TIPS – Chapter Eight
Airframe

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Miscellaneous

ELECTRIC TRIM TOGGLE SWITCH BOX CHECK

The only cloud on the trip was the continuous popping of the circuit breaker for the Electric Trim. This of course caused the autopilot to fly a little out of trim. Upon arriving home, I went to work on the Pitch channel of the beast and found everything OK up to the Trim Servo Amplifier, which had two burned out transistors. When I replaced these, everything was OK until I plugged the control wheel cable into the amplifier; then pop went the circuit breaker. I traced the problem to the flex cable and switch. Power was shorted to ground. When I opened up the toggle switch box, the insulation on the wires turned to powder and blew away. In discussing this problem with other owners and mechanics in our area, I found that this cable and switch are the most common cause of problems.

In at least one incident a serious accident was barely averted when the trim shorted in the nose down mode and the pilot was unable to lift the nose for takeoff. He ruined two tires aborting takeoff and going off the end of the runway.

Please get the word to our members to check the insulation inside of the toggle switch box on the wheel. The cable was apparently rubber and 14 years old in the sunlight.

DROOP WING TIPS

I installed a set of droop tips on my 400 and took them back off. I got mine from McAllen, TX. Before removing the original tips, I ran careful tests in smooth air on clean stalls, power on and power off, dirty stalls, power on and power off, cruise speeds and top speeds, then some take−off and landing roll tests. The droop tips were then installed and all the above tests run again, at the same weight and on the same day. I then flew the airplane in and out of our 1,500 ft. strip for a week, then put the original tips back on, and again ran another series of tests.

The end result was little or no change in stall speeds (less than 2 mph) and a slight decrease in top speed. I could tell no difference in take−off and landing roll, however, ground effect was a little more noticeable. The only distinct advantage was better aileron control at minimum speeds. I shipped them back and got a refund about four months later. I do not recommend them plus they don't look very good. I may try the Hoerner type tips as two of our members have told me they helped aileron control and may increase cruise speed. When landing at max weights on that 1,500 ft. strip, on a gusty day, I need all the help I can get.

DROOP WING TIPS EXCHANGED FOR HOERNER TIPS

Recently, I did two things to my Comanche that some of the members may have an interest in. Several months ago, I removed my droop tips and installed the Hoemer tips from Met−Co−Aire. The exchange was done on the same day and the aircraft flown under as near identical conditions a couple of hours later with the new wing tips.

The previous owner of 8016P had installed the droop tips and told me that he realized slight improvement in stall speed but not any noticeable increase in cruise. He did indicate that handling was improved in both turbulence and at slow speeds. When I put on the new Hoemer tips, I noticed an increase in stall speeds of several knots. The handling also seemed to be a little crisper than with the droop tips.

I hope to write a more detailed letter with performance figures sometime in the near future. To my knowledge, this is the first comparison between the droop tips and the Hoemer tips on the same aircraft on the same day. As far as I am concerned the droop tips do improve handling but the Hoerner tips are slightly better and, to me at least, more attractive.

PIPER WING TIPS

I have noted several requests from the ICS members for information on standard Piper−like tips which are made of fiberglass. Many tips come bare with the nav light holes, but without wing screw holes and the tinnerman back plate for the nav lights. So if you order, you should order a tinnerman nut plate also. Although not the same as the original, I still believe the Met−Co− Air tips are better looking, probably more efficient, and they cost $55 per tip.

NOSE WHEEL ALIGNMENT

It is most important that the ground and flight rigging of your Comanche complement each other. Does your aircraft become decidedly "squirrelly" or skip and swerve at the transition period of ground run to full flight? This would be noticed more likely in a no wind still air situation where you would expect a smooth transition into flight. If you do not attain this expectation it is likely that your aircraft is not rigged correctly. It is most desirable that your aircraft runs straight down the runway with all the wheels and the rudder in line with the longitudinal center line of the aircraft. As the flight surfaces become effective they should not be not trying to force the aircraft in one direction while the pilot is trying to steer the aircraft in a straight line down the runway.

The first step in ground rigging the aircraft is to jack the aircraft and get it horizontally and laterally level. We start by getting the nose wheel to run a true line with the center line of the fuselage. The important thing to note is that the nose wheel of the Comanche does not set on the true center line but sets to the right hand side somewhat.

There are two methods of aligning the nose wheel. One is to use a jig which is especially fabricated for the purpose; the other is by the chalk line and plumb bob method. As many of you would not have access to the aligning jig, I will deal with the latter method here.

With no load on the nose wheel check the clearance of the steering rollers to the steering bell crank. These bushings should rotate with a slight drag and have very little clearance. If clearance is excessive, correct it by fitting the appropriate oversize roller. These are available in sizes 0.625" D, 0.687" D, 0.812" D and 1.0" D. This cannot be emphasized enough. It is very important that this clearance between the steering bell crank and the rollers be checked while the airplane is on the ground with normal weight on the nose gear. “DO NOT ADJUST THIS CLEARANCE WHILE THE AIRPLANE IS ON JACKS!”

Place a suitable length of bar across the nose wheel tunnel resting on the forward edge of the fuselage skin below the nose wheel drag link hinges. Measure from the inside lower wall of the nose wheel well on the right hand side 5" and tie a plumb bob weight to the bar at this point. Measure 0.5" to the right of the rear tie down point and attach a plumb bob weight at this point. Mark a chalk line on the floor using the plumb lines as reference. You now have the true center line. With the rudder pedals clamped in the neutral position adjust the steering push rods to align the nose wheel by sighting down the chalk line. Do not adjust just one rod end but divide the adjustments amongst all four ends ensuring that the threads do not extend beyond the check holes in the rods.

When you have the nose wheel aligned, adjust the pedal bar angles to 13° aft of the vertical. Measure 20° either side of the chalk line, a line intersecting with the nose wheel contact center point on the floor. Check that the nose gear turns 20° left and right but not more than 25°. If it turns more than 25°, check for broken steering lock stops on the nose gear housing. Allowing travel of more than 25° causes the rudder stops to contact and strains the cables and pulley attachments. Having done this the rudder cables will have to be re−tensioned. In the next issue I will cover the alignment of the rudder and main wheels with the nose wheel.

FASTENERS

I recently replaced all the Southco fasteners on my '65 PA−30 cowlings and another mechanic I learned the following tip. Since the slot in the fasteners is actually concave, you can get a much better grip on them if you dedicate a proper size screwdriver and grind the blade so that it has the same concave shape as the Southco fasteners. This should reduce their deformation ("boogering" them up) considerably.

TWIN RUDDER SEAL STRIP REPLACEMENT

Regarding the airflow modification kit, P/N 76C−409 which was installed on most PA− 30's, at the recommendation of NASA, to improve Vmc and stall characteristics. An essential ingredient in the kit was the rudder seal strip, a rubber strip which was inserted in the gap between the trailing edge of the vertical stabilizer and the leading edge of the rudder.

The purpose of the strip was to prevent airflow from the high pressure side of the rudder, through the gap to the low pressure side, thus increasing the effectiveness of the rudder during single engine operation.

We are finding that the original rubber strip, due to the ravages of time, repainting, etc., have deteriorated on many aircraft and unfortunately the strip is no longer available. Knots 2U, Inc. has the FAA / PMA approval under STC #SA516GL to manufacture and install Teflon coated aluminum rudder seals which meet the FAR requirements for the PA−30. The seals not only limit the flow of air through the gap, but they do a better job aerodynamically than the rubber seal.

COWL ASSEMBLY

Another piece of information is that the cowl assembly P/N 22039−02 that you mention in the January Flyer is available in fiberglass from WagAero of Lyons, WI. This is an exact replica which they sell for the Skybolt homebuilt.

COMANCHE AIRFRAME AGE

Q. How Old Is Old?
I would like to have comments from your readers who have considerable time on their 400 Comanches. Our 400, N8509P, will soon have 3,000 hours on the airframe. We are noticing some slight airframe changes, such as paint coming off of some of the rivets on the leading edge of the wings, and a slight buckling on the bottom part of the fuselage in the spar area. We would like to know if there are other 400's being flown which have as many hours on it as ours and if any of these similar problems have developed. Our engine was majored at approximately 1,800 hours and the new mags were installed. We also installed new vibrators and upgraded all of the wiring. Since that time, the 400 has never failed to start. Except in very hot weather or when the

engine is very warm, it will start on the second or third blade over similar to the 250 and 260 Comanches.

We are quite concerned, probably like most 400 owners, that our bird is getting old and that there is absolutely no replacement for it.

A. Nobody knows yet how long a Comanche airframe will last. I know of some with 8,000 or 9,000hours on them that are still very sound. All Comanches were manufactured with a coating of zinc chromate on the inside of all metal surfaces, so you don't have to worry about serious corrosion from the inside. (The same is not true of all Piper airplanes, or Cessnas or Beeches). As for the paint around the rivets, I have been involved, with the factory, in an in−depth study of the problem. We found that a strictly minor corrosion around the rivets causes the problem. We find it on other aircraft, too, of course. When the paint was stripped, the area was cleaned and alodyned and repainted, the problem was solved.

The buckling on the belly doesn't sound at all serious, and it is hard to say what caused it. The spar has no attach points on the underside − only on the side of the fuselage, so this doesn't indicate spar trouble. This same buckling problem occurs on new aircraft, so don't worry about it.

You should be glad you have that zinc chromate inside the metal surfaces. I once saw an early model Bonanza on which the wing had corroded from the inside so badly that you could pry the rivet heads off with a pocket knife. When we discovered this, the pilot, who happened to be an FAA man, turned green and decided to walk home.

Flaps

FLAP MAINTENANCE

The key to having flaps operate properly is first to clean the tracks and leave them dry. Lubricate the roller on its pin, but do not get any oil on the tracks as this would certainly collect dirt and probably stick in the extended position in flight. After regular cleaning and lubricating the rollers, the following will probably keep you out of trouble:

1. Use no more than 15 degrees for take−off.
2. Use no more than 15 degrees for landing until you are absolutely certain that you will not have to go around.
3. After take−off, "milk" the flaps up a little bit at a time and stop at the first sign of any tendency to turn or roll. Five degrees of misalignment can be handled easily while fifteen degrees takes full opposite aileron.

Because drooping ailerons go with the flaps on a Robertson Stol Twin Comanche, they are currently placarded by AD to fifteen degrees max for take−off.

If cleaning the tracks and lubing the rollers doesn't solve your problem, check the retract springs to see that they are hooked up and not broken. Flaps are retracted by springs only and not by the flap motor.

FLAP MAINTENANCE

When flaps fail to retract properly, the retraction spring may be weak. On my 1962 Comanche, the flaps would not retract all the way on the ground. In the air, there was never a problem! The air loads on the flaps are such, that the flaps are always returned into the up position.

The flap retraction spring (Part No. 83302−40) are in most older airplanes the original, and have very little tension left! "B" model Comanches used a stronger spring (Part No. 83302−54), the same as on the Twins. Replacing the spring will usually prevent a flap hang up.

It is also advisable to lubricate the flap drive, under the rear seat. I have seen some very dry ones

FLAP MAINTENANCE

Dupont Slip Spray 6611 is called for in the Piper Service Manual for lubrication of flap rollers and tracks for aircraft with metal flap rollers. Rollers and tracks on aircraft with nylon rollers require no lubrication. Dupont has discontinued production of the 6611 lubricant, but a direct replacement is now available from Av−Pac. Order Av−Pac Part No. 60133, Teflon Dry Lube, $6.17.

Earlier model PA−24−180 and PA−24−250 manual flap hinges call for standard MIL−L 7870 lubricant.

RIGGING MANUAL FLAPS

As many Comanche owners are already aware, their particular airplane may seem to fly Chinese style: "One Wing Low". That is, it will fly this way unless the pilot maintains a slight but constant pressure on the control yoke toward the opposite side, until fuel burn sufficiently alters the lateral loading. Usually this shows up as a left wing low tendency. Most pilots tend to compensate for this by using fuel from the left tank(s) first so as to equalize the lateral weight distribution with time. Another way during flight is to adjust the aileron trim, provided the aircraft is equipped with remote electric aileron trim capability such as with the "Aerotrim." However, for Comanches not so equipped, the only recourse is to re−adjust the fixed tab on the aileron(s). Trouble is, this tab does not readily take to resetting more than a couple of times. And, of course, it cannot be altered in flight or for different conditions prior to flight each time.

The Problem:

My 1959 Comanche was no different and for years I flew it this way, keeping a slight roll pressure on the yoke. And since 1986, I had used the handy Aerotrim to keep the wings level while the ball was centered.

But what really disturbed me was the observation that with the wings level in flight, the left aileron seemed to ride much lower than it should have for the amount of rise in the right aileron, even considering that they are designed to operate differentially (more displacement on one aileron than the other, to help compensate for the effects of adverse yaw). And by moving the yoke to cause the left aileron to line up with the trailing edge of the wing, the other aileron was not lined up properly, and visa versa.

This indicated that either the ailerons, their control system or the flaps were out of proper rig or maybe all were. (Note: It is sometimes common practice to adjust the zero setting on one flap slightly different than the other flap to help compensate for a rolling tendency. I did this with my Cherokee years ago. But even with this, the ailerons should still match up with the trailing edge of the wing at the tips). Moving the yoke to line up the ailerons while on the ground resulted in a similar displacement. Time to re−rig!

The Solution:

Referring to the Comanche Service Manual for the recommended aileron adjustment procedure, it said (as was to be expected) to set each aileron so that its trailing edge matched (lined up with) the trailing edge of the associated flap when in the fully retracted position. Obviously, since mine didn't, it required that the rigging of the flaps be checked first. But the manual does not state where the flaps should be when in the zero degree, fully retracted position! It just uses the word "neutral," whatever that means. Remember, this is for the manual flaps that are on all 180 Comanches and on all 250 Comanches up through S/N 2843, model year 1961. (After that time, with the exception of any 180's, all Comanches were typically equipped with electrically operated flap systems. Manual flaps: are constructed differently with eight ribs compared to eleven in the electrically operated ones; are driven by a control rod at the inboard end rather than at the middle; and are hinged below the centerline to achieve some Fowler type action to an otherwise plain flap in comparison to the semi−Fowler action provided by the later type which rides aft, as well as down, on a rollered track. Furthermore, manual flaps operate in three settings of approximately nine degrees each to a maximum deflection of 27 degrees. Electric flaps have no pre−set stops and go to a maximum of 32 degrees on the 250 and 260, and to 38 degrees on the 400. Adjustment tolerances are +/− 0 degrees at the zero (neutral) setting and +/− 2 degrees for the manual flaps and +/− 1 degree for the electric flaps at the maximum deflected position).

