#19

No. 19 T-18 NEWSLETTER November 22, 1966

L.D. Sunderland, 5 Griffin Drive, Apalachin, N.Y. 13732

19

Jack Parks - Another T-18 is ready to fly. Jack has already completed taxi tests at Van Nuys Airport and is now ready to move his ship to Fox Field at Lancaster for the first flight and the flight test period. His final inspection was due today but the FAA man couldn't make it due to illness. Jack has used flush monel pop rivets on the entire airplane with the exception of one outer wing panel in which he used AN's. It looks as though he will fly with the exterior covered with zinc chromate and without a canopy. He has the standard flap system installed except for the handle. For this he removed the emergency brake handle from his foreign car and it seems to work nicely. Sure hope he doesn't park his car on a hill. His T-18 weighs 722 pounds with oil (707 empty). This is several pounds less than Kaergard's. Jack has a closed cowling but no electrical system, prop extension, wheel pants, radio or canopy. Lee Hamlyn tells me that Thenhaus' T-18, which has all these, weighs over 200 pounds more. (Since this was written Jack has put many hours on his ship. Flaps are a great help.)

Lee Hamlyn, Box 109, Reseda, Calif. - Lee has been flying Ralph Thenhaus' T-18 and plans to buy it after Ralph completes his Heath parasol. He is now using a Cherokee Sensenich prop cut down to 67x68. (I feel pretty lucky for this is the same type prop which I purchased from Sensenich for $85) On the way home from the fly-in he got a true airspeed of 160 mph at 2600 rpm. His maximum rpm is about 2900. John Thorp says that it is OK to turn the O-290 engine up to 3000 rpm but until now, Lee has been hesitant to cruise at over 2500.

I stopped at Lee's home to pick up a lower cowling. I had planned to mold my own bottom cowl in order to get a tailor made area around the carb air intake but I finally decided to buy one and mold an intake fairing which can be attached with fasteners to facilitate oil changes. Although Lee has molds for a complete fiberglas cowling, he recommends that the top and sides be made of aluminum since they have only simple bends. He makes all of the various T-18 fiberglas parts plus parts for mant other homebuilts. He does a real nice job.

What RPM is Red Line?-

John Thorp tells an interesting story about how the 2600 rpm red line got established for light aircraft. After World War II, an SAE committee meeting was called to set standards for engines and propellers for light aircraft. Representatives from the various air frame, engine and propeller manufactuting companies were present including John Thorp and Fred Weik. Mr. Weik stated that it looked like the propellers in post war airplanes would be in the 72 to 78 inch length range and that for the wooden props then in use, 2600 rpm would be a good maximum. So since that time, most of the airplane manufacturers have specified 2600 rpm as the maximum. But this is not necessarily a hard and fast limit based upon engine or propeller design considerations.

The Hughes helicopter uses an O-360 Lycoming engine which cruises at 2950 rpm. John was involved in its design. The only problem which arose was that the valve mechanism had a shorter life so they

had specially hardened cam shafts and lifters installed John thinks the 0-290 series engines can be turned at cruise speeds up to 2800 rpm without adverse effects.

You have heard that propeller tip speeds cannot exceed the speed of sound and that this limits maximum rpm. The speed of sound at sea level is 1100 feet per second, but you shouldn't attain tip speeds this high. A wooden propeller shouldn't exceed 800 fps and a metal propeller 1050 fps. A 68 inch long propeller turning 3100 rpm has a tip speed of 1000 fps. The best maximum tip speed depends somewhat on blade pitch. So for T-18 length propellers, you can cruise at up to 2800 rpm.

How do you determine the 75% power point for your airplane? Power var varies roughly as the cube root of rpm. So to determine the 75% power point, first determine the maximum level flight rpm for a given temperature and altitude. Your engine is delivering its maximum horsepower for that set of conditions but you don't know what it is (or don't need to know). Now, reduce rpm by 10% and you are obtaining 75% of the original maximum power. If you assume a maximum of 2900, the 75% point is 2610 rpm.

