

EAA MILE HIGH CHAPTER



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NEWSLETTER
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VOLUME 10, ISSUE 11, NOVEMBER, 1987

THIS MONTH: This month's meeting will be held on Saturday, November 14, 1987 at 7:30 P.M. in the Club Room of the Denver Air Center, which is at the junction of the two main roads leading into Jefferson County Airport. The program will be a presentation on sheet metal fastening by Bill Amos. He is going to talk about the many different types of rivets available, from the driven ones that are most common to the structural pop rivets that not everyone has seen. He will bring examples of each to show. He will also bring some of the tools that are needed to build a metal airplane. In addition, he is going to bring a workbench with vise, compressor, riveting tools, and plenty of scrap aluminum so that everyone can practice driving a few rivets. This should be a good program. Bill supplied all of the sheet metal information that is contained in this Newsletter.

LAST MONTH: With 50 members and guests in attendance, the meeting of October 10, 1987 was called to order at 7:50 P.M. by President Kirby White at Jeffco Air. The minutes of the September meeting were approved as published in the Newsletter.

Guests: Guests present were Jim Leistikow of Denver, George Maxey of Westminster, and David Weise of Littleton -- who is building a Sonerai.

Treasurer's Report: There was none given.

Old Business: There was no old business to discuss.

New Business: The main part of the business meeting was the annual election of officers and volunteers. The entire 1987 slate was re-elected to another term in 1988. During the October, 1984 business meeting, it was voted that at every following October meeting a vote would be taken whether to transfer any money from checking and savings to the Steve Ansley Memorial Fund, and if so, how much. Treasurer Cathy Sheeon was not at the meeting to give a Treasurer's Report, so it was decided to vote on this issue at a later date. Kirby asked if the membership wanted to have a banquet for the December meeting again this year. Everyone said yes, and Colacci's Restaurant in Louisville was traditionally voted as the place to hold it. Kirby said that he would make the necessary arrangements. Along the same lines, he asked if the Chapter would be willing to let Cathy Sheeon spend some money for decorations and cookies, as it did last year for the banquet. It was voted that she could spend whatever would be necessary, within reason. Kirby talked about the reason for the meeting not being held in the Club Room of the Denver Air Center. He said there were two people doing the scheduling of the Club Room, and another

New Business cont: group was promised the use of the room on our meeting night. Kirby said that he has been asked on several occasions whether Chapter 43 would be agreeable to paying the normal \$25 a night fee for the use of the room. He said he has been trying to resist it, but the Chapter would now have to make a decision on whether or not to pay the fee. Kirby said that we were not by any means being singled out; that even club members of the Denver Air Center have to pay the \$25 whenever they reserve the room. By agreeing to pay the fee, Chapter 43 would be guaranteed the use of the room, and not even a club member could keep us from using it. Kirby said that our average usage would be about ten times a year, or \$250. A discussion was held among the members, and it was agreed that the Denver Air Center Club Room was an excellent place to meet. A couple of options were talked over regarding paying for the room. One was to have a kitty at each meeting so that those so inclined could throw in something to help defray the cost of the room. The other option was to have Kirby see if a reduced rate for the entire year could be had by paying in advance. Kirby said he would check on it, and then a decision could be made at the November meeting. Kirby announced that the Denver Air Center was planning a tour of the Longmont Air Traffic Control Center on October 20, 1987. He had a sheet for anyone interested in the tour to sign. Kirby said that he had quite a few 1987 Chapter 43 Rosters left over, and that anyone who wanted an extra copy would be more than welcome to one.

Gene's Corner: Gene Horsman was not at the meeting, and so wasn't able to inform us of recent aviation-related matters.

