

## Can You Stop Nose Gear Shimmy?

By Dave McFarlane



**Nose gear shimmy is destructive and not normal, and yes, it can be stopped. Never allow any amount of nose gear shimmy to continue. The quicker you take action, the easier it will be to stop it.**

**"A Cessna nose wheel is supposed to shimmy."**

**"You can't really stop it."**

**"All the Pipers do it."**

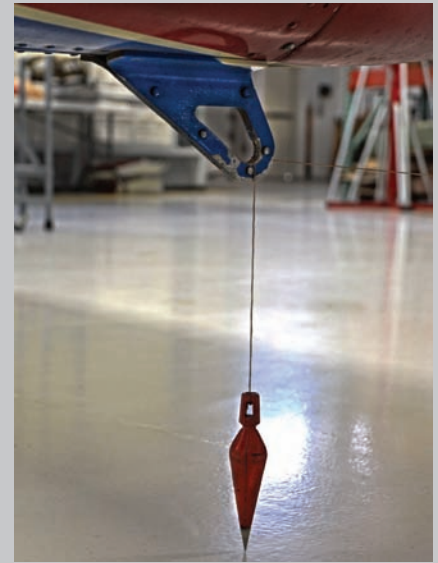
You have heard similar comments many times. My response is always the same question. "Did it shimmy when it was new?" I would like to share with you our experience in solving this problem.

I will bore you with the routine detail of what to look for and how to fix the mechanical issues that allow shimmy to get started in a minute. First, let's talk about the physics of nose gear shimmy. Years ago and after a lot of frustration by us and our customers and a lot of experimenting, we discovered what was causing our shimmy problems. We observed that uncorrectable nose gear shimmy seemed to only happen on hard surface runways and rarely on turf runways. Our customers reported that they could stop the shimmy by either taking weight off the nose gear with the elevator or applying the brakes putting more weight on the nose gear. It didn't seem logical that just changing the weight on the nose gear could affect shimmy since the airplane is designed to function with different loading on the nose gear and the weight change does not significantly change the nose gear geometry. We guessed that our customer's shimmy might have been stopped by the fact that the changing nose weight also changed the tire shape. We assumed that when the tire shape changes so does the contact profile of the tire to the runway. We had already done all of the normal things to perfect the nose gear and shimmy damping system rigging and mechanicals. The customer's tire seemed fine with no unusual wear patterns that could be detected. We still had shimmy! In frustration, an experiment was done by removing some tread rubber from

the tire. It did not seem to be a logical solution, but it worked. The shimmy went away!

There are some interesting dynamics going on during the shimmy action (besides trying to vibrate your airplane apart). When the nose tire is shimmying down the runway it is oscillating from pointing left and then pointing right many times per second while the airplane is going straight. The greater the tire angle diverges from straight ahead, the greater the shimmy inertia and energy. Since the oscillations are equal in divergence angle and time duration, the rubber on your tire is being scuffed in a uniform and distinct pattern that repeats itself each revolution of the tire. This wear pattern shape is directly related to the tire shape created by the amount of weight on the nose tire, the tire pressure, and the speed of the aircraft. The frequency of the shimmy is a derivative of these factors. You might have noticed a braking feel to the airplane when severe shimmying is happening. The braking is from the nose tire skidding sideways during the more extreme angle divergent portion of the shimmy cycle. Since shimmy generally takes place for a short time, the early stages of this wear pattern are microscopic and hard to detect visually or by feeling the tire tread by hand. After the first shimmy, the then created wear pattern tends to start the oscillating action when the airplane speed and nose gear weight matches the speed and weight that the airplane was traveling when the shimmy wear pattern was created. You might have noticed that shimmy starts at about the same landing or taxiing speed each time. The results are that the shimmy gets worse every time it happens even if the mechanical issues that let it start shimmying the first time have been corrected and the shimmy dampener is working and trying to do its job. The shimmy dampener simply is not strong enough to prevent shimmy when a nose tire has an established shimmy wear pattern in the tread. The hidden mystery to this problem is that early shimmy wear patterns in the tire are virtually un-detectable.

## Drop a plumb bob to determine aircraft center line



One of the hardest parts of proper rigging is determining where the nose tire is straight ahead.

The method we use is to create an airplane center line by dropping a plumb bob from the center of the firewall to the ground (center can be determined from the rivet pattern or measuring from the motor mount attachments) and again dropping the plumb bob from the center of the tail tie down hook. Mark both of the plumb bob points on the shop floor and create a chalk line mark between the points. This is your airplane center line. Extend the center line forward as close to the nose tire as possible.

Place a straight 2x4 stud or a piece of straight angle iron against the side of the nose tire. Adjust the nose wheel and tire until the 2x4 is parallel with the airplane center line. Check your results by placing the 2x4 on the other side of the tire. The 2x4 acts as a tire angle multiplier giving you measurable results.

Parallelism can be checked by simply measuring the distance between the 2x4 and the chalk line in two places. Be sure not to move the airplane while you make your nose gear alignment adjustments.

### Prevention Tips

The key to shimmy problems is to prevent shimmy from starting in the first place. You have to start with the routine stuff that is in the service manuals. The Cessna Pilots Association has a very good article on fixing the mechanical issues associated with nose shimmy on Cessna airplanes. Their Tech Note No. 001, Revision 004 dated 04/15/2010 does a good job of describing and illustrating the system and directing corrective repairs. This tech note seems to parallel the Cessna Service Information Letter SE84-21 on the same subject.

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### Continued from previous page

**1** The first step in preventing the problem is to look for any un-damped nose gear movement. This is motion of the nose tire without the shimmy dampener moving. Looseness in the nose gear system cannot be detected with the nose wheel off the ground unless the pressure is released from the nose strut. When you move the nose wheel right and then left, the shimmy dampener should also move. If there is any un-damped motion, tighten or replace the worn components such as the torque link bushings and spacers, the steering collar, and shimmy dampener attachments.

**2** Remove the shimmy dampener attachments. Check the shimmy dampener for proper fluid and proper operation. Check the dampener for seal condition and excessive wear in the piston and dampener bore. The dampener shaft must have considerable resistance to motion when moved quickly but move easily when moved slowly.

**3** Nose gear rigging is important to prevent shimmy. If the steering rods or bungees are biased, damaged, or holding improper tension, shimmy can be started. The aircraft service manuals do a good job of describing proper nose gear rigging procedures. Wheel bearings must be in good condition and properly adjusted.

**4** Bad bearings or adjustments can allow un-damped tire movement. Tire balance is also critical for preventing shimmy as an out of balance tire puts cyclic centrifugal loads on the tire tread. Out of round tires will do the same thing. One of the objectives of preventing shimmy is to not have any type of cyclic loads going into the tire system.

Check the tire itself for casing shift or other damage as follows:

- Take the weight off the nose tire for a period of time to let the tire take its proper shape.
- Assure that the tire is inflated to the proper pressure for the aircraft.
- Spin the tire by hand and look for any significant lateral divergence (tire wobble) or vertical divergence (out of round). The tire must rotate true, but a little out of round is normal.
- If tire casing shape problems are detected, let the tire stabilize longer without weight. If that does not correct the problem, the only fix is to replace the tire.
- If the tire casing seems to run out true and the tire is determined to be airworthy in all aspects, remove the shimmy wear pattern in the tire tread.

