Tony Bingelis

SPINNER SAFETY

It happened, as it frequently does, soon after the application of full throttle for take-off. The loud noise accompanied by a horrendous vibration scared me almost completely out of my wits — leaving just enough awareness to know I had better do something. I immediately throttled back and pulled off the runway into the grass, not knowing if the propeller had thrown a blade or if the engine was self-destructing.

On shut down, I found that it was neither. The back spinner bulkhead had failed at three of its four attachment points, and the spinner was on the verge of parting company with the airplane. Because it didn't break completely loose, the cocked spinner did a thorough job of decimating the front end of the cowling.

Had the spinner broken loose in flight, the consequences could have been more serious, perhaps disastrous, if on parting it had crashed into the windshield or tail surfaces.

This particular spinner failure was attributed to the lack of a front bulkhead (the omission of which was intended to be only 'temporary'), and to an old work-hardened bulkhead with a few tiny undetected old cracks.

The failure occurred approximately 30 hours after the initial installation. And what a surprise it was because the spinner had always tracked perfectly.

This incident lends credence to the belief that propeller spinners are more likely to fail during take-off. Typically, the partially failed spinner will viciously chafe and masticate the cowling until it ultimately separates from the aircraft. It is a frightening experience, one that needs not be repeated to drive home the message. You better believe it — a spinner once installed cannot be ignored . . . not for long anyway.

Vibration A Warning?

The appearance of an unexplained vibration, no matter how infrequent or intense, could be a sign of an impending propeller or propeller/spinner failure. In thinking back, I'm almost certain now that some of the occasional light vibrations I detected were spinner induced and not attributable to improper or excess leaning.

Admittedly, excessive vibration can sometimes be caused by old or deteriorated engine shock mount bushings, improper engine timing, improper leaning, and insufficent engine-to-cowl clearances to name a few culprits. Obviously, excessive and/or prolonged vibration can be harmful to both the propeller and spinner, even if they are not the initial cause of the problem.

Spinners Are Hard To Inspect, But . . .

Because spinners are so hard to inspect effectively, any time you have the engine cowling removed you should grab that opportunity to examine your spinner installation . . . from behind. I mean, really **look** at it.

In particular, examine the rear bulkhead for signs of metal distress or incipient cracks.

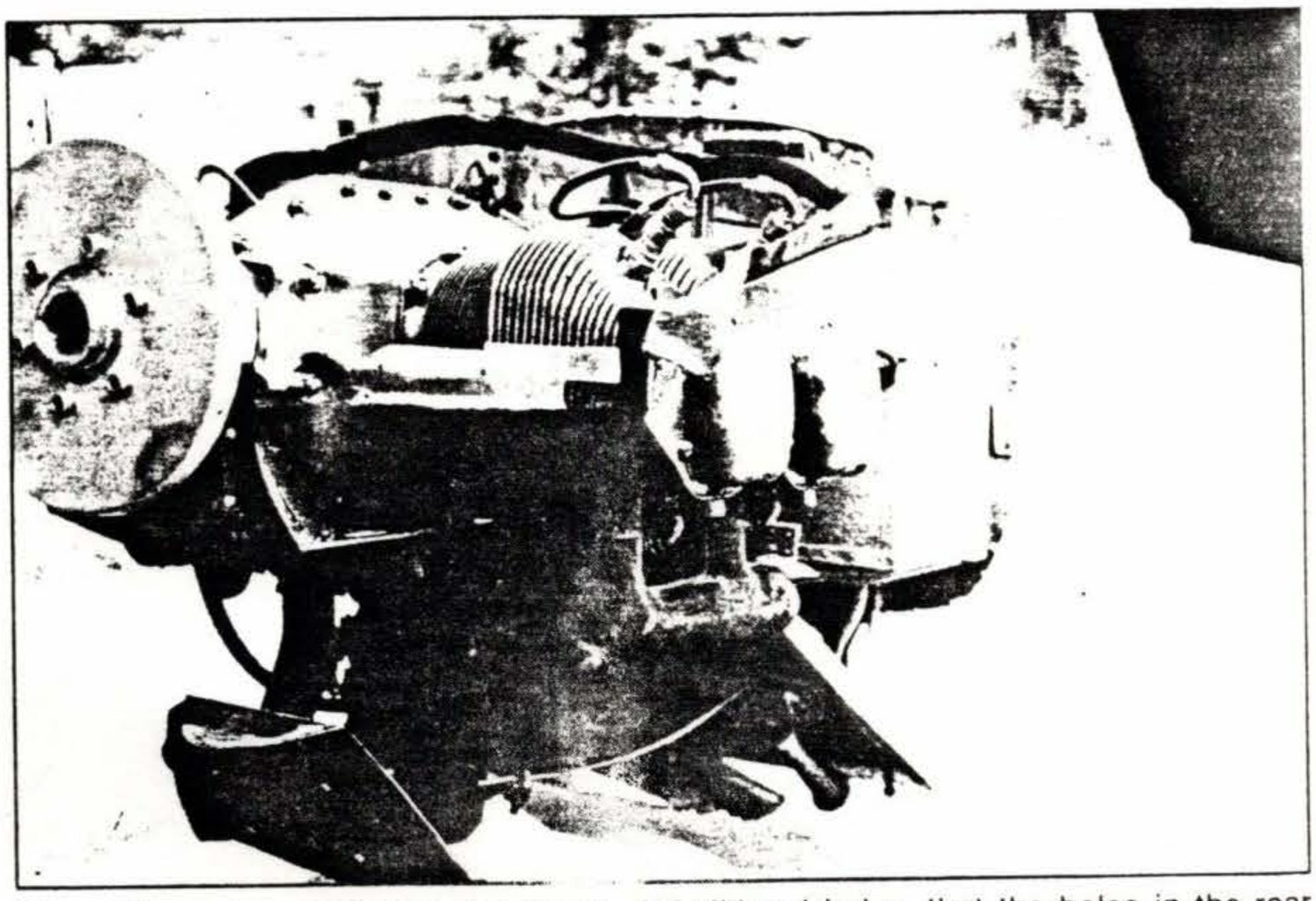
Another potential source for spinner cracks is in the areas around the propeller cutouts.

Look also at each spinner attachment screw and check for the unwelcome presence of cracks radiating out from under the screw heads.

