

Tips from Comanche *Flyer* magazines Feb 1973 – Sep 2012

## CHAPTER FIVE

### MAINTENANCE

### (GENERAL PROCEDURES, PAINTING, PLANNING, CORROSION CONTROL, HANDLING)

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## Miscellaneous Maintenance Tips

### Landing Gear

If kept well lubed and properly adjusted, gives very few problems. If green light fails, check bulb, check for broken wires to gear switches, check all knife connectors, and check all four switches. One pilot reported gear switch was worn and jumped out of down position which caused green light to go out. Hesitation in gear coming up is usually in solenoid, one of the above or up limit switch.

### Shimmy Damper

On nose wheel should be checked for tightness at attach points if nose wheel shimmies.

### Flaps

Most problems caused by dirty flap rails and rollers or weak spring. They must be clean. Nylon rollers help because they do not need lubrication.

### Gas Fumes in the Cockpit

Could be caused by leak in top of a tank, vent tube lines or loose fitting caps. Also check seals between wing and fuselage lines. PA-30 MUST have new type tank caps on outboard tanks. Also check fuel boost pumps under floorboard, strainer bowl attachment and selector valve for leaks.

### Platinum Plugs

Definitely help in eliminating oil and lead fouling.

### PA-30 with Tip Tanks

If tip tanks have been run dry do not switch to tip tanks on next flight until sufficient altitude is available. It takes a long time to get all the air out and fuel flow to the engine reestablished. Imagine PA-24 would be same.

### PA-24 with Alternator System

has an over-voltage relay which will trip and cut out the alternator completely. It can be reset by operation of master switch. Check for poor ground connections at battery and connections to frame.

### Check Cooling Baffles on your Engines

Some were found missing on aircraft at Lock Haven. Also check rubber and felt seals to fit to engine and cowling for proper engine cooling.

### If Autopilot Malfunctions

check BNC connectors at servo for moisture problems. Clean ALL connections frequently. One pilot reported bevel gear control came loose in servo and let gears move apart

### If Fuel Injected Engine Drips Fuel after Shut Down

check idle cut-off plates for fit.

### If You get a Kickback in Starter when Cranking Engine

check impulse coupling in left magneto and "P" lead ground of left Mag.

### You can get Induction System Icing in a Fuel Injected Engine

Impact Icing.

ADVISORY CIRCULAR, AC m-113, DATE 10/22/81

## Compression Test

The differential compression test is designed to check whether a cylinder may be leaking by the piston rings, exhaust valve or the intake valve. If there is a compression loss, listen to the crank case vent, exhaust stack and carburetor intake, to find where the cylinder is losing pressure. A good pressure indication may not be conclusive. Rocking the propeller

back and forth VERY SLIGHTLY while pressure is on the cylinder will show a pressure fluctuation if piston ring bands are worn.

### **Borescope**

A carefully conducted borescope look in the cylinders will often reveal the cylinder causing excess wear when a compression check will not reveal the problem cylinder. Another method sometimes used to find a problem cylinder, is to insert a mechanics magnet through the top spark plug hole and check for iron fuzz in the bottom of the cylinder.

### **Oil on Spark Plugs**

Worn, stuck or broken piston rings and/or worn valve guides are the usual cause. Rings can be broken and the cylinder still have good compression if the compression rings (top) are in good shape. Badly worn valve guides will sometimes allow oil to drain down into the exhaust pipe or into the carburetor duct while the engine sits idle.

### **Intake Pipe Leak (Carb. to Cylinder)**

This is a common problem that will lean the affected cylinder. Check to make sure all fittings are secure. Fuel Injectors: Even a partially clogged injector on an injected engine will starve that cylinder and cause it to run hot, resulting in excessive wear and power loss.

### **Magneto Timing**

Improper magneto timing to the engine can cause hot running and loss of power. Excessive or lack of mag drop is an indication of poorly timed magnetos.

### **Check Idle Mixture**

Warm the engine to operating temperature, then allow the engine to stabilize at idle RPM. Pull the mixture control to idle-cut-off and carefully observe both RPM and manifold pressure as the engine dies. RPM should hesitate (not go up more than ten RPM) before falling. Manifold pressure should go down about 1/2 inch before going up as the engine dies. Push the mixture in before engine stops and repeat the above several times. If RPM goes immediately down and manifold pressure immediately up as engine dies, the idle mixture is set too LEAN. RPM up more than ten RPM and manifold pressure down more than 1/2 inch, the mixture is too RICH. Idle RPM will usually require setting after idle mixture is adjusted.

## **OIL ANALYSIS**

Routine and regular engine oil analysis can help you detect and correct small problems before they become big problems.

## **Preventive Maintenance**

Good fun for a Sunday afternoon is a trip with a screwdriver and a few wrenches around the trusty ole Comanche. Preventive maintenance it's called. There are several often missed locations to note particularly.

Start by finding the proper kind of "teeny weeny leetle" wrench to tighten the knobs on all of the radios. Now while you are checking and tightening knobs check the knobs on the air vent doors and the knob on the rudder trim adjustment. I have had at least one of each of this fall off and vanish - usually under the seat.

Next, put a wrench on each of the nuts that holds the circuit breakers on their panel and see that these nuts are tight. I had occasion to test the circuit breakers and found that the main breaker felt like it needed to be reset. I pushed it right through the panel because it had no nut on it. What if it had really needed resetting?

Next, check the nuts that hold the mike and phone jacks in their locations. Are these jacks loose?

Now is the time to adjust the sun visor so that it doesn't flop down in your face every time you are demonstrating your best 60 bank to your instructor.

Go over all the sheet metal screws both inside and out and don't forget those on the wing fillets.

Get out your wrench and remove the battery ground cable from its connection to the frame of the aircraft. Clean all corrosion from both the braided cable and the connecting point on the plane. Replace the cable and tighten the bolts securely.

Do not tighten (or loosen) any nuts or bolts having to do with the mechanical workings of the plane such as engine mounts, stabilator connecting bolts, axle bolts, or landing gear parts. These bolts and nuts need a fine touch and usually require a torque wrench to be adjusted properly.

A little preventive tightening here and there can save an awkward situation later.

Is your engine cooling air going where it is supposed to go? Open your engine compartment and look at the rubberimpregnated baffles. These are the floppy things that are usually stapled to the top of the aluminum housing that surrounds the engine. They are supposed to be bent inward toward the cylinders so that when the air pressure is applied from the cylinder side, they are pressed outward against the cowling. If you raise the cowl and inspect its inside, you can see where the baffles have been rubbing (good) and where they have not been rubbing (bad). The rubbing is a sign that they are effectively sealing the air inside the engine compartment and thereby forcing it to flow down through the cooling fins on the cylinders. If the baffles are bent outward or are torn or missing, your engine is not getting the cooling it deserves. Get the baffles fixed for longer engine life.

Did you know that your plane was equipped with an accordion? Let's see a show of hands class. How many can point it out?

This accordion is a source of potential trouble in older Comanches and should be inspected very carefully at regular intervals. It is the flexible duct between the air filter and the engine's air inlet. If the accordion has holes in it (even pinholes) the air which is sucked into the engine through these holes is not filtered. Dust and dirt can reach the cylinders through the air system and can shorten the life of the engine. Of course, the problem is more severe when the plane is operated in dusty conditions. To detect these pin holes put a bright light inside the accordion on a dark night or in a dark hangar and look for light leaks. Get it fixed for longer engine life.

And while we are talking about dirt bypassing the air filter, we remember that we read somewhere that one should not run with carb heat on for long periods of time on the ground. The operation of the carb heat control causes a bypass gate to open and allows air to enter the induction system without passing through the air filter. Of course at altitude, this is not so bad - until the pollution layer gets that high.

Now I know everyone who has a carburetor heat control is rushing right out to the plane to see where this bypass trap door is. While you are looking at the business end of the carburetor heat cable, check the bushings and shaft of the control and also the throttle control on the carburetor itself. You can find these check points better if you have someone in the cockpit to operate the controls (one at a time) while you are looking for what moves in the area of the carburetor and air box.

On injected engines check that the alternate air doors close tight when the handle is in the Normal position and that the spring and mechanism allowing the door to open by itself operates correctly if vacuum exists in the air intake system as a result of engine nacelle openings being clogged by snow or slush.

## Windshield Covers

I recommend having a cover to put over the plane not inside such as curtains or reflectors. Covers keep the interior cool both for people and equipment.

When it snows the cover keeps snow off the windshield so that when the cover is removed. The windows are clear and ready to go. It also helps after a rain in preventing dust from settling on the windshield and getting it dirty or scratched.

Third - the cover is a protector against blowing sand. However, the cover should have a soft backing and be kept clean and tight to minimize scratching.

There are only three drawbacks I have about the cover.  
It rots in the sunlight and then tears when frozen and stuck to the aluminum.  
The space it takes in the luggage compartment (small price to pay).  
Cover takes two people to put on when the wind is blowing.

## Spark Plug Cleaning

Since the introduction of so-called low lead fuel, we are forced to clean the spark plugs more often than we did several years ago. Constant cleaning wears the insulator down and this can even change the heat range of the plug if sand blasted too much. I would suggest that you use a lower air pressure on plug cleaner than you would use for an automotive plug.

Now there is a better way. Turn the plugs upside down and fill them with HOPPES gun cleaner and let them stand all night. Next morning scrape the loose lead deposit from the insulator with an old dentists probe. Then sand blast lightly and the job is finished.

## Keys

**Q.** At various times during the past year, I have had to replace each of the locks on my 1970 Comanche. I now require three keys if I want to go anywhere. One key for each door and one for the starter switch. HOW can I fix this problem short of buying another set of locks? The part I enjoy most about the FLYER is the help it gives in providing answers to problems such as this.

**A.** Use the starter key as your master key. Remove the lock barrel from both the baggage and cabin doors. Any competent locksmith can fix the tumblers in them so that they match your starter key. This is a simple fix and will get you back to a single key. Some people like to have two keys, one for the starter and one for the doors. They feel that there is an element of security, especially if the keys are kept on separate rings.

## Painting Preparations

Preparing the wing for Imron, I removed the flaps, ailerons, and tip tanks to insure a complete job. Decided it was easier to completely strip these, though the paint shop(s) only strip the top surfaces, normally, if the paint has a good bond, and the owner doesn't ask for a complete strip. Good thing I did! Found considerable corrosion, under the paint, (synthetic enamel, 1971, good condition), behind the gear, on the flaps. The only sign of this was "stains" on the paint. Immediately stripped the wing behind the gear and found the same. Recommend all low-wing A/C, up for repaint, be stripped behind the gear, as a mandatory check on this. By the time we are due for repaint again, those would be holes!

## Painting Tips

I had the plane painted two years ago and at this annual we discovered the concealed iron fittings in the tail cone had started to rust. From the evidence it seems that during the stripping process, the protective paint was inadvertently removed, exposing the cleaned fittings and permitting the rust. When the spray paint came through the rear opening it protected some of the parts perfectly. Lesson learned - tell your painting contractor about this next time. We checked all the other possible areas of the plane that could have this damage, but couldn't find any

## Dirty Belly

Until recently, I have had to clean the bottom of the fuselage of my Comanche about every fifty hours for this area has always collected a dirty oil film.

At the suggestion of our Tribal Chief, I installed a vented can to the bottom of the oil breather tube AND - no more dirty belly!

The container used to arrest the oil vapors from going overboard is a standard aerosol paint can with the center section of the top removed. At the junction of the top and sides, I used a one-quarter inch drill and created several vent holes.

On my Comanche, a 250, the oil breather tube is located against the right firewall so that all I had to do to install this device was to cut a couple of inches off the bottom of the breather tube, and then slip the breather tube into the container making certain that the bottom of the container rested on the flange to which the bottom cowling attaches.

Simple - YES - Effective - YES - Cost - NOTHING.

## **Dirty Belly**

While going through some past tips, I noticed someone said that they used an empty aerosol can to catch crankcase fumes. Our bird also has a drain tube from our wet style vacuum pump. I attached both the crankcase and wet pump drain tubes to an aerosol can and now no more drips on the hangar floor. Works great. Crankcase tube fits into top of can and a 1/2 inch diameter 90 degree copper elbow soldered to the side of the can receives the wet pump tube. Be sure to make breathe holes around the top of the can. I clamped the can to the engine mount tube.