Progress Reports: Jim Thompson talked about the progress he was making in getting his Cessna 170 airborne again. His engine was not rebuildable, but he was able to locate another Continental O-300 in California, which was fairly low time. He said he planned to do a major overhaul on it, and made a very generous offer to the members of Chapter 43. After the cylinders have been reworked and all of the other machine work has been completed, Jim will lay out all of the parts in his garage and invite anyone interested to come over and watch the assembly process. His Inspector will be on hand to oversee everything and answer technical questions. Quite a bit of interest was expressed by the members in participating in such a presentation, and Jim said he would let everyone know when the assembly would take place. Dean Cochran reported that Ron Denight's Toyota starter installation worked out real well. It spins the engine fine, and the gear teeth mesh nicely. Bob Greeno machined the necessary mounting bracket.

A&P: The business portion of the meeting adjourned for coffee at 8:25 P.M. After the break, two videotapes were shown -- one on the Sentimental Journey B-17 and the other on the Lancair home-built kit airplane.

MARKETPLACE: For Sale: 25% interest in 1957 Cessna 172, \$2,350 invested. Ralph Molski 430-9406

For Sale: 12V quartz heater, New condition, Draws 16A, \$80. Steve Franseen 987-1880

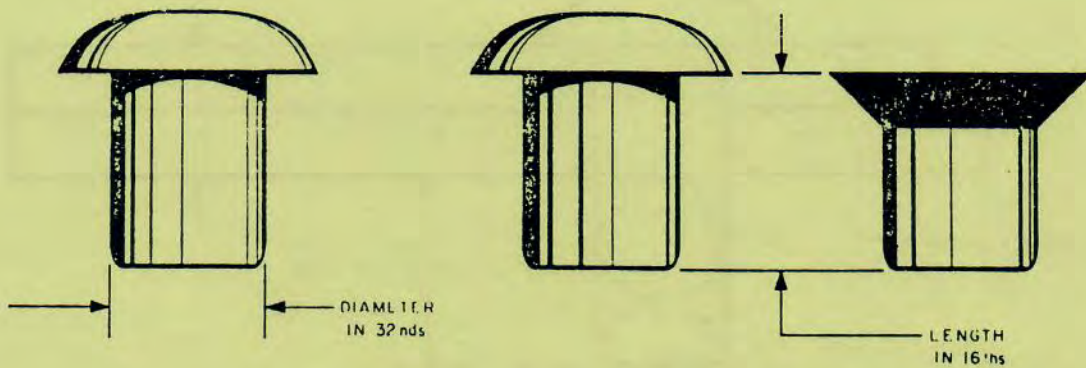


Figure 3 - Rivet Diameter & Length

RIVET SELECTION

When selecting rivets for a particular use, the following points must be considered.

HEAD STYLE The MS 20470, Universal head rivet, is the standard protruding head type. The MS 20426, 100° countersunk, is standard for flush riveting aluminum alloy structures. The MS 20115 and MS 20427 are the corresponding monel rivets.

DIAMETER Selection of rivet diameter depends upon the thickness and location of the metal being riveted. Specifications on a print are the best guide for rivet size. Sometimes the size of rivets in an adjacent or similar structure to the one being considered is a good indication. A simple rule applying where only two sheets are being joined is that the rivet diameter should be approximately "three times the thickness of the thickest sheet".

LENGTHS Too short a rivet may result in insufficient filling of the rivet hole and a small formed head. Too long a rivet is difficult to drive and may bend over and "clinch" rather than form. After experience in riveting, the correct length becomes apparent by sight. A standard formula used for determining rivet length is:

Proper rivet length = Grip of Material + $1\frac{1}{2}$ times the rivet diameter

$$L = G + 1\frac{1}{2}D \quad \text{Where: } G = \text{Grip} \\ D = \text{Rivet shank diameter}$$

Rivet "extension" is the amount of shank that projects from the side opposite the head side.