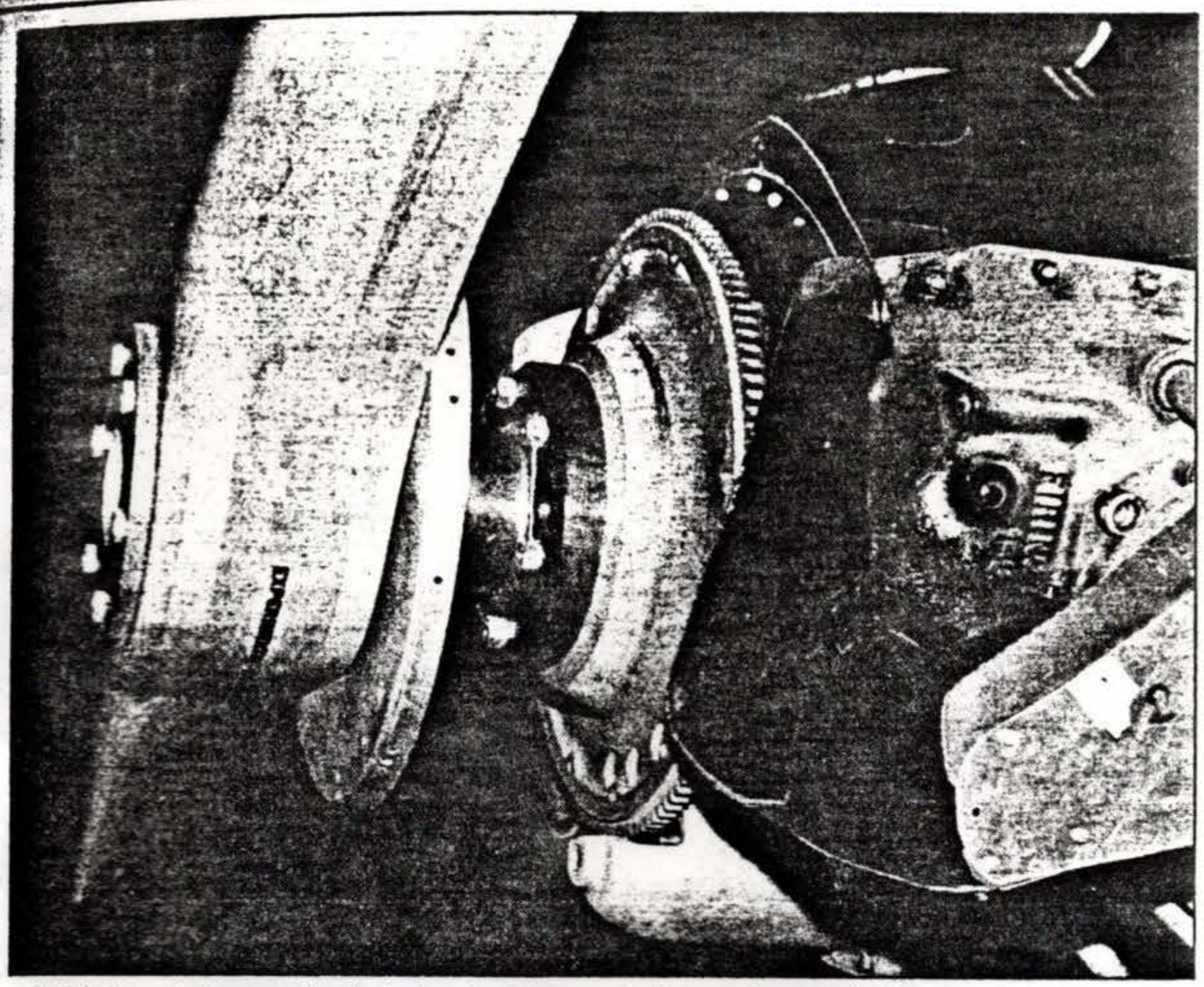
Maintenance people tell me that many of the older aircraft on which they perform annual inspections can be expected to have had lost screws replaced with a variety of mismatched screws to secure the spinner. Most of the screws will, invariably, be rusty and hard to remove.

During your own annual inspections always replace lost screws with those of the correct length and type. Although the effect of mismatched screws on the balance of a spinner installation might be negligible, it is worthy of note.

Well, so much for you folks with spinners currently in service. Now, if you are a builder who has yet to undertake the completion of his first spinner installation, you might find a few tips to be of



Remember, when drilling your spinner bulkhead holes, that the holes in the rear bulkhead are larger, usually, 5/8" dia., to accommodate the prop flange driving lugs. Don't drill the large holes through the front bulkhead! Check and see what you need.



A thick metal propeller hub front plate must always be used with a wood propeller.

greater interest to you, so let's compare notes.

Your first thoughts on the subject will, naturally, dwell on the matter of selecting a spinner.

Aircraft Spruce and Specialty Company was one of the first suppliers to make a spinner kit available to the homebuilders. It was sort of an offshoot of Henry Ford's philosophy. That is, you could have any kind you wanted just so long as it was their Bullet Nose Spinner Kit. Thankfully we have come a long way, amigo, and we can now select from a variety of ready-to-use stock spinners manufactured for certificated aircraft, or purchase one of the kit spinners fabricated especially for the homebuilt trade. Indeed, there are all kinds of spinner shapes and sizes from which to select.

Ready To Use Stock Spinners

The ready-to-use spinners, for the most part, are those produced for certificated aircraft (Cessnas, Aeroncas, Luscombes, Pipers, etc.). They are well made and when obtained through homebuilt suppliers are quite affordable. Their greatest appeal is their ease of installation. All you have to do is select a spinner that suits your fancy and fits your engine — then, bolt it on.

The prop cutout is already made and the bulkheads will have been pre-drilled and fitted with nutplates. It should be noted, with relief, that such a spinner will track concentrically and you will not expect to encounter any alignment problems.

There is one thing you should keep in mind though. Since the prop cutout is for a metal propeller, you may have to enlarge the cutout area to accommodate your wood prop. This, however, is a very minor chore compared to preparing a kit spinner blank for installation.

The Kit Spinner

Sometimes kit spinners are sold without either a front bulkhead or a rear one. More often only a rear bulkhead is available and you will have to try to locate a front plate (bulkhead) that will fit your propeller hub/spinner combination.

Most, but not all, kit spinners will have the correct size propeller bolt bulkhead holes already drilled or punched out. If the bulkhead blanks are not already pre-drilled, they should, at least, have punch marks to aid in accurately locating the bolt holes that you will have to drill. Actually, if the holes are not already in place, I would seriously consider buying some other type of spinner.