## **Exhaust Gaskets**

These inexpensive copper gaskets should be replaced if you see the tell tale grey exhaust on the cylinder head. I have seen numerous cases where the owner eventually spent \$600 for a new cylinder that was burnt beyond repair.

## **Engine Fuel Pump**

These highly reliable pumps which are basically an upgraded automotive pump have a habit of failing when you most need them. If the aircraft has sat for more than a year, it ought to be replaced.

## **Ignition Wires**

Besides fuel for the engine, a spark in the cylinder is the next most important thing. There is no economy in cheap or old wires. Get the best. Don't replace a single wire but get a complete set. (Unless a single wire in your good set was damaged). If possible, carry a single spare cable and a couple of plugs in your tool box at all times.

## **Starter and Generator**

These essential items require only a little periodic care, but if you fail to do it, they will let you down at a most inopportune time. The basic care required is cleanliness and lubrication. The next time you have all the cowling off or if you have more than 500 hours since the last major inspection, it is time for a little preventive maintenance. Basically, this involves taking them both apart and cleaning with a blow gun and solvent to remove all carbon particles, dressing the armature and replacing new brushes, and lubricating the bearings and drives. Wire brush or sand all rust and paint and re-install. On the question of brushes, I took mine to the local automobile parts store and showed him the old ones and by not mentioning that they came from a plane, he looked at them and said '48 Chevy, \$1 a set.

Additional information from a maker of aviation alternators: At altitude, we found automotive brushes become fantastic abrasives! Decreased moisture at altitude was no longer present to provide the requisite lubrication qualities.

## **Voltage Regulator**

Just like it says in the manual this item requires periodic care. Mainly this involves cleaning the points, and checking voltage output on charge and adjusting as required.

## Engine Hoses

A fire or leak in any of the fluid hoses up front is generally disastrous. If you have observed on all post '73 certified aircraft that all hoses firewall forward now are required to have a fire proof sleeving which is either grey or reddish in color. This is capable of withstanding most fires. If your hoses are more than 5 years old, replace with new and for about 20 percent extra you can have the fire sleeving

## Ventilation Ducts

These are the red or black hoses for your heater, ventilation, and carb heat. When replacing these, I recommend getting the best which is called SCEET, available at most mail order places. It is priced accordingly, but worth it.

## Grease Nipples

If your bird is nice and clean on the landing gear and wheel well, why not give it the ultimate compliment by fitting the small plastic or rubber grease nipple covers. It looks professional and makes it easier not to miss any on the next grease job. And by the way, grease is very inexpensive compared to bushings and bearings.

## Generator Belt

The next time you have the prop off or when it is your turn to comply with the Hartzell AD, consider not only replacing the gen belt, but also install a second generator belt. That's right, a second belt. It is installed and safety wired onto the engine so that it does not interfere with any part. Then if your original belt is damaged or worn, you can cut the old one off, and slip on the new one. All this can be done without removing the prop. If this is done, it will more than pay for itself because the last time you paid for a new belt, I bet the labor charge for removing the prop was more than the cost of the belt.

**ED:** This trick might get you home without pulling the prop, but most belts that applied like this have been subjected to heat contact with the engine and are not in good condition.

## Aileron Explosive Rivets

While the local mechanic was working on the ailerons to install the new brackets (AD), an interesting thing happened. Older Comanche's used explosive rivets where a conventional rivet could not be used. Local mechanic was cutting these off with diagonal cutters when one exploded. He ended up with a small cut over one eye, and cuts on one hand; and a severe case of fright. After armoring himself he continued cutting them in the same manner, and two or three more went off.

If you have an older plane and the AD has yet to be complied with, it might be wise to forewarn your mechanic.

## Baggage Door Water Drain

I was working inside the baggage compartment of my 180, with a bright extension cord light, when I noticed that the space between the baggage door and the inside door liner was filled with water right up to the level of the first lightening hole.

It had been 2 weeks since the bird had sat outside on the ramp in a hard, driving Texas rainstorm. That water had been there a long time and wasn't going anywhere till it evaporated.

I drilled a couple of 1/8" drain holes in the bottom of the door. In the future I will periodically check to see that the drain holes have not plugged.

## Insulation

Ensolite is great stuff and really makes the airplane quiet. Pete Duckins of Milcut, Inc., PO Box 18645, Milwaukee, WI 53218 can supply you with the Ensolite. I also have a certificate of compliance from the FAA given to US Rubber showing the material is approved for installation in aircraft. You will need 25' of the material which comes in 60" widths. This will include doubling up on the bottom of the floor boards as well as the bottom of the aircraft. It will also take about 2 gallons of good quality commercial contact cement which dries non - flammable. The cost of the Ensolite will run you somewhere in the neighborhood of \$80.

## Exhaust Slip Joints

I've had my share of problems with the Comanche 180 exhaust system due to the crossover slip joints freezing up.

On one occasion with only five hours time, after it had been 'unglued' welded and reinstalled, I was amazed to find that the slip joint was already frozen up with ceramic like material from the lead in the fuel. Months later the system developed a minor exhaust leak with the typical dusting of white powder.

I happened to mention about the difficulty encountered in separating the frozen joint to the mechanic at that field. He came right back with "don't use strong arm methods, just run the engine up to get the exhaust system hot and as soon as you shut down squirt WD-40 into the hot slip joint".

Sure enough the joint slipped apart as if the joint contaminant were soft toothpaste consistency material. That solved the problem of separating the joint for maintenance.

The next problem was how to keep the joint free so it could 'work' and not produce cracks. The obvious solution seemed to be to give the hot joints a dose of WD-40 at shut-down for the day. I've been doing this for eighteen months and the joints have remained unfrozen and the system free of cracks. The excess WD-40 does tend to make a bit of a mess on the inside of the cowl, but I feel that is a small price to pay to keep the joints free and able to slip.

## Never - Seez for Exhaust Slip Joints

I, too, was plagued with the problem of non-slipping slip joints. Penn Air Inc., through the efforts of ICS, has been testing a product called Never - Seez NSBT - 8N which is a high temperature compound rated at 2,000. This product has been used on my 180 slip joints for about two years.

On my way back from the annual convention at Everett, WA, on a preflight in the wilds of Canada, I noticed a cracked exhaust stack (one of the slip joint stacks). When the bolts were removed, the section slipped out with no problem, with no sign of seizure. The compound was still white colored and I cautioned the mechanic to leave it there and not to clean the pipe.

From my experience, I highly endorse this product and understand it is available from Bearings, Inc.

## Never - Seez for Exhaust Slip Joints

In July of 1980, I wrote a note for the Flyer regarding exhaust slip joints and a product called Never - Seez (Part #NSBT-8N) which helped to keep these joints from seizing.

When the exhaust system is heated, the entire system expands. The slip joints (or expansion joints) allow the system to expand and contract. If they seize up, the pipes will crack or break.

It has been difficult to evaluate the product as I have found that most mechanics or owners will not take the few minutes necessary to coat the joints with Never - Seez.

At the ICS Convention in Quebec City, I talked with a member who has used the product since 1980. He reports that he recently took his exhaust system apart and the slip joints were all free. So the product can help but only if you take the time to use it.

It can be purchased at most bearing supply houses and comes in a handy 8 oz. brush can.

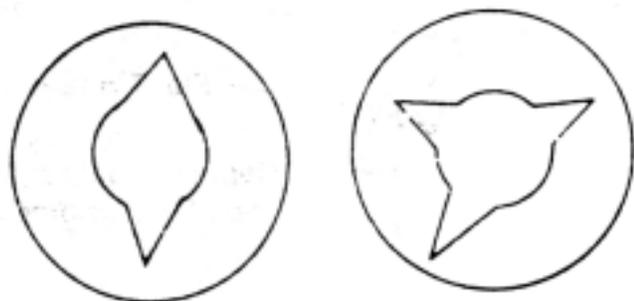
## Twin Engine Mounts

PA-30 and PA-39 owners with vibration problems would be well advised to obtain a copy of Piper service letter No. 223. The letter recommends replacement of the Lord mounts every 500 hours.

Our PA-30 had approximately 1,200 hours on engines and mounts when we noticed a slight vibration which became rapidly and progressively worse. With the right engine feathered the vibration was somewhat less severe than with the left engine shut down, which isolated the source to a degree, but we spent some very heavy bread on other people's OJT before the problem was solved.

The local Piper dealer, an FAA approved repair station, didn't give us any satisfaction, so we called in a neighbor A & P of the grey haired variety who recommended that we check the torque values on the Lord mount bolts. We had already done that, so this time we removed the rubber donuts for an internal check as per the service letter. They looked something like this: Externally, it was impossible to tell how badly they had deteriorated. At the same time, we removed the stabilator, weighed the bob weights, re-balanced it, and replaced it with new bushings.

Now our air-taxi customers compliment our Comanche on its nice, smooth ride. Keep up the good work.



## Mouse Proofing

Our "T" hangar is not enclosed and our worst problem has been field mice who build nests in the belly and at their leisure have snacks on the insulated wiring.

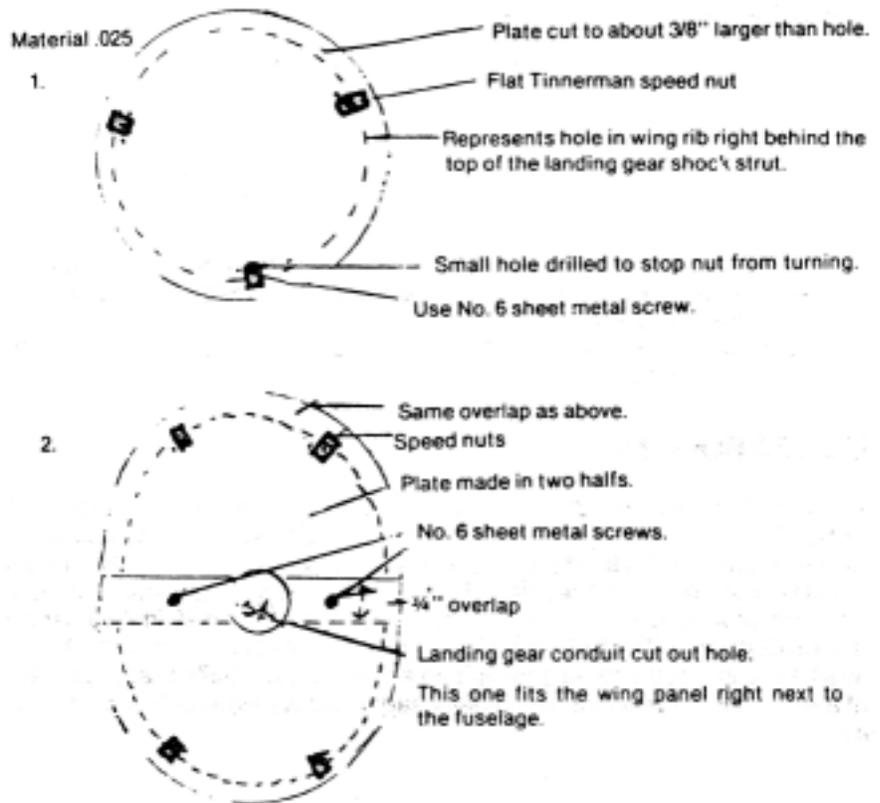
Their last lunch cost us a \$495 repair bill to our landing gear system. I would like to pass on our "fix" on this problem. I had three sheet-iron tubs manufactured here locally that fit around the mains and nose gear. Each tub is 20 inches high and 24 inches in diameter with interlocking fastener. Inside of each tub, near the tires, I have placed a commercial poison and with an added feature, baited rat traps. We know that a feline hangar resident would be cheaper, but we are unable to entice a cat to stay.

## Mouse Proofing

I remove the original wheel well baffle shields that were made of too light of material and soon cracked from the air pressure that is built up in flight. I make new baffles out of .025 using the old baffles for a pattern, also trim so that the baffle fits close enough to not let the mice in. I also glue a good quality flexiblefiber cloth to the top of the baffle.

This seals out dirt and grass etc. from getting in the wing area.

This is a rough quick drawing, but it should describe it.



## Electric Flap Motor

Flaps would not retract during preflight ground check.

Access to the flap motor assembly is through the baggage floor, because this particular motor is physically located under the center section of the forward one-third of the floor. The baggage floor CAN be removed through the baggage door with some difficulty and bending. Otherwise remove all seats and remove floor through cabin.

