Tiger was to be used competitively. To date, I've only tested the inverted capability in slow rolls and sustained inverted flight. Inverted snaps and spins are yet to be explored. I've already messed up my Tiger by leaking a couple of quarts of oil while on

my back. I'll probably modify my lubrication system for inverted flight before pulling many more negative g's.

I would like to conclude with the keynote "Be Prepared". I should not have to emphasize the significance of the red line. All Tiger pilots should observe it religiously. Below is a list of "Be Prepared" considerations.

1. Pilot should be experienced in aerobatics.
2. Aircraft should have accurate airspeed system.
3. C.G. should be forward for first flights.
4. Vacuum office for inverted flight.
5. Wear chute.
6. Practice opening canopy in flight to be prepared for emergency egress.
7. Have lots of air beneath you -- like 7000 ft.
8. Get off airways to keep it legal.
9. Clear the area before each maneuver.
10. WATCH THAT RED LINE.

HOW TO TAXI - So you think this is a pretty silly subject. I assure you that you won't think so the first time you notice a gravel dent in the leading edge of your nice shiny new propeller. The fact of the matter is that practically nobody is using a 63 inch propeller. Mine, for instance, is 67 inches long and with a 68 inch pitch is just perfect for the O-290-G engine. It turns up 2750 max. at 172 indicated. With a standard length gear, this puts the prop close enough to the ground to pick up loose gravel if you don't use some discretion in ground handling. Of course, it isn't as bad as a typical tri-gear airplane, but it will still pick up gravel.

Here are some suggestions which could save your prop:

1. Never apply high power while standing still or moving at low speed over gravel. If you have to taxi over loose gravel, get speed up before reaching it and either coast over it or hold reduced power. Don't stop and proceed slowly thinking this will be easy on the prop.
2. Choose run-up areas carefully. Even pavement usually has some loose gravel laying around, so avoid it. Try to find a patch of grass for run-ups on unpaved fields.
3. When stopping for parking, such as at the gas pump, try to avoid gravel also.

If you want to see how a propeller picks up debris, just watch an airplane running up over a dusty area. The swirl under the prop picks up debris just like a tornado. So, take heed.

CG CALCULATIONS - In Newsletter No. 26 I made some comments about cg calculations and promised to include data for my T-18 in this issue. In order to assure accuracy, I reweighed my ship -- this time with platform scales under both main wheels at the same time and a bathroom scales under the tail. Was I surprised at the difference over the previous measurements taken by first weighing one wheel and then the other with pairs of bathroom scales! Instead of getting an empty weight of 826 lbs without fuel or oil, it turned out to be 881. I knew the use of bathroom scales wasn't good but I had no idea how bad. It turned out that our local airport had two pairs of ordinary platform scales like we used to use on the farm to weigh grain. If you aren't so fortunate, why not talk your EAA chapter into buying scales?

Be sure to accurately measure the stations for the main gear and tail wheel as referenced to the leading edge of the wing

(sta 55). Use a plumb bob for these measurements.

The cg of a full tank is sta 50. When there is only a small amount in the tank, the cg is forward of this.

The following calculations are for my T-18. The table lists data on some others which have flown. Notice that I can take only 75 lbs in the baggage compartment with empty tank and not exceed the aft cg limit of station 71. I've verified in flight that station 71 is the neutral point so don't plan to exceed it. If I could find room I'd move my battery from the baggage compartment to the firewall. John Shinn has located his battery under the right front seat.

CG CALCULATIONS FOR N4782G

	Weight		Station		Moment %C	%C
Main Wheel	1019	X	54	=	55,026	
Tail Wheel	43	X	214	=	9,202	
	1062		60.4		64,228	
Fuel (27.5 Gal.)	165	X	50	=	-8,250	
Oil	16	X	28	=	- 448	
	181				-8,698	
Empty cg	881	X	63	=	55,530	
1 Passenger	+170	X	85.5	=	+14,535	
Oil	+ 16	X	28	=	+ 448	
Fuel	+165	X	50	=	+ 8,250	
Most Forward cg	1232	X	63.93	=	78,763	17.8
2nd Passenger	170	X	85.5	=	+14,535	
Baggage	75	X	109	=	+ 8,175	
Gross Wt. cg	1477	X	68.7	=	101,473	27.4
Fuel	-165	X	50	=	8,250	
Most aft cg	1312		71		93,223	32