Brake Lines - Brake lines running from the fuselage to the wheels should be made of 1/4" stainless steel rather than aluminum. The tubing should enter the fuselage through a 3/8" hole in the 3/4" angle about 2" aft of the firewall. The tubing should be protected by a 1" piece of Teflon sleeving where it passes through the angle. The tubing should be connected to the master cylinder with a flexible hose having a generous loop to allow bending

Spinners - John Tonzer, 6658 Jumilla Avenue, Canoga Park, Calif., still can obtain spinners for $45 each. John does not make any money on the deal. He is willing to do you T 18 builders a favor by packing and shipping these spinners which he obtains at a local shop. It is a really good deal so don't pass it up. There is no other source and you couldn't make or buy one for many times this amount. Send checks to John directly. If you aren't in a hurry, tell him so he doesn't have to pack 50 spinners all at once while he is trying to finish his T-18.

Ralph Thenhaus attached his first spinner with flush head screws in countersunk holes. This proved to be a poor arrangement for the screw holes all enlarged and the spinner had to be scrapped. Lee Hamlyn has installed another one with ordinary cap screws and they seem to be holding up well. He highly recommends this arrangement. You can't dimple the spinner since it wouldn't fit over the bulkheads.

Carburetor Air Scoops - John Thorp gave me some pointers on air scoops. I am using a standard TriPacer type carb heat box and air filter and wanted to know how to shape the air inlet for it. Two things are important. First, the scoop should have a generous (at least 1 inch) lower lip extending forward of the filter to help deflect the air into it. This is especially important with filters which slope back sharply like mine. Second, the inlet hole in the

air scoop should be only about half as large as the filter. This gives a diffusing action at the inlet and reduces the velocity of the air at the filter. Thus, less dirt particles enter the inlet since it is smaller, and since their velocity is lower at the filter they will not penetrate as deeply.

Carburetor Heat Muffs - The drop in rpm experienced when carb heat is applied is due primarily to the restrictive action of the carb heat system rather than due to an increase in inlet air temperature. These passages are never really big enough so make your heat muff and ducting as large as practical. To improve the heat transfer, wrap a steel spring tightly around the exhaust pipe inside the muff. The muff is made from two steel ends and an aluminum wrap-around jacket. Only one end needs to be welded to the exhaust pipe. If the other end is free to move, it will cause less stress on the muff during the dissimilar expansion and contraction of the steel and aluminum.

Sound-proofing - It is important to filter out both low and high frequency noise but no single sound-proofing material is available to cover the whole spectrum. So it is necessary to use two types. For high frequency filtering, use 3M acoustic tape which is aluminum backed. It comes in 6" wide rolls. It is quite expensive and is available directly from the 3M company. The smallest size roll may do many airplanes, so a joint order with your friends will help. Put the 6" tape on the inside of all cockpit skins including above the tank. A double cross layer should be used on the firewall and floor. Add a 1" layer of spun glass insulation to this to filter out low frequencies. The firewall should have a double layer of the 1-inch glass. John knows of no sure-fire way to get the glass insulation to stay attached. He usually resorts to mechanical means like small screws and large washers.

Upholstery - John says he is no expert on upholstery and would like to see one of you builders come up with a good light-weight design including a means for attaching the panelling as well as a good seat design. All suggestions will be appreciated.

Zip Codes - I am still missing the majority of zip codes. I hear rumors that the post office is going to start charging the addressee extra when no zip is included so please send me your zip if it isn't on this newsletter.

Plans - There are many sets of plans floating around for which John has not been paid the full purchase price. If you have a set of used plans, be sure you have the original owner notify John of the sale. Otherwise you won't receive additional prints as they come out. Also, if you are receiving this newsletter but have sold

your plans, please notify me of the new owner's name and address and plans number.