One could assume several possibilities for the initial zero degree flap setting position, but logic indicates that it should be the same as for the electric flaps, even though the manual doesn't say so. At my request, Maurice Taylor asked the factory. But while they couldn't provide an updated procedure, they indicated that my assumption was okay. This, as is stated in the manual for the electric flaps, is a 13 degree difference between the upper surface of the flap at a designated point and the longitudinal level line at the fuselage level points. This works fine, but be aware that the designated point on the electric flaps doesn't exist on the manual types due to their different construction. But since the shape is the same (or should be), a point anywhere along the flap should be the same. Just be sure you place the measuring level on an undistorted surface, the best being immediately adjacent to, but not on top of a rib rivet line. Check several places, on both flaps, and use a spot that is most consistently representative of both flaps.

If a "bubble protractor" type level is not available, one can easily be constructed. Simply buy a 6" plastic protractor and a 6" plastic rule and attach them together with a small screw at the center point of the protractor. Then attach a small "pocket string level" to the edge of the rule. Thus, by moving the rule around the protractor's center attachment point, one can read angles to less than one degree accuracy. The bubble, of course, determines the level reference point for the assembly. Make sure that the bubble is parallel with a straight line on the rule that is scribed through the center hole and use this line for reading the angles.

Procedure:

1. Chock the aircraft so it won't move; open the cabin door and climb in and out several times to cause the aircraft to settle in a position that won't change while working on it.
2. Remove the rear wing root and wheel well fairing strips from both wings.
3. Clean the flap operating bell crank assemblies and install (if not already there) flap stop plates on both bellcranks. (Piper Kit 754−413 per SL−360).

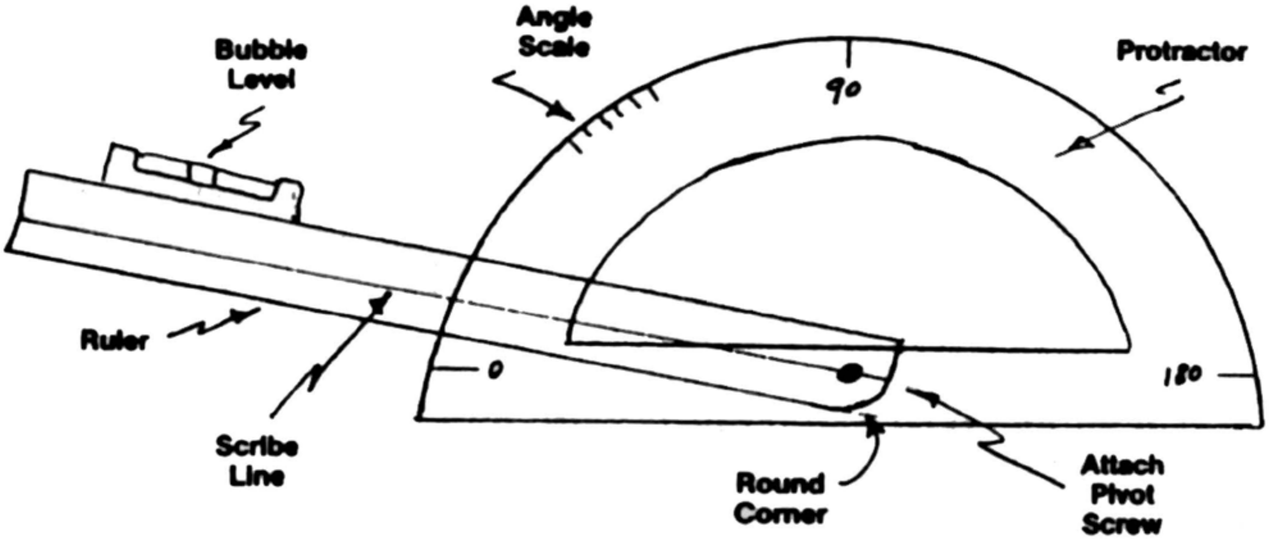
4. Back out both leveling screws on the side of the fuselage above the baggage compartment door (about 3/16") and place a straight−edge across these screws. A carpenter’s framing square is good for this as it easily remains in place.
5. Place the protractor on this straight edge and rotate the ruler with bubble level until the bubble is centered. Record the angle indicated on the protractor for reference (mine was 6 degrees).
6. Then after determining the appropriate measuring place on the flaps as described previously, place the protractor on the flap (fully retracted) and again adjust the rule until the bubble is centered. Record this reading. Do the same for the other flap.
7. These retracted flap readings should equal the leveling point reading, plus the requirement of 13 +/− 0 degrees. If not, the flap(s) must be adjusted.
8. To adjust the flap, the control rod must be either shortened or lengthened by rotating it. Unfortunately, there is no way to get any type wrench on the holding nut at the forward rod end bearing. This necessitates removing the bolt from the rod end bearing at either end. I found the inboard end the easiest and once loose, it took only 1 1/2 turns of this rod end bearing to change the zero flap setting by the one degree mine required. Just be sure to note the placement of washers and don't let the flap swing free when the bearing is detached. It may take more than one try, but the bolt has to be reinserted each time. Adjust both flaps as necessary.
9. Place the flap handle in the flap fully extended position and again measure the flap deflection angle with the bubble protractor as before. The difference between this reading and that at the leveling point should be 27 +/− 2 degrees.
10. If not within these limits, or if fine tuning is desired, adjust by altering the length of the control cable. This is done separately for each flap via the turnbuckles under the rear seat. There is one for each side, aft of the juncture with the common cable from the flap handle. After adjustment, ensure that both turnbuckles have no more than three threads exposed on each side and that they are properly re−safetied by using new safety wire with at least four turns around each shaft.
11. Retract and re−measure the angular setting of both flaps. Then, if desired, set the flap handle to each of the other settings and measure both flaps. Intermediate settings should result in near 9 and 18 degrees (after subtracting tare), but may vary from this due to wear of the notches in the flap handle ratchet. It is not critical and both flaps should be similar. Record all measurements for future reference.
12. Lubricate if necessary. But before replacing the wing root fairings, adjust the fillet between the wing root and fuselage so that it lines up perfectlywith the wing. This fillet is attached at both the side and forward ends by screws with captive nuts through slotted and access holes. The flaps must be fully extended to access the side hole.

Observations:

It is interesting to note that when the control rod end bearing is detached from its bellcrank bolt, the flap is free to swing from above its zero reference to almost vertically down. Attempts to give just a little more flap extension will be to no avail since at the +2 degree tolerance limit, it is the rod end bearing bolt that touches against the flap load spar, not the rod or any part of the flap. So I set mine at 28 rather than 27 degrees, which was still within limits and allowed some clearance.

Since cables do stretch after a lot of use, and flap rigging is necessary prior to aileron rigging, it is probably a pretty good bet that every manual flap Comanche needs this type of attention if it hasn't been properly done for some time. It is easy to do by one's self by following the above procedure. I also recommend that the opportunity be taken to ensure that the flap up−locks on both sides are in good condition and are adjusted properly. See SL−360 for additional references.

The procedure for adjusting the electric flaps is similar as to the use of a bubble protractor but, while the procedure is outlined in the Service Manual, it is a little more complex due to the use of limit switches and indicator.



FLAP ALIGNMENT

Another simple item to check and maintain on both the single and twin is flap alignment. With electric flaps there is no connection to keep both left and right flaps "in line" at all times. Should one flap not retract fully (even within a "half inch" of full retraction) after take off it will take full opposite aileron to maintain level flight. Luckily when you throttle back and lower flaps to land, things straighten out and you wonder what happened.

The two measures to prevent this would be to keep the flap "slotted tracks" super clean, but not oily, as this would pick up dirt. Also, on run up make sure you cycle flaps to note they retract fully on both sides.

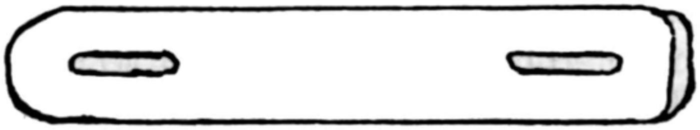
FLAP MAINTENANCE

For those of you with manual flaps, the system can wear enough such that sooner or later you'll try to lower flaps and they won't come down. Of course "Murphy" will make this happen as we set up for a short field landing at our favorite fishing hole airport!

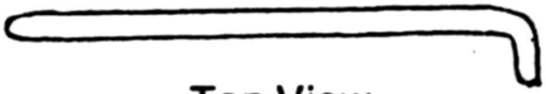
The manual flap system has a "tongue" that pushes a locking pin out of the way so that the cable tension (via your arm) can lower the flaps. Eventually the tongue will wear enough so that it doesn't push the locking pin completely out of the way and voila − you have flaps locked in the up position! Of course, removing the assembly, cleaning and new lubrication is desirable on a periodic basis.

There is a "stop" adjustment for the tongue that is: held in position by two screws. This stop faces you when you remove the wheel well liner and is located on the front of the mechanism that rotates when you lower the flaps. The flap rod end connects to this mechanism also. Simply loosen the two screws and remove the stop. It looks like this:

A small rat−tail file can elongate the holes somewhat so that the stop can be slid further inboard. Reinstall the stop and your flaps will now lower as the tongue has a greater travel to push the locking pin out of the way.



Front View



Top View

FLAP MAINTENANCE

Older Comanche flaps were mounted using steel bushings, which were eventually replaced with P/N 26343−00 nylon bushings. The steel bushings vibrated on the aluminum tracks and wore a widened area in the front of the slot, resulting in a "sloppy" flap. In extreme cases, you can see the trailing edge of the flap fluttering in flight, I'm told.

I replaced my steel bushings with nylon immediately after purchasing the plane. Nevertheless, my outboard track assemblies were worn, but not too badly. So when an opportunity arose to pick up a pair of new track assemblies (P/N 23227−03), I did so. However, I was then told by three mechanics that it was a terrible job to replace them − the upper wing skin had to be peeled back to buck the rivets in the rear spar. In fact, I saw one airplane where they tried to avoid this by replacing only the aluminum track, by drilling out the rivets holding the track in the steel angles that rivet onto the rear spar and wing skins. I agreed that that was a terrible job, so I didn't replace the tracks.

Until this year, that is, when intergranular corrosion was found in the left outboard track. My mechanic and I discussed the situation, and basically prepared for an all−day job of deskinning, etc. To make a long story short, however, by removing the false spar just outboard of the track assembly, a lightening hole in the rear spar is exposed, allowing you to buck the rivets easily. Total time for the job winds up being an hour or so, including the removal and replacement of the false spar.

This may be old news to really experienced Comanche mechanics, but it's apparently not universally known, so I thought I'd pass it along to those dreading replacement of worn track assemblies.

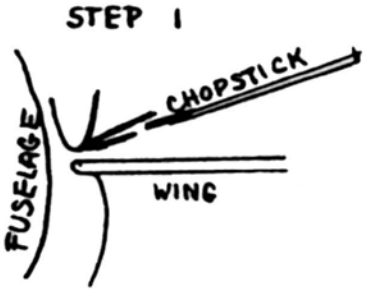
Wing Miscellaneouos

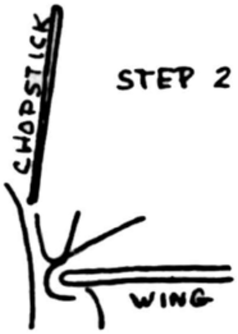
WING ROOT GAP SEALS

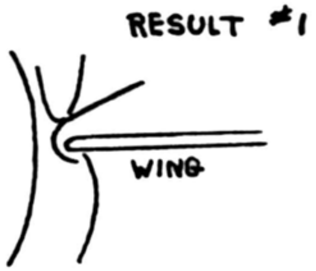
So you say you want to put on new wing root gap seals? So you pull out the old one real easy and get the feeling that Piper put the seal on before they put the wings on the fuselage − you're right. Then you get the uneasy feeling that putting on the new one will be tough − you're right again. But there is hope.

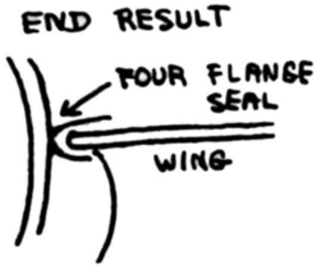
The seal is a four flange seal. Two flanges grip the wing skin and two lap against the fuselage, one up and one down. Don't despair. Go have a good Chinese dinner and save the chopsticks! Chinese chopsticks, the round, smooth kind, will help quite a bit. Now get a big tie wrap, i.e., one that is about 3/8 inch wide and 12 inches long. You are now armed with the tools to do the job. Lubricate the side of the fuselage with WD− 40 or Teflon lightly. Just make it a little slippery.

Now, place the seal in the proper alignment above the wing skin and lower it till the flange that will be under the wing touches the top of the wing and bends slightly. Keeping pressure on the seal from above, tuck this flange back toward the fuselage with the chopstick until you see it flip underneath the wing. Do this only for about a 2 inch span. Then, keeping pressure on the seal at this point, begin tucking the flange (with chopstick) that will point downward and lap against the fuselage. Simply force it to bend on itself and fold against the fuselage. It will now be in a "U" shape against the fuselage. Then, using the tie wrap end, force the flange to snap down in position underneath the whole seal. You can move the whole thing up and down gently with the big end of the chopstick and a peek underneath (remove fairings) will confirm the correct position. Cut off bottom pieces of seal where it goes over wing spar. Have patience and you'll get it eventually.









Ailerons

AILERON CABLE SEPARATION BY CORROSION

I had a call to report a broken aileron cable. This happened during a period of strong, gusty winds, but fortunately, while the aircraft was on the ground. His plane was parked outside with the control wheels tied together to keep the ailerons from going from stop to stop. A call from the airport alerted Ed to the fact that the ailerons were banging back and forth. His examination showed a broken aileron cable which was rusted in two just aft the wheel well area. This should have been discovered more than one annual back.

At the seminar in Hamilton, Ontario, an A.M. engineer brought with him an aileron cable which was eaten almost in two. As I remember, he found this on his first inspection of a member's aircraft. Again, this should have been found prior to that inspection.

It is my feeling that we have three areas which are most susceptible to cable corrosion. These are just aft of the wheel well, between the wing and fuselage and under the floor near insulation which may get wet and is therefore slow to dry out.

Inspecting an airplane properly is no easy job. It takes time, alertness and dedication on the part of the person running the inspection.

AILERON ADJUSTMENT

Last year, I published an article describing the problem and an appropriate procedure for adjusting the flaps on a Comanche. ("Rigging Manual Flaps"). As noted in the article, what brought this on was a condition that always seemed to result in the ailerons being displaced from their proper streamlined position while in flight; re−rigging was required. But the problem in doing so, and what made this article so important for other members to be aware of, was that the aileron adjusting procedure, as outlined in the Piper Service Manual, started off by stating that one should first align the ailerons with the flaps at the trailing edge. Thus, one had to adjust or ensure that the flaps were properly rigged first. But, unfortunately, the manual didn't include a sufficiently detailed procedure for such rigging on an aircraft equipped with manual flaps; only for those equipped with electrically operated flaps. My article describes an appropriate procedure for rigging manual flaps.

