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FLY-IN - Last year we held a T-18 Forum at the Rockford Fly-In and we shall hold one again this year. It will be held at 10:30 a.m. Saturday, Aug. 7. This will be a good opportunity to get your questions answered, share experiences and pick up ideas.

POP RIVETS - A number of people have asked questions about pop rivets. Your dealer has a catalog which tells the size rivet for various grip lengths. If he doesn't have an extra copy, it will cost you only a 5¢ stamp to get one from United Shoe Machinery Corp., Shelton, Conn., 06485. The T-18 is designed for use of the low-strength aluminum pop rivets (150 lbs shear strength) except where the plans state, "no low strength rivets". The price of aluminum pop rivets at our local distributor is about $12. per thousand while monel pops are $17. to $20. per thousand. Monel rivets are much stronger, 420 lbs shear strength. Regular AN rivets have a shear strength of only 375 lbs.

I am using only the monel pop rivets. I tried several countersunk head aluminum pops the other day and was very disappointed with the finished head. The head turned partially inside out so the supposedly flat head was dome-shaped.

I never use pop rivets anywhere it is easy to hand drive a rivet on the bench -- such as in the webs of wing spars. There I use AN rivets and drive them with a hammer and rivet set. I personally feel that pop rivets may become loose quicker than an AN rivet even though they are stronger. I've had this happen. When drilling out rivets, the pop rivet will start to spin almost immediately. Also, if you try to flatten the aluminum surrounding a flush pop rivet by tapping it with a hammer after the rivet has been driven, sometimes the rivet will become loose. This indicates that a pop rivet might work loose sooner. I've not observed this type of thing with AN rivets.

It might pay for you to contact your FAA agent before using pop rivets since some of them don't permit their use (for instance, one in the Albany, N.Y. area). John Thorp tells me that the FAA cannot legally stop you from using them however, but they can give you a hard time.

I feel that you are less apt to end up with twist in a wing or control surface if it is assembled with pop rivets. And twist is a major problem to look out for. Ralph Taenhaus had to re-skin his center wing because of built-in twist and Bill Warwick thinks his wing drop-off in a stall may be caused by twist. With pop rivets, you can get an assembly all clecoed together and checked for straightness before starting to rivet. When using AN rivets, you rivet up one piece at a time with at least a portion opened up for bucking. This process is certainly more conducive to getting a twisted assembly.

AIR COMPRESSORS - I recently fixed up an air compressor from parts obtained from a local junk yard. I found a two cylinder refrigeration compressor which, when driven by a 1/3 hp washing machine motor gives me more than enough air (up to 125 psi) to keep a rivet gun going as fast as I can work it. The compressor, tank and mounting base cost me only $3. If you are lucky enough to find a compressor pump, you might want to put a rig together. Sears sells a regulator and gage set. Of course, you cannot use the compressor from a hermetically sealed unit found in all modern refrigerators. You need the separate compressor that looks like a little gasoline engine. To get sufficient volume, get one with two cylinders. Also, don't use the type with the intake through the crankcase as this will get too much oil in the lines. If the intake is along the side of the cylinder with a drain to the crankcase, plug up this drain to keep the oil out of the air lines. Otherwise, no modification is necessary on the compressor pump.

An automatic shutoff switch is not necessary for the average usage. Just plug it in and let it run as long as you are using air. However, a pressure relief valve is a must for safety. I bought one from a local air compressor dealer for about $2. It can be adjusted for any pressure. I believe the Sears models can't be adjusted. You'll also need a pressure regulator and two gages.

SPINNERS - As I mentioned before, John Tonzer will make spinners to the T-18 drawings for $31.50 if we can get orders for 12 or more. So far I have received only 3 checks which I am holding until more orders come in. If you want one of these spinners, send me a check made out to John Tonzer for $31.50 along with a stamped self-addressed envelope. If I don't get the required 12 orders, I'll return your check.

GAS TANKS AND RADIOS - Those of you who do not like the idea of having a bulky radio console hanging under the panel between the pilot and passengers knees may want to locate it in the upper center of the panel. Some of the newer radios will fit into this space with only a slight notch taken out of the tank. John Thorp tells me he plans to locate his radio in the panel. Floyd W. Maples, 1323 Hopkinsville Hghy., Clarksville, Tenn., has made a fiber-glas tank with a clearance notch for a Narco VHT-2 radio. He will make one for you for $70. with a built-in fuel gage float.

FUSELAGE - Someone asked what "spline curves" means on the fuselage skin prints. A spline is a draftsman's tool made of flexible material and is used for drawing in contour lines. When you lay out the skins, first locate the points at the frame locations, then take a long flexible piece of material -- wood is fine -- and anchor or have helpers hold it to the points at the frames. Carefully mark along the spline with a pencil.

DRAWINGS - Some people are confused and perplexed that dimensions aren't always given directly with lines and arrows in the familiar fashion. The use of stations, water lines, and butt lines is accepted aircraft practice and is as simple to understand and use as a,b,c. Stations (STA) are given in inches measured from some arbitrary reference point usually somewhere in front of the ship's nose. Water lines (WL) are vertical distances in inches and butt lines (BL) are lateral distances measured from the fuselage center line. Reasons for using this system are many and obvious. Drawings are much less confusing without all the extra lines and numbers and it is easier for the designer to keep everything correct. You will find few sets of plans as accurate as the T-18 plans.