Installed the new motor, along with a new rubber coupling which acts as a universal joint to the transmission. Everything went back together and worked beautifully, for two days, then failed. We could hear the motor running, but the flaps weren't moving.

This time, the trouble was slippage of the new rubber coupling along the shaft, allowing complete disconnection between motor and transmission. The old coupling was well stuck in place from heat and age; but the new one was not. We added small plastic spacers each side of the coupling; now it cannot get out of place. We suggest this small addition any time you go through a similar process. The floor panel was replaced through the baggage door.

## Aileron Cable Cut by Screws

Watch out for too long screws in wheel well mud shields. Found one rubbing on aileron cable cutting it half way through.

## **Bad Spark Plug Detection**

It is easy to find a bad spark plug by letting engine-cool down slightly and smudging some green chalk on each exhaust stack and then restart the engine on the bad mag only. The cylinders that are firing will turn the chalk white and the non-firing cylinders remain green.

## **Twin Exhaust Heat Shield Burn Through**

On this latest 100 hour inspection, our service facility found that the engine heat shields, Piper Parts 23512-01 and 001, were starting to fail. These are two thin stainless steel sheets, with a small amount of insulation between them, protecting the bottom shell of the engine nacelle.

There is a round three or four inch hole in the bottom aluminum engine shell against which the top of the stainless steel heat shield sits and can be seen through the nacelle top inspection plate behind the firewall. Our right engine heat shield was starting to fail; possibly allowing some exhaust fumes and heat to get through.

About three inches above this failing heat shield is a fuel line and just a few inches more is the thin aluminum shell that holds the auxiliary rubber fuel cell in place.

We asked our service people to insulate the fuel lines and install a removable three to four inch round stainless steel snap-in cover on top of the visible top section of the heat shield as further fire proofing.

We did find the two new heat shields but it took two weeks, phoning all over the USA to do so.

## **Twin Exhaust Heat Shield Replacement**

We have found some aircraft where the exhaust heat shield assembly P/N 2351200/01 (no longer available) has been eaten away by the ravages of heat and time. I am referring to that stainless steel area which is hollowed out under the nacelles and behind the cowl flaps, into which the engine exhaust spills. There is a fuel line which runs above that heat shield, in such close proximity, that failure of the heat shield can create a hazardous condition. Knots 2U, Inc. manufactures a stainless steel nacelle fairing which is installed in that area and closes that hollowed out area so that the exhaust gas, as it exits the stacks, is smoothly curved downward to the surface of the fairing and then crosses to the rear of the wing, on the stainless steel of the fairing. There are numerous advantages to the installation.

1. We have experienced a 4 - 5 mph. speed increase as a result of the improved aerodynamics.
2. The space between the old heat shield and our new stainless steel nacelle fairing can be filled with an improved insulation material reducing sound level considerably.
3. The exhaust gasses and associated heat is now separated from the area containing the fuel line, in a much safer manner.

Finally, a benefit which I personally enjoy is the ease with which I can clean the exhaust stains on our smooth stainless steel fairing, as compared to the messy rough area which existed previously.

## **The Whistle Slot Freezing of engine breather tube.**

During the past winter in very cold temperatures the following happened. The end of the engine breather tube froze up, a pressure build up occurred in the crankcase, and the crankshaft nose seal ruptured. The oil leak that resulted covered the aircraft with oil from nose to tail. Fortunately, a safe landing was made before all oil was lost.

First, the cause of this incident. Moisture is expelled through the breather tube which often extends through the bottom of the engine cowling into the air stream. Under very cold conditions, this moisture may freeze and continue a build-up of ice until the tube is completely blocked.

It is normal practice for the airframe manufacturer to provide some means of preventing freeze-up of the crankcase breather tube. The breather tube may be insulated, it may be designed so the end is located in a hot area, it may be

equipped with an electric heater, or it may incorporate a hole, notch or slot which is often called a "whistle slot". The operator of any aircraft should know which method is used for preventing freezing of the breather tube, and should insure that the configuration is maintained as specified by the airframe manufacturer.

Because of its simplicity, the "whistle slot" is often used. Although the end of the tube may extend into the airstream, a notch or hole in the tube is located in a warm area near the engine where freezing is extremely unlikely. When a breather tube with whistle slot is changed, the new tube must be of the same design. Replacing a slotted tube with a non-slotted tube could result in an incident like the one described above.

## **Stainless Steel Hardware**

Stainless steel hardware kits are becoming available through a number of outlets. For those interested in putting their own kits together, there are cheaper alternatives than the package kits. Most industrial suppliers sell stainless steel fasteners at half the price of the prepackaged kits. The benefit of the stainless steel hardware is fairly strong in the Northwest where we get a fairly steady dose of moisture year around. As the years go on and the screws are removed for inspections, changing them to stainless is a reasonable alternative.

A little understanding of the terminology is all that is necessary for starting one's own hardware kit. The bulk of the screws used to hold the cowlings down are "8-32 x 1/2" TRUSS HEAD PHILLIPS" machine screws. The 8 in 8-32 refers to the diameter and the 32 in 8-32 refers to the number of threads per inch, 1/2" is the length, while "TRUSS HEAD PHILLIPS" is the type of head. Aircraft screws generally use "TRUSS HEAD" which is a low profile screw as opposed to a "PAN HEAD" which would also work but would stick out more.

Another type of screw used a lot is the "FLAT HEAD PHILLIPS 100" machine screw. These are seen on fuel tank access covers. Note that aircraft screws use a "100" countersink instead of the '82" bought in hardware stores; so note the difference.

The last type of screw is the sheet metal screw. Most sheet metal screws fasten into a tinnerman nut which takes a type "B" sheet metal thread instead of the type "A" which has a sharp point and different pitch.

Three things to identify when ordering a screw are:

1. Head: example, "TRUSS HEAD PHILLIPS"
2. Threads: example, 8-32 (sheet metals are No. 8 or No. 6's etc.)
3. Length: example, x 1/2" etc.

A good start on a stainless steel kit for most Comanches would be as follows:

1. 100 6-32 x 1/2 " TRUSS HEAD PHILLIPS
2. 200 8-32 x 1/2 " TRUSS HEAD PHILLIPS
3. 50 10-32 x 1/2" TRUSS HEAD PHILLIPS
4. 200 6-32 x 1/2" FLAT HEAD PHILLIPS 100 Countersunk
5. 200 8-32 x 1/2" FLAT HEAD PHILLIPS 100 Countersunk
6. 100 No. 6 TRUSS HEAD PHILLIPS SHEET METAL TYPE "B"
7. 100 No. 8 TRUSS HEAD PHILLIPS SHEET METAL TYPE "B" (for '58 and '59 wingtips) or 100 No. 6 FLAT HEAD PHILLIPS SHEET METAL TYPE "B" (for '60 and newer wingtips)
8. 50 6-32 NYLON INSERT LOCKNUTS
9. 100 8-32 NYLON INSERT LOCKNUTS
10. 100 No. 6, 200 No. 8, and 50 No. 10 NYLON WASHERS for the areas where heat is not a factor such as holding the cowling on.

The preceding list will provide many extra screws, but it seems as though every time I take the cowling off, a screw or two is lost. It is always handy to have a few extra. The cost for the above if bought from a place such as Coast Industrial in Portland would be about \$40. Shop around, the prices do vary. To store the hardware, I bought one of the flat fisherman's fly tie boxes which displays the screws making them easier to find. The box is also a good way to organize.

## Leading Edge Tape

Anybody get nicks on the leading edge of their elevators? Try puffing on the scotch brand of heavy tape over the leading edge. It works wonders. You can wax it too. If you have blue trim use blue, red, or whatever color or black. It is called Scotch brand plastic tape and it is 1 1/2 inches wide. Waterproof and stretches really well. **ED:** Works equally well on leading edges of the wings.

**ED:** Balancing of the stabilator is a VERY delicate affair – even a slightly too thick layer of paint in the wrong place can make it impossible to balance it correctly, which again can lead to catastrophic failure through buffeting. I do not know if application of the mentioned tape can be dangerous.

## Wind Control Locks

Control Locks: There is a very inexpensive alternate to the wind lock device being advertised in the Flyer. Just purchase a pair of suitable length shock cords with hooks from any automotive or hardware store. (Approximate un-extended length 24 inches.) Hook each diagonally from pilot control column to co-pilot rudder pedal and visa-versa. Then complete tensioning by pulling each cord through the inboard section of each column and hooking together. This keeps rudders and ailerons neutral while stabilator goes to down position.

## Wind Control Locks

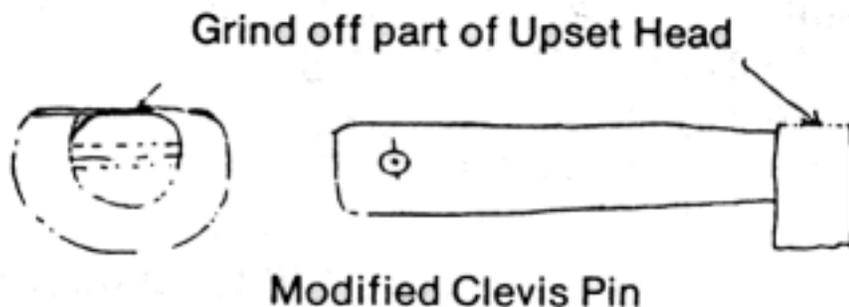
A single long bungee works fine. Hook it around one brake pedal then through the yoke and run it across and through the other yoke and affix the other end to the the other brake.

I also experimented with a shorter bungee and planned on hooking it under the panel or somewhere equally convenient. After looking at the options for places to attach it, I decided that I didn't want anything hooked under the panel because of the risk of damage to components behind the panel.

## Cowl Latch Hinge Pin

If you haven't already received this tip, it might save someone some unnecessary expense. One of the hinge pins on the cowl latch (Piper P/N 12723-004) on our PA-24-260 broke off at the cotter pin hole. A check with the Piper parts distributor revealed that the pin was unavailable as a piece part; only the entire cowl latch assembly (number above) could be obtained, at a cost of \$22.65. A kind hearted mechanic showed me how to make a replacement pin using a standard clevis pin, Part No. MS 20392- IC-23, also available as Piper Part No. 424149.

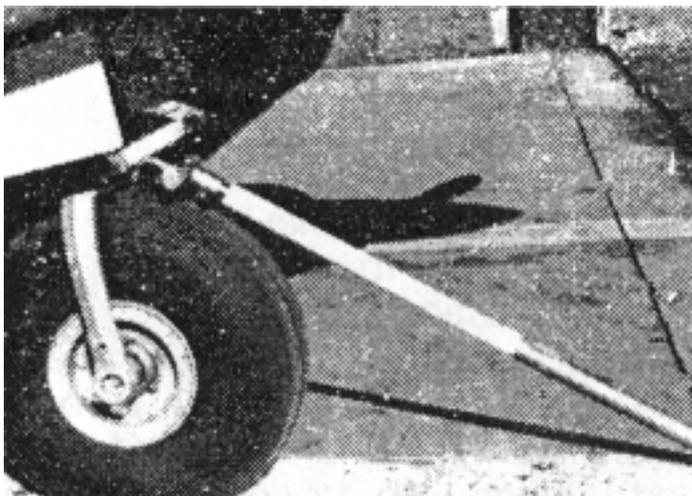
One simply grinds off one side of the upset head on the clevis pin, to match the existing part. Note that on the Comanche 260, the flat face must be ground off approximately parallel to the axis of the cotter pin hole; otherwise, the hinge assembly interferes with insertion of the cotter pin.



## Tow Bar

I did get out my tow bar that I made several years ago. The bar is basically the same except I changed the hooks a little, but the important difference is that on the lower side of the bar I welded a piece of three-quarter inch aircraft tubing crosswise in such a position as when one lets go of the bar it will fall down and the hooks raise out of the steering fork lugs and fall free; thus there is no chance of the prop striking the tow bar or taking off with it stuck in the front fork. The savings here can be very worth while.

Pictured right is the tow bar that Steve modified.



## Aileron Cable Separation by Corrosion

I send this letter because I had a Mayday happening recently in my 1961 PA24-250 which could be repeated by some other Comanche pilot.

Upon take-off while at about 500 feet altitude, an aileron cable separated depriving me of all aileron control capability. It developed that the cable, which had been "inspected" each year for at least the eight years I have owned the plane, had, apparently corroded and rusted at the point of the wing root, (where wing joins fuselage) until it finally separated. The corresponding cable on the other side was badly rusted at the corresponding point. Each annual inspection had not revealed this dangerous condition.