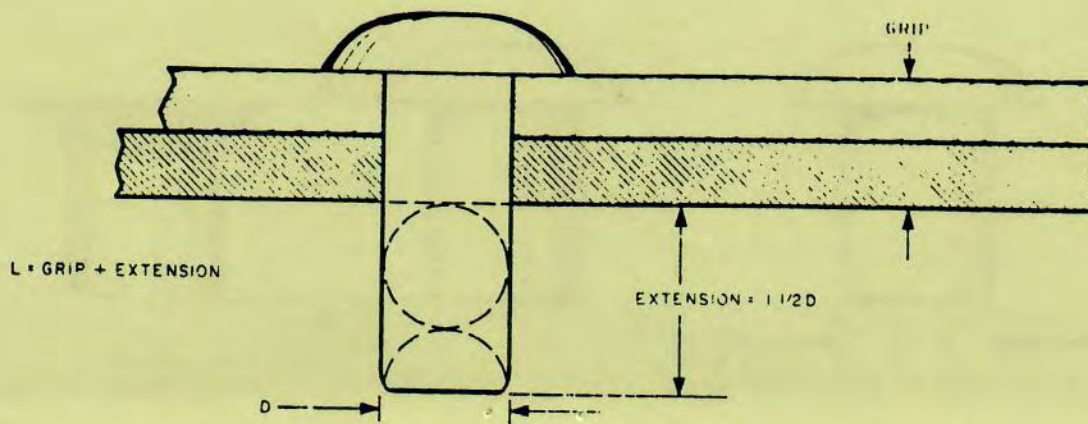


Figure 4- Rivet Length

In practice, an extension of from $1 \frac{1}{4}$ to $1 \frac{1}{2}$ the shank diameter is considered the correct length.

PREPARATION FOR RIVETING

Before driving rivets, careful preparation is necessary. Time spent in making a careful set-up will pay off in the quality of the completed job. Some of the points to consider before heading a rivet are as follows:

- (1) Layout rivet hole locations with a soft pencil. A scribe should be used only when marks will be removed by drilling since it makes objectionable scratches. When marking heat-resistant metal use a grease pencil. If a lead pencil is used it will make a line of carbon which can combine with the metal at high temperatures and cause a crack.
- (2) Make sure rivet holes have enough edge distance in order to prevent a tearing out at the edge of the sheet. The minimum edge distance is two times the hole diameter.

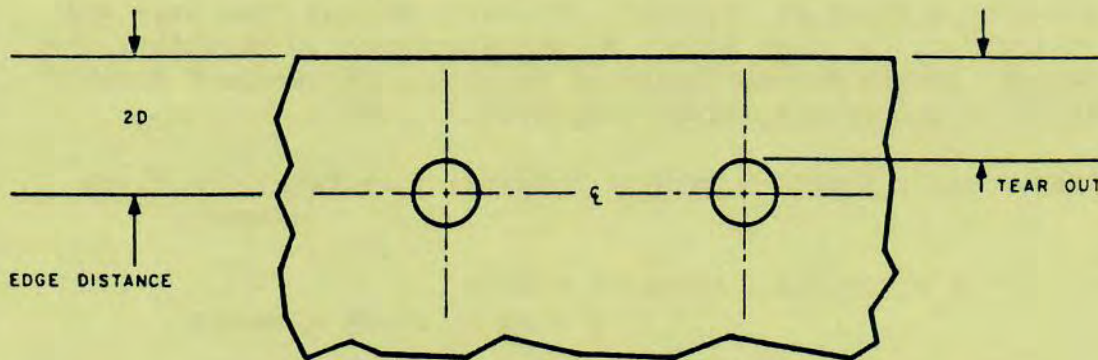


Figure 5- Edge Distance

The minimum edge distance for non-flush rivets in aluminum is twice the rivet diameter. See Figure 7. Flush rivets require an edge distance of approximately $2\frac{1}{2}$ diameters or as indicated in Table 3.