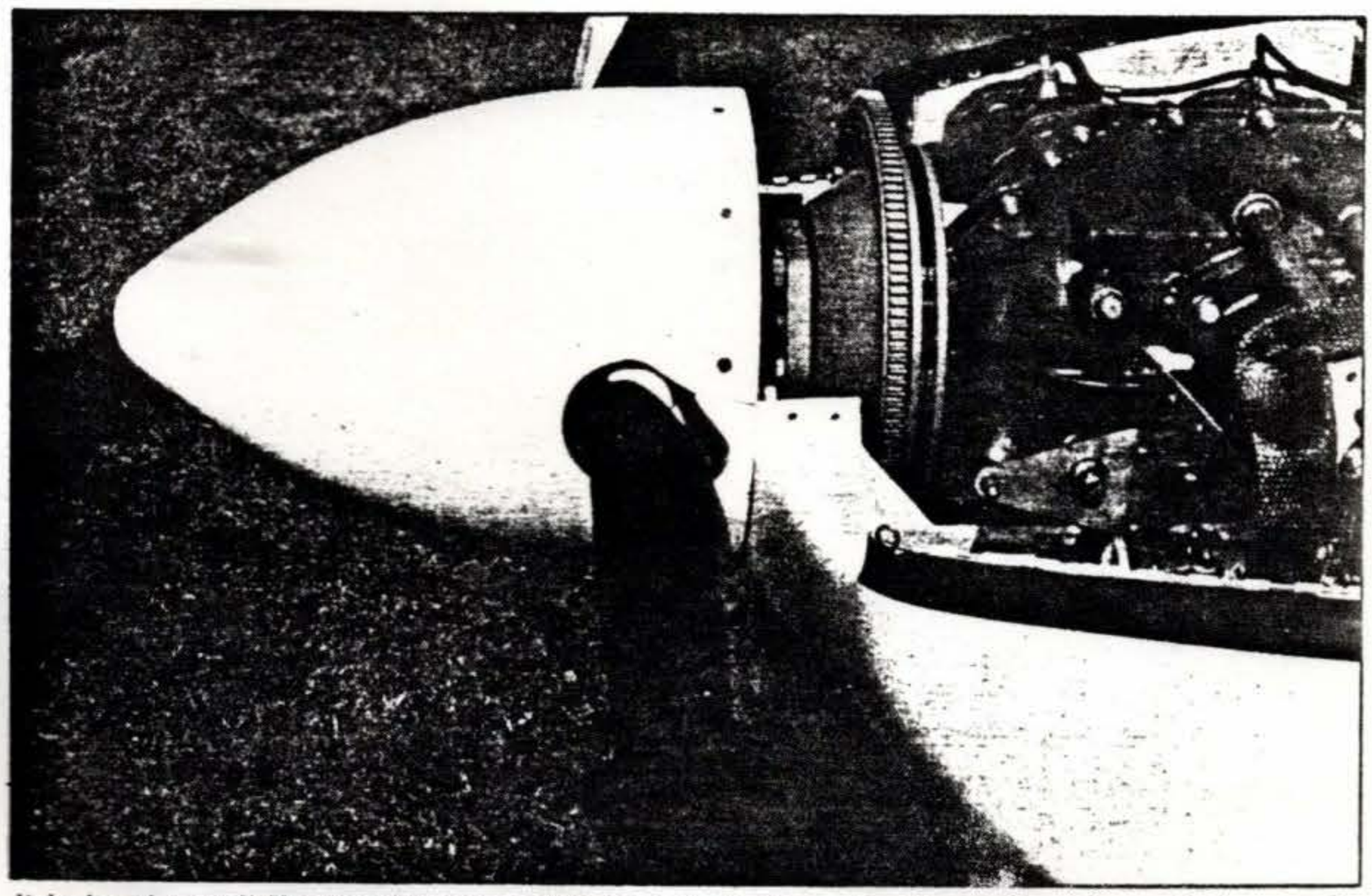
When ordering your spinner, always specify the type and size engine that it is destined for. The six bolt hole pattern for a small Continental (4.375" between centers) is different from that for a Lycoming (4.750" between centers). So, while both engines, typically, take bulkheads drilled for six 5/8" bushing holes to accommodate the prop shaft drive lugs, remember that a spinner bulkhead will not fit just any engine.

Another thing about buying a spinner. Unless it is large enough to blend into your cowling contours, it will look pathetically small. It will also look ridiculous if the diameter is too large because it would then project beyond the cowling line and into your air inlet area. Know before you order that the quoted spinner diameter is acceptable.

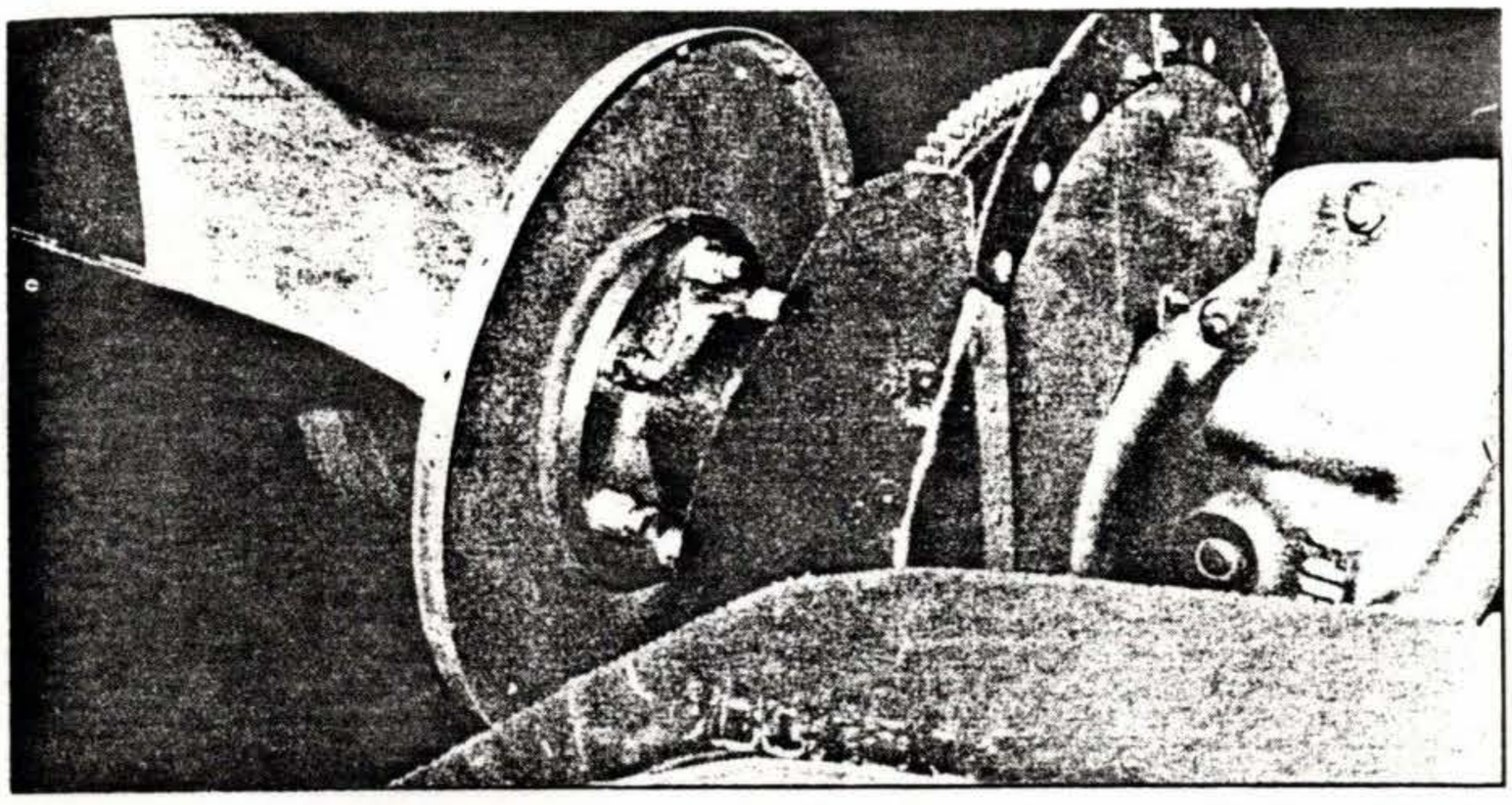
Making the Prop Cutouts

As previously mentioned, metal and wood propellers have different hub thicknesses. Begin by making a paper (manila folders are great) template to fit your propeller hub. Trace this onto the spinner blank being careful to locate the opposite opening 180 degrees away from the first, keeping the same side of the template facing you. Check?