For general interest, manual flaps are incorporated on all PA24−180 model Comanches, regardless of model year, and on all PA24−250 models up through s/n 24−2843, model year 1961. After that time, with the exception of the 180's, all Comanches were typically equipped with electrically operated flap systems. Manual flaps are constructed differently with eight ribs compared to eleven, are driven by a control rod at the inboard end rather than at the middle, and are hinged below the centerline to achieve some Fowler type action to an otherwise plain flap in comparison to the semi−Fowler action provided by the later type which rides aft, as well as down, on a rollered track. Further, manual flaps operate in three settings of approximately nine degrees each to a maximum deflection of 27 degrees. Electrically operated flaps have no pre−set stops and go to a maximum of 32 degrees on the 250 and 260, and to 38 degrees on the 400.

So, once the flap systems are correctly rigged, as outlined in my article for manual flaps and in the service manual for the electrical type, THEN one can proceed with aileron rigging. The procedures are outlined in the service manual and are applicable to all model Comanches. But a few hints may be in order. It is first necessary to construct the gauge used to set the aileron bellcrank control rod. The dimensions for this gauge are shown in the service manual. It can be easily cut out of stiff, thin cardboard or aluminum sheet. I used cardboard. The same gauge is used for both wings; simply turn it upside down for the opposite wing, and save it for future use.

With the gauge in place and the bellcrank positioned as shown in the manual, remove one end of the control rod and, through trial and error, adjust its length so that the trailing edge of the aileron aligns with the trailing edge of the retracted flap. Next, using a bubble protractor similar to that described in my previous article, adjust the aileron bellcrank stop bolts to achieve the aileron up and down travel limits described in the manual for the specific model type. (180/400's have different tolerances from 250/260's.)

Then, with the ailerons externally clamped in neutral position (welding or wood gluing clamps similar to large clothes pins are handy), adjust the two cable turnbuckles attached to one of the bellcranks to achieve proper cable tension and relative aileron position (the clamps will have to be removed for each trial adjustment in order to gain access to the turnbuckles as it's a tight fit for most people's hands). Typically, these two turnbuckles must be adjusted by tightening one and loosening the other so that both ailerons align with the trailing edges of their adjacent flaps simultaneously. One of these cables is routed to the control column in the cockpit while the other is routed to the opposite bellcrank.

Then, when this has been achieved satisfactorily (note the caution in the manual procedure), re−clamp both ailerons to align with their respective flaps and adjust the turnbuckles on the control cables inside the cockpit (above the pilot's rudder pedals) so that both control yokes are in proper neutral (level) position. The co−pilot's yoke can be made to match with the pilot's yoke by separately adjusting the two turnbuckles associated with the cross−connecting chain between them. Proper tension will also remove any sloppiness that may have previously existed. Later model 260's and all 400's are also equipped with an aileron−rudder control cable interconnect system. A separate adjustment must be made on these aircraft to set proper spring extension per model (see manual).

Also, check to ensure that with full aileron deflection, both up and down, the bellcrank of one aileron goes against its stop simultaneously with the opposite stop of the bellcrank for the other aileron, and vice−versa. Do this before safetying the turnbuckles.

If your turnbuckles are the type that uses the small wire clips instead of the often very difficult to wrap safety wire, these can be easily removed by prying off from the center hole in the turnbuckle with a screwdriver or pliers. If done with care, they can be re−used after re−shaping. Note, however, that the slot the wire clip slides into exists on both sides of the barrel at both ends, as indicated by little notches, but is only along one side of the screw portion. This side is marked by a small indentation of the edge of the eyelet. This allows for half−rotation adjustments but is important to observe beforehand, or you may end up spending hours trying to insert the safety clip where there is no slot! Finally, be aware that control surface adjustments are not part of authorized owner preventive maintenance. Work under the guidance of your cooperating mechanic or inspector as he will have to ensure that the adjustments are done correctly, safetied, and make the appropriate logbook entry. Then, go out and fly straight and level for a change!

Engine and Cowling Controls

TWIN COWL FLAP CONTROL CABLE REPLACEMENT

By David R. Clark ICS 08592 A/P

As you may notice, practically nothing of what I'm going to tell you is in the Twin Comanche Service Manual. Recently, at the end of a beautiful flight to Fayetteville, AR, I pulled on the cowl flap controls only to have the left one come out about three extra inches. This, I soon found out, was due to the cable breaking off just proximal to the attachment bolt, just in front of the firewall. Because of the spring mechanism, this automatically returns the cowl flap to the closed position. The next day back at home base, I discovered that the cable with the handle still attached to it will remove easily from the housing by simply pulling it out through the panel side. A conversation with Maurice Taylor confirmed that a new cable could usually be fed back in through the same route. This greatly relieved my fears, as I had envisioned having to tear the floor out, etc., to replace the entire cable assembly.

Here is the drill:

Establish that you have a broken cable. Remove the left side engine nacelle (it's on the left side on both engines). See where the cable comes out of the firewall and attaches to the cowl flap control mechanism. It's obvious if it's broken.

First, locate a suitable replacement cable insert. I could not find anybody selling this part separately, and Av−Pac tried to locate one also, without success. Even they realized their price of $196 for the whole assembly seemed too much for what I needed. Again, Maurice Taylor to the rescue. He located a cable assembly at Dallas Air Salvage, which is about a 30 minute drive from my hangar. A very knowledgeable fellow named Lucky had 8 or 9 of the cables and lots of good advice. He wanted $55 for one of these used cables (which was the whole assembly).

Next, remove the cable insert from its housing on your "new" replacement cable and don't lose the small ball bearing which is the friction lock. Clean off the cable and gently straighten out any kinks at the end. Don't cut into it with pliers, as it is fairly soft material. Now, file the tip to make it rounded so it will pass easily through the housing. Finally, lubricate the wire with silicone lubricant or the like. Remove the old broken cable from its housing, but don't discard it (more about that later). Next, push the new cable through the opening in your panel and gently, but firmly, coerce it the twelve feet or so out to the engine. Occasionally, you'll have to twist or rock it in and out a little to get it all the way. If you hit a snag just when you think you are almost all the way through, take off the inspection plate at the top of the engine nacelle, just above and behind the fire wall. Loosen the clamp that holds the cable housing and pull the housing back into the rear compartment. This will straighten it out enough to let the wire pass the final sharp curve. Once the cable is through, replace the housing back in place and tighten the clamp. Here is the only place the manual tells you how to adjust the housing clamp. See page 2D23 in service manual. Make sure you re−install the tiny ball bearing friction lock on the handle as you push it the last few inches into the panel.

Now loosen the bolt where the old broken off piece of cable is still attached. Remove this and insert the new cable. Again, be careful not to over−tighten, as this acts as a guillotine and can cut the cable. (Warn your A&P about over-tightening this bolt.) Make sure the cable is straight when the cowl flap is in the closed position, because if a slight bend or bow exists, it will gradually break, just like mine did. Here is a good time to inspect the cable on the opposite engine. There was a bow on my other cable which I took out by adjusting it.

Make sure the return spring is still on the cowl flap mechanism. Also check this at annual time. If one of your cowl flaps is much harder to close than the other, it is usually due to the spring breaking or because it is missing.

A really enterprising person could get a piece of piano wire of the same diameter as the cable and "sweat" the old wire out of the handle and replace (solder it back in) it the same way. If you do this with your old cable, you'll have a spare.

TWIN COWL FLAP CONTROL CABLE REPLACEMENT

Having just read a recent issue of the Flyer about replacing the cowl flap control cables on the PA−30, I thought I would suggest an easier way than he encountered.

Mine is a 1964 PA−30, and I have replaced both cowl flap cables. One broke, and I had to solve the dilemma quickly and as cheaply as possible.

I removed the old cables from the aircraft by disconnecting them forward of the firewall and pulling on the cowl flap handle inside the cabin until the entire cable had been removed from the cable housing.

I then placed each handle in a vice and heated the tip with a blowtorch, pulling on the cable, until the wire separated from the handle. (The original installation has the wire crimped inside the handle − you have to pull hard and sweat it out).

Then I visited a good hardware store in my area and bought (for about $5) a roll of piano wire of the same gauge. I visited another store and bought silver solder.

I cut the new wire to a length about a foot longer than the length of each wire removed (for a safety margin) and then silver soldered each piece into the handle, using a vice to hold the handle in place and silver solder to hold the wire in the handle securely.

I then fed the wire into the cable housing in the aircraft with pliers in my right hand, feeding the cable six inches at a time (lots of hard effort), and applying grease with my left hand as it went in to the housing. I didn't need to remove the top of the nacelles as David did − I simply applied the effort on the pliers at the entry to the housing and with the benefit of lubrication, the cable went through, even around the last turn through the firewall.

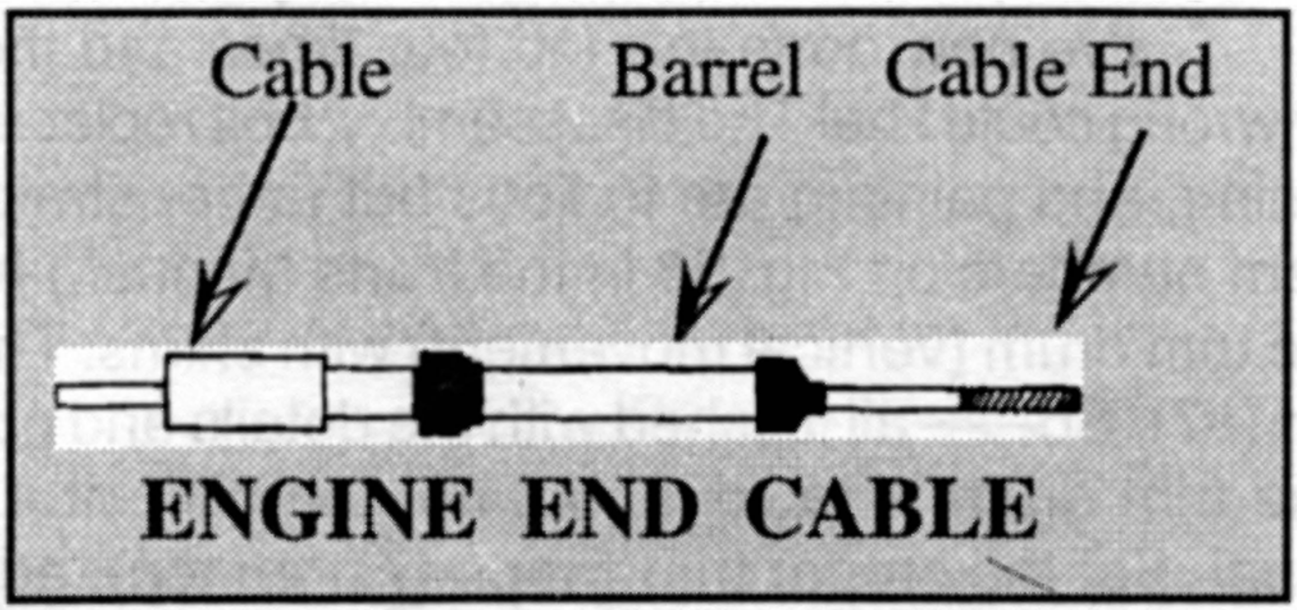
Once all the way through, I simply cut the wire to length, screwed the cowl flap holder to the wire, and the job was completed.

Total cost was about $20 or less, and the total time was about three hours (excluding the driving around to stores). By the way, do not try this with regular solder − it won't hold it securely enough. Silver solder is the only way to go.

BINDING THROTTLE CABLES

Ivan Warrington, ICS #08405

The Gremlins have been at it again! After a recent trip to Lubbock I noticed that all the controls on the throttle quadrant were binding abnormally. I concluded that it was due to the 23° overnight temperatures in Lubbock. Upon return to Dallas I tubed all the cables (discussed in a later article) and they were still binding. I was sure that I was about to install new cables. Before this drastic measure was taken it was time to go to the mountain and talk to the Guru. He told me that the hollow tubes at the engine end of the cables were bent! Say What? What barrels? Here is how to find out if your cable barrels are bent. Push all control levers forward. Start at either engine, any control. Try to turn the barrel it should rotate easily on the cable. Now move control to mid position and try again. The barrel should turn as easily as it did before. We're almost finished. Now move the control to rearward position and turn barrel. Did it turn as easily as the first two times? It did, well it ain't bent. Repeat for each control. Did the barrel bind in any of the positions? It did, well it's bent. For repairs to be made the cable will have to be disconnected from engine. Be sure not to move the turnbuckle. Place the barrel on a short piece of two−by−four or anything straight and turn to find the high side. Take a hammer and slightly tap the barrel to straighten. Now try the cable in all of the fore mentioned positions, better huh? How did the barrels get bent in the first place? Well I'm going back to the mountain real soon to find out. Gremlins maybe!



Twin Cracked Firewalls

TWIN CRACKED ENGINE NACELLE

We are the owners of a Twin Comanche. The purpose of this letter is to relate what might have been a very serious structural failure in our airplane, but fortunately we discovered it in time to remedy the situation. I fly the airplane almost entirely myself, and for that reason I am more sensitive to any changes in the airplane than would usually be the case.

Recently I noticed that in taxiing in on the slow idle, I was getting an extremely rough right engine. On careful investigation and a run−up with the cowls off, I found that the trouble was where the motor mount bolts to the fire wall and where the bracket to which the motor mount is bolted, which is riveted to the vertical bulkhead in the nacelle. Either due to not having the motor mount tight or to some excessive strain on that part, as a result of the fact that the motor mount itself did not perfectly fit the alignment, a crack had developed on the vertical bulkhead for about six or seven inches, and the crack had opened up about a quarter of an inch at the bulkhead.

We remedied the situation by putting doublers on both sides of the bulkhead and riveting new rivets through both doublers and the bulkhead itself, re−riveting the motor mount bracket. It is my suggestion that Twin Comanche owners should make this a definite portion of their inspection. This can be done by removing the square plate which is on the nacelle and observing with a mirror and a flashlight.

TWIN CRACKED ENGINE NACELLE

During the annual inspection on my Comanche, a crack was discovered inside the right engine nacelle. The crack was located on the Outboard Engine Nacelle Bulkhead in the upper corner, where the bulkhead rivets to the Firewall and where the upper engine mount frame bolts to. The crack was approximately 3 inches long and had separated horizontally about 1/2 an inch. Additionally, the resulting vibration caused a crack in the Firewall itself, from where the lower engine mount frame attaches to the Firewall to the area where the Cowl Flaps bracket is attached to the Firewall.