Rivet Size	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{5}{32}$	$\frac{3}{16}$
Edge Distance	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{11}{32}$	$\frac{13}{32}$

EDGE DISTANCE FOR CSK RIVETS

Table 3

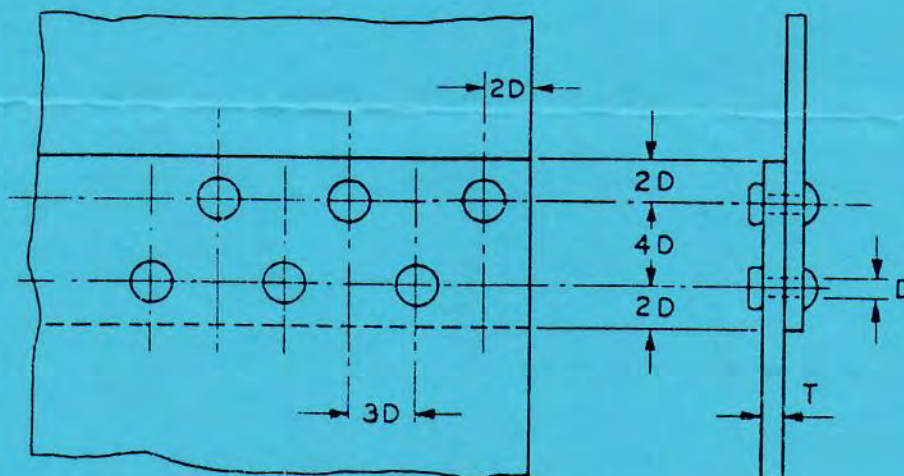
It is often good practice to use the edge distance of the next size larger rivet. This will allow a replacement rivet of the next larger size without going below the minimum edge distance.

RIVET PATTERNS FOR REPAIR WORK

A rivet pattern depends upon the type and required strength of joint being made. A balance between rivet shear strength and sheet bearing strength should always exist. Typical rivet patterns for repairs to primary structure can be found in the Overhaul Manual.

RIVET SPACING

In no case should rivet spacing be closer than three diameters center to center. The maximum spacing depends upon the strength needed and possibility of the metal buckling between rivets. As a general rule, the maximum rivet spacing should not be over 24 times the thickness of the thicker sheet. A rivet pattern may be indicated on drawings as shown in Figure 8.



SAMPLE RIVET PATTERN FOR SINGLE-LAP SHEET SPLICE

FIGURE-8

DW5254A

RIVET ROWS Rivet rows are often staggered in order to distribute the stresses evenly and to avoid removing too much metal in the same cross-section. The distance between rows is dependent on the rivet size and pattern. Minimum distance between rows is:

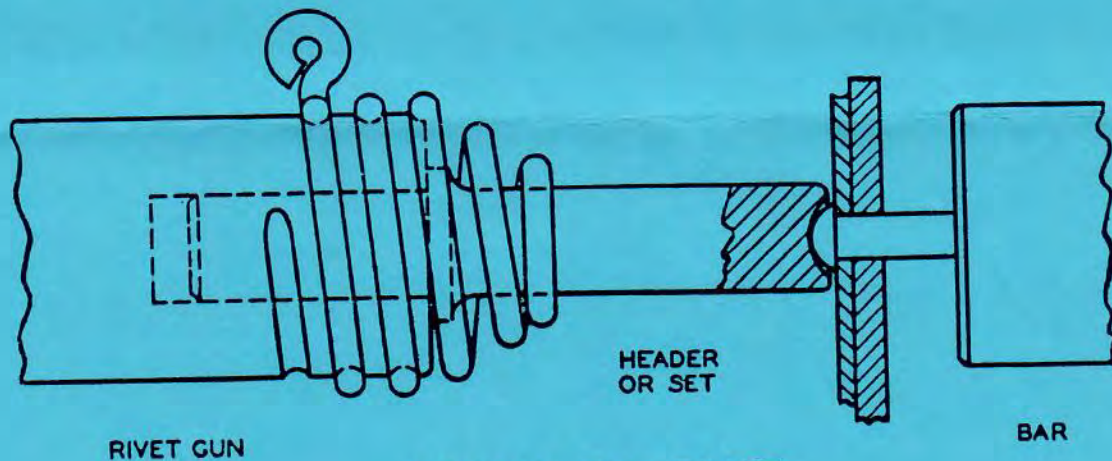
- Non-flush rivets - 3D
- Flush rivets, dimpled - $2\frac{1}{2}D$
- Flush rivets, countersunk - $3\frac{1}{2}D$