A gentleman at the Flight Safety District Office advised me that for a proper inspection, the aileron controls should have been rotated from stop to stop by a person at the controls while the inspecting party should feel the cable for the entire length of movement with his hand (through inspection plate, preferably with a cloth in hand to detect any fraying or rusting) on both sides of the aircraft.

I was able to land without injury or damage, but the next pilot might not be so lucky.

## Sheared Wing Rivets

During the annual (my AI) being the over careful inspector that he is, while pulling himself from under my bird, noticed a small chip in the paint, up under the right wing, the chip being about 1/4", to 3/8" in size. It was between the body and the flap of the right wing. He stated that he did not like what he saw and had me get under the wing and lift with my back, while he looked in the area. What he found was a very slight deflection in the right wing that was not in the left wing. He said to remove the rear area of the bird, and after removing the rear seat, the luggage area panels, etc., he climbed inside the luggage area to have a look. He could not see anything, out of the norm, so next he started with a small punch and a small hammer. He tapped each rivet one by one and found a very slight movement in a couple after turning upside down with mirrors, etc. he found that - EIGHT WERE SHEARED IN HALF, about 12 hours worth of work in the removing and reassembling, plus the replacement of the rivets 7085P was as good as new. I think that we all need a close inspection of our birds in this area.

## Control Cables Tension

It has been brought to my attention that a number of Comanches have very loose Control cables. When an owner brought his aircraft into our shop and complained that the auto pilot was behind the aircraft or was flying it sloppily, in most case we found the control cables were too loose. Once they were properly tensioned, the problem was solved. Listed below are proper cable tensions:

### PA24

Ailron	26 lbs +/- 20%
* Rudder	18 lbs +/- 20%
Stabilator	18 lbs +/- 20%
Stabilator Trim	12 lbs +/- 20%

\* Measurement to be taken at flexible cable located near firewall.

### PA30/39

Aileron	26 lbs +/- 20%
Stabilator	18 lbs +/- 20%
Stabilator Trim	12 lbs +/- 20%
Rudder Trim	10 lbs +/- 20%
* Rudder	25 to 40 lbs

\* Measurement to be taken at flexible portion of control cable near the forward cabin bulkhead.

For those with auto pilots installed at factory or the same auto pilot installed elsewhere, the bridle cable for the roll control as well as the bridle cable for the pitch control should both be at 17 lbs. + 2 lbs. This on the advice of Scott Collins at Century Flight Systems in Mineral Wells, TX.

Please be sure that the cables in your aircraft are adjusted as they should be.

## Water in Twin Engine Nacelles

Water can collect in The rear of each engine nacelle. Up to one gallon has been reported.. Make sure there is an opening between the skin of the wing and the skin of the nacelle at the lowest point. Big enough not be clogged by dust/dirt from the inside. Check with a heavy gauge safety wire and/or air pressure.

### WATER WICKING

The mention of water wicking in the belly fiberglass of our Comanches, should be in the "Tips" from my letter of years ago. When we redid the belly, we found the problem and replaced the fiberglass with fire-resistant closed cell foam. Also replaced the floor rivets, (with FM approval), with P.K. and timmermans, for future needs to remove the floor. I don't know about other manufacturers, but it seems all Piper metal aircraft have "reverse" lap joints in the skins. It still leaks like a sieve, tied down, despite new window caulk. Came to the same conclusion, that it was through the skin-lap-joints. Short of re-bucking all the rivets, not sure how to cure it. Repaint is a temporary cure. Anyone know if "Par-al-Ketone" can be thinned down enough to wick it into the skin joints? Attempts to thin silicone rubber enough have failed.

## New Paint Job Planning

Here are a few suggestions to consider when contemplating a new paint job:

1. Replace all rusty exterior screws (with stainless) before painting where possible.

2. Never use cheap paint. The actual paint job only takes about 4 hours, however, normal surface preparation and masking usually takes between 90 to 100 hours of hard work.
3. If the new paint scheme involves a dark color on the upper nose cowl, or upper fuselage, consider "clear coating" these areas to protect the pigment from fading (especially reds and blues).
4. If you are not a creative person (visionary), I highly recommend that you consider a modern "Piper" factory design such as on the Turbo Arrow, Saratoga, Archer, or Malibu.
5. Never put a Cessna scheme on a Piper, a Piper scheme on a Beechcraft, a Mooney scheme on a Cessna, etc.
6. If you are planning to strip the aircraft, consider the newest process of plastic bead blasting instead of the corrosive chemical process (especially if you have never stripped an airplane before).
7. When picking trim colors, be sure that they contrast each other sufficiently enough to complement each other, otherwise they may look like the same color, (example: orange and brown, red and black, dark blue and light blue).
8. Custom features to consider are:
  1. Glass flake (Gold and/or silver) and then "clear coated" offer a very custom look to either metallic or solid colors. The darker the color, the better this process looks. Example: black trim color oversprayed lightly with some gold and some silver glass flake mixed with clear, then just clear as the final topcoat.
  2. Split color fuselage. Example: white over gray, white over creme, blue over white, etc. With this type of scheme the trim colors separate the two-tone fuselage. Another popular style today is the new "Laser" designs which complement the split color fuselage.
  3. Painted leading edges (trim colors) which looks similar to de-icing boots. A small painted on pinstripe adds even more to this custom feature, and it's great for hiding summertime "bugs".
  4. Total aircraft "clear coat" adds depth to the already "wet look", protects all paint pigments from fading, and relieves the pristine aircraft owner of ever having to wax the aircraft.
9. Remember to elevate the aircraft on jacks to facilitate painting of the belly and underside of wings. And while you have it up on jacks, go ahead and do the after-paint retraction test.
10. Keep the FAA happy! Plan your new paint scheme with 12 inch registration numbers. This is important to remember when planning your paint job.
11. Last, but not least, never repaint a Comanche without rebalancing the horizontal stabilator. The polyurethanes available today are heavier than the acrylic lacquers that the factory used. "High speed flutter" could be the result. While the aircraft is in for this maintenance, lubrication, new weight and balance, and returned to service entries in the logs are mandatory.

**ED:** HQ has received two reports of serious problems with bead blast stripping - beads in fuel system and engine accessories.

## Paint Stripping by Bead Blasting

There are potential hazards associated with careless or improper technique when using the "plastic bead blasting method" for removal of paint.

The "media", as it's called, is a sandy colored ground plastic reminding one of fine sand. It is shot onto the skin under controlled air pressure. If it is directed too forcefully, it will stretch the skin, causing "oil canning". Control surfaces, which are very thin, are extremely susceptible to deforming.

In my case this did not occur; but as I later discovered, the shop did not strip the control surfaces at all so as not to cause damage. They neglected to inform me about this, thus subjecting me to possible flutter! Fortunately this has not happened.

What did happen was that large quantities of media contaminated every part of the fuel system resulting in dual engine failure (while cleared for takeoff). Six weeks and many thousands of dollars later we believe the problem is solved. Along the way, we experienced catastrophic left alternator seizure in flight. The event was so violent as to shear the brackets, and snap the belt, which punctured the nose bowl. Upon examination the right alternator was about to similarly fail. A starter motor had to be replaced as well.

The left engine driven fuel pump was affected and had to be replaced. Both fuel injector servos were contaminated and required overhaul. The fuel dividers had to be cleaned, and many require replacement. Fuel began leaking from the aux.

tanks into the mains, and also was leaking out the belly drains. The fuel valves had to be overhauled. Media that settled to the bottom of the cells, adhered to the rubber and had to be physically removed.

By now the picture should be clear that one must be very careful when selecting a shop to paint your pride and joy. I have since learned a bit about preparation and painting. The experts tell me that the process of bead blasting is quite good, if done properly. Some shops who are noted for excellent work have evaluated the method and rejected it for the foregoing reasons, and also because they claim it is not as efficient as claimed by the makers of the equipment.

My advice is:

choose a reputable shop, ask for references and check same, ask about precautions, ask to see the insurance policy (and call the company to make sure it is in good standing), ask for written performance guarantees, show up unexpectedly during the process, and be suspicious. Not all shops are excellent, and now and then there is one that is plain shoddy and dishonest. Unfortunately, this casts a shadow on everyone in the business.

## Painting Tips

I turned to the DuPont Imron system and their preparation treatments. I have painted a number of cars with Imron with excellent results but did not particularly like their primers because they gave too much buildup. Now, they have a new primer just for aluminum which one can put on as thin as you like.

I contacted Aero-Blast the manufacturer and patent holder of the glass-bead blasting system. They now have a plastic blasting system that varies the size and density of the beads for the application. They are much softer and a skilled operator, I found, can take the paint surface off but still leave much of the original primer, so if you have a good underlayerment, you can save quite a lot of time and money when re-coating.

Aero-Blast put me in touch with SBN Aviation in South Bend, IN. Many conversations back and forth with Phil McClure, head of the maintenance division of SBN convinced me that they had done this enough times to know what can go wrong and how to prevent it.

First, they completely remove all movable surfaces and blast them separately. When the rest of the airplane is done they put the movable surfaces back on and re-balance them. They remove the engine cowling and completely enclose the engine and compartment in plastic, put the panels back on and thereby prevent plastic beads from getting to the components like had evidently happened.

Finally, after the blasting is complete, they remove all inspection panels and vacuum and blow out as much of the plastic media as is possible. Evidently there is always a small amount that gets in nooks and crannies to be worked out as the airplane is flown and used over the next few months. But, after they are done there is no significantly noticeable media inside anywhere you can look without a major effort. Naturally, all the windows, nooks and crannies, crevices and openings have been masked prior to the blasting treatment.

After the major work is done a fine detailing gun is employed to go around each nut or rivet head to ensure an even surface before priming. The overall result was a light green airplane showing the original Piper zinc chromate primer with occasional places where bare metal showed through.

Prior to painting, I used DuPont's 225 and 226 surface treatment and Alodine system to ensure that where metal was showing through it was properly prepared to hold the primer. One gallon of Corlar 224 primer was enough to do a light seal over the entire surface. It is incredible how much paint it takes to cover a Twin Comanche! While three quarts of Imron are enough to do a typical car like a compact to mid size, it took four gallons of Imron to lay on the base coat on the PA 30. That is a lot of weight!

My experience with painting automobiles led me to believe the thinnest coat possible consistent with good color consistency is the way to go. Even so, a light mist coat followed by one wet coat of my tan base color used almost all of the paint I had purchased. There is a lot of area on that bird!

One precaution anyone painting with Imron (or I guess any other polyurethane) will soon realize is that stuff can kill you! It is extremely toxic and it forms a coating in your lungs, when inhaled, that can create a condition much like the flu. Charcoal canisters and filters are simply not sufficient.

I use a completely independent air system piped into a mask that I rigged up for that purpose. It has charcoal filters that clean the air from the air compressor that I use to feed the system. Since I use a Bessam-aire painting system, I only have one hose attached to my mask, and the spray gun is totally independent of that air source. Incidentally, both the Bessam-aire and the similar Vector systems are far superior to the conventional siphon and bleed air systems commonly used in paint shops. You get less bounce back and use more of your paint by putting it on the surface with those systems than you do with the conventional high pressure methods.

Also, the Bessam-aire gun is highly adjustable from a fine line to a broad swath that is quite even and well regulated. No gaps or thin spots either. When priming and painting the airplane, I had the flaps and ailerons removed but left the elevator in place, for ease of painting and to ensure that they were properly balanced upon reinstallation, I had that done by my really good maintenance shop at Berz Macomb Airport where I base the plane.

Incidentally, it takes two people to paint an airplane among other things because it is so large. Things like laying out stripes, etc. require four sets of hands and two sets of eyeballs to make it just right. Masking goes twice as fast and you have more time for painting. Then while the painting is going on the second person can be keeping after cables and hoses and making sure that the painter can reach and is comfortable for every spot on the airplane. A neighboring teenager hired on to perform those chores for me.

The use of extra high quality fine line tape for stripes and extra high quality masking tape makes a big difference too. Also, I found there is a treated paper that is far superior for masking when painting with polyurethane, because it does not permit the solvents or paint to bleed through and attack the underlying surface. Even though they say preparation is 90% of the job of painting, using high quality materials costs just a little bit more but is well worth it in terms of the overall result.