How do you remove rubber on a good tire to get rid of this mysterious and evil tread wear pattern that nobody can see or feel? We use an electric disc grinder that is used in the weld shop for grinding welds and smoothing structural steel. Any large sanding disk power tool with a course grit disc or a belt sander would also work. There will be some rubber flying around the shop so this is a good job to do outside. Get someone else to do it if you have allergic reactions to latex or rubber products. Block the nose gear off the ground and give the tire time to stabilize its

**5** shape without weight. Again assure that the tire has the correct inflation pressure. Touch the grinder to the tire at an angle that rotates the tire and removes rubber. With a little practice you will be able to control the tire rotational speed with small grinder angle adjustments. If you allow the tire to rotate too fast, very little rubber will be removed. If you allow the tire to rotate too slow, it is hard to remove the rubber evenly. Taxi speed tire rotation seems to work best. You can actually remove small "out of round" tire conditions by being steady with the grinder and allowing the grinder to work harder on the tire high spots. The grinder must be worked across the tire tread as evenly as you can. Never grind into the sidewall of the tire. You can feel advanced shimmy wear patterns before you start and they will take more work to remove than the patterns you cannot feel. The tire must feel smooth and even when you are done. Only experience will tell you how much rubber to remove. Be sure that the tire has good tread depth when you are finished, and verify that there is not any inadvertent damage to the tire. Clean up the rubber grindings and high speed taxi test the airplane. You will probably be smiling with the results. It is a good idea to re-balance the tire after grinding the tread and before returning the aircraft to service. If the test does fail, repeat the process. Yes, with a little patience, this shimmy beast can be tamed!



**Use a belt sander to remove the shimmy wear pattern in the tread.**



**Use wheel balancer P/N TOOL128 for 3/4" diameter axles or P/N TOOL129 for 1", 1 1/4", and 1 1/2" axles to check tire for proper balance (additional sizes available). See page 263 for additional information.**

# Landing Gear and Nose Wheel Steering Parts

Landing Gear and Nose Wheel Steering Parts

## Nose Wheel Steering Rod Boots for Cessna 150 thru 182 Aircraft

**New!** Improved! Extended Life and Better Fire Protection Boot P/N MC0713666-1 for 182E thru 182T  
McFarlane has improved the design of both the boot and the retaining flange. The Cessna boot is prone to ripping and tears caused by fatigue and premature infrared heat related material break down. McFarlane has utilized a three ply material design incorporating both Kevlar and fiberglass, and a supple high temperature rubber coating. Kevlar and fiberglass work together to prevent wear, fatigue, and heat failures while offering 15 times the fire resistance of the original boot for extended fire protection at 2,000 degrees F.

McFarlane has also upgraded the original aluminum flange to a stainless steel firewall material. The flange is included with the boot.

- Kevlar/Fiberglass composite for strength and fire protection
- Fire proof stainless steel flange
- Deeper convoluted design for better flexibility and longer life

### Don't Forget the Hose Clamp, P/N MCS2357-2S!

Cessna failed to list the clamp in the parts catalog, therefore people tend to use a nylon cable tie which will easily melt away with an engine fire. Always use metal clamp P/N MCS2357-2S to attach the boot to the steering link.

### P/N MC0413304-3 for 150 thru 152 series

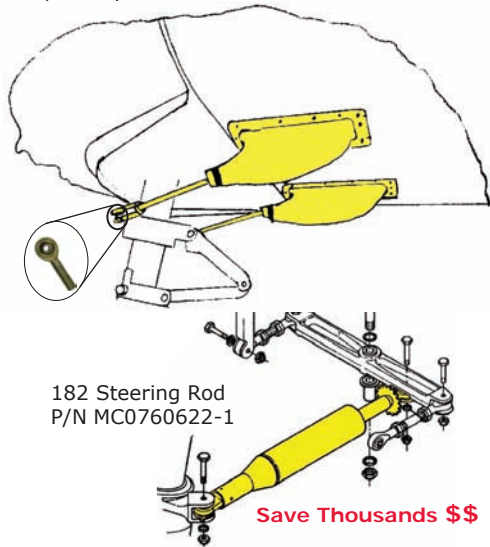
P/N MC0543015-6 for 172, 175 and early 182 series  
McFarlane 150 thru early 182 series steering rod boots are manufactured with a black Kevlar®/fiberglass blend fabric. The fatigue resistance of Kevlar is uniquely mated with the fire resistance of fiberglass. This is a super tough, high temperature fabric that will provide many years of outstanding performance.

- Keeps exhaust and carbon monoxide out of the cabin
- Protects the cabin in case of an engine fire

## Doubler for Cessna Aircraft

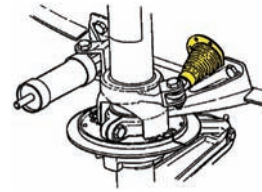
Doubler for 150-152 aircraft is now McFarlane FAA-PMA approved.

- White Poly Paint - ready to install
- 1/2 the price!



182 Steering Rod  
P/N MC0760622-1

Save Thousands \$\$



182E thru 182T Boot  
P/N MC0713666-1



150 thru early  
182 series boot

**These Bad Boys  
Can Take the Abuse!**



**Doubler Now FAA-PMA  
Approved at 1/2 the Price!**

Save Hundreds \$\$



Model	S/N	Boot (2 per A/C)	Steering Rod		Doubler (2 per A/C)	Rod End (2 per A/C)
			Left Hand	Right Hand		
150, 150A,B,C,D,E,F,G,H	All	MC0413304-3	MC0543022-3	MC0543022-4	MC0413304-6	S1107-3
150J,K,L,M	All	MC0413304-3	MC0543022-3	MC0543022-4	MC0413304-6	S1823-3
A150K,L,M	All	MC0413304-3	MC0543022-3	MC0543022-4	MC0413304-6	S1823-3
F150F,G,H	All	MC0413304-3	MC0543022-3	MC0543022-4	MC0413304-6	S1823-3
F150J,K,L,M, FA150K,L	All	MC0413304-3	MC0543022-3	MC0543022-4	MC0413304-6	S1823-3
FRA150L,M	All	MC0413304-3	MC0543022-3	MC0543022-4	MC0413304-6	S1823-3
152, A152, F152, FA152	All	MC0413304-3	MC0543022-3	MC0543022-4	MC0413304-6	S1823-3
172, 172A	All	MC0543015-6	MC0543022-1	MC0543022-2	0543026-1	S1107-3
172B,C	All	MC0543015-6	MC0743008-1	MC0743008-2	0543026-1	S1107-3
172D,E,F,G,H,I,K,L,M,N,P,Q	All	MC0543015-6	MC0543022-1	MC0543022-2	0543026-1	S1823-3
F172D,E,F,G,H,K,L,M,N,P	All	MC0543015-6	MC0543022-1	MC0543022-2	0543026-1	S1823-3
FP172	All	MC0543015-6	MC0543022-1	MC0543022-2	0543026-1	S1823-3
FR172E,F,G,H,J,K	All	MC0543015-6	MC0543022-1	MC0543022-2	0543026-1	S1823-3
P172	All	MC0543015-6	MC0543022-1	MC0543022-2	0543026-1	S1823-3
R172E,F,G,H,K	All	MC0543015-6	MC0543022-1	MC0543022-2	0543026-1	S1823-3
172R,S	All	MC0543015-6	MC0543022-1	MC0543022-2	0543026-1	S1823-3
175, 175A,B,C	All	MC0543015-6	MC0743008-1	MC0743008-2	0543026-1	S1107-3
177, 177A,B	All					S1823-3
182,182A,B,C,D	All	MC0543015-6	MC0743008-1	MC0743008-2	0543026-1	S1107-3
182E,F,G,H,J,K,L,M,N,P,Q,R,S,T F182P,Q, T182, T182T	All	<b>New!</b> MC0713666-1		<b>New!</b> MC0760622-1	<b>New!</b> Hose Clamp P/N MCS2357-2S <b>New!</b> Rod End P/N MCMM3M12	