RIVETING PRACTICES

DRIVING RIVETS In maintenance work, rivets are most frequently headed by blows from a rivet gun applied through a "set" or "header" while the shank is backed up with a bucking bar. The rivet header must fit the rivet with which it is used. The header, except for the flush type, should contact about the center 2/3 of the rivet head. The bucking bar should be large enough to absorb the force of the gun and bring rivets down rapidly. The steps in rivet driving are as follows:

STEP 1 Select a gun suitable for the rivets to be driven. Install the proper header. Be sure a retaining spring is in place. The spring is an important safety device for without it the header could fly out and hurt someone.

STEP 2 Always test the gun for adjustment before using it. Hold the header against a wood block. Adjust air pressure with the knurled knob until the best driving force is obtained. Blows should be heavy enough to drive the rivet rapidly but not damage the work or cause the gun to go out of control.



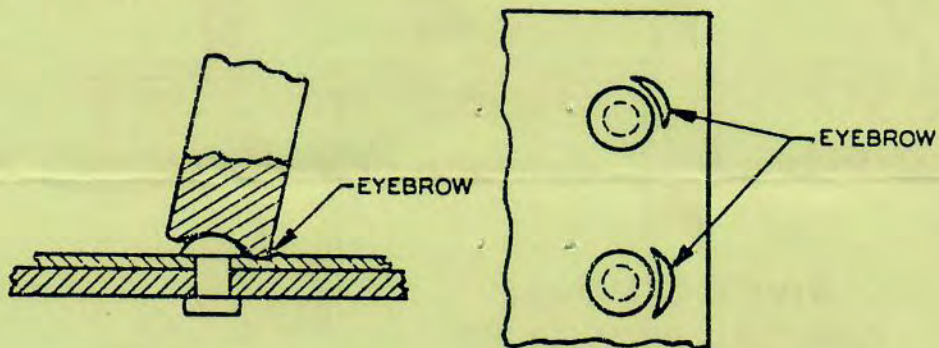
DRIVING THE RIVET

FIGURE-9

DW3932A

STEP 3 Whenever possible, install the rivet so the formed head will be against the thicker sheet. Keep the rivet in place by holding pressure against it with the gun.

STEP 4 Avoid "eyebrows" by holding the gun perpendicular and using the proper header. Eyebrows damage the material and are cause for rejection of some jobs.



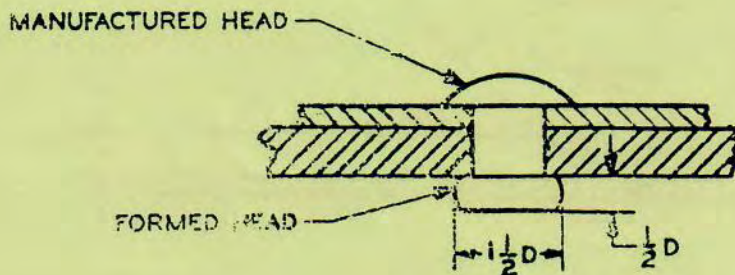
EYEBROWS

FIGURE-10

DW 3933A

STEP 5 Hold the face of a smooth bar squarely on the rivet shank. Hold it firmly but not so tight as to prevent the bar from vibrating while the rivet is being driven. Tape the bar to prevent scratches where it is apt to come in contact with any part of the structure.

STEP 6 Drive the rivet by pulling the trigger full open, giving a short, sharp burst. Bringing a rivet down quickly prevents excessive work hardening which would not permit its shaping to a well-formed head. With the correct adjustment and timing the rivet should be driven in one or two bursts. After driving, the formed heads of rivets should be uniform and have approximately the dimensions shown in Figure 11.