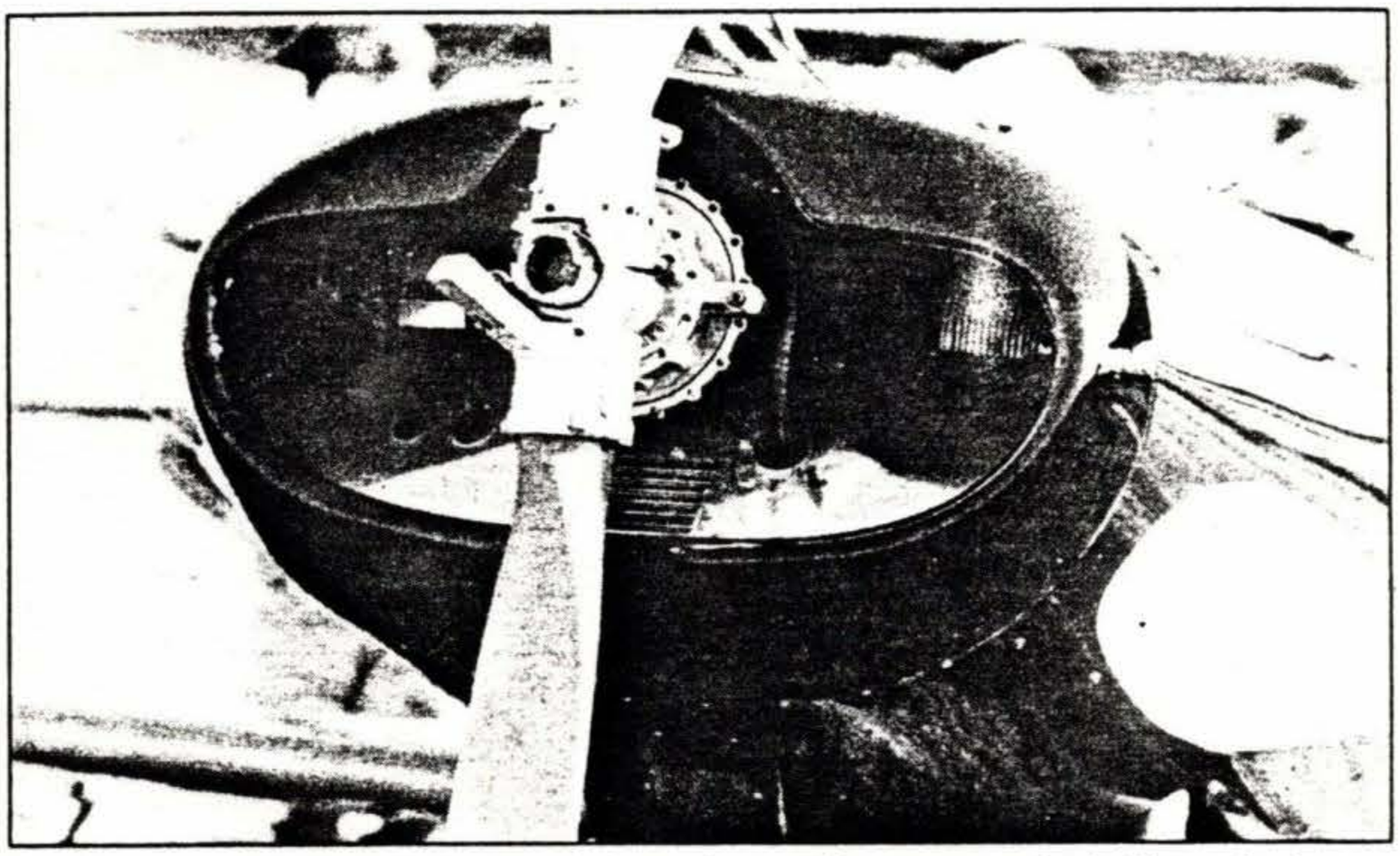
As you cut the openings, proceed slowly and check the fit against the propeller frequently. Try for a uniform 1/16"-1/8"



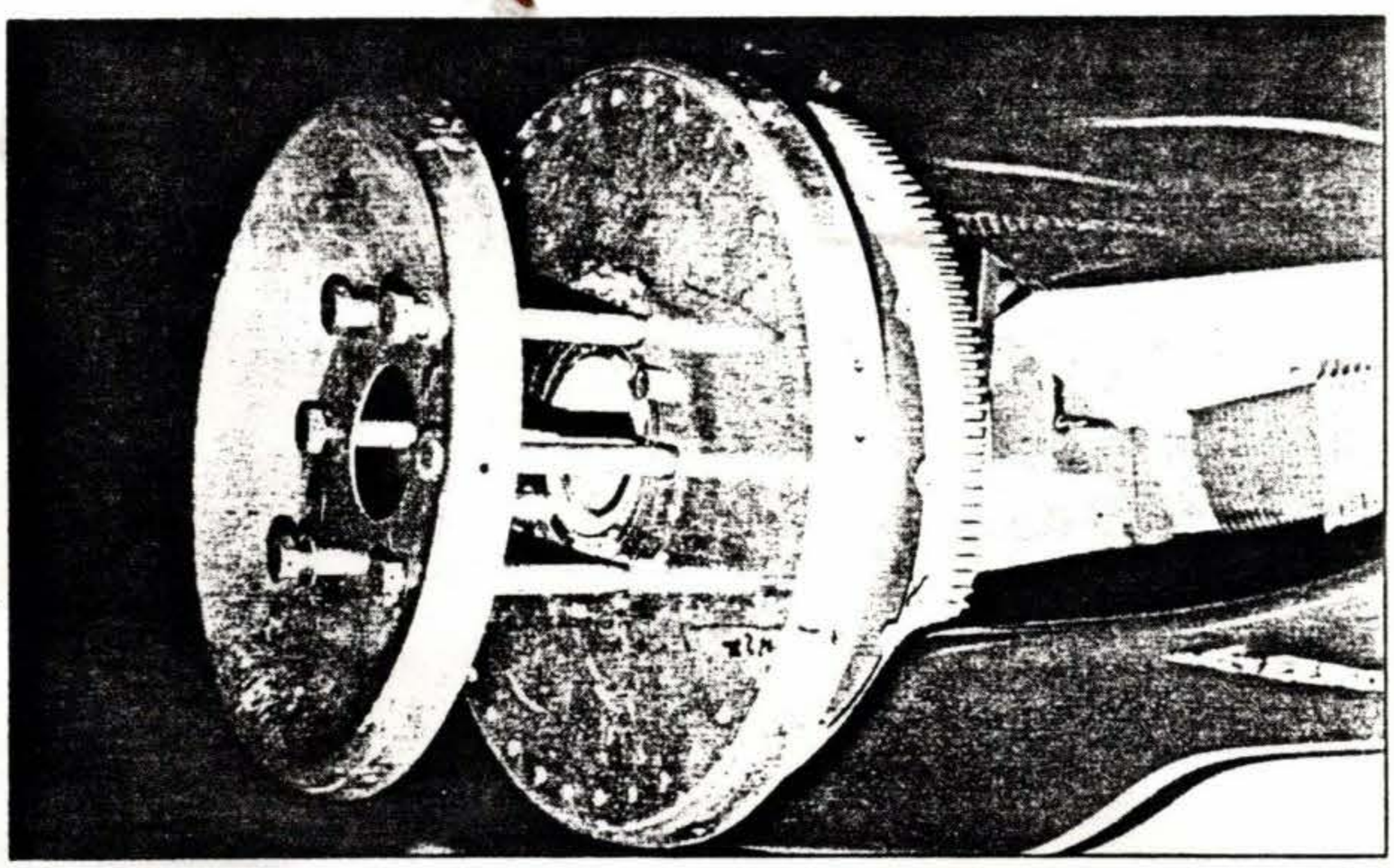
It is hard to tell if a front bulkhead is installed. Some builders do not use fasteners to secure the front bulkhead to the spinner although common practice dictates otherwise. If no front bulkhead is installed, that lack coupled with the used of countersunk screws could lead to future cracking of the rear bulkhead.



A flimsy backplate, no front bulkhead and a fiberglass spinner would all combine to make this a high risk installation. Fortunately, this gent's friends talked him into installing a front bulkhead.