The crack in the Firewall necessitated the replacement of the Firewall. The repair of the Nacelle Bulkhead was performed by Midcoast Aviation. As you can see by the enclosed analysis, and diagrams, it was necessary to cut away the damaged area, install a stainless steel filler and a stainless steel doubler to complete the repair. Since this damage was very difficult to see, I strongly recommended that the inspection plates on the engine nacelles be removed, and using a flashlight and a mirror, examine the area where the bulkheads fasten to the Firewall. If someone should find similar damage, they can reference the repair to the repair Midcoast has performed, and possibly save them the cost of a DER inspection.

Nacelle Structural Analysis

Introduction

This report provides the structural analysis for repairs detailed in Midcoast Drawing 60−000R001 "Repair, R/H Engine Nacelle Structure." The aircraft is a Piper Twin Comanche, Model PA−30.

The damage consisted of cracks found in the outboard nacelle web and on the firewall. The repair replaces the firewall, and trims out the damaged section of nacelle web.

Analysis

Firewall: the original firewall was manufactured from 0.023 thick galvanized steel. The −9 Firewall is fabricated from 0.025 thick 301 1/2 hard stainless steel. From Jorgensen Steel Handbook, galvanized steel sheet is 15% low carbon steel alloy. Per Machinery's Handbook, 21st edition, page 2120, the Ftu = 65 KSI max. For 301 1/2 hard stainless steel, per MIL−HDBK−5D, Table 2.7.1.0(b), Ftu = 141 KSI. By comparison, it is obvious that the 0.025 stainless steel is acceptable.

Nacelle Web:

Approximately 4" x 7.5" section was removed from the web (see −7 Repair Filler). The bulkhead is 0.050 thick 2024−T3 bare aluminum. Per MIL−HDBK−5D, Table 3.2.3.0(bi), Ftu = 65 KSI. The −3 Repair Doubler is 0.063 thick 2024−T3 alclad. Per Table 3.2.3.0(el), Ftu = 59 KSI. The repair rivets are primarily MS20470AD4, per Table 8.1.2. (b) shear = 388 Lbs.
Check −3 Doubler Thickness:
Calculate required thickness: 65/59 x 0.050 = 0.055. The 0.063 thick −3 Doubler is acceptable.
Check Rivet Quantity:
Strength loss for 4" side: 65000 x 0.050 x 4 = 13000 Lbs.
Rivets required: 13000/388 = 33.5 or 34 rivets.
Strength loss for 7.5" side: 65000 x 0.050 x 7.5 = 24375 Lbs.
Rivets required: 24375/388 = 62.8 or 63 rivets.
Total required: 63 + 34 = 97 total rivets.
Examination of the drawing shows this quantity is met. Note that this method is conservative. A realistic method is to measure diagonally across the trimmed out area. This gives a length of approximately 8", thus: 65000 x 0.05 x 8/388 = 67. This gives a Margin of Safety = 97/67 −1 = +.44.

Conclusions

It is concluded that the repair detailed in 60−000R001 is structurally sound and acceptable.
Note:
CAR 3.624(b)(1) suggests 0.015 Heat and Corrosion resistant steel to be acceptable. The 0.025 301 1/2 hard stainless steel meets this requirement.

△8. Fabricate the -9 firewall using the original firewall as a template. Install using equivalent type fasteners. Note: Original mfr'd from 0.023 galvanized.

7. This drawing details repairs to the R/H engine nacelle. The outboard web was cracked at the upper outboard engine mount fitting attachment. The firewall was cracked at several locations.

6. The repair detailed in this drawing is applicable to a Piper Twin Comanche, Model PA-30, and was developed for S/N 30-958.

5. IT IS A MFG. OPTION TO RUBBER STAMP P/N ON EXPOSED SURFACE OF PART.

4. APPLY ONE COAT OF ZINC-CHROMATE PER MIL-TTP-1757 OR EPOXY PRIMER PER MIL-P-23377D ON APPLICABLE PARTS.

3. CHEMICALLY CLEAN ALL SHEET METAL PARTS PER MCPS 300-01 AND CHEMICALLY TREAT PER MCPS 360-02.

2. BREAK ALL SHARP EDGES..

1. MATERIAL PROCESS AND METHODS SHALL COMPLY WITH PERTINENT FAA AC NO. 43.13-1 AND -2 SPECIFICATIONS OR EQUIVALENT.

-GENERAL NOTES-

UNLESS OTHERWISE SPECIFIED

ALL DIMENSIONS ARE IN INCHES

LINEAR TOLERANCES	0.X	± .1
	0.XX	± .03
	0.XXX	± .010
ANGULAR TOLERANCES		0° ± 0° 30'
ALL MACH. SURF.		125 ✓

BASIC CODES

BJ = MS20470AD

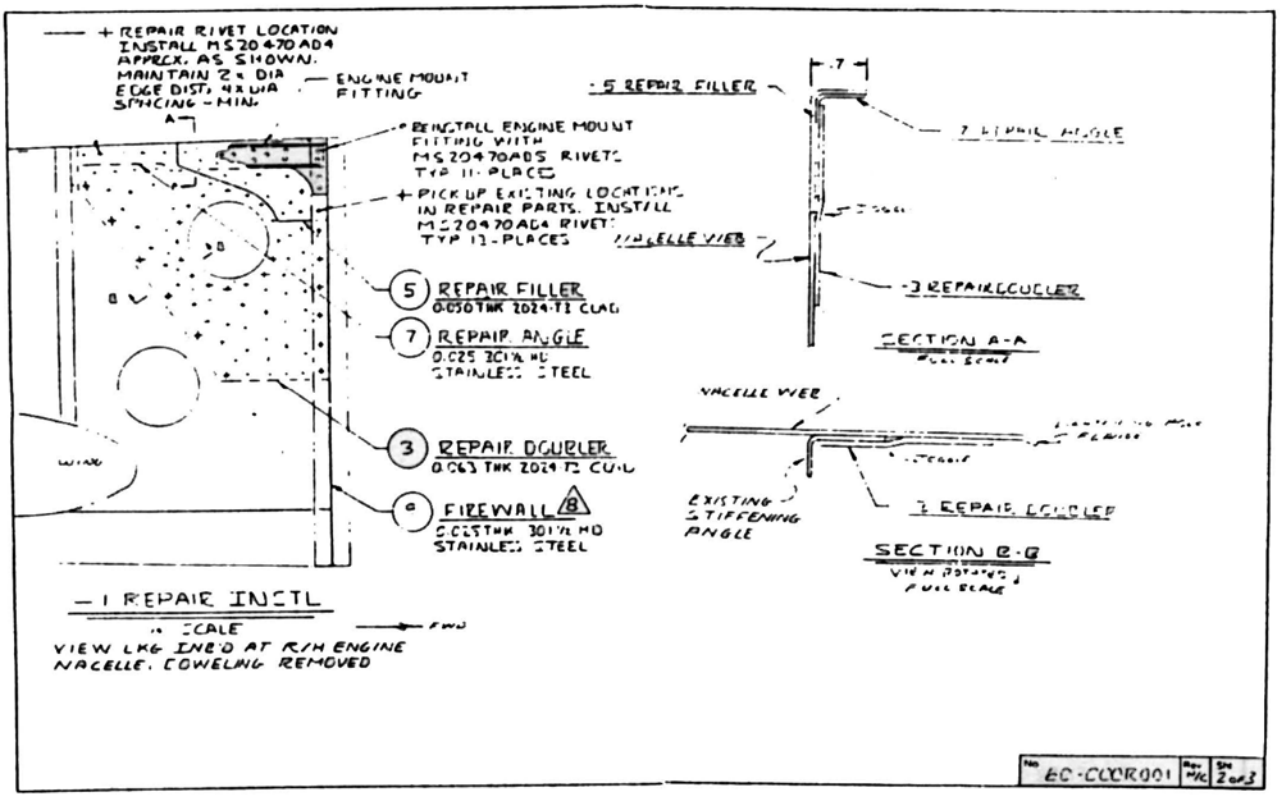
BB = MS20426AD

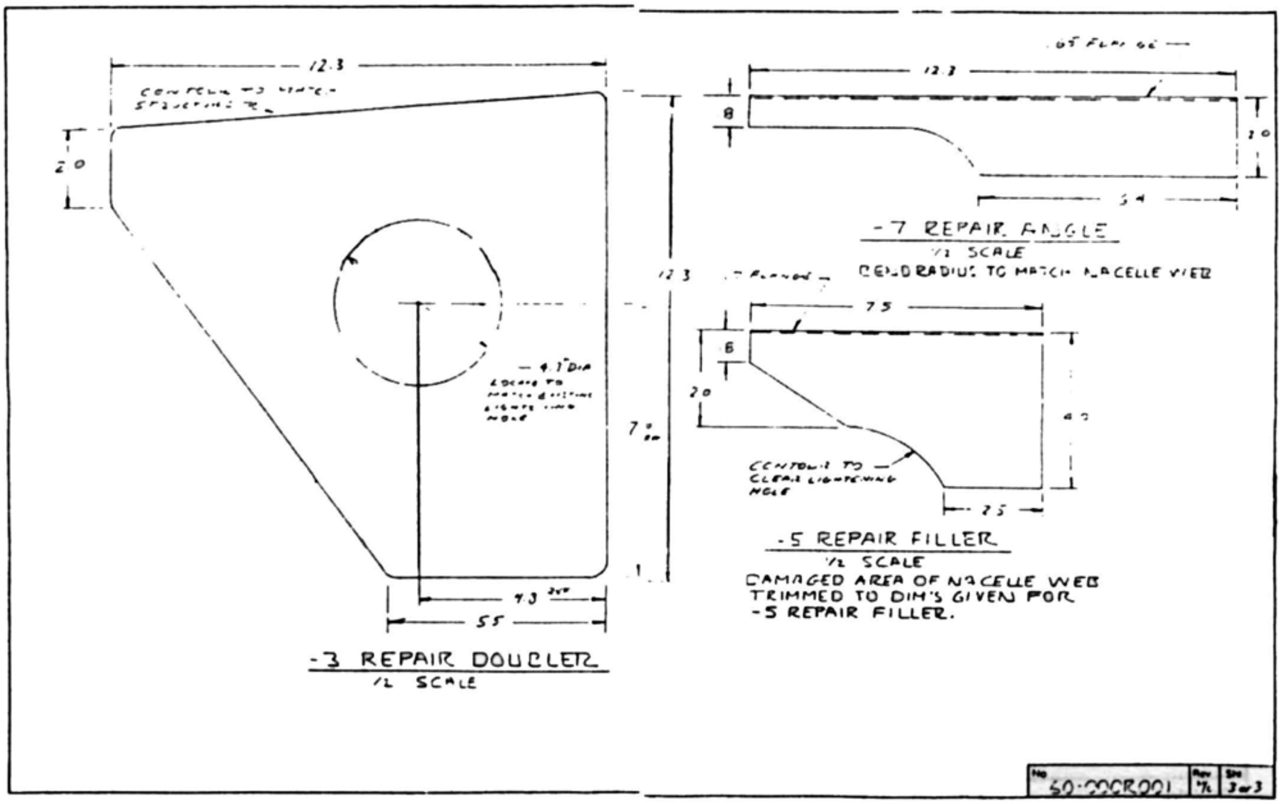
DRAWN: A. Georgian	DATE: 17 May 1990	MIDCOAST
CHECK:	DATE: 5-17-90	TITLE: REPAIR, R/H ENGINE NACELLE STRUCTURE
DESIGN: A. GEORGIAN	DATE: 5-17-90	
APPROVED:	DATE: 5-17-90	NO. 60-000R001

REV. N/C

SHT. 1 of 3

MFE58011
Revised 8/7/88

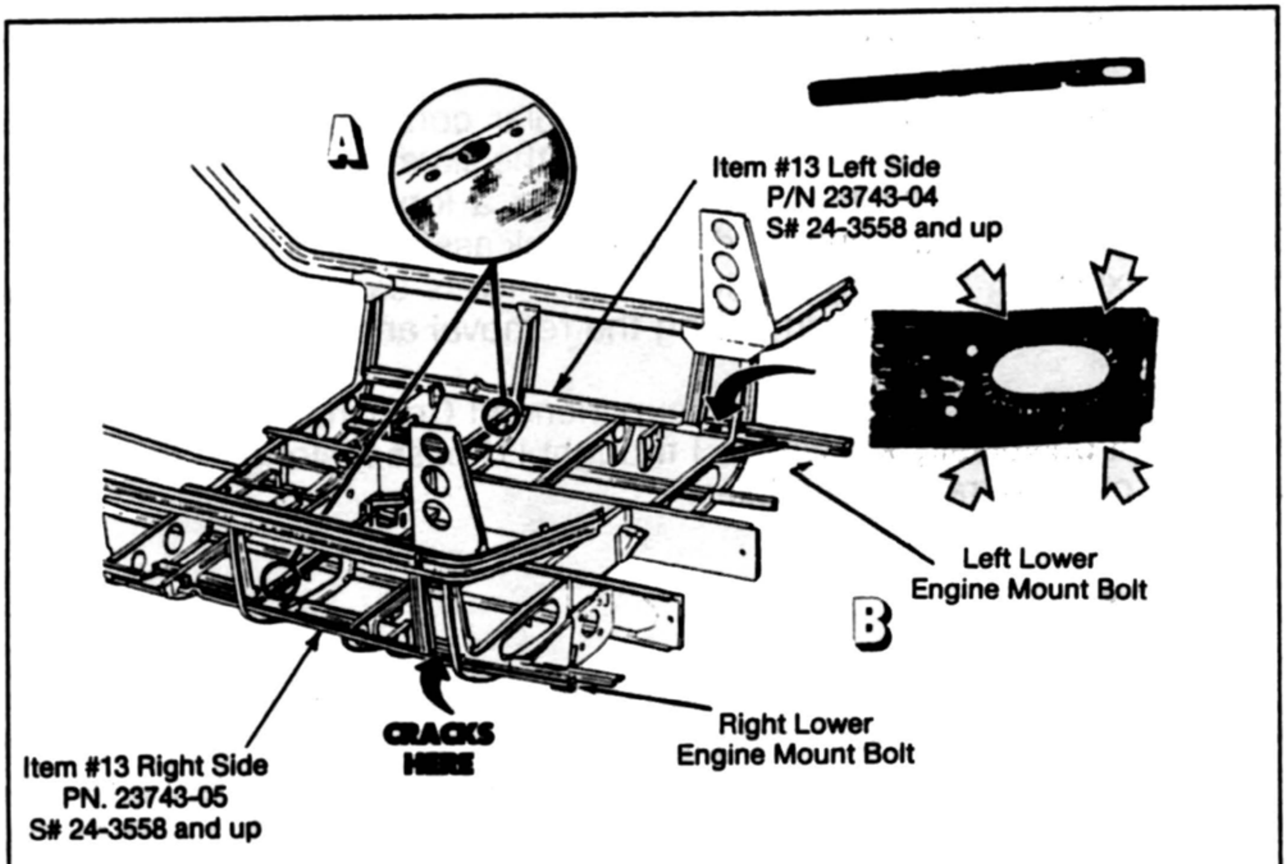

+ REPAIR RIVET LOCATION INSTALL MS20470AD4 APPROX. AS SHOWN. MAINTAIN 2 x DIA EDGE DIST, 4 x DIA SPACING - MIN.
ENGINE MOUNT FITTING
A
REINSTALL ENGINE MOUNT FITTING WITH MS20470AD5 RIVETS TYP 11 PLACES
+ PICK UP EXISTING LOCATIONS IN REPAIR PARTS. INSTALL MS20470AD4 RIVETS TYP 13-PLACES
B
B
WING
5 REPAIR FILLER 0.050 THK 2024-T3 CLAD
7 REPAIR ANGLE 0.025 301½ HD STAINLESS STEEL
3 REPAIR DOUBLER 0.063 THK 2024-T3 CLAD
FIREWALL 8 0.025 THK 301½ HD STAINLESS STEEL
-1 REPAIR INSTL
SCALE
FWD
VIEW LKG INB'D AT R/H ENGINE NACELLE. COWELING REMOVED
.7
-5 REPAIR FILLER
-7 REPAIR ANGLE
NACELLE WEB
-3 REPAIR DOUBLER
SECTION A-A
FULL SCALE
NACELLE WEB
FLANGE
EXISTING STIFFENING ANGLE
-3 REPAIR DOUBLER
SECTION B-B
VIEW ROTATED, FULL SCALE
No EC-CCCR001
Rev N/C
SH 2 of 3