T-18 WEIGHT AND BALANCE DATA

SN	Owner	Main Wheels	Tail	Oil	Fuel	in. a	in. b	Empty	cg (sta) Aft.	Fwd.	Wt. Gross
37	Thenhaus	817	36	16	0	1.25	160	60.5	68.7	62.6	1450
37	Hamlyn	866	45	16	0	1.25	160	61.65	69.7	63.2	1475
41	Hansen	951	43	16	0	1.13	160.25	60.8	69.8	62.5	1600
62	Ferko	815	43	8	0	1.75	161	61.32	70.2	62.9	1450
68	Schureman	767	29	16	0	1.5	161	59.6	70	62.1	1350
77	Sunderland	1019	43	16	165	1.0	160	63	71	63.9	1477
79	Kaergaard	672	42	16	0	1.75	160.75	62.7	71.7	62.9	1300
196	Anderson	990	55	16	42	1.38	161	62.6	70	62.9	1600
328	Martens	1051	48	16	0	1.38	161	60.65	69	62.3	1700
390	Grammer	940	43	16	0	1.75	162	60.34	69.2	62.25	1575

Comments:

37 - Thenhaus - No canopy, 0-290-G
37 - Hamlyn - Canopy, Pants, New Cowl
41 - Hansen - Const Speed Prop, 180 Lyc.
77 - Sunderland - 0-290-G
79 - Kaergaard - No canopy - 0-290-G
196 - Anderson -180 Lyc
328 - Martens - 180 Lyc

a is distance in inches from wing leading edge to main wheel station.
b is distance from main wheel station to tail wheel station with fuselage level.

HOMEBUILT MAINTENANCE - Now that you've got your homebuilt aircraft flying after those seemingly endless months of toil and sacrifice, yo can finally relax and enjoy flying again on all those nice sunny days instead of being cooped up in the workshop. Also, you can do some of those odd jobs around the house which you've been promising your wife you'd do "just as soon as I get'er flying". Wow, what a great feeling You can even take a little snooze after supper without feeling guilty No longer do you go to work the next day with zinc chromate stains on your hands, cut fingers or burns from a hot welding rod. Yep, you can just fly to your hart's content or until the gas bill gets too big.

And just think how much money you are going to save on maintenance and annual inspections. Isn't it silly all the rules the FAA has about maintenance on type certificated airplanes? Sure hope they don't get any ideas like that about homebuilts. That would be ridiculous since anyone who can build an entire airplane can surely keep it running. Besides, you are going to stay on the safe side and check it over good once in a while.

Up to this point the picture is all roses, but it is all too easy to let human nature take over and give that ball-of-fire homebuilder a case of the "put offs". Since there is no absolute deadline on maintenance, it is easy to just relax and enjoy life and wait a little longer to do that preventative maintenance.

The disciplines and skills learned by the homebuilder are not necessarily those required by a good aircraft mechanic. Before a person can make a part from raw materials he is forced to learn how to go about it, otherwise he will end up with scrap. Building an airplane is thus a mandatory learning process for the novice. He has nothing to lose but his time and money if he goofs -- and even that is a very effective learning process. Maintenance, however, is another story. There is considerably more at stake than time and money if maintenance is not performed until it is forced upon us by a failure of some part. Much as we dislike being policed by the FAA, that is really the reason for all the emphasis on maintenance and inspections.

Currently, all preventative and actual maintenance on homebuilt aircraft can be performed by the owner with an annual re-certificatior inspection performed by the FAA at least once a year. Our FAA office does a good job on these inspections, butthey emphasize that they are not meant to be a substitute for good periodic inspections. Just wha should periodic inspections consist of and how often should they be made? This is where the average homebuilder should resume the learning process. To know when and what to do he should by all means study a book such as one which is intended to prepare a person for the A&P mechanics test. An example is the Zweng manual on this subject. If you can't answer the sample questions that apply to your type of airplane, then you should do some studying.

Regarding inspections, the homebuilder should discipline himself to stick to a rigid, preplanned program. EAA chapters can help by devising such a program and take positive action to see that it is enforced. For insance ask each aircraft owner to voluntarily submit his log books to a designated chapter representative once per year and thus show evidence that inspections are being performed.

Here are a few suggestions which might be of help in establishing your maintenance program:

1. Enter all maintenance actions in a log book.
2. During the first 25 hours, remove all cowling every 5 hours and thoroughly inspect the powerplant. If your cowling can't easily

prog[illegible]

be removed this often, including the nosepiece, without removing the propeller, then it isn't designed right.

3. Every 25 hours thereafter remove cowling, wash down compartment, and inspect engine mount for cracks, baffles, exhaust system, tightness of fittings and nuts, jugs, and check oil screen for metal particles.
4. Re-pack wheels every 100 hours and check plugs and points.