If ever a propeller installation needed a spinner this one must be it. Not only does a spinner improve the appearance of an airplane, it also, in many instances, improves engine cooling.



This builder may have been more concerned with the rigidity of the rear bulkhead than obtaining the correct fit for the front bulkhead. If the stiffness of the rear bulkhead is not a factor, spacing for the front bulkhead is easier to obtain with a large washer-like spacer cut from aluminum in the required thickness.

clearance between the cutout and the prop. Don't try for a tight fit as the spinner might cut into the prop.

Cutting out the prop opening with metal cutting tinsnips might be a bit difficult because the spinner metal can be as thick as .080". Be careful to leave about 1/8" extra metal so the crimp marks can be filed away later.

It might be easier to make your cutouts with a hand held hacksaw blade, a nibbler, or even a saber saw fitted with a fine tooth metal cutting blade.

Whatever the method used, the spinner should be supported somehow dur-
over the protruding end of the 2 x 4 and proceed with your work of cutting out the prop openings.
bench. You can then slip the spinner over the protruding end of the 2 x 4 and proceed with your work of cutting out the prop openings.

Always file and sand away all tool marks and nicks.

Although some large stock spinners have the prop cutouts flanged, I would not recommend that you try to do the same on your spinner. You will only induce stresses by stretching the metal and would probably leave tool marks that could become starting points for cracks.

Likewise, I would not recommend riveting in doubler reinforcements around the cutout edges — or epoxying them in as one builder suggested. Along that line, if you have seen doublers in spinners I am sure it was because someone was trying to salvage a cracked spinner . . . another impulsive idea that should never take wing.

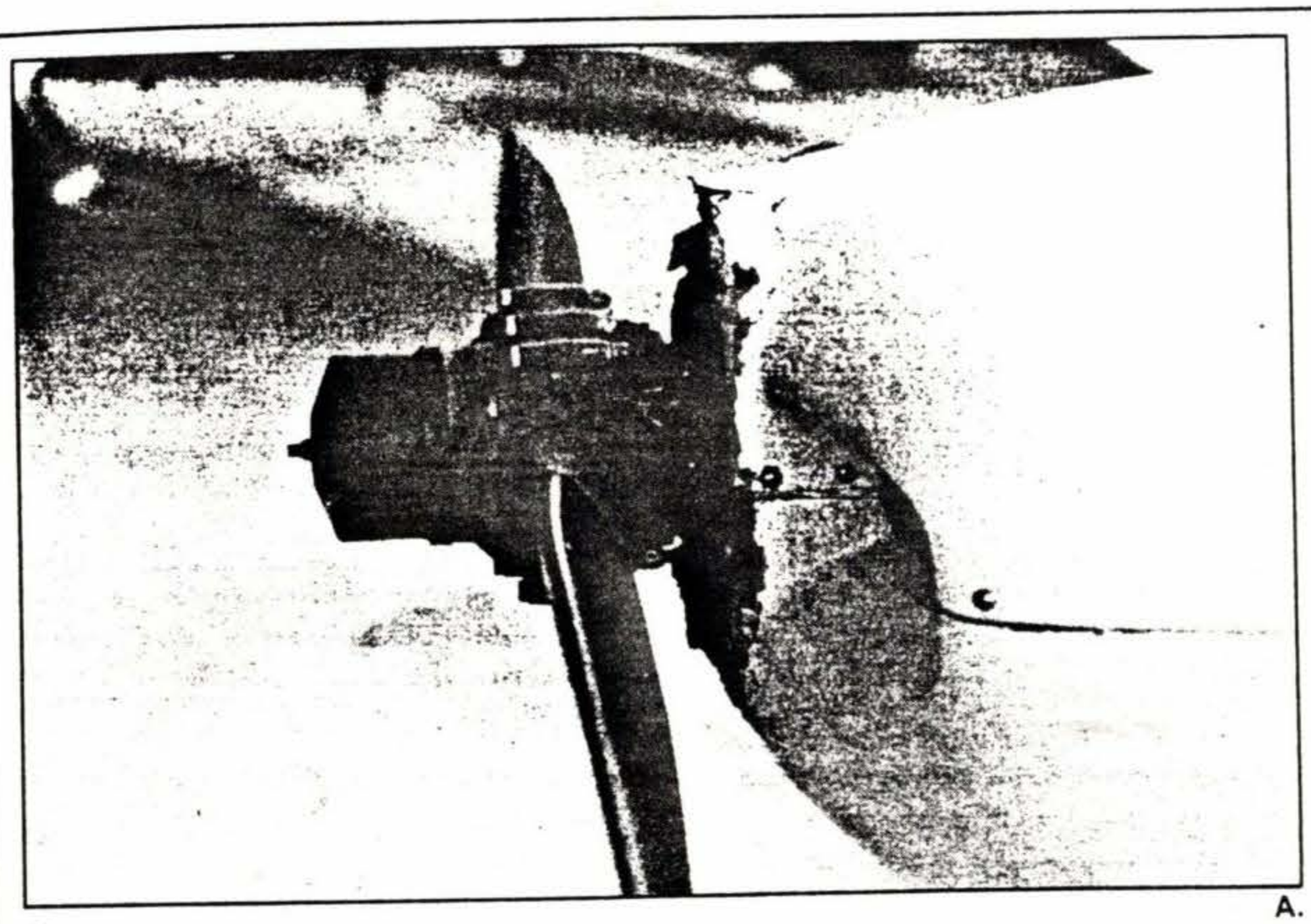
Installing A Kit Spinner

There are several good methods for aligning a spinner installation. The key element is the perpendicular alignment of the bulkhead in relation to the spinner.