12.3
CONTOUR TO MATCH STRUCTURE
2.0
12.3
4.1 DIA LOCATE TO MATCH EXISTING LIGHTENING HOLE
7.0
4.3
5.5
-3 REPAIR DOUBLER
½ SCALE
.05 FLANGE
12.3
.8
1.0
3.4
-7 REPAIR ANGLE
½ SCALE
BEND RADIUS TO MATCH NACELLE WEB
FLANGE
7.5
.6
2.0
4.0
CONTOUR TO CLEAR LIGHTENING HOLE
2.5
-5 REPAIR FILLER
½ SCALE
DAMAGED AREA OF NACELLE WEB TRIMMED TO DIM'S GIVEN FOR -5 REPAIR FILLER.
No 60-000R001
Rev N/C
SH 3 of 3

Seat Rails-Cracked Stringers

SEAT RAIL BULKHEAD

One of our members, Eugene Chiappe, ICS #07578, advises that he found the bulkhead cracked where the plate nuts are attached, which hold the back end of the seat rails (See "A" on attached drawing.) He made this discovery as he was changing some insulation in this area. He told me that the previous owner had put in new carpeting and then mounted the seat rails on top of the carpeting. This allows the rail to move every time a person sits on that seat. The seat rail should rest on the floor panels with nothing in between. The fix was the removal of the nut plates, the cracks stop drilled, a piece of 1/2" x 1/2" angle was applied to the full length underside of the bulkhead and the nut plates replaced. I want to thank Eugene for finding this potential booby trap and calling it to our attention.



FUSELAGE FRONT FRAME ASSEMBLY

STRINGER CRACKS

Several members have advised me that they have found cracks on the forward end of the stringer #13 at the point shown on the drawing on both sides (see page 8 − 20). So far all the airplanes reported have been 260's, but I doubt this is confined just to this model. Time does not seem to be a factor, as these range from 2,900 hours to 11,000 hours.

On these 260's, the cracks can be located approximately 4" below the air vent at the pilot's and copilot's heels. By removing the left and right inspection access panels which are under the pilot and copilot's heels, you can use a mirror and flashlight to inspect this area. See photograph for what you can expect to find if there are cracks in this area.

This particular stringer on the forward end has a race track shaped hole cut into it which, I assume, is for the passage of wires, although none of the reported aircraft had any wires through this hole.

As the bottom engine mounts attach to the forward end of these stringers, the load from it is then transmitted back through the stringers into the fuselage.

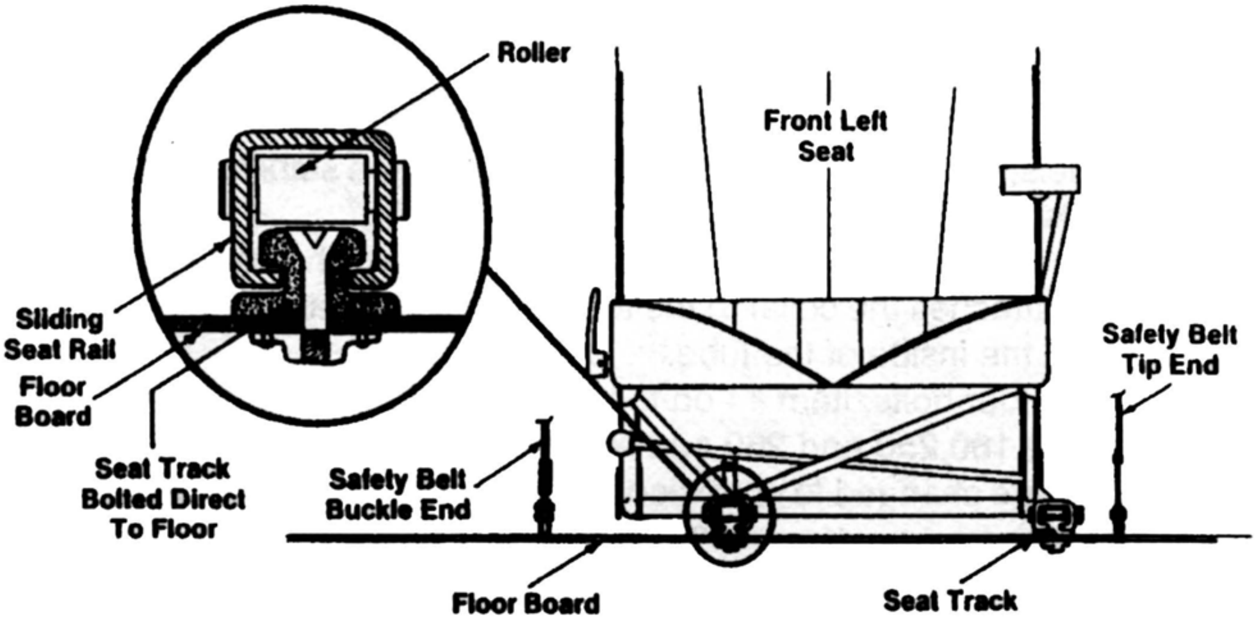
So on single engine Comanches, on your next inspection, please check this area. It would be appreciated if you would get back to me if you find any cracks. This way we can determine if there is an ongoing problem.

RAILS

In the March 1992 Flyer, we discussed cracks in the bulkhead under the pilot's and copilot's seat rails, where the carpeting had been placed between the seat rail and the floor, allowing the seat rail to rock. I had queried Piper about this and received a drawing from them showing the seat rail mounted to the floor boards with nothing in between. Since then, I have learned that some of our airplanes may have come from the factory with the carpeting mounted between the seat rails and the floor. Perhaps this was a cost reduction item.

I am receiving many calls regarding the damage that this is causing. If yours are installed in this way, I strongly suggest that you get the rails down on the floor boards where they belong and inspect for cracks. Remove whatever is necessary to do this. But if you do not remove the carpeting from under the seat rails, plan at one of your next inspections to remove both side panels, take up the floor boards, which in itself is no easy task, and repair the damage. Then install the seat rails as shown in the drawing and this problem will not reoccur. This will require the completion of a Form 337 and FAA approval to return the aircraft to service.

I have included an extract from Piper drawing #26652 (See opposite page) showing the correct installation of the seat rails.



Extract from Piper Drawing #26652
Seat Installation

Stabilator-Balance, Trim, Corrosion, Flutter

STABILATOR BALANCE

I now have a new, more serious problem and a question: It concerns tail flutter in the PA−30. I believe that my problem was due entirely to CG being too far aft. The tail flutter occurred when the take−off weight was at gross but the back seats were shifted two notches further back than I normally have them set. Is there any report of flutter in any condition other than CG too far aft? We are all well familiar with the stories of Bonanza's tails fluttering and coming off. Has this ever been suspected or known to occur in a PA−30?

When the tail fluttered the horizontal portion of the tail could be seen vibrating up and down rapidly, perhaps 5 times per second, and the control yoke likewise vibrating at the same frequency in and out, with excursions of about 1/2 to 1 inch with each vibration − in other words quite noticeable indeed and worrisome to the plane occupants about the possibility of our losing the entire tail of the aircraft. This entire episode lasted about 10 minutes at 5,000 feet, occurring about 10 minutes after takeoff. In addition, it occurred, less severe, 2 days later, 2 hours into the flight, well under gross weight and certainly within correct CG envelope, for about 15 minutes. Could I have damaged the aircraft controls enough that one time that I was out of CG at gross weight to the point, that I will have the problem continuously now regardless of loading or CG, on an intermittent and unpredictable basis? I would also worry about the concept of metal fatigue and that I might have an increased chance now of losing the tail suddenly one day.

ED: ICS Technical advisor said we have had a number of calls recently regarding a vibration in the tail (stabilator tip's moving up and down), in most cases at high speed, however in two at relative low air speed. This is caused basically by just one thing − the stabilator is out of balance. If the stabilator is painted or repaired it MUST be checked for proper balance.

All PA−24's, 26's, 30's and 39's were painted with lacquer. If you use polyurethane, it is approximately 20% heavier than lacquer. There have been some cases where you can not get the stabilator balanced without removing the polyurethane because of the extra weight. I can not over emphasize the importance of having this checked.

Flutter of the horizontal stabilizer can also be caused by the stabilizer bearing block being loose. See Piper SB 411A and 464, and AD 74−13−01.

STABILATOR BALANCE

After experiencing a vibration, we read of other people's vibration problems in the "Tips Special". Since we had just had a paint job, we decided that a stabilator balance check was in order and boned up on the service manual procedures.

No problems until we priced the balancing weights called for. First, you can't find master check weights, (P/N 23584−00), but that isn't a big problem since the manual gives the weight (1.58 lb.). Second, the balancing weights, (P/N 23179−00), were quoted at $232 each! Since the manual doesn't give any information on these weights, that could have been a big problem.

However, a quick call to ICS turned up a complete set of weights at Air Salvage of Dallas ((214) 227−1111) for $30. Two weights balanced the stabilator nicely, using the service manual procedure.

For information, the balance weights (P/N 23179−00) are 2" x 1 1/4" x 1/16", with a hole in the center for a close fit on a #4 bolt. The weights are steel, primed and painted and will weigh about 3/4 ounce each.

While we had the plane on jacks, we adjusted all control cables for travel and tension, adjusted the slide blocks around the control yoke tube and adjusted the landing gear (the left main was not going quite all the way into the well).

As a result, our Comanche is flying great! We recommend everyone pay attention to the control cable tensions, especially in the twins, since any slack in the rudder cable will deny full rudder travel.

STABILATOR BALANCE

I have had a twenty year love affair with the PA−30. It is quick, efficient, well built, and just plain pretty. However, this gives no license to ignore some plain aerodynamic facts of the design. The airplane will perform exactly as the pilot tells it to, within design limits. Like some other pretty things, if mistreated it will bite.

A Comanche demands certain respect and understanding. Comanche owners can understand the airplane better if a few minutes are taken to remove the inspection plate forward of the stabilator and LOOK and THINK.

The balance arm forward of the stabilator is carefully balanced by adding or removing weights.

Static balance of the control surface IS essential. I first was briefed on the consequence of failure to maintain this balance by Maurice Taylor, who was placed among us to keep us and the Comanches alive. I listened carefully to each word and went directly to Bill Turley's shop for work that I did not trust myself to do; then I went out and nearly killed myself and my Comanche on a test flight to Vne plus 10%. A few words need to be said about Comanche airplanes at speed approaching or exceeding Vne. I hope Comanche owners will consider them in the spirit in which they are presented. Keeping alive is high on our list, for how else can we keep these airplanes flying?

I hope you will pull the inspection plate off your airplane. We will assume stabilator static balance is perfect as can be. Move the stabilator up as for entering a dive and again down as for a climb. Now, position it about where it will be when trimmed for cruise. Notice that movement of the stabilator causes related movement of the linked trim tab. If the plane is trimmed for cruise, positive pressure will be required at the control wheel to enter a dive, and you will have to pull to make it climb. The amount of pull or push you exert relates to amounts of force necessary to change angle of attack of a surface in aerodynamic balance for level cruise flight at that airspeed and power setting. This force translates to either positive or negative loads on the stabilator. These aerodynamic loads are not in balance unless the aircraft is trimmed in and out of each pitch change. At low speeds the imbalance is of no importance. At speeds approaching or in excess of Vne, the aerodynamic imbalance produced by forced pitch changes from the trimmed position is far in excess of any static imbalance we check the balance arm for, and will result in heavy buffet of the stabilator. The message comes through loud and clear: Trim the airplane for pitch change at these speeds. Make every effort to avoid this never−never speed, but if you are caught in it, don't manhandle the airplane.

I was lucky. The Comanche is a well built airplane to which I probably owe my survival. A "Brand X" most likely would have disintegrated. This high speed stabilator buffet is not characteristic of the airplane and ordinarily is induced by control pitch input by the pilot.

I have talked to a number of people who have "enjoyed" the type of ride I had. The worst characteristic I have found is not in the airplane, but is in those of us who fail to recognize the loads we can place on the airframe. Note the drooped and warped stabilator, failing from heavy negative loading and heavy buffet from aerodynamic imbalance produced by high speed pitch change without corresponding trim. We have to learn from these shared experiences. Vne speeds demand absolute respect, proper stabilator static balance, trim for pitch changes, and no heavy hands.

STABILATOR JAM

One of our members, Barry Canner ICS #06049, has a PA24− 260C, S/N #24−4989, built in 1971 with an Altimatic III Autopilot installed at the factory. He found that the stabilizer bridle cable was quite loose when adjusted to the proper tension of 17+ 2 lbs. He discovered that due to the servo location, this raised the stabilizer cable allowing the back clamp to catch on the stiffener or bulkhead. Barry checked with Century Flight Systems (formerly Mitchell) and found that their drawing #69−D508 calls for a bracket and pulley #7−A598 to be mounted under the floor board to hold the bridle cable down, as well as a football shaped bracket #7131068 around the stiffener to prevent the clamp from catching. Barry's airplane did not have either in place.