Oil Coolers - John is convinced that the oil cooler should be mounted in the cowling nose piece and directly attached to it. This will keep the oil temp about 20 degrees lower than with the cooler mounted on the rear cylinder baffle. Also, the connecting hoses are much shorter.

MORE ON ENGINES

Crankshafts - There have been some questions about the strength of the Ground Power Units (O-290G) crankshafts. John Thorp says that there were some early reports of crankshaft flange failures, but that if the prop shaft extension has a good tight fit there will be no problems. The GPU shaft is OK.

Carburetor Air Intake - Some T-18'ers at the Rockford Fly-in asked about putting the intake for the carburetor up in the cylinder air inlet slot so as to make a more streamline, tighter fitting cowl, (one Piper model does this). John advised against this because the induction pressure drop will be too great and you won't be able to get full power. It is best to have as short a path as possible from the intake to the carburetor. Some airplanes (like the new Mooney) even go so far as to have an air filter bypass to use when flying up high where there's no dust and dirt. This gives the lowest possible pressure drop. Johns says that with his filter design using an automotive carburetor filter (for 283 Chevrolets) the pressure drop is so very low that a bypass would give no advantage.

Oil Pressure - Some GPU engines will provide too low a value of oil pressure even though all bearings, etc., are within tolerance. This is probably because the pressure relief mechanism is set too low. This can not be corrected by replacing the spring with a stronger one. The problem lies in the cage that the pressure relief ball seats in. In some of these cages the holes are larger than standard for aircraft. Remove the cage and replace it and the pressure should fall in the correct range.

Exhaust System - Most builders have been having trouble getting stainless steel for exhaust systems. John says that regular automotive low carbon steel exhausts are OK and will last quite well. The variety of bends available is much greater too.

A cross-over exhaust system will give about 100 rpm increase because of the reduced exhaust back pressure. A cross-over system has front cylinder exhausts tied together in one exhaust pipe and back cylinders on the other exhaust pipt (see drawing 3543).

Cowling - Be sure to have enough outlet area for best climb speed. Since the best climb for the T-13 is greater than 100 mph an ejector type cooling system will give no advantages and is more complex. (At 100 mph at sea level the ram air provides about 5" of pressure.)

Static Pressure Port - John says that there is no point on the fuselage which will provide reliable static pressure throughout the flight conditions. If you want to have your pilot and static pressure probes mounted on the wing you'll have to go out about 2 chord lengths (100") to avoid fuselage proximity effects. If it is mounted under the wing it will read low and then you will need to add a flare ahead of the static line compensate correctly.

The best place is to mount the pilot and static probes on the vertical fin (about 15" up). This gets the probes above the prop-wash for all flight conditions down to about 60 mph where it hits a drop off.

Rudder Bearings - Some people have suggested that nylon be used instead of Micarta for the rudder bearings. John Thorp says that micarta (which he recommends) is a little harder to machine but Nylon is harder to lubricate --- you can't load it up with graphite. Micarta is the best overall.

Welding - The question was raised about how you can tell if heliarc parts are good. John's comment, If it isn't cracked its good, if it is it's no good. The cracking occurs during the temperature stress during welding. To minimize this risk preheat (and sometimes post heat) is advisable. A torch (gas welding) is dirty and costs more but it does provide preheat and post heat. As a result it is less risky for cracking.

Use low carbon steel welding rod for all welding techniques. High alloy welding rods are more tempermental.

Engine Bearings - The bearings for the 0290C and the 0290D are the same parts and have the same part numbers. Therefore, if you can buy bearings for the 0290G you will save money.

Vacuum Pump - The 0290C has an accessory pad for mounting a vacuum pump so that if the adapter and gear train are available you can have an engine drive vaccum system.