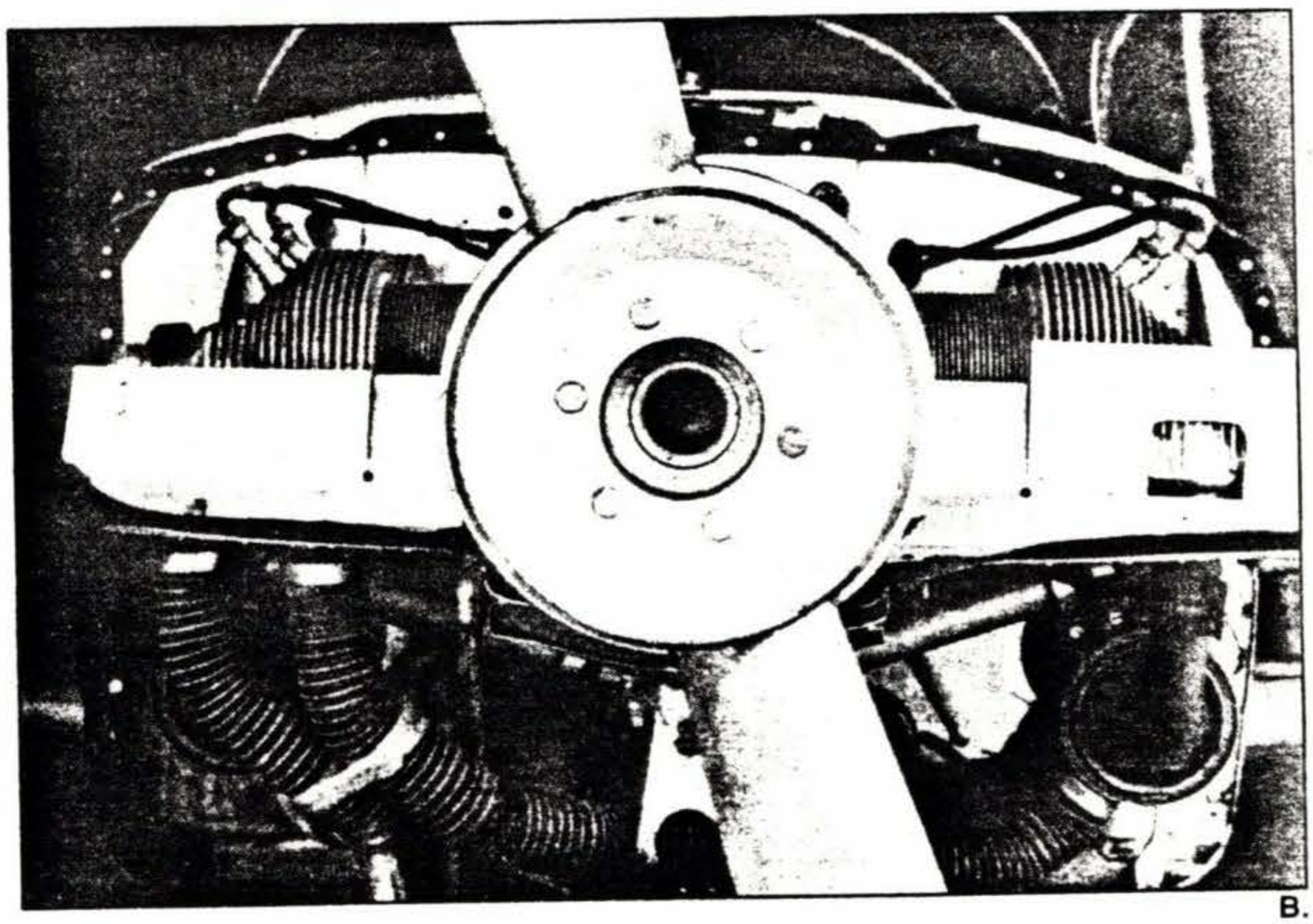
Metal spinners are much easier to fit to the bulkhead because their rims have been machined accurately. Fiberglass spinners, on the other hand, may have a poorly trimmed, inaccurate rim. This makes alignment difficult without resorting to some tracking device.

I think the easiest way to accurately align a spinner is by doing it on the engine. First, remove the upper spark plugs so the propeller hub can be rotated easily. Then, bolt the rear bulkhead to the engine crankshaft, or propeller extension if one is used. The next step is to slip the spinner onto the rear bulkhead and temporarily clamp it along its rim with a few Cleco shoulder clamps.

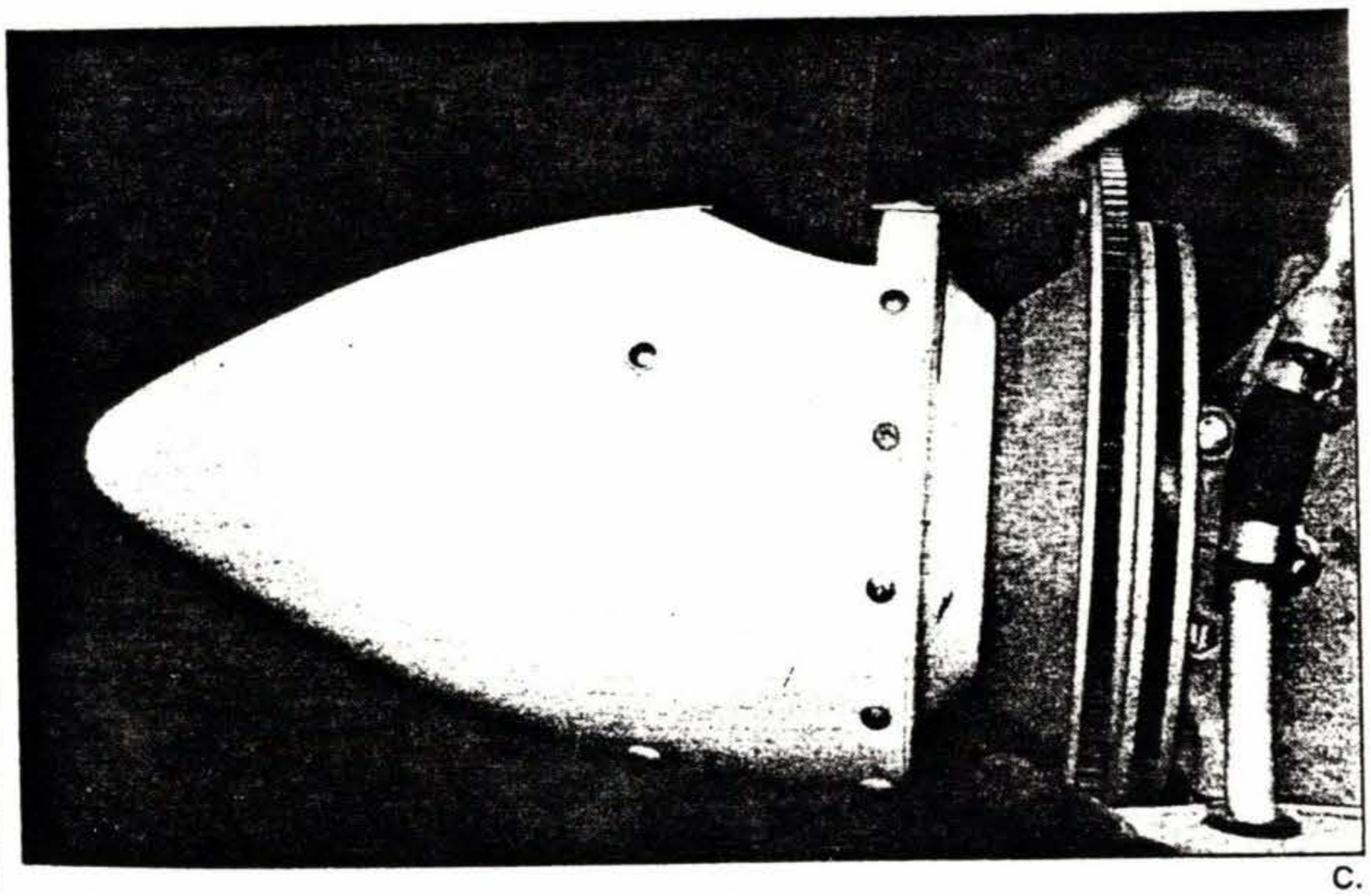
Check the spinner track by rotating the crankshaft. Since it is difficult to detect a slight runout visually, turning the engine slowly by hand, rig up a dial in-



A.



B.



C.

A.
On application of power for take-off, three of the spinner attachment points failed causing it to become cocked at an angle. The flailing spinner destroyed the front end of the cowling. Probable cause was attributed to the lack of a front bulkhead and an old fatigued rear bulkhead.

B.
The front bulkhead for this spinner was slightly undersized so the builder layed a strip of tape around its perimeter. He should have, instead, made and installed a plate behind the front bulkhead to move it forward.

C.
A necked down rear bulkhead such as this one provides a more rigid installation than the common flat flanged type. Note the obvious presence of a front bulkhead.

dicator or pointer. Install the pointer at the nose end of the spinner. Readjust the Cleco clamps at the spinner rim until there is absolutely no bobble at the nose end of the spinner as the engine is turned.