Lyle Fleming, Lancaster California -- My T-18, N252, has 180 hours on it and is ready for its first annual inspection. During the year, the plane was at 12 different fly-ins where I gave numerous rides. At Rockford three rides per hour, five hours per day, for four days.

Reworking the cowling by closing the gap on the sides from around five inches down to about 1-1/2 inches, plus putting on wheel pants added 15 miles per hour to the cruise. It now indicates about 155 at 8,000 feet while turning the engine 2450 rpm. This is about 15 miles per hour more than the 250 Comanche that I had.

The prop that is on the airplane is 68 inches in diameter by 81 inches pitch. This seems to be a real good combination for the Lycoming 180. The engine turns 2100 rpm on the ground and 2700 (the red line) straight and level with the throttle to the firewall at 8,000 feet and will indicate 175 miles per hour. It takes a lot less runway to take off than it does to land.

My own personal opinion is that the T-18 should not be operated out of a field with less than 2000 feet up to 2000 feet elevation with clear approaches. Longer length above that elevation. Takeoff is about 1000 feet up to 2000 feet elevation.

This summer with two 200 pound fellows, 50 pounds of baggage and 45 gallons of gas we averaged 175 miles per hour ground speed to Northington, Minn., from Lancaster with two fuel stops.

Ron Zimmerman, 1915 McKinley St., NE, Minneapolis, Minn. 55418 ---

Back in October, 1964, I rode with Bill Hansen in his (N152A) new Tri-gear Tailwind to Mississippi State University. We spent a week there while Sean Roberts ran some tests on the Tailwind. They recommended nylon yarn for tufting. The tufts need only be 2-1/2" - 3" long. They shouldbe taped on in a staggered pattern -- this reduces the possibility of the slight turbulence of one tuft affecting the ones downstream of it.

On the subject of stall characteristics of the T-18, I experienced a slight left wing heavyness both before and in a stall. The break was pretty much straight ahead. There was little or no warning (buffet) before the stall. I tufted and experimented with stall strips to get more warning before the break. I tried to get the wing to stall sooner in the area of the wing walk so the tail would pick up the buffet for a warning. I got the warning I wanted but the whole center wing broke at the same time. I didn't think trading warning for a gentle stall was worth it so I threw the stall strips away.

After re-building my T-18 and re-skinning the whole wing, my T-18 now stalls 10 mph (indicated) lower with the same indicator (calibrated) and pitot-static. At first I wouldn't believe it but the ailerons are not as responsive as before (in a stall) so it must be going slower.

Originally I flush rivited only the nose ribs and main beam. When I re-skinned, I used flush rivets back to but not including the rear beam. Also originally, I bent the wing skin L.E. around a radiused piece of 3/4" plywood. This required much sweat, 4 letter

words (Darn, etc.), and an extra set of hands. The second time around I used the method described in Newsletter No. 23, Pg. 8 (1.7 dimension). With this method it can be done alone in 1/2 the time during a church service. (Amen! Ed).

I don't think the extra flush rivets did much to reduce the stall speed, but I do think I got a better L.E. contour on the airfoil which might be a big factor in the lower stall speed. I am not sure how close the airspeed indicator was calibrated before the crash, but it checked out very close after.

It is my personal opinion that the L.E. contour and uniformity has as much to do with stall habits as unwanted wing twist does. A little extra attention to these factors should be worthwhile. I have my horizontal tail off now to be updated.

Prop extensions - Ron Zimmerman - Due to rising costs I can no longer sell prop extensions for $60. postpaid. The price is now $60. plus $3. postage and handling. This includes anodizing and Zyglo inspected extension and 6 plated drive lugs. The prop extension can be modified (special order) for the Lycoming O-360 engine for $15 extra ($75. + $3. P and H). These will have 3/4" CB and 1/2" bolt holes for the engine end and 5/8" drive legs and 7/16" bolt holes for the prop end.

I have on hand three extensions that have been modified for O-360 engine with 3/4" drive lugs and 1/2" bolt holes on the prop end. This modification was necessary to remove some damage done in the anodizing process. These three will be sold for $80. + $3. P&H. When these are gone I'll make more like them by special order for $95. + $3. P&H.

I also have on hand one standard #1070 extension with the bolt holes reamed for 7/16" bolts (some O-320 engines).

Firewall Fittings - Dick Walen - Want to save $$ on firewall bulkhead fittings? Make your own by brazing a flat washer to a pipe coupling. Drill firewall same as OD on pipe coupling. Drill three holes in flat washer, apply rubber cement to back side and pop rivet to firewall. Chromate after assembly but before installation.