If you have a single or twin which came with the Altimatic III or IIIB, I suggest that you check to determine if yours has the two brackets and the pulleys installed.

If the clamps get caught on the stringer it will make it impossible to move the stabilizer control.

STABILATOR ATTATCHMENT HARDWARE

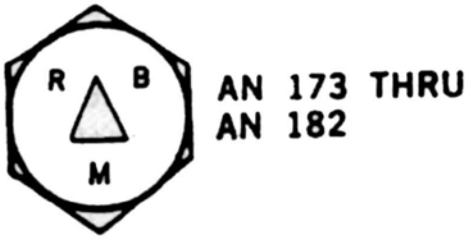
In the February '93 Flyer, I talked about the importance of checking the stabilizer for looseness. In the process of making this inspection, several alert mechanics, one of whom is Dave Pratt, the IA inspecting Dick Cameron's (ICS #07109) aircraft, reported finding various problems.

1. The two bolts, item #1 on the drawing, which are AN175− C33A, Piper #502−343, for the 180,250 and 260 and AN175−33A, Piper #402−346 for the 400 and PA30/39, which hold the stabilizer horn to the stabilizer tube, were badly rusted where they go through the inside of the tube.
2. The one bolt, item #2 on the drawing, which is AN174−22A, Piper #402321 on all models, which attaches the stabilizer horn to the stabilizer balance weight tube, should also be checked.
3. The two bolts, item #3 on the drawing, which are AN24− 46A, Piper #400−932, that attaches the collar to the torque tube, were also badly rusted where they go through the inside of the tube.
4. The four bolts, item #4 on the drawing, which are AN1 74− C32A, Piper #502−329 for the 180, 250 and 260 and AN175− C32A, Piper #502−342 for the 400 and PA30/39, were changed to corrosion resistant bolts IAW Piper S/L 667A, dated 3/4/74.

The bolts removed from Mr. Cameron's 180 were AN175−33A (noncorrosion resistant) bolts. The parts book now calls for AN175−C33A (corrosion resistant) bolts in the 180, 250 and 260, but not specified for the 400 and the twins. I sent a request to Piper that this be changed, and they have now advised me that the bolts can be interchanged, so use the AN175−C33A on both the 400 and the twins.

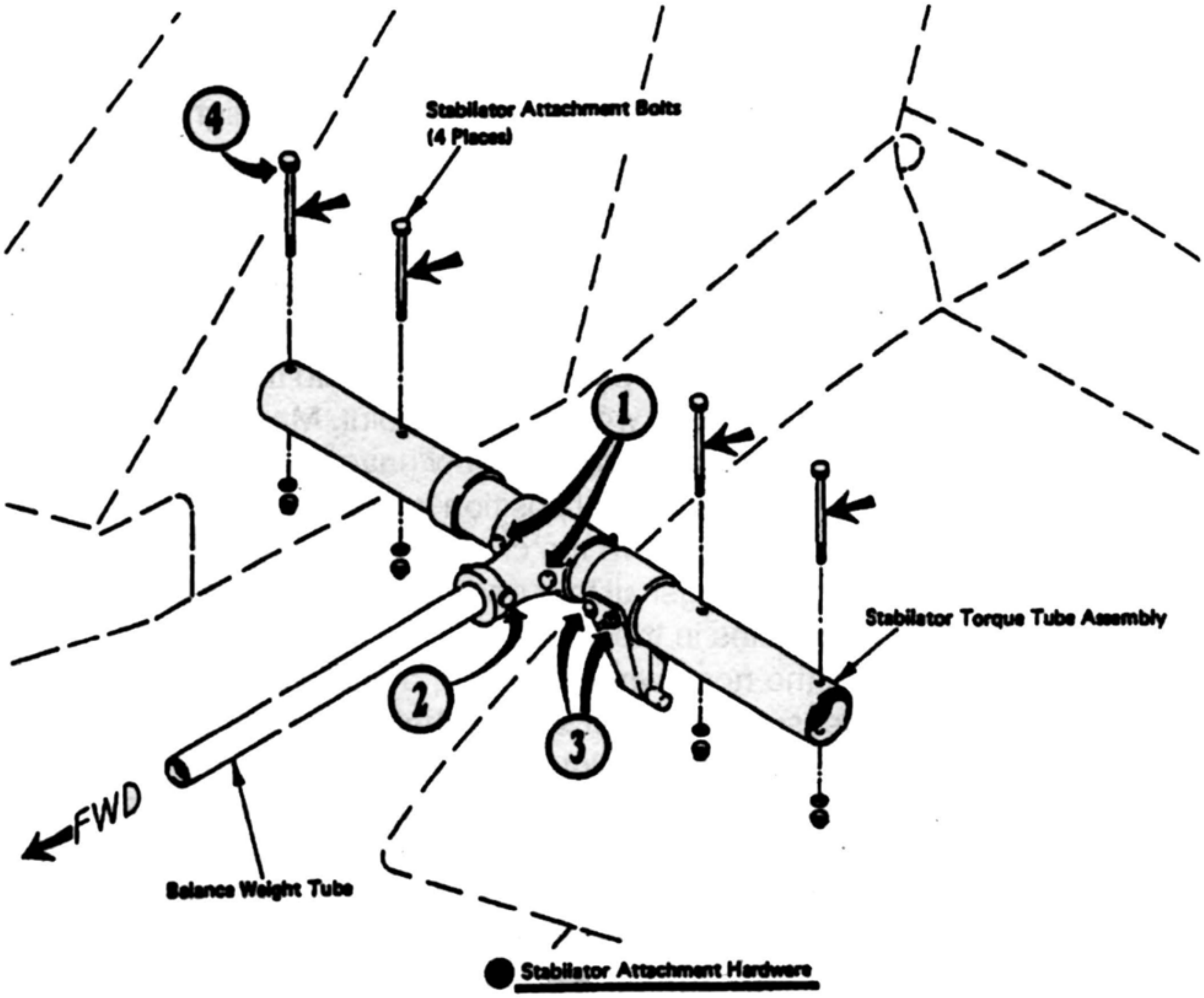
The torque tube on this aircraft was also badly rusted. I cannot over emphasize the importance of checking these parts, and I have been informed by Piper that NO corrosion is to be allowed. To identify the bolts, see the drawings below:

Also see FAA Special Airworthiness Information Bulletin #CE-04-88 dated 9-15-04. Also ICS member Hans Neubert is doing extensive research on this subject.



Non-corrosion resistant

Corrosion resistant



STABILATOR INSPECTION

From the desk of Maurice Taylor Note: Also see FAA Special Airworthiness Information Bulletin #CE-04-88 dated 9-15-04. Also ICS member Hans Neubert is doing extensive research on this subject.

We have talked about the inspection of the empennage in the past, but I think that we should remind you again regarding, this important inspection. If the stabilizers on your aircraft haven't been taken off to inspect the torque tube and bolts, I strongly advise that you have it done at the next annual. We have found bad bearings, rusty bolts, and rusty torque tubes. Piper doesn't allow any corrosion on this tube. Be sure that you have the corrosion resistant bolts installed as shown.

1. The two bolts, item #1 on the drawing, which are AN175− C33A, Piper #502−343, for the 180, 250, and 260, and AN175− 33A, Piper #402−346, for the 400 and PA30/39, which hold the stabilizer horn to the stabilizer tube were badly rusted where they go through the inside of the tube.
2. The one bolt, item #2 on the drawing which is AN174−22A, Piper #40232), on all models, which attaches the stabilizer horn to the stabilizer balance weight tube should also be checked.
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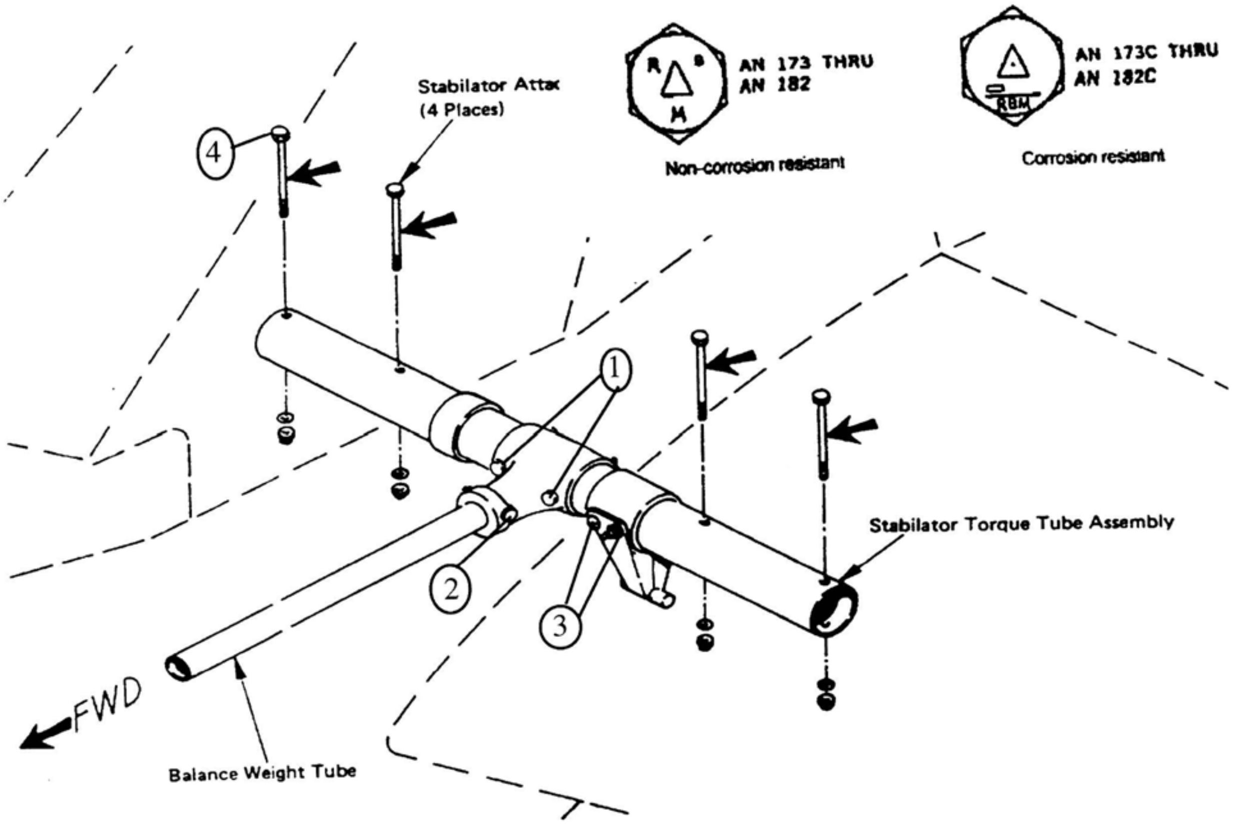
The bolts removed from and owner's 180 were AN175−33A (noncorrosion resistant) bolts. The parts book now call s for AN 17 5 −C 3 3 A (corrosion resistant) bolts in the 180, 250, and 260, but not specified for the 400 and the twins. I sent a request to Piper that this be changed, and they have now advised me that the bolts can be interchanged, so use the AN175−C33A on the the 400 and the twins. To identify the bolts, see the drawings.

Stabilator Looseness Problems

There are four bearing blocks with five hi−shear rivets in each block that support the stabilators to the fuselage. This subject is covered in SB 411A and 464A, as well as in AD 74−13−01 and AD 75−27−08. There should be no looseness at all in the stabilator. The method of checking this on every pre−flight is clearly shown in the Comanche preflight video as well as on page 3 of 3 in SB 411A. As I recall, I have had only three calls regarding a loose rivet in this area, although there doubtless are more than this. Piper recommends an AN2 I − 15A bolt and replace only the loose rivet, and not all rivets if they are tight.

From what members tell me, looseness in the two bearings, part #452−363, is more common. This is Fafner #KP37BS. If checked as shown in the video, you can detect the slightest looseness in any part of the stabilator attachment. And, if you find any looseness or noise, have it checked and repaired as necessary with the above listed service bulletins.

Remember that, unlike the rest of the aircraft, the stabilator tube itself is not corrosion proofed. The inner race of the bearings is such a close fit that there isn't room for it. There have been several cases where this tube has been found to be rusty. In some cases, the rust has been on the tube inside the stabilator making it very difficult to get the stabilator off. If yours has not been off the airplane in some years, I suggest it be removed and the tube checked at the next annual. Corrosion-proof the inside of the tube with zinc chromate or an equivalent product, and then coat the outside of the tube with a product like Lps #3, which will help protect it from rusting.



STABILATOR FLUTTER REVISITED (PA30)

Dick Brown, ICS #12179

An old subject; possibly a new twist. Is there anyone out there flying a PA−30 who may still occasionally feel a "vibration" in the yoke on letdown, and have not been able to find the reason for it? First, what you are feeling is in all likelihood stabilator "flutter". It is serious, the aircraft should be grounded until a cause is determined and fixed. Having said that, I can tell you it isn't always easy to find that cause. Here is my story.

My PA−30 would occasionally behave as described above if I let the airspeed build on letdown to the 180−190 MPH indicated range. I know you don't need to let the airspeed build on letdown, and to do so may be "bad manners", particularly if IFR with traffic ahead. But neither should we be flying any airplane which wants to give you a "massage" at the upper end of operational speeds, way below Vne.

Don't dismiss "vibration" in the yoke on letdown as harmless. A slight back pressure on the yoke and a power reduction always stopped what I was feeling, but that is not assurance that nothing serious is going on. I didn't realize that at first. Maurice set me straight that it was flutter. I'm not recommending that you take time to do this, but if you did look back at the tip of the stabilator when you felt that "vibration", you would see the flutter. This is serious. Think "disintegration" when you think "flutter".

My IA and a whole lot of unnamed Comanche people tried to help me with this problem over a longer period of time that I care to admit. You know who you are. Thank you.

Yes, I read TIP's thoroughly, did everything Maurice suggested at least twice, drove my IA batty, and gave our good friends at WEBCO a shot at it. To conserve space, I’m not going to list everything that was checked or replaced, but take my word for it; we tried to leave "no stone unturned". However, we found nothing definitive where you could say, "that" is the problem. Unfortunately I spent considerable bucks replacing some stuff, including the torque tube bearings, which in retrospect probably didn't need replacing.

What was the culprit? One day, I took the tail cone and the fuselage inspection cover off, and was doing what seemed like I (and others) had done so many times before; i.e. going inch by inch over everything, both internal and external, which could possibly bear inducing stabilator flutter. My eyes, seemingly providentially, happened to fall on the culprit.