Also, if you should decide to do something like paint your own airplane, do not mix different manufacturers systems to save a few bucks on thinner or primer, for example. It is just not worth the risk.

## **Pitot Cover**

Saw aircraft with tennis ball stuck on Pitot head and thought that it was very clever. Swiped one from the wife and drilled a 1/2" hole. Works great. Red, yellow or white?

## **Tie Down Tension**

Noticed some aircraft are tied down with slack, others are taut. In the old days of hemp rope, we were cautioned not to tie down with a tight rope because if the rope got wet and the sun came out, the rope would shrink considerably. Do not believe this argument applies to plastic rope, and that the correct procedure is to tie the aircraft down fairly tight to prevent movement.

## **Corrosion Control and Protection**

What am I supposed to be looking for? Corrosion!

What does corrosion look like and what can be done about it if I do see some? There are many types of corrosion that occur to metals.

The first type is dissimilar metal corrosion. This is when two different types of metal are in contact with each other and are connected by a continuous path (salt spray, exhaust gas or any liquid or just moisture). Accelerated corrosion of one of the metals may occur. One area of-typical concern here would be the main landing gear retraction cable brackets which are made of Chromally 4130 Steel and attached to the aft face of the primary or front wing spar. There is one for each main gear cable and is found in the wheelwell inboard near the fuselage.

Then there is corrosion on the spar where the bracket legs attached.

Be sure to have your mechanics inspect these areas carefully, which can be done anytime and not just during the 100 hr. and the Annual inspection. I emphasize this because of the high stress area on the spar where the brackets attach and on where the brackets support the retraction cables. This could affect the landing gear operations and cause a failure.

The third type of corrosion is Intergranular. This is the least common type of corrosion and is an attack of the metal along the grain boundaries of metal alloys. It is found in aluminum alloys 2024 which make up most of the Comanche. Since 2024 Aluminum contains appreciable amounts of copper and zinc, it becomes highly vulnerable to this type of attack if not heat treated properly. This type of corrosion is difficult to detect until it shows its ugly face as blisters on the surface. At this point it is too late to do anything except replace the part.

What does surface corrosion look like? Normally, it will look like white or gray powder. When looking for surface corrosion, concentrate on the areas of the fuselage and wings where two skins overlap. I have found many areas along these seams where I see blisters or bubbles forming under the paint surface. I take a small sharp pick and puncture the bubble. I then look to see if there is a white powder on the bare metal surface. In some cases, if the corrosion pit is deep enough or if there is a concentrated area of corrosion along or on top of one of these seams, it may warrant drilling out the fasteners and separating the aluminum sheet for further inspection in between where the two layers overlap. Normally there is also a third layer which is either a rib or bulkhead where the sheets will be fastened for more strength. This area could also have corrosion.

This is where trained, qualified mechanics come to play so as to determine to what extent is the corrosion and if it warrants all the labor that will be spent to tell what the severity of the corrosion is. If your inspector has detected certain corrosion and feels that further disassembly is required in order to more accurately diagnose the extent of the corrosion, by all means, support him. Sure it is expensive at the time, and maybe you weren't planning on the added expense this could entail, but you are not only saving money down the road, you are guaranteeing that your airplane will be around for years to come to provide immeasurable enjoyment for yourself, family and friends.

An area of particular concern to me is airplanes that have been stripped through the years with chemical strippers. Those strippers will migrate under the seams of the skins and under the rivet heads and etc. In my opinion, it is almost impossible to completely flush these chemicals out of those areas. After a period of time, the corrosive elements in the strippers attack the metal surface layer and soon after severe corrosion sets in. This is the number one cause of all the blistering you might see around the edges of overlapping skins. The only cure is to stop using chemical strippers.

## Fire Hazard, Steering Rod Boots

Relocation of both steering rod boots to the cockpit side of the firewall all single engine models would permanently eliminate the problem of a burning boot.

**ED:** See Anatomy of an Accident. This proposal is prompted by Piper SL 435 which has already relocated the left boot on the 250 models to the cockpit. Piper did this to increase the useful life of the boot. Our reason is to make for a safer airplane. Contact was made with Piper Engineering on this proposal and their approval obtained, "as long as the boots do not interfere with the controls".

No control interference will occur if properly installed because the rudder pedal throw dimensions and clearances are identical on both sides. (If the boot will work on the left side, it will work on the right side.) Further, since the 250 dimensions are identical with all the single engine models, the recommendation will work for the entire fleet. Installation and sign-off should refer to SL435 which specifies anew boot PN 21378-00. These are reasonably priced at \$7.35 each from Av-Pac. An STC is not required and a 337 should not be necessary. P. K. Roberts has already modified his aircraft and forwarded the following notes:

Two people are needed. Remove front seats for access. The steering rod bolt through the right hand end of the steering bellcrank on the 250 is quite long with insufficient clearance above for removal. Move the bellcrank by turning the nosewheel by hand to the full right turn position to withdraw this bolt. Discard the old mounting plate in the engine compartment. Withdraw both steering rods as far as possible into the engine compartment to get them out of the way

when installing the new boots. Use an awl or temporary bolts from the engine side to assist alignment of the boot mounting screws.

The illustration in SL 435 erroneously shows the boots clamped roughly 3" from the end of the rod. This will not provide full rudder pedal travel as the boot compresses to its limit. The clamp must be mounted on the end of the rod as close to the rudder pedal as possible. You may again have to turn the nosewheel to the right during assembly to get the long bolt through the RH end of the steering bellcrank.

## Firewall Fuel and oil Lines Deterioration

We have had some failures in these lines that have had the possibility of being a disaster in the making. The lines I want to talk about are the governor oil line, the fuel pressure lines and the fuel flow lines. It was brought to my attention by one of our members of failure of each of these lines.

Basically, these lines fail for one of three reasons.

First, they are not properly secured, permitting the line to vibrate until it breaks.

Second, most of the lines are made of aluminum and can, and do, corrode.

Third, the line has been mishandled in such a fashion that a line that is intended to be straight is bent and one which is supposed to be bent is straightened. Either way can result in a fractured line and its early failure.

I cannot overemphasize that any fuel leak in the cabin area is a most dangerous situation. The fuel pressure and fuel flow, as well as the oil pressure, has a restrictor at the source to greatly reduce the flow if a line should fail.

There is no reason why, even given the age of our Comanches, they should not be as airworthy as when they left the manufacturer, but they must have proper maintenance. Both Piper and Lycoming issue service letters and service bulletins to point out the areas which may need special attention. An example of this is in April 1986, when we had one from Lycoming advising the importance of proper clamping of the governor oil line on the four cylinder engines. Obviously, many mechanics ignored this, so on some failure of the lines, the FAA came out with AD 90-04-06, which forced us to do what Lycoming wanted us to do back in 1986.

I can think of two ways we could improve the situation in which we are finding ourselves.

1. The aircraft with a carburetor, such as the 180, 250 and 260, has two pressurized lines that enter the cabin - fuel and oil. Each has an .040 restrictor at the source. I have not heard of any failure of a primer line, and this type system is common in many airplanes, including four engine equipment with reciprocating engines. The line from the source to the primer, although not pressurized, will have fuel in it pulled up by the primer pump. Other than the period of priming the engine, there is a dead line from the primer to the engine, meaning that no more fuel can get to it as long as the primer is locked. The tubing costs about \$3 per foot and comes in 12' lengths. I think this is more than you would need. Take a careful inspection and replace any or all of it if it is not perfect.
2. A more desirable fix, although more expensive, would be to install a pressure transmitter and instruments to read the signal. To do this, you need to find the items that would work with the pressures we have and then go through the FAA to get a systems approval to cover all of our aircraft. I do not know the cost of such a system, or how difficult approval might be with the present attitude of the FAA, but it would have the advantage of keeping fuel and oil out of the cabin. It would be subject to erroneous readings if there was a failure of either transmitter or the instrument which receives the signal.

I still believe that the system we have at present is very safe, if only the proper attention is given to these lines. You must look at them and replace them if there is the slightest doubt about their quality. And do not forget that the flexible lines also need to be replaced in a timely fashion while you are checking your other lines.

All of the failures I have known about have occurred in the engine compartment, other than one in a twin, which was just aft of the firewall in the nacelle. None of the failures have been in the cabin area.

## Storage

I have had several inquiries about what should be done if you need to put your aircraft in dead storage for a period of time.

See Lycoming SL 180A for information about the engine.

The aircraft itself should have the chrome part of the shock struts wiped down with a rag wet with hydraulic fluid #M1 1-H-5606.

Make sure that the tires are properly inflated as they lose air much faster than do the automotive tires. Once in the hangar where the aircraft is to be stored, fabricate 3 pieces of aluminum, or other similar metal, which is at least 12" wide and long enough to go around each wheel. With a metal brake, fold each end back 1/2" to 1/4" so that they can be hooked together. This will stop any mice from getting in the airplane. (See illustration.) I got this idea from Glen Farr, ICS #02561.

The battery should be removed and stored in some place where you know it will be above freezing temperature.

The fuel tanks should be topped off, as aviation fuel has a life of two years.

If you have no choice but to leave the aircraft outside, it must be adequately tied down with good control locks to prevent possible wind damage of the control surfaces. It would be wise to have someone check the security of the tiedowns at intervals.

Protective covers for the cabin area would be helpful, particularly if the aircraft will be outside and exposed to the elements.

## Cleaning

For the windows, we use turtle wax applied with a soft cloth to rub out dirt and bugs. A little water to dilute the thick wax makes it work better. Let dry to a haze and remove with a soft cloth dipped in house hold flour (not too much). This process removes the excess wax and the flour serves as a very fine pumice to polish the plexiglass. After some trial, one can get just the right amount of flour. The excess will blow away in the prop wash. You will be surprised how clear the windows become over time.

To remove bugs from the leading edges and other areas of the aircraft, we use Amway "Industroclean," 2 oz. in a 16 oz. spray bottle. Fill remainder with water. Spray areas to be cleaned, let stand a few minutes, and the bugs will start to dissolve and can be wiped away. Finish with another spray bottle with clean water and dry. This works great on the prop too.

When cleaning the belly, a dilute solution of Conklin's "Mox" is applied with a spray bottle and cloth. Mix 2 oz. product in a 16 oz. spray bottle & fill remainder with water. This alkaline solution works very well removing the carbon from the exhaust and other dirt. Again flush with clean water and wipe dry.

To wash the plane, Conklin's "Spring Dew" is used. Two or three bottle caps full in a bucket of water is all that is needed. The neutral PH of this product leaves the bird squeaky clean.

## Cable Lubrication

A generic issue during the annual was push-pull cables; cowl flaps, alternate air doors, heater controls, and most of all, landing gear cables. Bobbi introduced me to Bike Aid, finely pulverized Molybdenum Disulfide in a volatile, non-corrosive liquid vehicle. The squeeze bottle comes with a blunt thin screw-on needle that enables one to get into tight corners. Apply it to the outside of a flex cable. The liquid carries it through the wound steel sheath. Work the cable and it will free up. It can be found in motorcycle shops under several names. It works great and is easy to use. And because the MoS2 is a "dry" lubricant, it is not subject to dryout or oxidation to a non-lubricating form.

My tachometer cables also needed attention because the tach. needles were dancing. Maurice says that means they need lubrication. Personally I don't see how tach. cables on a PA 30/39 can survive with the loops and curves they have in the plane, but they do.

We broke the connections at the tach. drive adapters in the engines and pulled the cables out with a twist and pull type action. First they were cleaned of the fine gray paste we found on them and then inspected for "fish hooks" (broken wire strands) and then reinstalled with lubricant. The lubricant in this case was a "grease" used for Weed Eaters. It is not really a grease, but MoS2 in a viscous vehicle. Weed Eaters have a flexible cable between the motor and the cutter that runs upwards of 5,000 RPM. A petroleum grease would have its molecules shredded by the shear forces in that application, not to mention the effects of oxidation and drying. MoS2 lubricates by the fact that material forms crystalline plates, like sheets of paper, which slide effortlessly over one another. The "grease" can be purchased at any John Deere or Weed Eater dealer; it comes in finger sized tubes. My tach. cables went back in easier than pushing a tooth pick through hot butter.