Bending Brake - Peoria High School - I made the little metal brake as shown in Sport Aviation February, 1962. Made several hold-down shoes and have folded or formed almost all 4130 parts - aileron horns - flap control parts - even .125 4130 parts on the walking beam. (Be sure to de-burr edges before bending). Also, made a shoe for brake pedals.

Sander Belts - For people using a Rockwell delta or Mead belt sanders using 1" x 42" sanding belts -- is to make our own belts purchase (from local mill supply house). Rolls of 1" x 50 yards of Behr-Manning "handy-roll" metalite cloth or equivalent. Cost about $5.75 to $6. pr roll depending on grit size.

Cut pieces at 45° angle, 42-1/2" long. Wet one end in warm water - scrape off 1/2" grit material (make up 6-8 belts at one time.) Allow to dry then glue the lap joint with Elmers or while glue - hold in vise or clamp until dry. Make sure belt ends are aligned and do not use too much glue. This gives you 15 cent belts that work as good as the "ready made" ones costing 50 cents each.

VALVE PROBLEM - If you haven't had a stuck valve on takeoff, you really haven't lived. This happened to me during climb out recently Fortunately, I was at 600 feet altitude and about at the end of the runway. I was able to just make it back and land across the other runway with only minor damage when I ran through the snow at the edge of the runway. Inspection of the engine revealed nothing wrong except that a piece of carbon had gotten under an exhaust valve. This kept the valve from seating properly and, with no heat sink for cooling, the valve got overheated and expanded in the guide. Even though the valve stem to guide clearance was within tolerances, the valve stuck open. This not only caused a power loss due to one less cylinder, but it also caused severe backfiring. This must happen when burning exhaust gas from the other cylinder is sucked in through the open exhaust valve at the same time the intake valve is open. Believe it or not, this makes a very noisey glider out of an airplane. John tells me that Bill Warwick had a similar close call when his 180 Lycoming powered T-18 injested a nut from the induction system and this got lodged, jamming a valve open.

Changing Spark Plugs - John Thorp says that it is very common for carbon to get lodged under a valve when spark plugs are changed. Removal of the top plug can break loose chips of carbon which fall down past the valves. If a valve is open slightly, the chips will collect around the seat and when the valve closes it will smash and sometimes stick fast. Since the valve can't touch the seat, it becomes very hot and may either stick or start to burn. John said this happened to him on three different types of engines until he figured out whatwas causing it. He thinks that 90% of the pitting of both exhaust and intake valves is caused by this.

Now he removes the bottom plugs first. Then before removing each top plug he brings the piston up on compression thus insuring that the valves are closed. For added safety blow air through both spark plug holes. John says he has never had any burnt valves over the years since he began following this procedure. He has written to both Lycoming and Continental to bring this situation to their attention. I don't know whether my valve problem was caused by changing plugs since I haven't had them out too recently, but you can be sure that I will remove the bottom plugs first now that I'm aware of this situation.

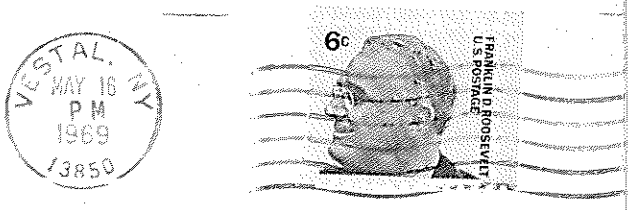
For Sale - Dick Hansen's beautiful T-18, N299Y - is now for sale. It has a 180 hp Lycoming, constant speed prop, and loaded with radio and instruments. If interested, contact Frank Nixon, Volpar, Inc., Stagg St., Van Nuys, Calif. We of the T-18 community have all suffered a great loss by the passing of Dick Hansen last month. He donated the use of his airplane for the various test programs.

New Address For Sport Aero - According to Dick Fawcett the new address for Sport Aero is: Sport Aero, 44-48 Carrol Drive, Sumpter, South Carolina, 29150. I haven't heard from Lucius Bigelow for some time but assume this is the latest address.

K&A Airfab - Last issue I listed a new material source but left off the street address. It should read Keith Shepard, K&A Airfab, 3437 Kelburn, Rosemead, California, 91770.

Sport Aviation Article - If it was hard to figure out how I made the tufts, it is because they left out a line between 6" and tape. It should read "with a 6" spacing. The yarn was then cut just ahead of each piece of tape".

Thanks to everyone for the letters and comments.



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