1 Quantity of one required per aircraft.

2 Models R172E,F,G,H are pending FAA-PMA approval

## Nose Wheel Steering Rods for Cessna Aircraft

Tired of 'soft' worn out steering rods?  
Replace them with improved McFarlane steering rods.

- Redesigned long life springs!
- Stainless steel tubes for improved corrosion resistance (MC0543022 Series)
- Hardened internal washer for greater durability
- Optimum performance even after years of service!

### **New!** Steering Bungee P/N MC0760622-1 for 182E thru 182T

**New!** Sprocket P/N MC0760630-1 for 182E thru 182T  
Anodized to prevent corrosion and wear

**New!** Rod End P/N MCMM3M12 for 182E thru 182T  
Direct replacement



MC0543022 Series

MC0743008 Series

### Maintenance Tip:

How do I know if my steering rods need to be replaced?

- Nose wheel steering is unusually sluggish.
- One or both sides offer little or no spring resistance to steering input.
- More than 1 1/8" of free travel is present in either steering rod.
- The aircraft pulls to either side during taxiing.
- Inconsistent steering or rudder rigging.

FAA-PMA Approved

## Nose Gear Torque Link Repair Kits for Cessna Aircraft

P/Ns TL-KT-1 thru TL-KT-11

- Includes all commonly replaced torque link parts in a convenient kit
- McFarlane manufactured FAA-PMA approved kits.
- Fits most single engine Cessna aircraft.
- Now with specific model eligibility.
- Prevents Nose Wheel shimmy.

### Kits include:

Bushings, Spacers, Shims, Nuts, Bolts, Washers and Cotter Pins.

## Brass Nose Gear Torque Link Shim Kit for Cessna Aircraft

- Eliminates undamped torque link motion to prevent shimmy
- Also available individually or in torque link repair kits

P/N TL-SHIM-KT-1

### Kit contains:

- (2) MCS1450-6B14-005 .005" Thick
- (2) MCS1450-6B14-007 .007" Thick
- (5) MCS1450-6B14-010 .010" Thick

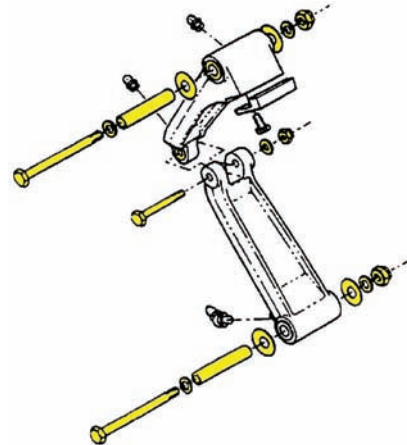
## Torque Link Spacers for Cessna Aircraft

P/N MC0543047-1 and MC0543047-2

- Tightly controlled minimal end chamfer maximizes bearing surface between spacer and fork to ensure a secure clamp and prevent fork wear.
- Precision length

## NAS1149F0316P Ultra-Thin Washers

These hard to find 3/16" ID, 0.016" thick standard steel washers are sometimes useful for fine tuning the center "knee" joint fit on most Cessna torque links. Available in packs of 5. **Not included in torque link kits.**



Model	Serial Number	Part Number																	
		TL-KT-1	TL-KT-2	TL-KT-4	TL-KT-5	TL-KT-6	TL-KT-7	TL-KT-8 <sup>2</sup>	TL-KT-9 <sup>2</sup> <sup>7</sup>	TL-KT-10	TL-KT-11	TL-SHIM-KT-1	MC0543047-1	MC0543047-2	MCS1450-6B14-005	MCS1450-6B14-007	MCS1450-6B14-010		
150, 150A,B,C,D,E,F,G,H,J,K,L,M	All-Except aircraft with heavy duty nose gear	•																	
A150K-M, F150F-M, FA150K-M, FRA150L,M	All	•																	
152, A152, F152, FA152	All	•																	
172 <sup>1</sup>	28000 thru 36141, 36150 thru 36153							•											
172 <sup>1</sup> , 172A,B,C,D,E,F,G,H,I,K,L,M,N,P,Q,R,S	36142 thru 36149, 36154 thru 172S99999	•																	
172RG	All					•													
F172D-P, FP172, FR172E-K, P172D, R172K	All	•																	
175, 175A,B,C	All	•																	
177, 177A,B	All									•									
177RG, F177RG	All					•													
182	All	•																	
182A,B,C,D,E,F,G,H,J,K,L,M,N,P,Q	All	•																	
182R	All	•				•													
182S,T	All	•																	
F182P,Q	All	•																	
R182, T182, FR182	All	•																	
T182T	All	•																	
TR182	All	•																	
205 (210-5) 205A, (210-5A)	All	•																	
206, P206, P206A, TP206A, TU206A, U206, U206A <sup>2</sup>	All	•	•																
P206B,C,D,E <sup>1</sup> , TP206B,C,D,E <sup>1</sup> <sup>2</sup>	P206-0307 thru P20600641																		
P206E <sup>1</sup> , TP206E <sup>1</sup>	P20600642 thru P20600647																		
TU206B,C,D,E <sup>1</sup> , U206B,C,D,E <sup>1</sup> <sup>2</sup>	U206-0657 thru U20601537																		
TU206E <sup>1</sup> F <sup>1</sup> , U206E <sup>1</sup> F <sup>1</sup>	U20601538 thru U20602199																		
TU206F <sup>1</sup> G, U206F <sup>1</sup> G	U20602200 thru U20607020				•														
206H, T206H	All				•														
207 <sup>1</sup> , T207 <sup>1</sup> <sup>2</sup>	20700001 thru 20700228				•	•													
207 <sup>1</sup> , 207A, T207 <sup>1</sup> , T207A	20700229 thru 20700788				•														
210, 210A,B,C,D,E,F,G,H,J	All	•																	
210K <sup>2</sup>	All	•	•																
210L <sup>1</sup> <sup>2</sup> , T210L <sup>1</sup> <sup>2</sup>	21059503 thru 21060255	•																	
210L <sup>1</sup> , M,N,R	21060256 thru 21065009				•														
P210N,R	All				•														
T210F,G,H,J,K	All	•																	
T210L <sup>1</sup> , M,N,R	21060256 thru 21065009				•														

<sup>1</sup> Partial model eligibility

<sup>2</sup> TL-KT-8 and TL-KT-9 torque link kits are used on Cessna model aircraft with heavy duty landing gear that utilizes AN6 size (3/8-24 UNF) bolts in the upper and lower torque link joints. The normal duty landing gear uses AN4 size (1/4-28 UNF) bolts in the upper and lower torque link joints.