When you have the spinner tracking perfectly, drill the first screw hole through the spinner and into the bulkhead beneath with a number 40 (1/8") drill bit (about 1/2" away from the prop cutout) and insert a Cleco fastener.

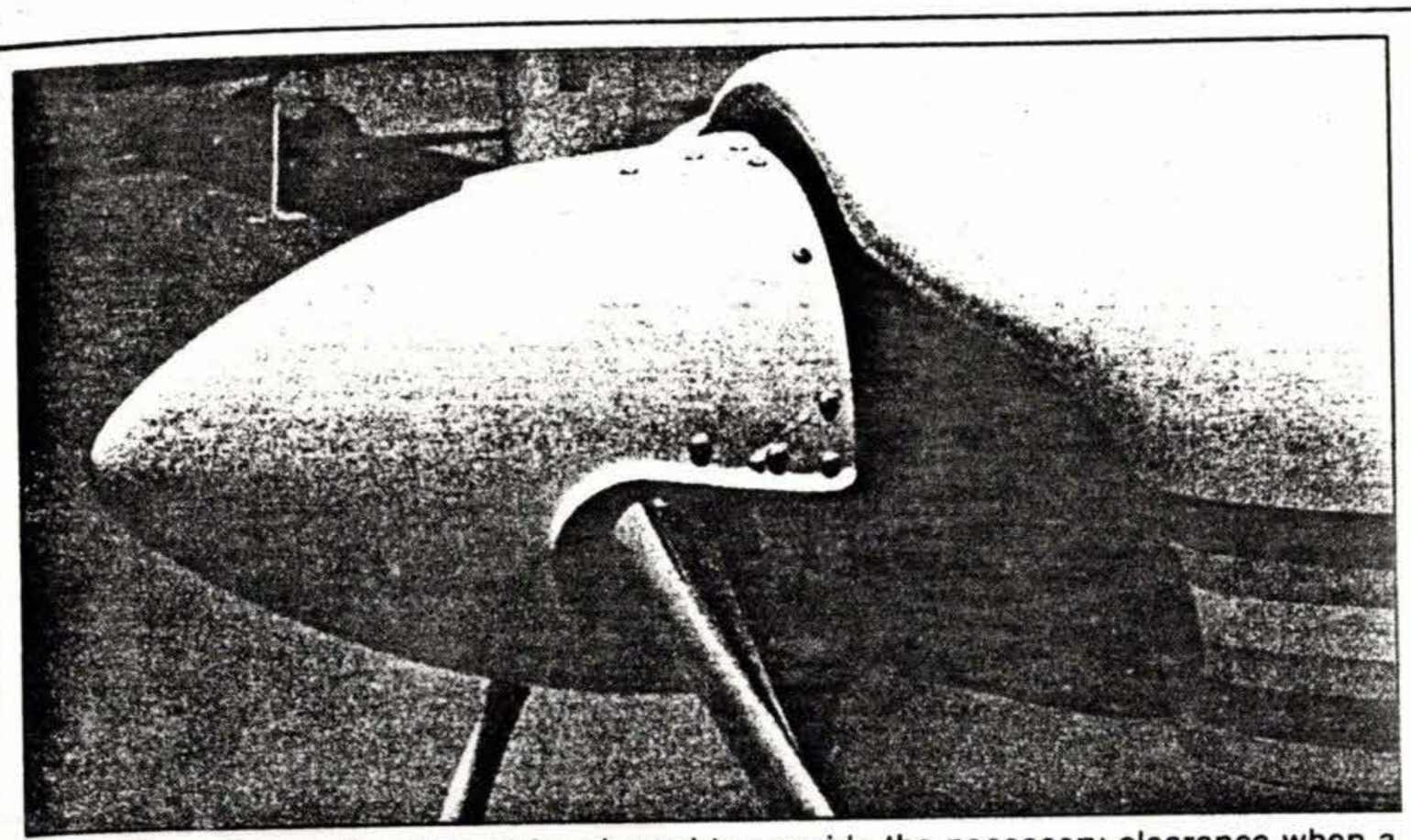
Recheck your alignment and then drill another hole 180 degrees opposite the first, and slip in another Cleco fastener. You can then complete drilling the remaining spinner attachment screw holes using the same procedure.

A total of 10, sometimes 12, equally spaced screws are used to secure the larger spinners. Finish the hole drilling by redrilling all those small holes to the finished size. Most builders prefer to use 3/16" stainless steel screws although a few do install the number 8 screws. In any event, don't use countersunk screws.

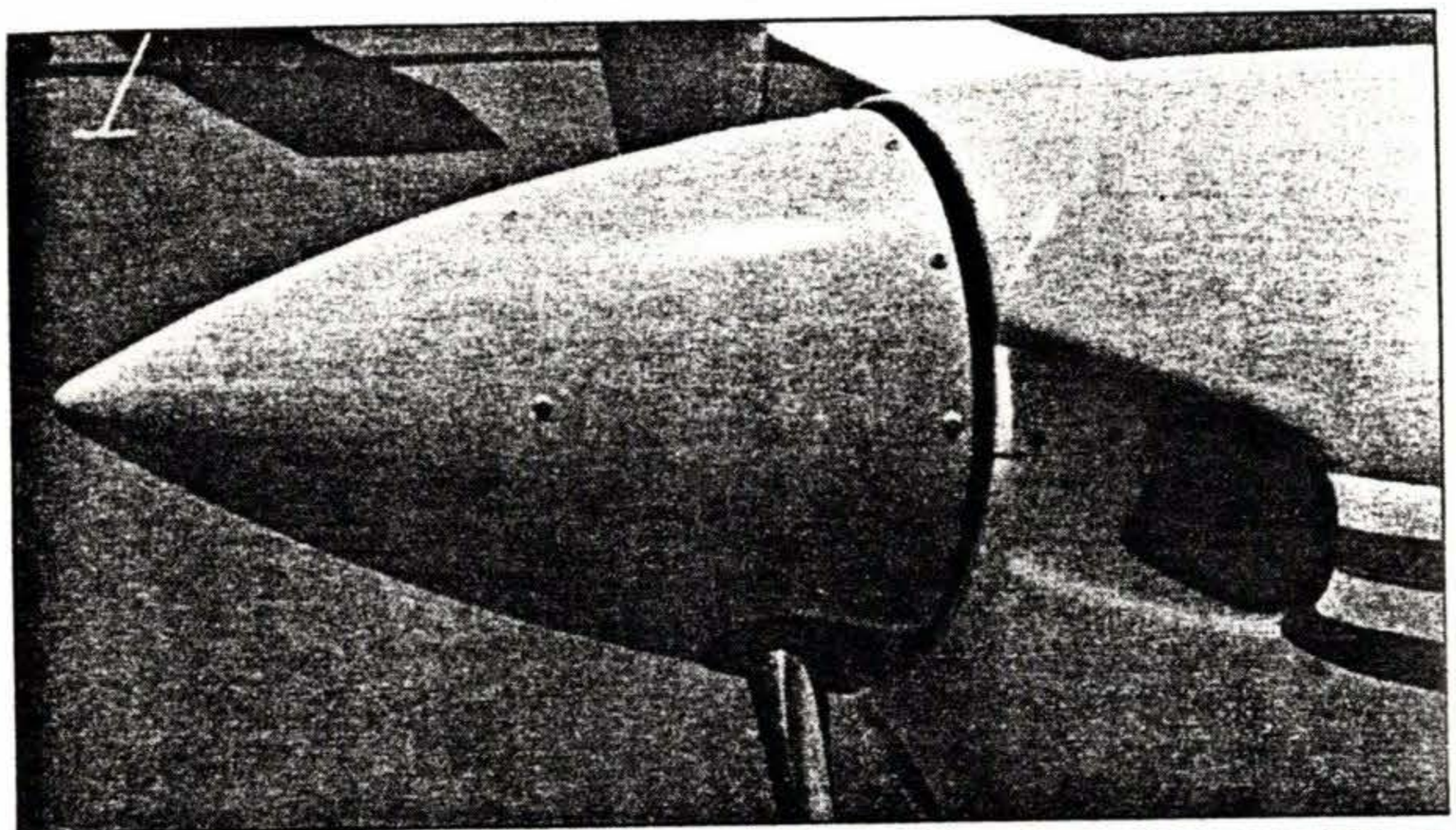
NOTE: When drilling the screw holes through the spinner and into the underlying bulkhead, locate the holes as far from the spinner edge as you can without interfering with the future installation of the nutplates in the bulkhead beneath.