## Maintenance of Your Tail Feathers

Roy Sneesby ICS # #00570

Over the previous 12 months I have been inspecting and servicing the elevator and rudder system on each Comanche to come into the shop for maintenance. Every aircraft without exception required a full service in this area. This stemmed from an article in the Flyer sometime ago pertaining to rusted bolts in the elevator torque tube. I have been taking this inspection several steps further where as I have been checking the torque tube and bearings, also the rudder torque tube and lower rib section. Many aircraft were in bad shape in this area.

To service this area properly, the rudder must be removed and the lower rib removed. The elevators and the torque tube and bearings must also be removed from the aircraft.

Aircraft which have not had their elevators removed for some time or ever, sometimes require some desperate measures to remove them from the torque tube. Each elevator is attached to the torque tube by two through bolts which should be made of stainless steel, if the ancient AD had been complied with.

These bolts pass through two individual mounting blocks which are bolted to the spars of the elevator. This leaves a space on the tube between these mounting blocks which is unprotected from corrosion attack. If this rust build up is sufficient it makes removing the elevator extremely difficult without damaging the inner mounting block. In some cases I have had to use a hot air gun to warm up the blocks and at other times it was necessary to remove the top skin in that area to gain access to the corroded area so that it could be cleaned up.

The mounting blocks are a very close tolerance fit on the torque tube, so even a very small amount of rust will resist removal of the elevator.

After removal of the elevators the torque tube can now be removed complete with bearings and bearing blocks and the balance weigh torque arm, taking notice of the position of any alignment shims if installed. These shims maintain the alignment of the balance weight torque arm at the cable attachment end, keeping the cables aligned with the pulleys.

Note that on the twin engine airplane only three of the four torque tube bearing block bolts can be removed from the airframe. The top left bolt will not come out because the head fouls on the rudder trim mounting brackets. If this bolt is corroded the bracket has to be removed.

Separate the components of the torque tube assembly into individual items, clean and inspect. Remove all indications of rust on the torque tube and the balance weight torque arm including the inside of the tube taking care of the four rivets securing the bearing stop sleeve to the torque tube. This is where you can now make an individual assessment of the serviceability of each item.

The seals on the elevator bearing can be removed and the bearings cleaned and re-greased if there is no looseness or perceptible damage. After assembly, all exposed sections should be primed and painted before replacing on the aircraft.

To ensure a good coating of paint inside the tubes, seal one end and pour the paint into the tube half filling it. Seal the other end and rotate to distribute the paint. Pour out and allow to drain and dry.

Before fitting the elevators, coat the torque tube and the insides of the mounting blocks with a tenacious grease of anti-seize compound. Do not over torque the mounting bolts as this distorts the blocks and tubes leading to looseness of the components. While the tail assembly is removed from the aircraft take the opportunity to inspect each of the mounting blocks which are riveted into the rear of the fuselage. This area is subject to an AD to check for loose rivets. Often these are loose when checked individually, where as no looseness was evident when the assembly was bolted up.

Now turn your attention to the rudder and torque arm tube. Inspect the exposed portion of the tube inside and out for rust, and the lower rib for corrosion and missing rivet heads. To access this tube and mounting plates further the lower rib has to be removed.

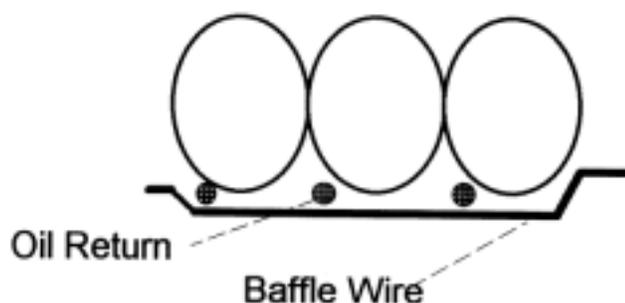
I have often found this tube to be rusted inside the rudder, also rivet heads missing due to corrosion where the rudder torque tube mounting plates are attached to the ribs.

## Tech Tip / Drain Tube Fracture

Andor Koval, ICS #12035

Here is a problem that I detected with careful looking on my Comanche 260, which has an IO-540 Lycoming engine. Under the cylinders on both sides there is a 1/8th inch wire rod which holds the front and back baffles against the cylinders. This rod has a bend, but runs across the two rocker cover oil drainback tubes under the cylinders. I found that the wire rod had cut into the drain tube. When I pulled down on the wire rod, oil leaked from the tube. The steel rod had worn about 1/3 of the way through the aluminum tube. The rod effectively plugged the leak, so unless I pulled down on the rod I wouldn't have noticed this. Eventually, the wire would have sawn through the tube and an oil leak would have resulted. I will bend the rod more and add a small rubber hose to protect drain tubes. However, I suspect that the baffles are incorrectly installed as it seems that the wire should not be so close to the tubes.

Any questions you can call Andor A. Koval N9007P, evenings (510) 828-3749.



## Uncommon Nuts

Bill Stein, ICS 12208

When reinstalling our newly upholstered panels in our 250 Comanche, I found that the nuts securing the four cabin vent actuating knobs were missing. I then remembered that before doing the reupholstering job, those vents were not completely flush to the fuselage when the knobs were at the closed position. A thread gauge and caliper told me that I needed 7/16 - 32 panel nuts. They could not be found anywhere in Las Cruces, NM. I tried all the hardware stores, Radio

Shack, and electronics bone yard to no avail. My final solution was order a tap and make them. A local machinist did the job and I have extras if anyone else may need some.

Give me a call at (505) 526-3641. Now the vents close completely flush with the fuselage too

## **Improvised Emergency Jumper Hook Up**

Tom Field, ICS 03685

I recently had a circumstance that led to a small breakthrough that I thought was worth sharing.

We were about to take advantage of the clear skies the crisp, Texas cold snap had brought. The battery wasn't interested though and the starters would not budge the engines. I do have a set of cables with a Piper style plug, but they were in my garage.

The 59th offer of standard auto cables was being, proffered when the brilliant light struck me. I had the GOOD Samaritan pull his car out to the plane while I searched through the toolbox I always keep in the plane.

One of the tools I keep in the aircraft is a small 6 inch set of Vice Grip pliers. I find this all purpose tool especially useful for work in the engine compartment. And I had just found another use for it! The pliers were adjusted to clamp onto the center electrode (positive +) of the plug socket and snapped into place being very careful not to contact the plug socket sidewall. The standard jumper clamp was then applied to the end of the pliers that stuck out. The other (negative -) lead was grounded to the nose gear casting. Both engines kicked over nicely and off we went, well prepared to handle one new emergency.

## **Paint Tips – gear retraction problem after painting.**

Bill Troyanoski, ICS #12100

I flew down to Port St. Lucie International to have N9339P painted by Aircraft Painting Center, operated by Michel Prefontain. Three weeks later, N9339P was spectacular. I can truly recommend his company. The only miscue to the experience occurred while retracting the gear on climb out on the way home. The gear circuit breaker blew prior to a full retraction. After placing the gear lever in the down position and resetting the breaker, the gear returned to a down and locked position. Relieved, I tried to cycle the gear again, but the same scenario prevailed. I checked the position of the actuator, found it to be almost in the fully retracted position and made the decision to fly home.

Upon investigation, my mechanic found the gear door was reassembled with the Gear Door Connecting Rod installed with the spacing backward. This shortened the travel upon retraction, resulting in a bent connecting rod. Fortunately the gear came down. This problem has occurred before and is outlined in the TIPS MANUAL Chapter 7.

## **It's the little Things that can Bite You**

Bob Edelson, ICS #09877

For those of you who own turbo twin Comanches, I would like to share a discovery that was made in the course of our October annual.

But first, during our annual three years ago, we found that the alternate air door attach points were nearly worn through the edge of the metal where the clevis pin passes through. At that time, we plug-welded the holes and redrilled them. The fit was relatively loose, but it was similar to the condition when we bought the aircraft in 1990.

During our current annual, upon opening the cowlings on the right engine, I manipulated the alternate air door and found it hanging by only one of the two "ears." After removing the air filter to take out the air door, it slipped from my fingers and dropped into a position where it perfectly blocked the entire inlet air passage to the fuel controller.

Now picture the scenario, about 10 or 20 hours later, when this would have occurred in flight. Talk about an instant engine shut down! I hesitate to suggest a repair which does not return the part to original condition because of "big brother." However, I am sure your own trusty A&P will come up with an acceptable fix. I suggest he/she reinforce the area and eliminate the excess play. Do both engines. Check it now. Don't wait for the next inspection. My recent experience should alert all of you turbo twin Comanche drivers to a potentially dangerous situation.

I had also been having trouble keeping my left engine fuel selector pointer tight. Finally, I asked my A&P to check it, and he reported that the internal threads on the aluminum pointer were partially stripped. I ordered a new one from Webco, and in the interim, we snugged the set screw as firmly as possible. I next flew to ABE on business and ordered all four wing tanks topped. Before departure I drained the sumps on all four tanks and reset the pointer to the mains. I dropped my customer off at HFN and returned to ISP. Since I had only used the mains, I ordered the line person (politically correct) to only fill the mains. When finished he reported it took 11 gallons. I asked if he was sure, and he nodded in the affirmative. I knew I was the beneficiary of a tail wind which gave me a 190 knot ground speed coming back, but 11 gallons in 90 nautical miles was not possible. When I rechecked the main tanks, they were brim full. He then admitted that the left main had taken very little fuel. I then checked the left aux and found it low. It took six gallons.

I hopped in the cockpit, wiggled the left fuel selector, and the answer became obvious. Due to the loose pointer, the selector was just out of the detent, although the pointer I was directly in line with the indication for the main. Being out of the detent by that small amount was sufficient to permit fuel to be drawn from both the main and the aux. This was confirmed in my recent conversation with Maurice Taylor.

Needless to say, we installed the new pointer before the next flight. The lesson here applies to all fuel selectors with the detents. Make sure you feel it pop into position. Visual is not good enough.

## Heads Up - Rudder Spar Cracks

Angelo R. Gianni, ICS #44084

Mechanics that work on my plane at Ashtabula County (OH) Airport found microscopic cracks in the rudder spar (part # 20729-10) of a PA24-260 on which they were performing an annual. They appropriately inspected my plane (N7903P) and found similar cracks. The cracks were located where the fasteners attached the hinge to the doublers. I sent a Fax copy of a diagram I drew to Maurice for his review with some notes on the Fax. It was impossible to see the cracks with the naked eye unless the metal had been flexing, causing a thin black line to appear. The cracks can be seen under 10X magnification. My A&P's used a flashlight and mirror to locate the cracks on N031P. They advised me of the potential problem in order to get permission to disassemble the rudder so they could get a closer look. They thought they would need to do a dye penetrant to confirm the existence of the cracks. The cracks appeared to form at the radius of the washers and flange of the spar.

Then the fun started! After several extensive conversations with Maurice, I called no less than fourteen (14) new and used aircraft parts dealers in order to locate the part. I had three (3) sent to me that were allegedly sound pieces out of dozens that were checked. One had cracks and the other two didn't properly line up with the rudder holes. I instructed each dealer to look closely at the spar in order to insure there were no cracks in the area I described as having the problem prior to dismantling the rudder and sending the part to me. Of the spars that were not found to have cracks, none of the holes drilled in the spars lined up with the rudder from 03P. As I later found out, Piper drilled and assembled the rudders individually. Therefore, a used spar did not line up with the rudder. I then decided to see if I could get someone to build a spar for me. This turned out to be too expensive and time consuming. That is when Maurice suggested Williams Airmotive Wings located in Kendallville, IN (219) 3470807 as a possible source for the repair. Williams did the work in less than two days and beefed up the area so that future problems could be minimized. Roy Williams was pleasant, professional and very helpful. I drove the 560 miles in order to deliver the rudder to Williams. While I was there, I toured his facility. I hitched a ride the next day with a friend who owns a bird that flies about as fast as the Comanche, a Bonanza, and had the rudder reinstalled in Ashtabula by the weekend.

After the repair was complete, I went back to my notes and checked the number of spars I had inspected from dismantled planes. The information was startling. Counting the 260 and my plane based in Ashtabula, eight (8) of the eleven (11)

spars that I located had the same cracks as found on 03P I believe this is significant and should warrant every member owning a 250 or 260 to conduct an inspection of their bird's rudder spar. (The 400 has a different rudder design. I'm not sure of the 180.)