<sup>3</sup> Aircraft models in this serial range may use one of two choices for McFarlane Torque Link Kits. The aircraft that have both upper and lower spacers measuring ~ 2 inches long will use McFarlane Torque Link Kit TL-KT-1 (containing two MC0543047-1 spacers). The aircraft that has an upper spacer measuring ~ 2.6 inches and a lower spacer measuring ~2 inches will use McFarlane Torque Link Kit TL-KT-2 (containing one MC0543047-1 and one MC0543047-2 spacer).

<sup>4</sup> Aircraft models in this serial range may use one of two choices for McFarlane Torque Link Kits. The aircraft that have both upper and lower spacers measuring ~ 2 inches long will use McFarlane Torque Link Kit TL-KT-5 (containing two MC0543047-1 spacers). The aircraft that has an upper spacer measuring ~ 2.6 inches and a lower spacer measuring ~2 inches will use McFarlane Torque Link Kit TL-KT-4 (containing one MC0543047-1 and one MC0543047-2 spacer).

<sup>5</sup> Aircraft models in this serial range may use one of two choices for McFarlane Torque Link Kits. The aircraft that have both upper and lower spacers measuring ~ 2 inches long will use McFarlane Torque Link Kit TL-KT-1 (containing two MC0543047-1 spacers). The aircraft that has an upper spacer measuring ~ 2.6 inches and a lower spacer measuring ~2 inches will use McFarlane Torque Link Kit TL-KT-7 (containing one MC0543047-1 and one MC0543047-2 spacer).

<sup>6</sup> Aircraft models in this serial range may use one of two choices for McFarlane Torque Link Kits. The aircraft that have both upper and lower spacers measuring ~ 2 inches long will use McFarlane Torque Link Kit TL-KT-1 (containing two MC0543047-1 spacers). The aircraft that has an upper spacer measuring ~ 2.6 inches and a lower spacer measuring ~2 inches will use McFarlane Torque Link Kit TL-KT-11 (containing one MC0543047-1 and one MC0543047-2 spacer).

<sup>7</sup> Availability of one component of this kit (0841000-63) is limited. Call for current status.

# Landing Gear and Nose Wheel Steering Parts

## Torque Link Stop Lugs and Safety Plate for Cessna Aircraft

Replace worn out stop lugs to reduce drag? Really?

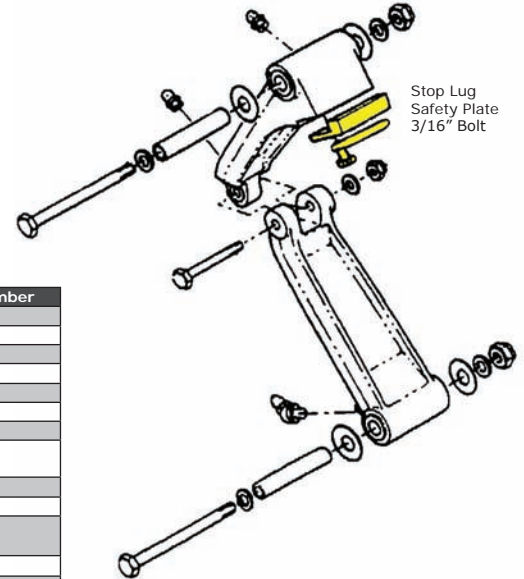
**This often overlooked but important part is affordable at McFarlane!** The torque link stop lug is a sacrificial part that hammers against a flat spot on the lower part of the shock strut outer tube when the strut extends after take off. This prevents the strut from overextending and forces the nose wheel and rudder system into proper alignment for flight.

Due to repeated hammering with every takeoff, these stop lugs must be periodically replaced. Excessive wear can allow overextension of the strut. They also often wear unevenly resulting in inconsistent alignment of the nose wheel in flight which then causes extra drag and yaw. The extra yaw can require increased rudder trim which causes even more drag. So yes, replacing a torque link stop lug can reduce drag!

- Safety plate features bend up tabs to secure stop lug bolts
- Super tough 4130 alloy steel
- Kits include stop lug, safety plate and applicable 3/16" bolts.

### Maintenance Tip:

Replace the stop lug if it is no longer flush with the strut, mushroomed, worn rounded, bent away from the torque link, or if it has stress cracks. The safety plate should not be reused.



Stop Lug  
Safety Plate  
3/16" Bolt

Aircraft	Serial Number	Stop Lug	Safety Plate	Kit Part Number
150D,E,F <sup>1</sup>	15060477 thru 15063457	MC0442506-8 <sup>2</sup>	MC0442506-9 <sup>2</sup>	TLSL-KT-1
150G,H,J,K,L,M	All	MC0442506-8	MC0442506-9	TLSL-KT-1
A150K,L,M	All	MC0442506-8	MC0442506-9	TLSL-KT-1
F150F	F150-0001 thru F150-0055	MC0442506-8	MC0442506-9	TLSL-KT-1
F150G,H,J,K,L,M	All	MC0442506-8	MC0442506-9	TLSL-KT-1
FA150K,L,M	All	MC0442506-8	MC0442506-9	TLSL-KT-1
152, A152, F152, FA152	All	MC0442506-8	MC0442506-9	TLSL-KT-1
172H,I,K,L,M	All	MC0442506-8	MC0442506-9	TLSL-KT-1 <sup>2</sup> TLSL-KT-2 <sup>3</sup>
172N,P,Q	All	MC0442506-8	MC0442506-9	TLSL-KT-2
172R,S	All	MC0442506-8	MC0442506-9	TLSL-KT-1
F172H,K,L,M	All	MC0442506-8	MC0442506-9	TLSL-KT-1 <sup>2</sup> TLSL-KT-2 <sup>3</sup>
F172N,P	All	MC0442506-8	MC0442506-9	TLSL-KT-2
FR172E,F,G	All	MC0442506-8	MC0442506-9	TLSL-KT-1 <sup>2</sup> TLSL-KT-2 <sup>3</sup>
FR172H,J	All	MC0442506-8	MC0442506-9	TLSL-KT-1
FR172K	All	MC0442506-8	MC0442506-9	TLSL-KT-2
R172E,F,G,H,K	All	MC0442506-8	MC0442506-9	TLSL-KT-2
182K,L,M,N	All	MC0442506-8 <sup>2</sup> MC0442506-11 <sup>3</sup>	MC0442506-9	TLSL-KT-2 <sup>2</sup> TLSL-KT-4 <sup>3</sup>
182P <sup>1</sup>	18260826 thru 18262465	MC0442506-11	MC0442506-9	TLSL-KT-4
	18262466 thru 18265175	MC0442506-11	MC0442506-9	TLSL-KT-4
182Q,R	All	MC0442506-11	MC0442506-9	TLSL-KT-4
182S,T	All	MC0442506-11	MC0442506-9	TLSL-KT-3
F182P,Q	All	MC0442506-11	MC0442506-9	TLSL-KT-4
T182T	All	MC0442506-11	MC0442506-9	TLSL-KT-3
206H, T206H	All		MC0442506-9	
P206B,C,D,E	All	MC0442506-8 <sup>2</sup>	MC0442506-9 <sup>2</sup>	TLSL-KT-2
TP206B,C,D,E	All	MC0442506-8 <sup>2</sup>	MC0442506-9 <sup>2</sup>	TLSL-KT-2
TU206B,C,D,E,F <sup>1</sup>	U206-0657 thru U20602199	MC0442506-8 <sup>2</sup>	MC0442506-9 <sup>2</sup>	TLSL-KT-2
TU206F <sup>1</sup> , G	U20602200 thru U20607020		MC0442506-9	
U206B,C,D,E,F <sup>1</sup>	U206-0657 thru U20602199	MC0442506-8 <sup>2</sup>	MC0442506-9 <sup>2</sup>	TLSL-KT-2
U206F <sup>1</sup> , G	U20602200 thru U20607020		MC0442506-9	
207, 207A, T207, T207A	All		MC0442506-9	