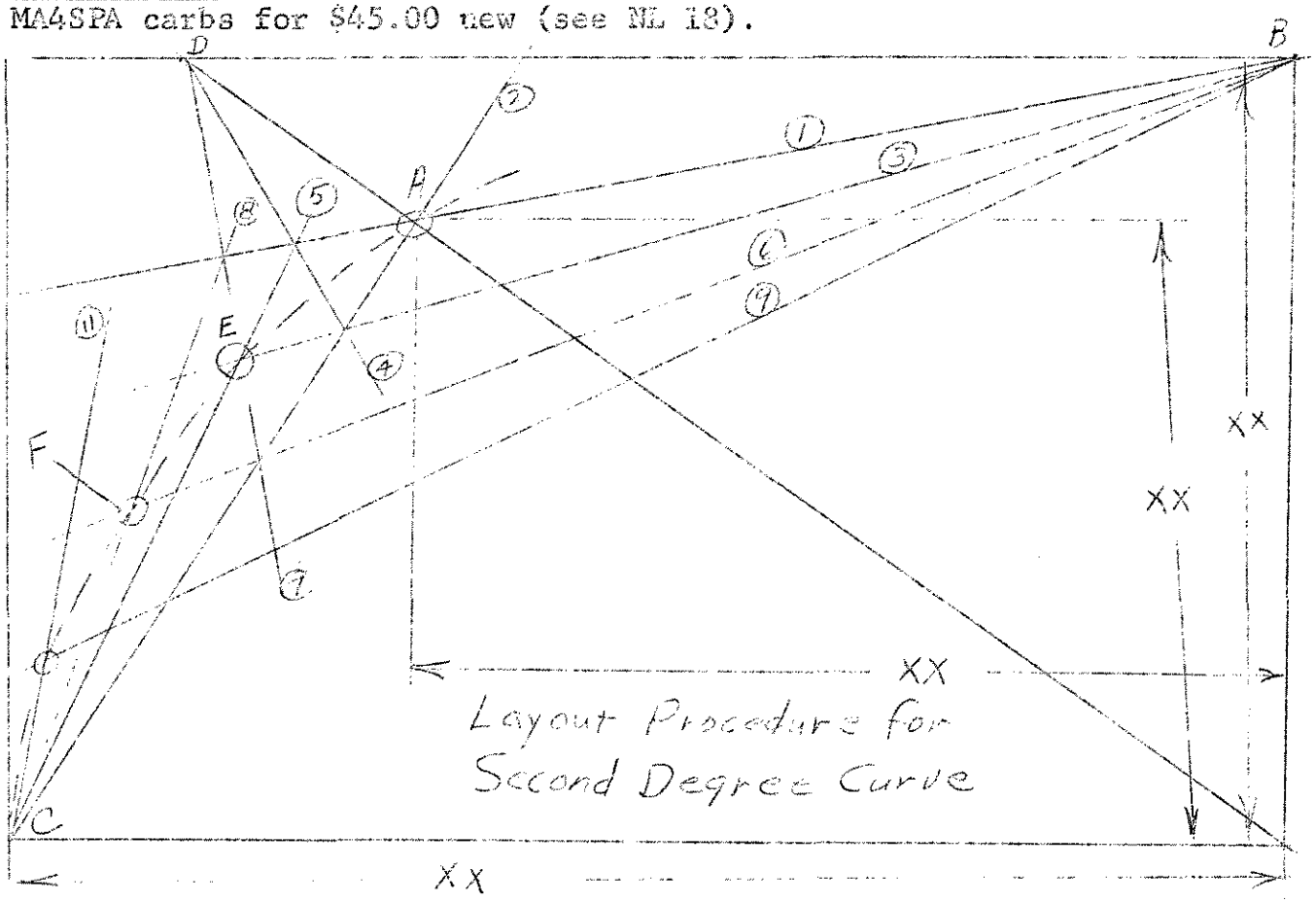
Removing the Engine Flange - John says that the flange on the front of the 0290C can be removed by using a little elbow grease. The way he approaches it is to bandsaw off the upper lip with the case open and then drill ¼" holes around the flange and knock it off. He even takes a hand axe to it! A little filing is then required to smooth up the job to professional standards. (Others have removed this

flange while the engine was still together but using basically the same technique.)