## Something else to Add to "LOOK FOR"

Hans D.Neubert, ICS #07685

### Synopsis:

After fixing a leak on the rig brake caliper and installing new brake pads, the left side caliper seemed a little more difficult to reinstall, at which time I noticed that a large sector of the wheel rim was missing. A photo of the failed wheel is shown above. The missing sector was directly behind the caliper while parked in the hanger, and not noticed. I think that I made only one flight with the defective wheel, so there was some luck involved. The tire held pressure, and only showed signs of bulging where the tire bead was not in contact with the wheel flange. Due to the close proximity of the disk brake to the wheel rim, and lack of visibility (my brakes are on the inside), it can be easily overlooked. I haven't had a bad landing in a long time so there is concern about the cause of the failure. A metallurgist coworker was asked to examine the wheel and provide some insight towards its failure.

### Analysis:

The average age of original Comanche wheel rims is in the order of 35 years. They are made of cast Magnesium, subject to more corrosion than cast aluminum, and are notch sensitive. During routine maintenance, I have cleaned out brake disk dust, dirt and grease from the space between the wheel and brake disk. This black dirty "stuff" is a good initiator of corrosion.

The wheel failed in fatigue, likely initiated by a small crack at the LHS rim edge. A hard landing does not create this type of failure. As shown on the photo, the wheel rotates clockwise, and the failure initiation site was at the rear (LHS), with another failure site started at the forward edge (RHS) sometime later. The final break between the two rim edges occurred after the two rim edges had fatigued toward the wheel base. A possible cause for the initial crack was the use of large screwdrivers to break the tire bead from the rim.

### Recommendations:

When preflighting the airplane, look at the wheels to verify the wheel rim is continuous. When changing tires, look for cracks around the edge of the rim and keep the wheels clean. If a crack is suspected, use a spray-on dye penetrant to verify. Use tools that will not damage the wheel rim when removing the old tire. As a word of caution for those who have a high pressure sprayer, don't use it on the wheels. The water will easily migrate past the felt grease seals, and the steel axle will rust itself to the remaining steel parts. Finally, it is easier to replace a damaged wheel while the airplane is in a hangar than at some remote airport.

## Maintenance Warning

Mike Rohrer, IA, ICS #13393

For some time now, I have seen a downward trend in the quality of maintenance in aircraft I come in contact with. I felt this might be a good form in which to address it. These problems range from AD's not accomplished, AD's incorrectly done, outrageously high prices paid for poor work, incomplete logbooks and mechanics missing important items on inspections to prepurchase inspections NOT being performed until after the aircraft is bought (a POST purchase inspection?) Everyone knows how important AD's are. But why is there such difficulty in accomplishing them, and then documenting the work? It is a mystery. There are several very good companies that offer computerized AD lists. There is just no excuse for missing these items or incorrect documentation.

It amazes me that so many aircraft owners, both new and old, will blindly pay high prices for substandard workmanship. It must be the assumption that the higher the cost the better the product. Owners need to investigate the shop where their

work is performed. Ask questions--lots of questions. They should find out what is included in the price of the inspection. Ask if the shop uses a computerized AD system or the old "paper" lists. Ask for the qualifications of the mechanics who will be performing the majority of the work and their experience on your particular make and model. Ask for the option of an "owner assisted" inspection, although this may not be possible due to insurance restrictions. After any major work is finished, ask the mechanic to accompany you on a test flight. This may preclude having to go back to the shop for "strange" noises. No aircraft should be released to the owner after major work (i.e., engine, gear, or fuel-related) without a thorough test flight. (Make sure your insurance covers maintenance flights.) And finally, ask the manager/shop owner to both review any items on the bill you do not understand, and to review the entries made in your logbooks. This leads to my second point, shoddy logbooks and inferior work.

I'll use an aircraft I recently worked on as an example. The logs indicated maintenance had been performed on the landing gear for AD 77-13- 1. This is a two part AD: Part (A) checks for wear limits on gear components, while Part (B) calls for Bungee replacement. The owner thought the AD had been complied with, when in fact only Part (B) had. This seems to be a trend in Comanches: to date I have seen only one aircraft with the entire AD complied with. Without this accomplished correctly, the mechanic is setting the plane up for a gear failure ... it is not "if but "when". This aircraft had been in the care of a "reputable" and well- known repair shop.

The logbooks were in such disarray that there were "engine" items written in the "aircraft" section of the logs. Also there were no engine times and no record of what type of oil was being used. It took me almost two hours to decipher just what had been done to this aircraft.

On this same aircraft, the logs showed it had been painted in 1992. I found six inspection panels that had never been removed, as evidenced by the panels still being painted over, and screw heads still full of paint. This aircraft had been through SIX ANNUALS and these panels were never removed!

When I removed these panels, I found both Aux. tanks leaking and found water had seeped in allowing severe corrosion in all four tanks. I found filters that hadn't been changed since who knows when. It is my policy to drop the exhaust for inspection, as this is a critical item in Comanches. While the exhaust is down, we check the cylinders for cracks. Three out of six cylinders were cracked, and two were not repairable. The owner was very upset with my policy. He didn't think that the exhaust should be dropped, I guess because he was paying for the repairs. The buyer called several respectable shops and found that dropping the exhaust was not a common practice unless something was suspected to be wrong. How can a mechanic deem an aircraft airworthy and safe for a prospective buyer without dropping the exhaust and checking for cracked cylinders? After a considerable amount of money and time, this "creampuff" Comanche turned out to be a great plane.

If you have ever wondered whether or not it is cost effective to accomplish a pre-buy when considering an aircraft, here are great examples.

Recently, a new customer bought a seemingly nice Comanche single. He brought it to me for an annual and had a list of items he wanted fixed. If he had done a pre-buy and these items were found, he could have had better negotiation leverage. The previous owner could have avoided a majority of these problems with routine and preventative maintenance. It ended up costing the new owner a lot of money to fix these problems. Another customer bought an aircraft from a very well known and respected dealer. He did not have a pre-buy accomplished because the aircraft had just come out of an annual with the dealer. He brought it to me with a few minor problems, but what I found was very surprising. The case had a 1 3/4 inch crack, which is non-repairable. Also, a major AD had been signed off by this "reputable" dealer and NOT ACCOMPLISHED! These two items alone cost thousands. In addition, there were many "safety of flight" items. Yes, you should be appalled, I was.

I sincerely hope I have not painted too bleak of a picture. The problems I have addressed here are serious ones, I know. Information is power and pilots need to have as much as possible to make the right decisions.

## Water Contamination in Fuel Filters (Jan 2004)

Mike Rohrer - ICS #13393

I was just reading an article in the December issue of *Flying* magazine on a topic that I have written about several times. I guess it still isn't getting across. We need to take care of these machines so that they will take care of us. In addition, this is one of the reasons that our insurance rates are going up. Did you know that some companies are not insuring Twin Comanches that are older than 1965? And some are not even covering the Comanche 180's.

The *Flying* article states that a Twin Comanche lost power in both engines and crashed due to ice build-up in the fuel filters. Come on people, there is an AD that covers this and it's due every 50 hours. It states, "To eliminate water contamination of the aircraft fuel supply" and mandates compliance every 50 hours of operation. This aircraft had not been complied with in 16 calendar months and 234 hours of operation.

Basically the AD wants you to remove the filter bowls and check for water every 50 hours. The Owner's Handbook states auxiliary fuel and tip tank fuel should be used in level flight only. Examination of the wreckage revealed evidence of fuel at the scene with the left fuel selector in the "auxiliary" position and the right selector in the "main" position. The airplane was in cruise flight at 6,000 feet in below zero temperatures.

I know that not everyone checks his or her fuel filters, but at least drain the things 20 to 30 seconds for each tank. I go as far as draining them after flight. This way, if any water is trapped when first drained it most likely will be repositioned after flying.

I continue to see water in the filter bowls in twins, some so bad that the selector had to be overhauled because of severe corrosion.

A sign of corrosion is when you go out to the airplane after it has sat, and when you remove a fuel cap the fuel gushes out and one of your other tanks is low. This is the result of a rusted check valve in the selectors, which does not seat anymore. Therefore, fuel passes through into another tank.

So please, for safety sake, drain your tanks. Airplanes get very quiet when the fuel flow stops. It is so easy to drain, so why take the chance?  
It doesn't make any sense to me.

## Worn Flap Retract Springs Can Lead to a Hair-Raising Experience (Jan 2004)

Mike Rohrer - ICS #13393

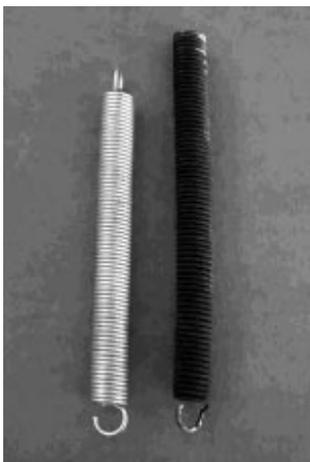
Take a look at your flap retract springs that are on the Comanches with electric flaps. I would bet that most are original items. If the springs are worn out, it can hinder the retraction of one side and that is a hair-raising adventure. Several months ago, one of our local "new" Comanche owners was getting checked out. He was doing touch and go's here at Altus. Just prior to touchdown on one of his approaches, he selected flaps. Everything went smoothly. But on climb out, he retracted the flaps and all hell broke loose. The right flap stayed down, and the airplane violently went into an approximately 90-degree roll.

Thank God the instructor knew what the last thing the pilot did and he put the flaps back down.

I had another customer call me and had the opposite problem. He put the flaps down just prior to touchdown and the one side stayed up. He just about didn't make it. I never agree on changing the configuration of the airplane once you hit the final approach fix or are established on final and neither does the airlines.

The reason his flaps didn't come up was that he cleaned his flap tracks and rollers, and they were very dry.

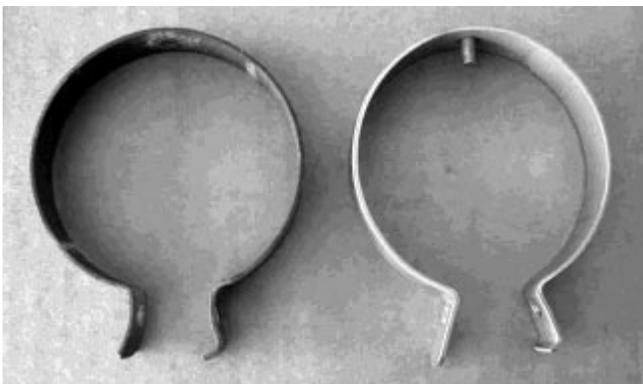
I know the book states that the “new” rollers don’t require lubrication, but I disagree. If I clean the tracks because someone has slopped grease on them (which is a no-no), I apply a light lubricant. Then they don’t stick. It works quite well.



*Pictured here is a flap spring, which if not kept in good repair, can lead to an asymmetrical flap situation.*

## **Exhaust Clamps (Jan 2004)**

Mike Rohrer - ICS #13393

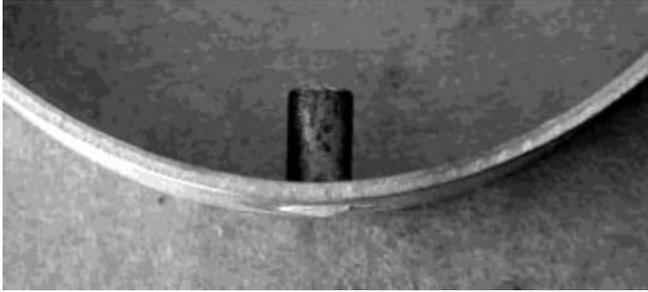


*Check exhaust clamps for wear. Here’s a side-by-side comparison of worn and new clamps.*

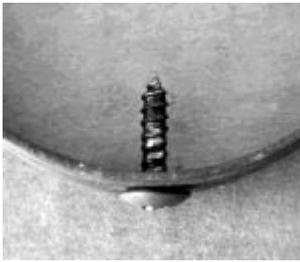
Another item to check is the exhaust clamps that are on all the Comanches except the twin. If you look at the pictures, you will notice a post that sticks out on the clamp.

This is made that way because there is a hole in the two pipes that attach to each other. This holds them in place and keeps them from coming apart. The tail pipe also has one and without it, the tail pipe can fall off. I have found many with the pin worn a little and has actually started to rotate to the point that the hole is egg shaped. I have also found where the pin had broken or worn off and the previous installer put a screw in its place.