<sup>1</sup> Partial model eligibility  
<sup>2</sup> When equipped with heavy duty nose gear  
<sup>3</sup> When equipped with standard duty nose gear

### More Important Than You Think

Overextension of the nose strut due to a worn out stop lug can lead to a cascade of problems. McFarlane A&P mechanics have seen struts over extend to the point where the metering pin comes out of the orifice. This results in loss of dampening action and the pin hammering the orifice every landing and distorting and enlarging it. Over time, the excess nose strut travel and lack of dampening can result in fatigue cracks in the torque link arms. McFarlane recommends thoroughly inspecting all nose strut components when replacing a severely worn stop lug.

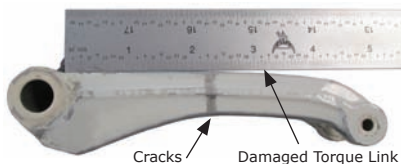
## Cessna Upper Torque Link Assembly

McFarlane has developed a stronger upper torque link for Cessna 210 Aircraft Upper Torque Link Assembly P/N MC1243426-2

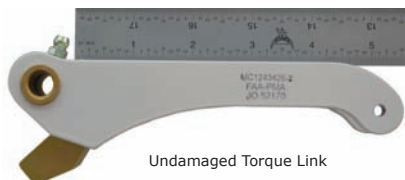
- Direct replacement for the original Cessna parts
- Stronger aluminum alloy and heavier flanges.
- More resistant to the bending
- Bent links allow the strut to overextend

Save Thousands \$\$

FAA-PMA Approved



Cracks Damaged Torque Link



Undamaged Torque Link

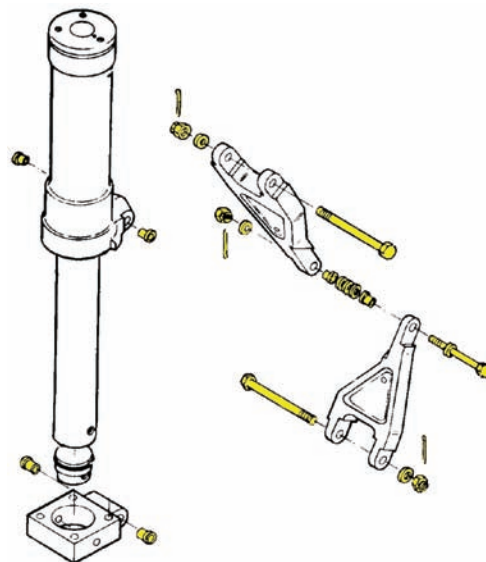


Aircraft	Part Number	Description	Upper Torque Link Assembly	Stop Lug	Bolt, Special	Shim	Lube Fitting	Link Only
210G,H, T210G,H	MC1243426-2	Upper Torque Link Assembly	•	•	•	•	•	•
210J,K,L,M,N,R, T210J,K,L,M,N,R	MC1243038-1	Stop Lug	•	•	•	•	•	•
P210N,R	MC1243422-1	Bolt, Special	•	•	•	•	•	•
	MC1243618-2	Shim	•	•	•	•	•	•
	MC1243618-3	Shim	•	•	•	•	•	•
	AS15002-1P	Lube Fitting	•	•	•	•	•	•
	6951	Link Only	•	•	•	•	•	•

## Nose Gear Torque Link Repair Kits for Piper Aircraft

Prevents shimmy by removing looseness in the torque links.

- Replaces all common wear torque link components in a convenient kit
- Fits most Piper aircraft
- Contains All FAA approved parts and standard hardware
- Save time and money! No more research and ordering of individual parts.