Material Source - Just spent an interesting visit at Spencer Aircraft, 3410 Dallas Avenue, South, Seattle, Washington, 98102. They are an aircraft surplus supply house who handle many goodies usable on homebuilts. They also give good discounts on new equipment. Examples: New vacuum pressure regulator for gyro instruments $12.50 (regular $25.00). Oil temp with 48 capillary $1.50 new. Gas tank strap cork covers $.50 each. Clecos $0.12 each, Cleco Pliers $1.00.

Pulleys - Bernard Thalman, 2912 Glenview Road, Wilmette, Illinois, 60091, has a bunch of AN210-2A pulleys for $2.00 for a set of 4.

Carburetors - Cris Staltzfus, Coatsville, Pennsylvania, 19320 has MA4SPA carbs for $45.00 new (see NL 18).



Second Degree Curve Layout - By Ron Zimmerman

1. Dimensions XX are given on prints.
2. Points A, B, C and D are laid out from the prints.
3. Draw lines 1 from B thru A, and line 2 from C thru A.
4. Line 3 is a random line from point B (as are lines 6 , 9 , ect.- depending on how many layout points are wanted for the curve).
5. Line 4 is drawn from point D thru the line 2 and 3 intersection.
6. Line 5 is drawn from point C to the line 1 and 4 intersection.

Sport Aero - Kent Hugus is now assistant to the vice president at Aero Commander and wants to sell out Sport Aero. His inventory is worth $5800 and he will sell out for $2900. Whoever buys him out should have $1000 more for operating capital and 1200-1600 square feet of floor space. Sure hope someone takes over this business because he has done a great service to the T-18 builders as well as builders of other aircraft. He is not taking any new orders. 2410 Greeenwood Drive, Albany Georgia is his address.

Kits - After each newsletter I receive enough kit orders to get a quantity discount. The only problem is that one person usually misses the boat and then has to wait until the next order which usually doesn't come until after the next newsletter. So, we now have a new deal worked out with the dealer whereby I can send him orders for any number of kits. He will ship the sheet immediately but hold the tubing orders until he collects 5. The price is higher for this deal but more convenient for everyone. I would like to emphasize that I make no money on these deals. I simply collect the checks and forward to Whitehead Metals as a favor to you. Each mass order usually costs me or John Shinn a half dozen phone calls and a dozen letters before final billing is in and the books straightened out.

The kit prices listed below are based on current prices and estimated weights. Your final billing will be based on prices as of date of order and on the actual weight of your metal. For some reason the kits always end up costing $5 to $10 more so I have to send out bills and collect the balance. So far, I've only been stuck by two persons. Shipping charges vary, but have usually been under $20. The latest prices are: Partial Kit $260. Complete Kit $335.

Partial Kit - Aluminum sheet and tubing:

Sheets	Size	Type	Tubing	Size	Type
1	.020	2024T3	36 ft.	3/4x.035	6061T6
1	.025	6061T4	24 ft.	1/2x.035	2024T3
9	.025	2024T3	12 ft.	1" x.035	6061T6
1	.032	2024T3	12 ft.	2" x.049	2024T3
1	.032	6061T4			

Complete Kit - Above plus the following:

1	.040	2024T3	12 ft.	2" x.033	2024T3
1	.040	6061T4			

Second Degree Curve Layout - continued

7. Curve reference point E is the line 3 and 5 intersection.
8. Line 6 is a random line from point B.
9. Line 7 is drawn from point D thru line 2 and 6 intersection.
10. Line 8 is drawn from point C to line 1 and 7 intersection.
11. Curve reference point F is the line 6 and 8 intersection.
12. Additional points are located by repeating the previous 4 steps.
13. The curve reference points are connected with a "splined curve".

407. J.R. Wood Jr.
705 N. Cross
Robinson, Ill.
62454