One more tricky job remains — checking for the correct fit of the front stabilizing bulkhead.

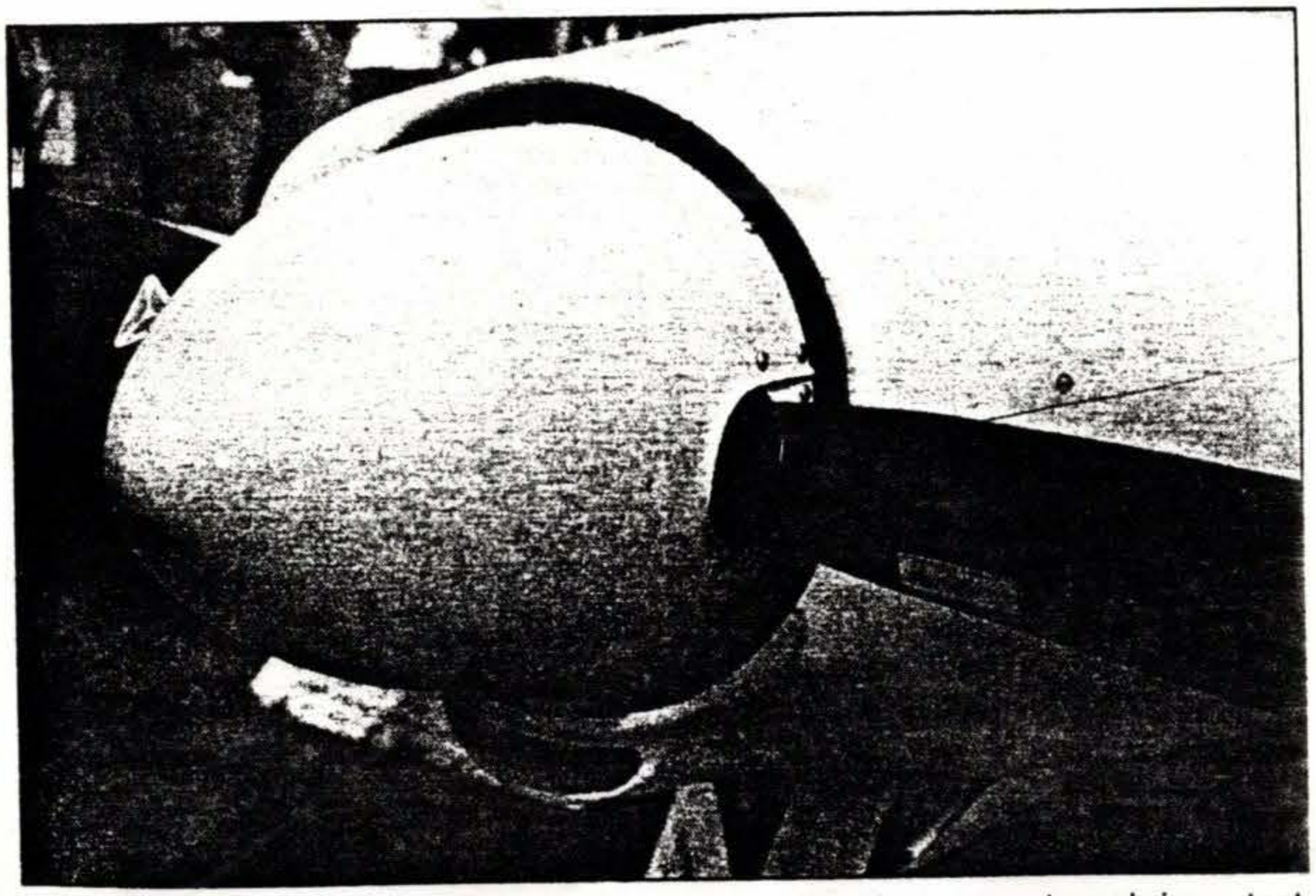
Install the front bulkhead with the propeller and rear bulkhead in place. Slip the spinner over the assembly and push it snugly in place. If the spinner slips over the rear bulkhead far enough so



Here's how the cowling has to be shaped to provide the necessary clearance when a necked-down rear spinner bulkhead bolts directly to the starter ring gear. Clearance between the starter ring gear and cowling might be reduced but certainly to not less than 3/8" (non acrobatic aircraft).



The near perfect spinner/cowling profile is easier to achieve if you obtain your spinner first and then build the cowling to match its diameter and curvature. If your cowling is a ready-made one, you are locked in to spinner diameter you can use.



The design of the cowling and the shape and size of the spinner are extremely important factors in the successful application of the annular cooling concept.

that the screw holes align, the front bulkhead is either fitting perfectly or it is too small in diameter. The problem — which is it? Finding out will entail still more work.

Remove the front bulkhead and install identical 1/16" washers behind it. This will, in effect, cause the bulkhead to be moved forward, deeper into the spinner. Slip the spinner back on. If it will not slide on far enough that the screw holes are aligned, the front bulkhead diameter and its fit was correct. You can remove the spacer washers and reassemble the spinner installation knowing that the front bulkhead fits and will provide the stabilizing support needed.

If on the other hand the spinner slips on too far, you know that the front bulkhead is still too small. Remove the front bulkhead and add another washer to each of the propeller bolts.

Reinstall the front bulkhead and check again. If the spinner doesn't quite slip on far enough for the screw holes to align, you will know that the spacer washers (now 1/8" in thickness) are just a bit too much. Check along the edge of the spinner and see how much it lacks to go on completely. Subtract that amount from the thickness of the spacer washers and you will know how thick a metal spacer you will need to make and put behind the front bulkhead so that it will fit snugly inside the spinner.

You will have to measure very accurately from the rear edge of the back bulkhead to the center of the flange on the front bulkhead to determine exactly where to drill the screw holes for securing the front bulkhead to the spinner. Start with a small drill bit and drill four equally spaced holes. That should be sufficient. Some builders prefer not to install screws in the front bulkhead claiming that they are not needed as the bulkhead merely stabilizes the spinner. You be the judge.

The Bottom Line

It is important that you realize that many propeller spinner failures occur at relatively low time in service. This would indicate that a failed spinner might not have been properly installed and aligned from the very beginning. Also, it is worth noting that large spinners on powerful engines not fitted with a front bulkhead are especially at risk.

In short, I am convinced, now, that anyone who installs a spinner without a proper fitting front bulkhead is begging for fate to take a swat at him.

For other information, see "Installing Spinners", January 1976 Sport Aviation.

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