Aircraft	Serial Number	Main Wheel Kit 2 kits req. if not labeled Left/Right	Nose Wheel Kit
PA-23, PA23-160	All	PTL-KT-91	PTL-KT-91
PA-23-235	All	PTL-KT-92 w/o Notched Bushings PTL-KT-93 w/Notched Bushings	PTL-KT-92 w/o Notched Bushings PTL-KT-93 w/Notched Bushings
PA-23-250	All	PTL-KT-92 w/o Notched Bushings PTL-KT-93 w/Notched Bushings	PTL-KT-92 w/o Notched Bushings PTL-KT-93 w/Notched Bushings
PA-E23-250	All	PTL-KT-92 w/o Notched Bushings PTL-KT-93 w/Notched Bushings	PTL-KT-92 w/o Notched Bushings PTL-KT-93 w/Notched Bushings
PA-24, PA-24-250, PA-24-260, PA-24-400	All	PTL-KT-36 Left PTL-KT-75 Right	PTL-KT-95
PA-28-140, PA-28-150, PA-28-160, PA-28-180	All	PTL-KT-11	PTL-KT-31
PA-28-151	All	PTL-KT-13	PTL-KT-29
PA-28-161	2816001 thru 2816119	PTL-KT-4	PTL-KT-31
	2841001 thru 2841365	PTL-KT-10	PTL-KT-26
	2842001 thru 2842999	PTL-KT-5	PTL-KT-32
	28-7716001 thru 28-7816253 28-7816254 thru 28-8616057	PTL-KT-15 PTL-KT-4	PTL-KT-31
PA-28-181	2843001 thru 2843999	PTL-KT-3	PTL-KT-30
	2890001 thru 2890231 28-7690001 thru 28-7890231 28-7890232 thru 28-8690062	PTL-KT-7 PTL-KT-12 PTL-KT-7	PTL-KT-27
	All	PTL-KT-2	PTL-KT-52
PA-28-201T	All	PTL-KT-11	PTL-KT-31
PA-28-235	All	PTL-KT-77	PTL-KT-28
PA-28R-180	28R-30005 thru 28R-31279	PTL-KT-40 Left PTL-KT-59 Right	PTL-KT-78
	28R-7130001 thru 28R-7130013	PTL-KT-40 Left PTL-KT-59 Right	PTL-KT-81
PA-28R-200	28R-35001 thru 28R-7135062	PTL-KT-40 Left PTL-KT-59 Right	PTL-KT-78
	28R-7135063 thru 28R-7635545	PTL-KT-40 Left PTL-KT-59 Right	PTL-KT-81
PA-28R-201, PA-28R-201T	2803001 thru 2837061	PTL-KT-44 Left PTL-KT-61 Right	PTL-KT-81
PA-28R-201	2844001 thru 2844999	PTL-KT-39 Left PTL-KT-68 Right	PTL-KT-80
PA-28R-201, PA-28R-201T	28R-7703001 thru 28R-7837317	PTL-KT-44 Left PTL-KT-61 Right	PTL-KT-81
PA-28RT-201, PA-28RT-201T	All	PTL-KT-43 Left PTL-KT-61 Right	PTL-KT-80
PA-30	All	PTL-KT-95	PTL-KT-95
PA-31, PA-31-300, PA-31-325	31-5 thru 31-7812120	PTL-KT-22 w/Notched Bushings PTL-KT-21 w/o Notched Bushings	PTL-KT-90 w/o Notched Bushings PTL-KT-98 w/Notched Bushings PTL-KT-97 w/Notched Bushings PTL-KT-56 w/o Notched Bushings
	31-7812121 thru 31-8312019		
PA-31-350	31-5001 thru 31-8553002	PTL-KT-25 w/o Notched Bushings PTL-KT-18 w/Notched Bushings	PTL-KT-67 w/o Notched Bushings PTL-KT-73 w/Notched Bushings
PA-31-350 (T1020)	31-8253001 thru 31-8553002	PTL-KT-24 w/o Notched Bushings PTL-KT-17 w/Notched Bushings	PTL-KT-70 w/o Notched Bushings PTL-KT-64 w/Notched Bushings
PA-31P	All	PTL-KT-25 w/o Notched Bushings PTL-KT-18 w/Notched Bushings	PTL-KT-65 w/o Notched Bushings PTL-KT-72 w/Notched Bushings
PA-31P-350	All	PTL-KT-25 w/o Notched Bushings PTL-KT-18 w/Notched Bushings	PTL-KT-65 w/o Notched Bushings PTL-KT-71 w/Notched Bushings
PA-31T, PA-31T1, PA-31T2, PA-31T3	All	PTL-KT-23 w/o Notched Bushings PTL-KT-16 w/Notched Bushings	PTL-KT-65 w/o Notched Bushings PTL-KT-71 w/Notched Bushings
PA-32-260	32-1 thru 32-7700023	PTL-KT-14	PTL-KT-33
	32-7800001 thru 32-7800008	PTL-KT-9	
PA-32-300	32-40000 thru 32-7840043	PTL-KT-14	PTL-KT-33
	32-7840044 thru 32-7940290	PTL-KT-9	
PA-32-301, PA-32-301T	All	PTL-KT-8	PTL-KT-34
PA-32-301FT, PA-32-301XTC	All	PTL-KT-6	PTL-KT-35
PA-32R-300	All	PTL-KT-37 Left	PTL-KT-81
		PTL-KT-69 Right	

Eligibility continued on next page



Eligibility continued from previous page			
Aircraft	Serial Number	Main Wheel Kit 2 kits req. if not labeled Left/Right	Nose Wheel Kit
PA-32R-301, PA-32R-301T	3213001 thru 3229003	PTL-KT-42 Left PTL-KT-60 Right	PTL-KT-81
	3246001 thru 3257999	PTL-KT-45 Left PTL-KT-63 Right	PTL-KT-80
	32R-8013001 thru 32R-8629008	PTL-KT-42 Left PTL-KT-60 Right	PTL-KT-81
PA-32RT-300, PA-32RT-300T	All	PTL-KT-41 Left PTL-KT-60 Right	PTL-KT-80
PA-34-200	All	PTL-KT-42 Left PTL-KT-60 Right	PTL-KT-86
PA-34-200T	All	PTL-KT-38 Left PTL-KT-58 Right	PTL-KT-86
PA-34-220T	3433001 thru 3447029	PTL-KT-57	PTL-KT-86
	3448038 thru 3448079	PTL-KT-57	PTL-KT-86
	3449001 thru 34-8633031	PTL-KT-57	PTL-KT-86
PA-38-112	All		PTL-KT-1
PA-39	All	PTL-KT-95	PTL-KT-95
PA-42, PA-42-720, PA-42-720R	All	PTL-KT-20 PTL-KT-25 w/o Notched Bushings	PTL-KT-65 w/o Notched Bushings PTL-KT-71 w/Notched Bushings
PA-42-1000	All	PTL-KT-19	PTL-KT-65 w/o Notched Bushings PTL-KT-71 w/Notched Bushings
PA-44-180	4495001 thru 4495013		PTL-KT-80
	4496001 thru 4496999	PTL-KT-44 Left PTL-KT-61 Right	PTL-KT-74 PTL-KT-80
	44-7995001 thru 44-8195026		
PA-44-180T	All	PTL-KT-43 Left PTL-KT-62 Right	PTL-KT-80
PA-46-310P	All	PTL-KT-48	PTL-KT-96
PA-46-350P (w/ G1000)	All	PTL-KT-47	PTL-KT-88
PA-46-350P (w/o G1000)	4622001 thru 4622200	PTL-KT-46	PTL-KT-96
	4636001 thru 4636195	PTL-KT-51	
	4636196 thru 4636999	PTL-KT-50	PTL-KT-88
PA-46-500TP (w/ G1000)	All	PTL-KT-54	PTL-KT-87
PA-46-500TP (w/o G1000)	All	PTL-KT-55	PTL-KT-87
PA-46R-350T (w/ G1000)	All	PTL-KT-50	PTL-KT-89
PA-46R-350T (w/o G1000)	All	PTL-KT-50	PTL-KT-88

## Removing Torque Link Bushings (Nose Gear Scissors)

By Dave McFarlane

Removing the flanged bushings from the torque link forging can be difficult as there is not a good surface to press against or grab onto. An easy way to remove them is to thread them with a tap, screw a bolt in the thread you made, and then drive or press against the bolt. The thread does not have to be a full depth thread for the bolt to hold securely in the bushing. The bushing material is somewhat hard, but not so hard that a standard hardware store tap will not do the job. Use cutting oil on the tap to prevent tap damage. Normally the bushing will then come out easily. For stubborn bushings, soak the link assembly in boiling water before pressing the bushing. The heat will expand the aluminum forging more than the steel bushing. This helps loosen the press fit while limiting the temperature to prevent from overheating and harming the heat treat of the aluminum forging. A controlled oven can be substituted for boiling water as a heat source, but do not exceed 350° F. Do not use flame or other non-controlled heat sources. An alternate method is to put dry ice in the bushing before driving or pressing on the bolt you threaded into the bushing. Do not over-press or hammer as the aluminum can gall to the bushing and leave a damaged bushing bore. If the bushing does not come out with light to moderate force take the time to use some heat or cold to help.