The stabilator torque tube (the tube that runs through the tail cone and joins the left and right stabilators) is secured by four bolts within what I call a hub located in the tail cone. I think the PA−30 parts manual calls the hub the "horn", if I’m reading the diagram right. The fore and aft balance arm, to which balance weights and control cables are attached, is secured in a receptacle on the forward side of the hub ("horn").

The problem was that the stabilator torque tube was not secure within the hub. Sometime in the past, the torque tube had started to work, every so slightly, rotationally, within the hub. I discovered this by being fortunate enough to notice an almost indiscernible miliscrump of rotational motion of the torque tube relative to the hub. That wasn't supposed to be. An immediate check of the four bolts, which secure the torque tube within the hub, revealed no resistance to the torque wrench which meant the bolts were essentially "loose". I'll leave it to your imagination to envision how the aerodynamic forces acted on this little bit of rotational looseness in the fit of the torque tube within the hub to set up an excitation force to cause stabilator flutter. After the fix, no more "downhill" flutter at any speed within the operating limitations of the aircraft.

How this condition came to be is unknown. I'm under the impression that no AD or maintenance procedure requires the disassembly of these two parts. Unless one had to replace the torque tube due to damage, there doesn't seem to be any reason to disturb the original factory assembly. I don't remember seeing anything in TIP's nor did Maurice or WEBCO indicate this as something to check. Therefore I can only assume this has not been a problem in anyone's memory over the years. With hindsight being 4.0, it makes sense to check the security of every interface, no matter how unlikely, when not finding a more obvious solution to a flutter problem. But I’m right there with all the "experts" in not thinking of this interface, until the day the Lord looked down on me and took pity.

LOOSE HI−SHEAR RIVETS CHECK THEM AGAIN!

Concerning AD 94−13−10 I would like to inform the readers of my personal experience so they might benefit from it.

I own 9200P the 1967 Piper photo airplane which is a 260B. Recently while doing the annual inspection I discovered loose rivets in the stabilator hinge attachment blocks.

This was NOT discovered by the way the inspection is to be performed but by using my index finger to wiggle or push on each rivet individually. This airplane has passed the traditional test by having someone shake the stabilator up and down, back and forth on 3 separate occasions. It stands to reason that if you have 2 or 3 tight rivets securing the structure that if there are loose rivets in the structure they will not be disturbed because the tight rivets prevent play.

I also discovered that the bottom 2 blocks were secured by regular aluminum rivets.

Now that the loose rivets were discovered I called Maurice Taylor to get more info on the proper bolts to replace these with without spending $20/bolt times 20. The letter of approval from the FAA states that a an AN3−15A was to be the replacement for the AN3−20A that come as a kit offered by Piper. This AN3−15A is too long by about 1 1/2 inch. The bolt to use is an AN3−11A. Maurice will probably address this in another article.

Now into the actual work of replacement.

Piper recommends that you gain access to this area by cutting a hole in the aft part of the fuselage then use 2 cover plates (an option not included in Piper kit #760−835). I talked with others, such as the good people at WEBCO (who also offer a kit for this AD), on the subject and they suggest drilling out the rivets around 3 sides of this skin to gain access. Then rivet it back afterward thereby not disturbing the integral strength of that part of the fuselage. The stabilator, torque tube, and hinge assembly with balance weight can then be accessed by opening it up enough to work through the aft bulkhead. If you a have a few special tools which you would probably need anyway, I believe this is a much faster way.

The special tools you will need are: a Dremel tool with grinding stone for grinding off the bottoms of the high sheer rivets, small angle drill with #30 & #14 drill bits, 3 reamers sizes .186, .187, & 3/16ths (.1875) for reaming holes for tight fit. (The reamers I purchased from MSC Industrial Supply, 8913 H Street, Omaha NE ((800) 223−8195) for about $6 − $8 each. They are fluted reamers and about 4 1/2" long and will need to be cut down to a length of 2 3/4") 1/4 inch drive inch / lbs torque wrench, and possibly a self manufactured pin punch to drive a stubborn high sheer rivet.

After disassembly be sure to protect trim tab cables by wrapping them with tape and let them hang through aft bulkhead. Grind off the bottoms of 1 or 2 of the collars of the high sheer riverts. You probably will not need to drill these out; in fact I would not attempt it if it can be avoided by driving them out with punch. They may be difficult to drill straight. If you have the regular aluminum rivets it will probably be very difficult to drive them out so start by drilling with a #30 drill drilling halfway from bottom then drilling the other half from top so if you go to one side of the hole you can take care of this when drilling out to the #14 size. Incidentally the #14 is actually .182. This allows for you to gradually increase the size of the holes with the reamers to get a tight fit. The letter of approval states the finished size should be accomplished with a .1875 reamer (3/16ths is the same size) which would give a max. tolerance of +.002. This should give you a nice snug fit. You will find that the bolts do not mic out to be the same size. I found them to have as much as .004 difference in a package of 30. Once you have drilled out a hole with the #14 drill, ream up to the 3/16ths size BY HAND. In order to hand ream with them you may have to put them in a small chuck. Check hole with bolt for size before reaming to 3/16ths. Once you have the correct hole size install bolt with washer top & bottom, nut, and torque to 20 − 25 inch / lbs. Repeat process until all are finished, then reassemble stabilator.

This is for the IA's and A&P's who, like myself, have wished there was only some way to properly see inside a wing without taking the skin off, this is the answer. We thank Dr. Robert Bierenbaum for this.

STABILATOR TRIM DRUM PARTS INSTALLATION

I ran into a situation the other day while overhauling Ward Whipple's stabilator which would be of definite interest to anyone about to do this job.

I've done this job four times and thought I was reasonably proficient at it. How wrong could I be! The disassembly, bolt replacement, torque tube bearing replacement, cleaning, and painting are tedious but rather straight forward. (Numerical references are to item numbers on Fig. 38 in the Parts Manual.) In the process, we corrected some slop in the trim drum (vertical movement) with shims. This naturally requires unwinding the trim drum (#7). So, all finished with the details and now for reassembly. Again, this rewinding of the trim drum is tedious, but not too difficult if you follow the directions in the Shop Manual. Set the proper trim wraps (7 from top), adjust the screw actuator (#10) 0.285 inch (for the 180) from the top screw stop (#5) and you're in the neutral position, right?

Wrong! We did it as instructed, buttoned up the tail cone, flew a test hop and low and behold, we don't have nearly enough nose down trim available. You had to hold forward pressure on the wheel with full nose down trim and 120 knots indicated. Conversely, the nose up trim available was excessive, i.e., more than you ever need. So, back to the hanger, recheck everything, make some minor adjustments in the screw position in the drum and back for another test hop. This time a little better, but still not right!

At this point, we decided to go back to square one and restart with checking the rigging of the stabilator. So, level the aircraft, level the stabilator, and check the trim tab (in this position it should be flush with the stabilator (i.e., zero trim). But no, it's almost 3/4 inch down from zero. So I tried to readjust the stabilator tab activator arm (#1). Guess What? Not enough adjustment available. The rod came out of the rod end bearing (#3) and still wouldn't adjust. By now, I'm fit to be tied. I just couldn't figure out where I'd screwed up. So I throw caution to the wind and call Maurice. Well, Maurice is puzzled too. The probability of the actuator arm (#1) being the wrong length is slim to none, he says. Go back and recheck the screw (#10) position in the drum (#7). Well, it was accurate to plus or minus a thousandth of an inch.

About now, I'm looking desperately at the Figure 38 in the Parts Manual. Suddenly, there it is. I noticed the trim stops (#5 & 6) have different part numbers − one for the top and one for the bottom. Therefore, the height (length) of them are different, i.e., one is about 1/4 inch longer than the other. And yes, you guessed it, I had them reversed. The long one goes on the bottom and the short one goes on the top. (And, unlike the illustration in Fig. 38, the flanges on the stops should go next to the trim drum (#7). The bottom one in the illustration is correct, but the top one isn't.) I passed this info on to Maurice, and even he didn't know that the trim stops (#5 & 6) were of different lengths. They have no identification on them as to part number.

So, after I switched their position, and reset the neutral position, the actuator arm (#4) adjusted properly. We buttoned up the tail cone, flew the bird for an OK flight and signed her off. Learning experience, yes! But how was I so lucky the first three jobs to get those trim stops (#5 & 6) correct?

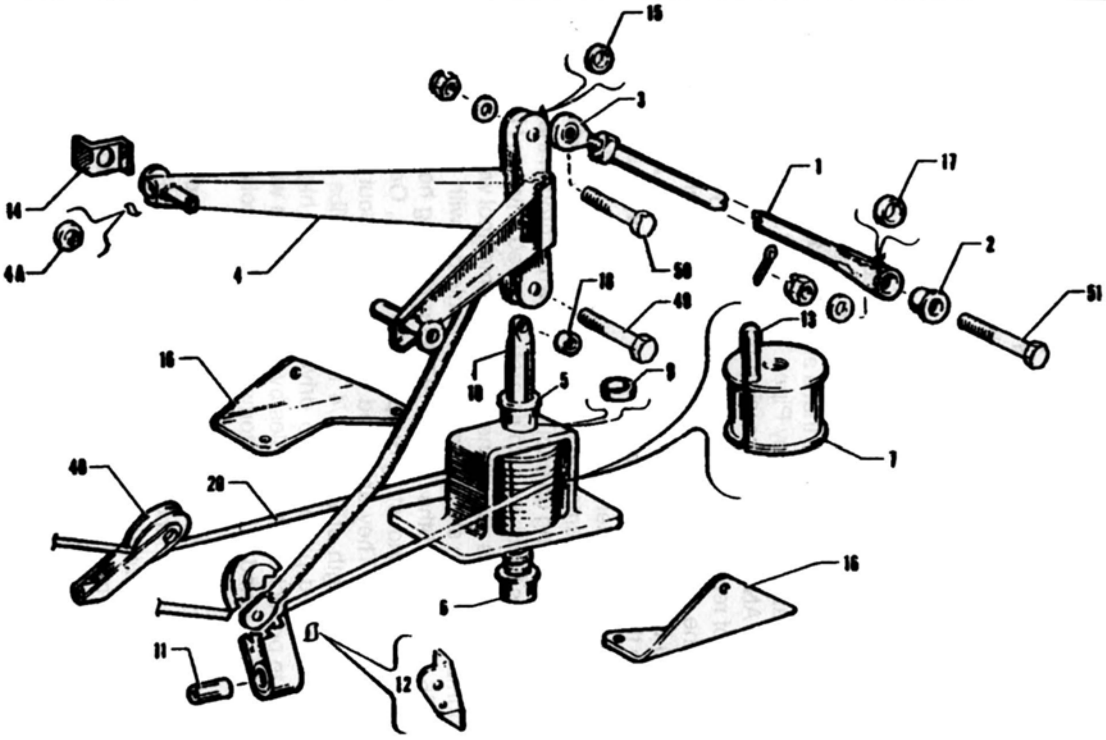


Figure 38. Stabilator Trim Mechanism Installation

ISSUED: DECEMBER 1966

PA-24-180
PA-24-250
PA-24-260
PA-24-400

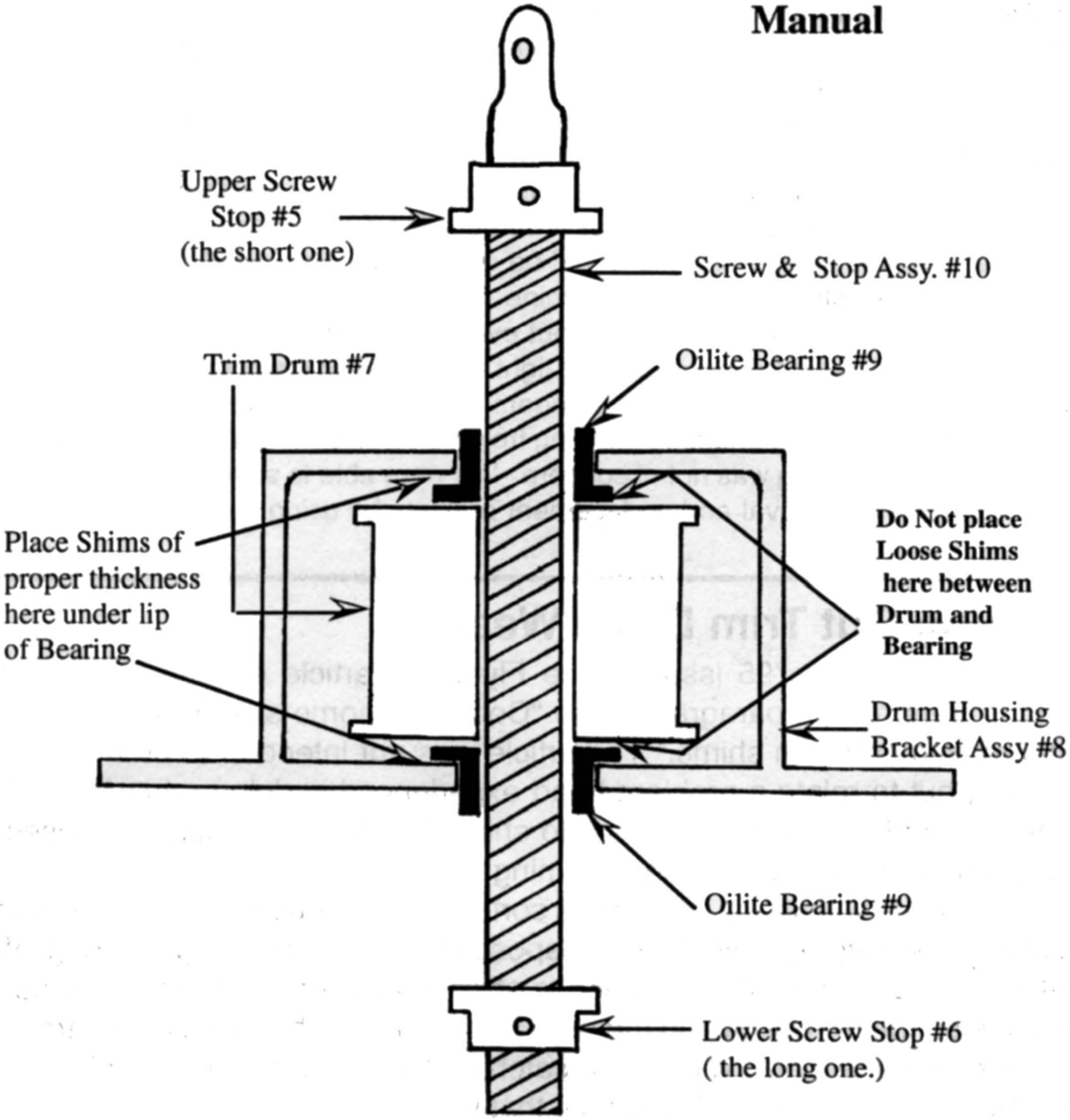
SHIMMING OUT TRIM DRUM WEAR

In the January '95 issue of the Flyer, my article entitled "Errors and Omissions" referred (in paragraph 2) to "Corrected some slop in the trim drum (vertical movement) with shims." The article was not intended to be a "how to" type article, but to relate a problem I had experienced in doing a trim / stabilator overhaul. Nevertheless, the reference to shimming the screw actuator raised a couple of questions as to how the shimming is done.