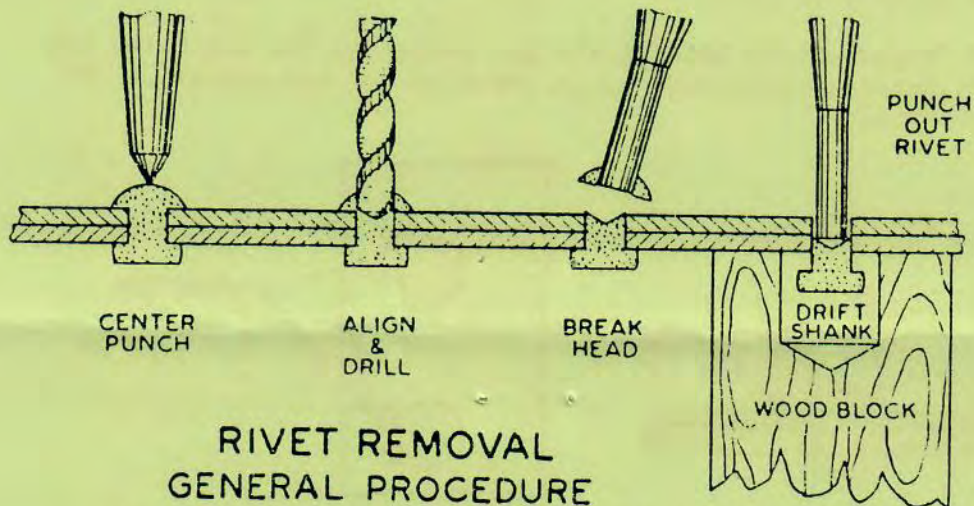


CORRECTLY DRIVEN RIVET

FIGURE-11

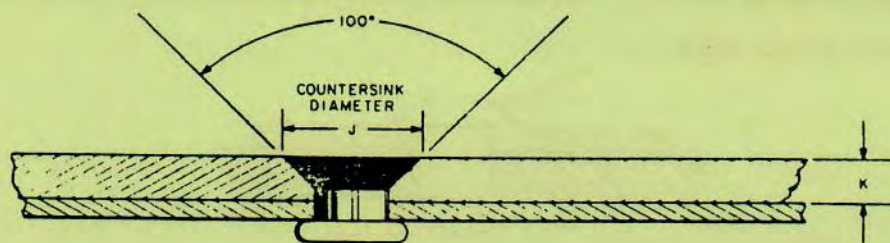
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- (2) After drilling, break the head off with a pin punch and carefully drive out the shank. If the metal is thin, it should be supported while the rivet is being driven out to avoid distortion. Use a notched bar or a wood block drilled to fit around the formed head. See Figure 35. If the corner of a bucking bar is used it will leave marks on the metal and does not really give good support.



(12) Flush riveting requires either countersinking or dimpling or a combination of the two. When fully driven, the head of a flush rivet should be smooth but above the metal surface from .001" to .004" (.008" for large rivets). If, for aerodynamic reasons, a smoother surface is required, the head can be shaved flush with a rivet shaver.

Thicker sheets are prepared for flush riveting by countersinking. In countersinking, metal is removed to make a tapered recess for the rivet head. If countersinking is done on metal below a certain thickness, a thin edge with less than the minimum bearing area or an actual enlarging of the hole will result. For this reason, the countersunk sheet should not be thinner than indicated in this table.