The clamps are expensive, but what is a life worth? I have taken these clamps and had a stainless steel pin welded back. This works fine, but don’t put a screw in it or put in back on without the pin. And when putting the exhaust back together, apply “Never Sez” to the slip joints and exhaust stud, and they will come apart with no problem next annual.



*Close-up of the exhaust clamp pin.*



*What not to do: A worn clamp with a screw used.*

## **Twins – Inspect Exhaust Shield (Jan 2004)**

Mike Rohrer - ICS #13393

For the twin drivers, take a look at the exhaust shield behind the engines.

These are two stainless steel sheets, with a piece of insulation between them. With the exhaust gasses and oil that accumulate there, this attracts moisture.

A good way to inspect this area is to remove the fairing behind the engine. Above the shield are fuel lines. If this shield fails because of holes due to corrosion, you know what can happen. I have found that to keep this from wearing out, install the pipe extensions that can be purchased from Gulf Coast Stacks.

This will save you lots of money in the long run.

If your shields are worn or damaged, they cannot be purchased from Piper anymore, but can be from Knots 2U, Inc. and they are not cheap. So take care of what you have.

## **Next Oil Change: Clean and Rotate Plugs (Jan 2004)**

Mike Rohrer - ICS #13393

When you change your oil next time, remove your plugs, clean and rotate them. You would be surprised how long they will last and most importantly, they likely will not cause you problems when you are on the road.

## Inspection of Wheel Assembly (May 2004)

Mike Rohrer - ICS #13393

Another good thing to do is during the annual is have the wheel assembly glass beaded, inspected and repainted. Not only does it look nice, but also it prolongs the life of the wheel. You would be surprised how much corrosion is under the grime. If you take care of it now, it could save you from having trouble when you don't need it.

Plus, the cost of replacing the whole assembly is over \$700. The inner assembly, which includes the brake disc, is over \$500, and there are very few, if any, good "used" wheels out there. Trust me; if you need a replacement and have to order one it will take up to five to six weeks from Cleveland Parker Hannifin. I know Webco keeps one in stock and we do, too. But lately I have been receiving more requests for them. So take care of them now, and you'll save in the long run.

## Lubricating the Tach Cable (May 2004)

Mike Rohrer - ICS #13393

To keep your tachometer in good running order, have the cable removed, cleaned, and accomplish the following procedure. Remember that the tach cable is inside a casing, so the actual cable that turns can be removed. Now take a spray can of brake cleaner and spray into the end that connects to the tach. Let it soak for about a half hour, wrap a rag on the end that goes into engine and blow compressed air into it. Be careful, as it can make a mess. Once this is complete, spray a good lubricant into the end (I use Kwikie Penetrant from Lawson products), slide the cable back in, and it should turn nice and smooth.

## How often to Replace Vacuum Hoses? (Jul 2004)

**Q** How often do hoses need to be replaced on my Comanche? I noticed a vacuum gyro hose that has a date of 1959 but still appears to be in fairly good condition. Should it be replaced? What about hoses in the engine compartment? Are there any hoses in the wings going to my main, aux or tip tanks that need attention?

**A** Wow! That's a pretty broad question with no single good answer. Therefore, I have referred your question to members of our Technical Committee and here are their replies:

1. We all know that a vacuum hose operating in a protected location and an engine oil hose have very dissimilar service lives. The quality and construction of the hose also affect the service life. All aircraft hoses should be changed at five-year intervals unless the hose is made of steel mesh reinforced Teflon. In this case the hose should be replaced on condition only.

2. I do believe it is safer to follow the manufacturers' recommendation for replacing the hoses. To my knowledge the hose manufacturer gives manufacturers recommendation unless the airframe manufacturer overrules it. Example: Teflon hoses have lifetime limit from Aeroquip, but Beech requires in the King Air B200 to replace those every 10 years.

3. I would suggest that we start with the "standard recommendations" regarding original equipment-type hoses and then the rules for Teflon, fire guarded hose.

The answer could then be expanded with the qualifying statement. *"A prudent operator would do a condition inspection during preflight inspections and annual inspections looking for signs of chafing, corrosion, extreme heat, leakage or general deterioration. Fuel and oil hoses present more potential for harm, so they deserve more scrutiny than a manifold pressure hose, or vacuum hose."*

As a personal aside, I have found oil hoses, equipped with fire sleeve, that were corroded beyond useful service in less than three years. These were located in a coastal environment. Joe Tomme, a respected IA with a lot of Comanche experience suggested to me that these hoses needed to be pulled during inspections and then be bent by hand while

listening for “crackling sounds.” I did this first on my 250 and found that the steel reinforcing wires on my three-year-old oil hoses would break when the hose was subjected to very gentle bending. Joe probably saved me an engine overhaul.

4. The factory, FAA and mechanics all say five years. I think that’s a little self-serving. Even on the older-style hoses not close to a heat source, I’ve seen many go 20-plus years. I don’t know the exact details, but all of the new hoses seem to be made of Teflon, and would last even longer, if properly fire-sleeved and all. On the other hand, fire sleeves may prevent adequate inspection.

5. Applicable areas to research are:

- The Comanche Service Manuals (which give inspection periods but refer to the engine manufacturers guidelines for replacement);
- Lycoming SBs – the only one of which seem to be relevant is the mandatory parts at overhaul (which includes oil and fuel hoses);
- The Australian CASA AC that gives guidance but is fairly onerous for private operators;
- Each FAA equivalent will also have an opinion depending upon the usage of the aircraft.

## **That Pesky Oil Leak (Jun 2008)**

F. Norman Wright, ICS #16240

It was a beautiful fall day and we were over the mountains of North Carolina enjoying nature’s splendor of color, when what to my wandering eyes should appear, but a trickle of oil coming down the cowling from the dipstick access door. A quick cross check revealed nothing abnormal, but I monitored the oil pressure closely until touchdown.

The access door had oil on the underside, but a check of the dipstick showed a normal reading. I had added a quart of oil at our previous stop and a little spilled. I wiped everything dry but assumed the wind had found a pocket of oil and spread it around on the trip. We cleaned the engine and put our bird to bed. Problem solved... or so we thought.

Our next trip was a few weeks later from North Carolina to Florida, with a stop at Allendale, S.C. Just before our first stop, what did my wandering eyes pick up, but a trickle of oil coming down the cowling. As we topped off the tanks, I again checked the quantity, which was full. I assumed I must have missed some oil on my previous cleanup, and we continued on to Florida.

Again, about 45 minutes later, my wandering eyes picked up that now familiar trickle. Since the quantity had been okay, we continued. Over the next two hours, the oil crept back the cowling, then up the windshield. Now we had two problems, a leak and restricted visibility. It was only a thin film and about four inches wide, but it added another task to the normal scan. After landing, another inspection of the oil quantity was made, and again no loss over the normal usage. The cooling air scattered the oil so that no one location could be pinpointed.

Over the next year we tried several fixes, each requiring an hour flight. We concentrated on the dipstick area; first changing the top seal, then the bottom seal, and then replaced the complete extension tube. The bolts along the top of the crankcase were removed and sealed, the crankcase breather was checked, but still the leak persisted.

Our timeline took us through two annuals and several trips to the shop. We were grabbing at straws now. How about the pushrod tube seals? Why not, we have tried all the obvious things. No, that wasn’t the culprit either, but it put us on the right track. The forward tube had a rough spot, and close examination showed an invisible crack that seeped when the engine and oil were hot. Of course it was right on the bottom, or it wouldn’t have leaked. The tube was replaced and the problem disappeared. This was the seventh time we had worked on that leak.

We now fly with no self-induced IMC, or IFR for us old guys. Also, I have lost my excuse for bad landings

## **An Easier Way: Nut Plate Strip for Mounting Main Landing Gear Doors (Apr 2010)**

David Clark, ICS #8592, A/P

If you have ever removed the main landing gear doors on a Comanche, either to work on the hinges or to repair a crack, etc., and then wished to re-install the doors, you know how difficult it can be to get the nuts started on the three attaching screws. With the airplane on jacks and the gear retracted to get the strut out of the way, you must hold a washer and a nut between your fingertips in an impossibly narrow cranny trying to thread them on the screw while working blind. A mirror only seems to get in the way and offers little help.

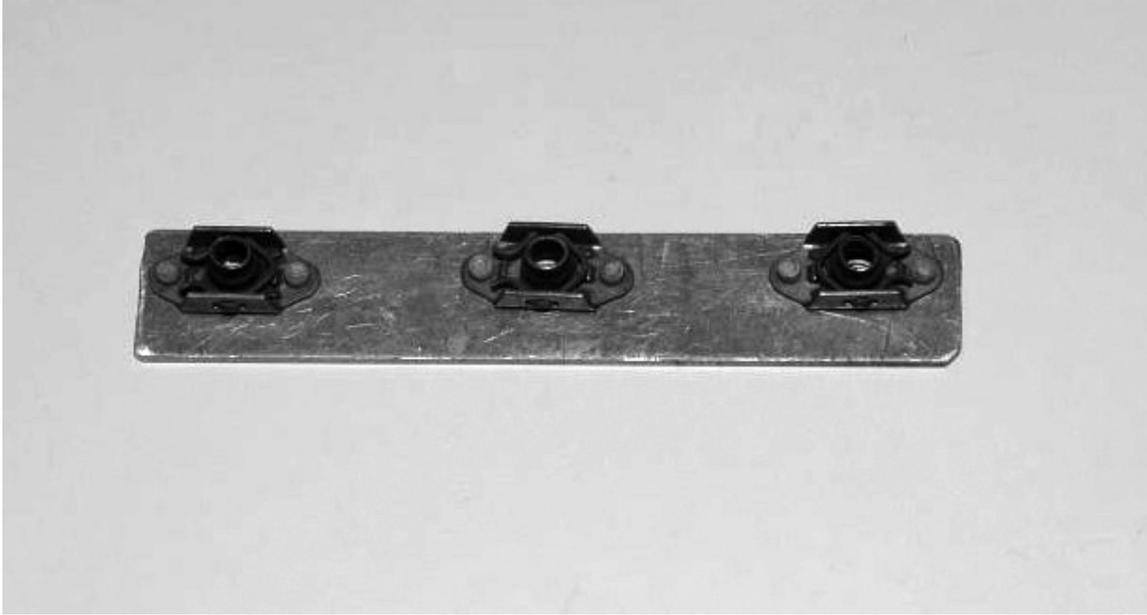
This can be a very frustrating chore. Thinking that there should be an easier way, I fabricated a small aluminium strip with nut plates mounted on it that could be dropped into the deep narrow slot up in the gear well. Then by using a scratch awl or a drift pushed in from the bottom, and after slipping the door hinge in place, I could easily line up the hinge and the nut plate with the external holes. After that, it was no problem to get one of the screws started which then automatically lined up the other two nut plates. Using this strip certainly made it easier and much quicker to re-install the main gear doors after their removal.

How it is made:

The strip itself needs three nut plates mounted on it to accommodate the three #10 screws normally used to hold the gear door hinge in place. It took me about an hour to make the two prototypes, one for each door. I cut a piece of scrap aluminum making it 0.75 inches wide by 4.5 inches long, and then placed it in the deep recess where the nuts and washers are normally screwed on. While holding it in place, I went through the external screw holes in the wing with a scribe and marked the nut plate hole locations on the strip.

Following that, I removed the strip from the airplane and drilled the screw holes required for the nut plates. I then re-inserted it in the wing and made sure that all three screws would line up properly with the new holes. I then drilled the smaller lateral holes for the rivets used to secure the nut plates on the strip. I used a counter-sinking tool on the rivet holes because I planned to hand squeeze counter-sunk rivets.

I discovered that I would need some slightly longer #10 screws than the original ones, because the strip adds one additional layer of metal for the screws to traverse. I also learned that the screws do not all pass through the same number of layers of wing structure along with the hinge. In addition, in the original setup, Piper used a screw with a grip on it and then "custom fit" it to each screw hole by using an appropriate number of washers to keep the screw grip from bottoming out. Because I used nut plates, I couldn't use washers, and it was much easier to use full thread screws of adequate length. This did not present a problem, however, since the screws themselves are not used specifically to line up the structures through which they pass, but rather to hold the hinge in place by sandwiching it between two layers of aluminum sheet. Thus there is no need to have a grip on the screws.



*Nut Plate Strip, Top View*



*Nut Plate Strip, Bottom View*