FILE SYSTEM - You will waste many hours looking for certain prints if you don't sit down and make a complete list of all the drawings and their numbers. Then just file the prints in order and it only takes a few seconds to scan the list for the desired print and then locate it. It is wise to classify prints by component and underline the numbers on the list according to a color code. All horizontal tail prints could be red, wings - blue, etc.

RIVETING TIPS -- By Dr. John Shinn

In riveting up my tail surfaces I have rediscovered a few important tips on riveting procedures..

(1) Rivet length is very important, especially on thin sheet metal. If they are too short they will not leave an adequately thick shop head and will not cover over the underside edge of dimples. If the rivet is too long it will be difficult to drive straight, it bends over one way or the other with the slightest misalignment. If the "too long" rivet is hammered down to

acceptable head thickness it will take a very large number of large blows. The expansion necessary to do this "over" setting operation will be so high in many cases that the pressure of the expanding rivet will rip the hole in the metal. A further disadvantage of hammering down a rivet which is too long is that the distortion of the skin is greater.

(2) Bucking bars are critical as to weight, shape and the holding forces. In general the larger the rivet the heavier the bucking bar required. The only problem with too heavy a bar is the weight and ability to get into tight places. When a bar of sufficient weight is held squarely on a rivet it has a good "solid" feel in response to blows from the rivet gun. Bucking bars of the size of the hand held "bumping" bars used by auto body men work pretty well for the easy to get at 1/8" rivets on the T-18. Because some rivets are hard to get at it is necessary to have odd shaped bucking bars -- long bars, "L's", offsets, etc. The important thing is to get as much mass as possible in line with the rivet being bucked. A bar with a small joggle (for reaching inside a part) works well if it is backed up by a large mass on the bar outside. If the mass is offset too much from the rivet centerline however, you will find that the bar rotates slightly in the riveting process, and a bent rivet will result every time unless the bar is held a slight amount in the opposite direction to counteract this tendency to bend over the rivet. The holding forces on the ucking bar are equally as important as the weight. Even a heavy bar will not produce good results if it is not held squarely on the rivet with a positive force. Make sure the bar does not rest on other parts -- it will not only produce some tendencies to rotate the bucking bar but will also mess up other rivets and parts unexpectedly.

Perhaps the most important thing in riveting is to keep enough pressure applied on the rivet gun and the bucking bar. Before pulling the trigger the rivet should be "squeezed" in place between the rivet set and the gun and the bucking bar on the other side of the metal being riveted. As the rivet begins to expand during the setting process the pressure on the bucking bar should be increased as much as practical. This will prevent the gun from denting in a low area in the skin around the rivet. This added pressure is especially important in working with light bucking bars and light sheet metal.

(3) Gun settings are important too. If the resulting hammering force is too low the rivet will take a great number of hits to set it and it will tend to pean or mushroom out at the end rather than expand uniformly along the shank. You will also find that the rivet has a greater tendancy to bend, and that the skin takes more of a beating so that dents are more prevalent. One further disadvantage is that the bucking bar "dances" around for a longer time and is more likely to slip off the rivet or end up at the wrong angle.

Therefore, I concluded that you should adjust the gun to set the rivet in just a few strokes (6 or so) and fire the gun in short bursts. Observe the rivet between bursts for any necessary corrective action. Then apply plenty of force to both the gun and bucking bar for the succeeding bursts. The screw on the handle of the gun adjusts gun speed and force. Screwing it in reduces the effective air supply. I found I could do most of my riveting with a line air pressure of about 50 psi. For the long rivets on the inner wing spar a pressure of 80 to 100 psi seemed better. The gun will work down to about 35 psi if necessary.

(4) Flush riveting requires that the gun be held very squarely with respect to the riveted surface with lots of force. If an adequate force isn't used you will find that the gun will tend to dance off the rivet and dent the adjacent metal. Again, plenty of pressure on the bucking bar side is a must. I find that the Good Lord made a pretty good universal joint in the form of a man's wrist. As a result it takes a little talent and practice to one-handedly hold a medium or long length rivet gun without slipping.

Short bursts and a firm grip will help here -- the gun won't slip so much between trigger squeezes.

(5) Bumping out the flush rivets is a trick we learned from John Thorp. After you set each countersink rivet keep the bucking bar in place and lightly strike the rivet area with a large rubber mallet. The bucking bar pushes out on the rivet and rubber mallet head depresses the skin surrounding the rivet. If you observe reflections on this skin around the rivet you can readily learn to tell when the surface is "bumped" back flat again. No matter how careful you are you will always find some local depression of the skin by the rivet set on thin skins. Heavy bucking bars held with large force overcome this to a degree but thin metal, being flush with the rivet, is deflected with each blow of the rivet gun. (One way to avoid this is to use shallow countersinks or dimples and then shave the excess rivet head off when done. This is a lot of work and with a little care the "regular" way does almost as well.)

(6) Inside-Out riveting can be used to an advantage especially for flush riveting. You put the gun on the shop head side and the flat bucking bar on the manufactured head side. Again, firm force on the gun and rivet is a must. This technique all but avoids the necessity for "bumping out" rivets (as described previously) and makes it easy to put on such things as skin stiffness, etc. For such "on the bench" work you lay the bucking bar on the bench, put the rivet through the metal and drive it with the gun backwards onto the bucking bar. I believe Bob Kaergard of Chicago who first recommended this for the fuselage says it works well "out in the open" too.

This about sums up my thoughs: Always use the correct length rivets and hold the gun and bucking bar squarely and firmly.

See you at the Fly-In. How about you contributing something to the Newsletter -- even if it's only questions to be answered?

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