As is true with many jobs of this sort, there's a couple of right ways to do it and at least one wrong way. So let's dispose of the wrong way right now. (Refer to sketch.) You do not want to put a loose shim or washer on the screw actuator (#10) between the trim drum and the oilite bearing (#9). This is asking for trouble since the shim (or washer) will, in time, catch on the screw threads and interfere with its movement. Nuff said; don't do it that way!

The preferable way to solve this little problem is to polish off the wear from the drum (#7) and measure the slack between the drum and the oilite bearing (#9) with your feeler gages. Then, very carefully, and with proper support, press the oilite bearing (#9) out of the drum housing bracket (#8) and place shims of the thickness you previously measured, between the oilite bearing (#9) and the drum housing (#8). Press the bearing (#9) back into the housing (#8) and reverse the whole process. In this way, the bearing (#9) will be displaced in the amount of the wear (shim thickness) and zero out the slop. Then assuming that you've attended to all the other wear points (bolts, bushings, and rod end bearings), you will end up with a snug, tight trim system.

Identification Numbers refer to Fig. 38 in Parts Manual



Sketch IS NOT drawn to scale

Wing Spars

SPAR CAP TENSION

Around 1964 while I was in the Calgary Piper dealers shop, I was watching a mechanic starting to remove the left or right main gear side brace support, P/N 20760−00 or −01 to install a new bushing. When he backed off the flange bolts that went through the fitting and the lower spar cap, I noticed that the spar cap sprung away from the fitting about one thirty−second of an inch or more. This showed that the spar cap was under considerable tension and, to my opinion, it should not be. The mechanic was not concerned, and having no interest of ownership of this aircraft, this was let go. I did prevail on the mechanic to slack off these same bolts on a later serial number Comanche and the spar did not move or spring away. This gave good reason to feel that the problem was poor manufacturing on maybe only a few PA−24s, serial numbers around 1800 to possibly 1950.

Two years later I purchased a well cared for low TT, NDH, Comanche 180, S/N 1889, 1960 model. When I checked this fitting on it, I found the same condition, i.e., the spar cap was under heavy tension. After some phone calls to the Piper factory and letters describing this condition, I got little if no concern from the factory representative. I did run across a mechanic who noticed this condition on an aircraft he was working on. He just elongated the three holes that the bolts went through into the spar web, but admitted that because the fitting did not fit the spar properly, there was still some tension on the spar cap. I even ordered a new side brace support, but it did not fit any better.

My solution to this was to make a proper fitting shim to go between the fitting and the spar cap, which relieved the tension. I wonder how many Comanches are the same? And why this was never brought to the attention of the FAA? Must really be a hell of a good spar. Before I purchased my 1972 '260C, I checked these fittings on both spars and found no such condition, both fittings fit the spar properly. Check yours.

TIPS FOR EASY INSPECTION OF THE WING SPARS

I became the owner of N7949Y, a PA30−200 Miller conversion Twin Comanche in March of this year. Ownership has been less than a pleasure with multiple problems being discovered after a prepurchase inspection that the airplane supposedly passed with flying colors.

On the trip home from New Jersey to Las Vegas, Nevada there were engine problems that necessitated overhaul of both engines which will be detailed in a later story.

On inspection of the airplane at my home base of North Las Vegas Airport by Don Brady, Chief Mechanic at Aerleon, Don recently found that there was "oil canning" of the right wing and left wing with the tip tanks filled. Oil canning, for the uninitiated, is producing the sound of an oil can with pressure and release of a wing segment of with lifting and lowering the wing from the top. Oil canning can indicate abnormal tension on the wing skin and may be indicative of a cracked or stressed spar or stringer or may show suboptimal riveting of the wing skin to the spar and stringers.

Maurice Taylor stated that mild oil canning was not of concern, but significant oil canning may be of concern. The suggestion was made that the skins would need to be removed to examine the spar and stringers.

The way that was suggested to do this was to remove the rivets on the skins and directly examine the spars and stringers.

This would be somewhat costly so with some thought we came up with an alternate way to examine the entire wing.

There are inspection plates on the rear surface of the wing at about every two to three feet. We were able to borrow a flexible fiber optic colonoscope and a light source. With the colonoscope, Don was able to carefully examine the spar and stringers and each rivet internally on the wing. Don was able to comfortably examine the wing from below without removing a single rivet and see that the oil canning was not of concern. We were able to save several thousand dollars of expense in removal and replacement of rivets by using the flexible fiber optic scope.

Strobes

WING STROBE INSTALLATION

Jack Becker, ICS #12815

Having recently purchased a pretty much original twin Comanche "C", I wanted to install wingtip strobes. Not having the faintest idea how to run the cables, I emailed the Comanche headquarters with a "help" request and promptly received a phone call from Maurice Taylor who quickly got me on the right track.

Following the instructions I received, this is how I accomplished the rather frustrating task; thank you for your help!

After removing the wingtip, locate the small U−channel just aft of the spar. Using a common "fishtape" or long enough stiff wire to reach the wheelwell. Put a 10 to 20 degree bend about an inch from the end of the wire and begin to feed the wire down the channel toward the wheelwell with the bent end down and aft. When you meet an obstruction, rotate the wire slightly and it will work its way around the rib so that you can continue feeding it. After some gentle persuasion, the wire will come out the 4" hole outboard of the wheelwell. The purpose of the bend is twofold; first to enable one to detour around ribs and secondly to make the slight jog in the channel about a foot from the wheelwell. After attaching a small wire to the fishtape, pull it back through the wing and out the end. After several attempts to pull the pencil sized strobe cable back to the wheelwell with the small wire and getting jammed somewhere in the wing I reversed the proceedure by attaching the fishtape to the wheelwell end of the small pullwire and feeding the fishtape back out to the wingtip while my wife pulled or the small wire. (Be extra nice to your wife; she is indispensable on this project.) It is necessary to have a slight amount of tension on BOTH ends to easily maneuver the strobe cable down the wing.

Once the fishtape with the bend still present arrives at the wingtip, attach the strobe cable to the end and work it back down the wing in much the same manner as the original trip using the bend to work around any obstructions until the cable reaches the wheelwell. Route the cable around the wheelwell with Adel clamps or through the aluminum stiffeners with grommets and some tiewraps into the fuselage through the existing grommet (that has some wires already in it) just behind the spar.

I elected to mount the power supply on the shelf just behind the 5th and 6th seats. A phone call to Whelan produced the advice not to run the cables next to any GPS antenna cables. In as much as I was removing original Narco radios for a new avionics package, suitable wiring to get 14v from the panel switch area to the shelf was already there and ready for use in its new purpose. I ordered an original landing light rocker switch to fit the panel from Avpac to use for the strobes and relabeled it. While not quite as easy as it sounds, it is a "do−able" project and hopefully this will help someone accomplish it.

TWINKLE TWINKLE LITTLE AIRPLANE, WHERE ARE YOU?

Larry Clark, ICS #10059, A&P, I.A.

Today the nighttime sky is filled with the flash of strobe lights. The strobe has been one of the best safety devices that has come along in years. It provides much higher light output and is more attention grabbing, as compared to the old red rotating beacon. Most of our single engine Comanche airplanes came from the Piper factory with a single Grimes or Whelen rotating beacon, mounted at fuselage station 161, on top of the fuselage just aft of the baggage compartment. The 260 models after 24 4804 had a Whelen strobe as factory standard, mounted in the same location, atop the fuselage.

All of what I am about to relate applies to you single Comanche owners that still have the rotating beacon or only a single strobe light on top of the fuselage. Those of you that fly twins with the beacon on top of the vertical fin or singles that have fin mounted lights or supplemental wing tip or belly mounted strobes can stop reading now and turn the page.

The Piper PA−24 Comanche was first certificated on June 20, 1957 using the requirements of the old CAR 3 dated November 1, 1949 including Amendments 3−1 to 3−12. At that point in our regulatory history, anti−collision lights were not required for night flying. Effective August 10, 1971, FAR 91 required anti−collision lights on airplanes that fly at night. The original red rotating beacon that was certified by Piper still meets this requirement. And if that is all your airplane has, you can continue to fly at night as long as you can continue to get parts to keep the old Grimes or Whelen beacon going around.

The problem is that when you replace the old rotating beacon, you must now meet the FM requirements of several publications. Start with FAR 91.205 (c) and FAR 23.1397 plus 23.1401. A good summary of the requirements is contained in Advisory Circular 20−30B, Aircraft Position Light and Anticollision Light Installations. The bottom line is that the location on top of the fuselage will not provide proper light visibility in any quadrant. Specifically, the rules require that the light be visible from 30 degrees above to 30 degrees below the level line of the aircraft. Some blockage by the aircraft structure is allowed (rudder, antennas, wing tips, etc.).

The worst blockage of the rotating beacon is directly ahead of the airplane. Any airplane approaching you head−on will not see your beacon if he is slightly below your level flight path. The forward fuselage, (cabin) blocks the beacon totally to any aircraft in front of you and lower. Walk out in front of your Comanche and imagine that you are another pilot flying toward you at night. Can you see your beacon or strobe? In fact, when I tested the fuselage mounted beacon location, there were no azimuth angles that permitted the light to be seen at 30 degrees below level. The best was −20 degrees directly left and right of the rotating beacon (three and nine o'clock positions). The top of the fuselage is fairly wide and flat even at station 161.

The answer to this problem is simple. Install more lights. A belly mounted rotating beacon or strobe will cover the blocked areas. Wing tip mounted strobe lights will also provide proper coverage to the front and sides. If you are considering adding additional lights, I recommend that you get a copy of Whelen Engineering Co. installation and service manual and read pages 2 and 3 to learn more about what is an "approved anticollision light system" that is covered under several STC approvals that they own. Just sticking a strobe light in the old beacon hole, does not meet the new requirements.

Also, be aware that some of the wing tip modifications place the strobes inside a covered area that may prevent the strobe from being visible in all quadrants to the rear of your airplane. This may require an additional anti−collision light in order to meet the coverage requirements. My PA 30 has the CometFlash strobes (four pulses for each flash) on the wing tips and tail plus the pulsed landing lights. People say that my airplane twinkles at night. I know that you will see me coming at you, will I be able to see you?

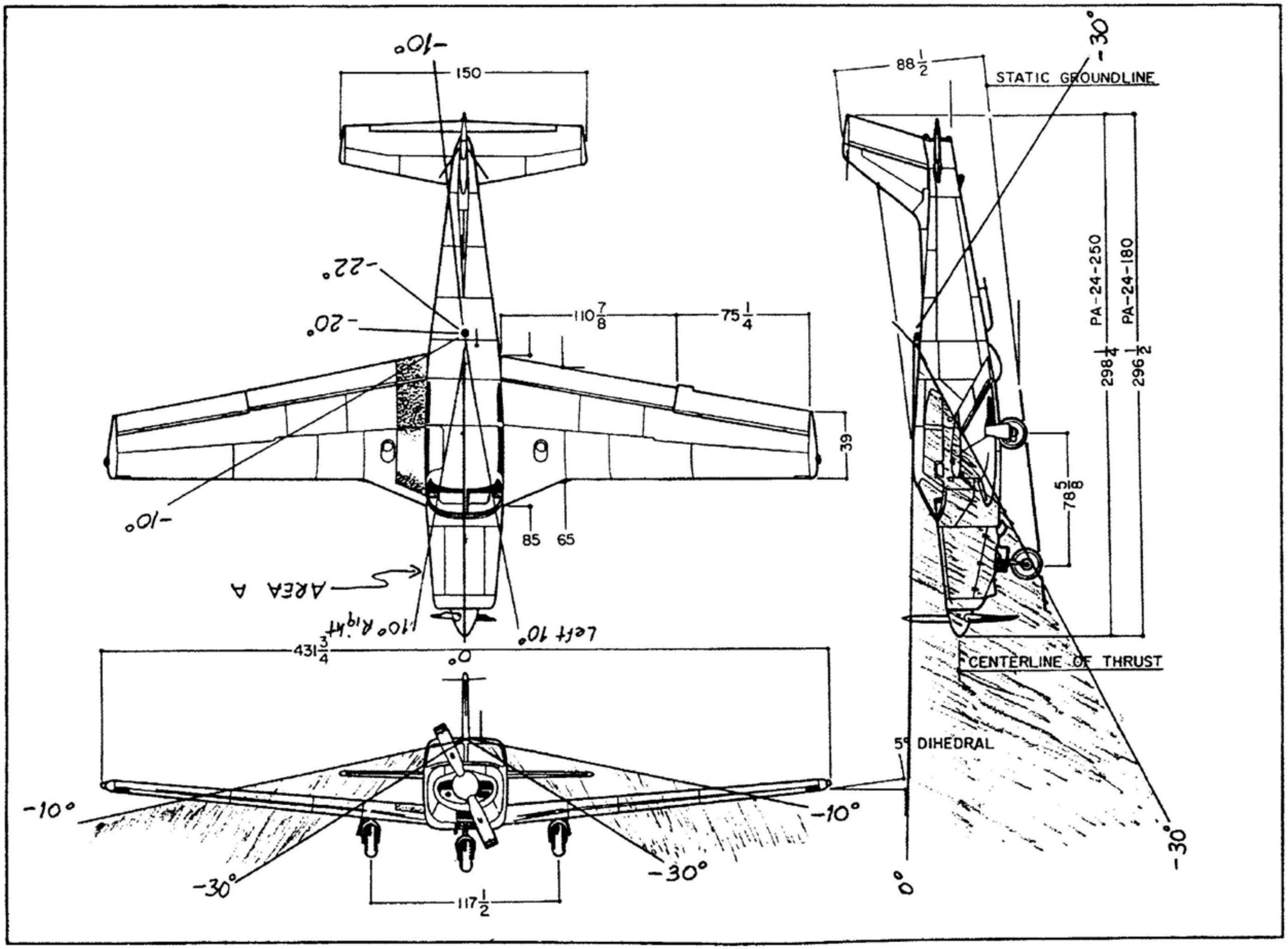


Figure 1-2. Three-View of Comanche PA-24