RIVET SIZE	J	K (MINIMUM)
3/32	.191	.040
1/8	.238	.051
5/32	.302	.064
3/16	.368	.072
1/4	.493	.091

Figure 8-Minimum Skin Thickness

Maximum sheet thicknesses for draw flush dimpling are shown in the following table:

RIVET SIZE	HOLE DIAMETER BEFORE DIMPLE	OUTER SHEET MAX. THICKNESS	TOTAL THICKNESS OF DRAWN SHEETS
3/32	40	.032	.064
1/8	30	.051	.072
5/32	20	.064	.081
3/16	11	.072	.101

Figure 10



Figure 11—Types of Flush Rivet Installations

Dimpling is required when the material to be flush riveted is too thin for proper countersinking. Dimpling must be done in a manner that will provide for an accurate fit of the flush rivet and not cause the metal to crack. Special dimpling dies used in a squeezer do a good job of forming dimples. If for some reason the work cannot be fitted in a dimpling machine, the "draw flush" method may be used. This consists of using a "draw set" or "draw bar" which is shaped to receive the dimple and the rivet itself which acts as the male die. Dimpling force is supplied with a conventional rivet gun and bucking bar.

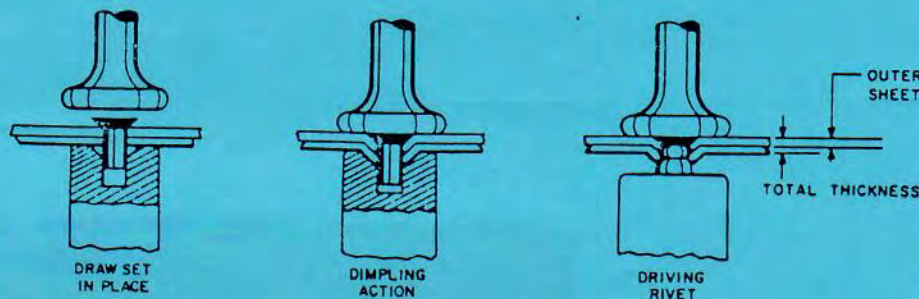
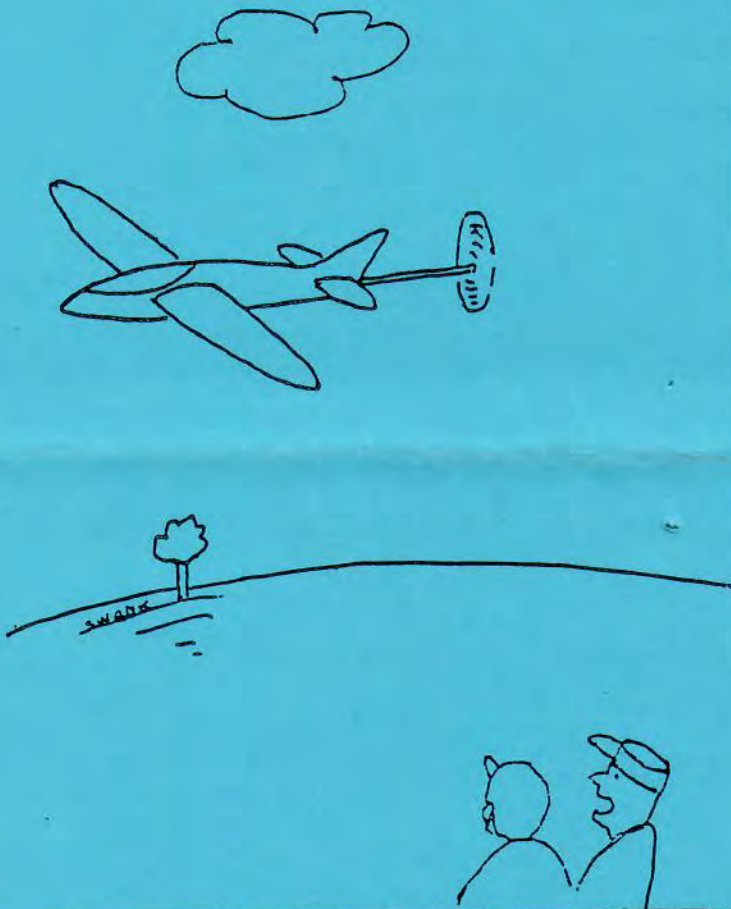


Figure 9—Dimpling By The Draw Flush Method



"Some people really carry this laminar flow concept to extremes."



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