## Cessna Brake Line Fairing Extrusion

**Reduce Drag!**  
P/N P580058

- Paintable
- Easily attaches with super glue
- Replaces P/N S1511-1

White rubber extrusion that attaches to the trailing edge of flat Cessna landing gears and serves as a fairing for the brake line.

This extrusion was original equipment on later model aircraft with flat gears. Many mechanics use this as an improvement for the earlier aircraft.



**McFarlane's FAA-PMA Australian Nose Strut Seal Kit Solves the Problem!**

Don't waste your time with substandard seals, nothing compares!!



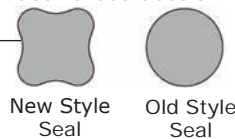
- Double edge ("X" style) seal that will not twist and leak!
- Solves the continuous leak and re-service problems with the Cessna nose strut.
- Go years without servicing!

**P/N MCSK172-1F**

- FAA-PMA direct replacement for Cessna P/N SK172-1F.
- Also includes AN901-5A gasket.
- Improved lock rings are made of 304 stainless steel for better corrosion resistance.
- Components also available separately.



**Seal Cross Section:**



Aircraft	MCSK172-1F Contains		
	Qty	P/N	Description
All 150, 152, 172, 175 and 177RG series	1	AN901-5A	Gasket
182E-T, A182J,K,L,N	1	MC0841200-19	Lock Ring
F182P,Q, FR182, R182, TR182, T182, T182T	1	MC0841200-25	Lock Ring
210-5A (205A)	2	MCS1628-329	Backup Ring
206, 207 series	1	MCS2418-1	Scraper Ring
210B-R, P210N,R, T210F-R	1	MS28775-010	O-ring
T303	1	MS28775-221	O-ring
337 series	1	MS28775-225	O-ring
	1	MS28775-228	O-ring
	1	1100	Square Seal

Note: P/N NSS-KT-2 doesn't contain the improved square ("X" style) O-ring. Adding this improved part is pending FAA-PMA approval.

NSS-KT-2		
Qty	P/N	Description
1	AN901-5A	Gasket
1	MC0841200-19	Lock Ring
1	MC0841200-25	Lock Ring
2	MS28782-32	Packing Retainer
1	MCS2418-1	Scraper Ring
1	MS28775-010	O-ring
1	MS28775-221	O-ring
1	MS28775-225	O-ring
1	MS28775-228	O-ring
1	MS28775-329	O-ring

Aircraft	Qty	P/N	Description
182, 182A,B,C,D	1	MCS2418-1	Scraper Ring
210-5 (205)	1	MS28775-010	O-ring
210, 210A	1	MS28775-221	O-ring
310, 310B,C,D,F,G,H,I,J,J-1,K,L,N,P,Q	1	MS28775-225	O-ring
320, 320-1, 320A,B,C,D,E,F	1	MS28775-228	O-ring
336	1	MS28775-329	O-ring



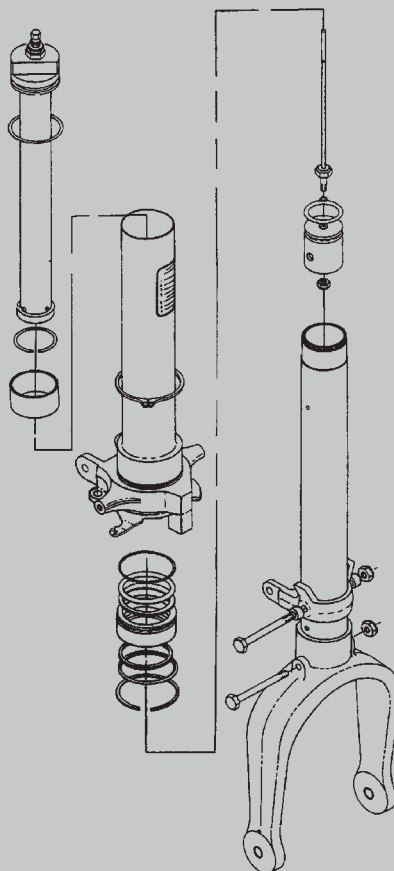
**Maintenance Tip:**  
Wipe the chrome strut down with Stoddard solvent (mineral spirits) periodically to soften and remove any dried oil film, dirt, dust and bugs.

**Why Does My Cessna Nose Strut Keep Leaking Down?**

By Dave McFarlane

Cessna Nose strut "leak down" has plagued Cessna owners for the last 65 years. Why is it that a month after you reseal the nose strut you find the strut down again or just low and showing signs of a little MIL-5606 on the pretty chrome? It always happens on Sunday when no one is around to help you service it. You service it up the next week only to have it to do it again next month. After several strut reseals most people just resign to servicing it often and consider it part of owning a Cessna. Piper and Beech struts do not leak down or need to be resealed often and they are high pressure!

With a strong belief that everything that goes wrong on an airplane has a reason that can be explained by physics, we did some research. It was observed that the low time leaking O-ring that was removed always showed signs of being slightly twisted and otherwise like new. Further experiments and close evaluations proved that the O-ring would twist from friction caused by an oxidized hydraulic fluid film on the chrome strut. You probably have noticed how MIL-5606 hydraulic fluid tends to dry and get sticky after it is exposed to air. Add a little runway dust to the back side of the strut and it really gets sticky. The low operating pressures of the Cessna strut does not put a lot of holding pressure to stabilize the sealing O-ring. It was observed that the sticky film on the chrome strut can grab and adhere to the O-ring during a normal strut action cycle. If the sticky film is not evenly dispersed on the strut, the O-ring is rolled a little on the filmy side only. This uneven rolling action puts a slight twist in the O-ring. This slight twist can break the normal seal between the strut and the



O-ring allowing a slow unpredictable leak.

It seemed logical that if you lowered the friction on the O-ring surface you could eliminate the problem. A hunt was on for a low friction O-ring that would resist being rolled and would have good durability. After many experiments with Teflon® coated and other specialty O-rings only partial success was achieved. They either were not as durable or the sealing characteristics were not as good as the standard rubber O-ring.

A break finally came at Airventure Oshkosh when Tony Brand of Horsham Aviation Services located in Horsham, Victoria, Australia came by and explained how they solved the problem. They had observed the same twisting of the strut O-ring and went on to explain how they replaced the round O-ring with a square ("X" style) O-ring that can not rotate. The standard backup rings were simply reversed to match the square sides of the new style O-ring. The "X" O-rings have the same material as the standard ones. Brilliant! Why didn't we think of that!?! We rushed home and changed all the O-ring seals in five of the airplanes on the field. One of them was our 152 trainer that takes a lot of abuse. We were going to find out if those innovative Aussies knew what they were talking about. Sure enough, that was almost five years ago and we have never had to service the nose strut (not even with air) on any of the aircraft with the square O-rings! My hat goes off to the boys from Down Under for saving the industry thousands of man hours every year and making the Cessna fleet more reliable! Thank you!

Our FAA-PMA seal kit, P/N MCSK172-1F now includes the square ("X" style) O-ring and instructions for reversing the back up rings.



# Landing Gear and Nose Wheel Steering Parts

## Shimmy Dampener Parts for Cessna Aircraft

### Save \$\$ – Repair your fluid dampener

Don't buy a disposable rubber dampener. Save money with replacement PMA parts. McFarlane now has affordable repair parts for the original fluid dampener. Save over \$400.

- More cost effective than a throwaway unit
- Proven design

### Improved Shimmy Dampener Shaft

Save more than 50% - Lasts longer!

- Perfected chrome finish for improved o-ring life and seal
- Durable one piece design — heat treated 4130 steel

### Head Bearings and Piston

Precision Machined, Direct Replacements

### Convenient Assemblies and Kits

- Simplify your repair process
- Assembled kits make overhaul more efficient
- One part number gives you everything you need

#### Maintenance Tip:

Measure the diameter of the head bearing to determine the correct piston assembly or repair kit.

**Piston Assemblies** includes pre-assembled shaft, head bearing, piston, head bearing o-rings, and roll pin.



Piston Assembly  
P/N MC0542118-5  
(with 1 3/16" head bearing)

**Quick and Easy!**  
We have done the assembly



Piston Assembly  
P/N MC0542118-1  
(with 1 5/16" head bearing)



P/N MC0542120-1  
Shaft



P/N MC0542102-1  
Head Bearing  
(1 3/16" diameter)



P/N MC0542102-3  
Head Bearing  
(1 3/16" diameter)



P/N MC0842400-3  
Piston

#### Seal Kit

P/N SDKT-1

Includes all necessary o-rings and backup rings



#### Repair Kit

P/N SDKT-2 (1 5/16" diameter)

Includes piston assembly, snap ring(s) and housing o-ring.



#### Repair Kit

P/N SDKT-3 (1 3/16" diameter)

Includes piston assembly, snap ring(s) and housing o-ring.



#### Hardware Kit

P/N SDKT-4

Includes all nuts, bolts, washers, cotter keys, and bushings to attach the shimmy dampener to the nose strut.



#### Seal Kits

P/N SDKT-5 and SDKT-6

Includes all necessary o-rings and backup rings



## Shimmy Dampener Replacement Parts for Cessna Aircraft

Aircraft	Serial Number	Part Number/Description	MC0542102-1 Head Bearing (1 3/16" diameter head bearing)	MC0542102-3 Head Bearing (1 3/16" diameter head bearing)	MC0542118-1 Piston Assembly (1 3/16" diameter head bearing)	MC0542118-5 Piston Assembly (1 3/16" diameter head bearing)	MC0842400-3 Piston	MC0542120-1 Shaft	SDKT-1 Seal Kit	SDKT-2 Repair Kit (1 5/16" diameter head bearing)	SDKT-3 Repair Kit (1 3/16" diameter head bearing)	SDKT-4 Hardware Kit	SDKT-5 Seal Kit	SDKT-6 Seal Kit
150, 150A,B,C,D,E,F, F150F	17879 and On		4	3				2						
150G <sup>1</sup>	1506453 thru 15067056		4	3	4	3	2	2	2	4	3	2		
150G <sup>1</sup> ,H,J	15067057 and On			3		3	2	2	2		3	2		
150K,L,M, A150K,L,M, FA150K,L,M, FRA150L,M	All			3		3	2	2	2		3	2		
F150G	All		4	3	4	3	2	2	2	4	3	2		
F150H,J	All			3		3	2	2	2		3	2		
F150K,L,M	All			3		3	2	2	2		3	2		
152, A152, F152, FA152	All			3		3	2	2	2		3	2		
172, 172A,B,C,D,E,F,G,H <sup>1</sup>	46433 thru 17256449		4	3	4	3	2	2	2	4	3	2		
172H <sup>1</sup> ,I,J,K,L,M,N,P,Q,R,S	17256450 and On			3		3	2	2	2		3	2		
F172D,E,F,G,H <sup>1</sup>	F172-0001 thru F172-0519		4	3	4	3	2	2	2	4	3	2		
F172H <sup>1</sup> ,K,L,M,N,P	F172-0520 thru F17202254			3		3	2	2	2		3	2		
FP172, P172D	All		4	3	4	3	2	2	2	4	3	2		
FR172E,F,G,H,J,K, R172K	All			3		3	2	2	2		3	2		
175, 175A,B,C	55896 and On		4	3	4	3	2	2	2	4	3	2		
177, 177A,B	ALL													2
182B,C,D	All		4	3	4	3	2	2	2	4	3	2		
182E	18253599 thru 18254143		4											
182K,L,M,N,P,Q,R,S,T <sup>1</sup>	18257626 thru 18281197													2
A182K,L,N	All													2
F182P,Q	All													2
T182T	T18208001 thru T18299999													2

<sup>1</sup> Partial model eligibility

<sup>2</sup> When equipped with fluid filled dampener (not a Lord rubber dampener)

<sup>3</sup> When equipped with fluid filled dampener with a 1 3/16" diameter head bearing

<sup>4</sup> When equipped with fluid filled dampener with a 1 5/16" diameter head bearing

FAA-PMA Approved

## Shimmy Dampener Assembly

Replace the Lord throw away dampener with our fully repairable Shimmy Dampener Assembly!

P/N MC0442512-1 for Cessna 150, 152, 172, 175 and 182 Aircraft

Improved design for consistent dampening action!

Direct replacement for part numbers 0442512-1 and 0542119-1

It's everything the original should have been and more than the rubber units ever could be!!

- Oversize shaft for rigid strength
- Wear resistant hard anodized housing
- Better shimmy dampening
- Totally repairable
- Self lubricating
- Costs less than the throw away rubber dampener



**New!**

### Temperature compensated hydraulics

- Almost no service required
- Even the first minor movements are dampened
- Consistent dampening action
- No oil leaks

### Seal Kit P/N SDKT-7

- Designed specifically to re-seal McFarlane shimmy dampeners
- Contains all required O-rings and back up rings

**Hundreds \$\$  
less than Lord  
throw away  
dampener!**



Shimmy dampener assembly P/N MC0442512-1 is eligible for all serial numbers of the aircraft listed except 175, as noted.
150G,H,J,K,L,M, A150K,L,M F150G,H,J,K,L,M FA150K,L,M FRA150L,M
152, A152, F152, FA152
172, 172A, B, C, D, E, F, G, H, I, K, L, M, N, P, Q, R, S F172D, E, F, G, H, K, L, M, N, P, FP172, P172D, FR172E, F, G, H, J, K, R172K
175, 175A, B, C
182B, C, D
■ S/N 55896 and On

Replacement Parts	Description
1520 ■	Barrel
1521	Bearing, Head, Shimmy Dampener
1522	Bearing, Head, Shimmy Dampener W/ Fill Hole
1523	Shaft, Shimmy Dampener
1524 ■	Piston (base number)
1525	Piston, Floating, Shimmy Dampener
1526	Screw, Set
1527	Spring, Shimmy Dampener
1530	Tool, Extraction, Floating Piston
1531	Tool, Spring Insertion
1532	Screw, Seal
AN565AC624H6	Screw, Set, 3/8-24 X 3/8"
MS1665-1137	Ring, Retaining
MS28775-216	O-Ring
MS51031-137	Screw, Set, 3/8-24, SS
NAS561P4-16	Pin, Retaining

■ Barrel and piston are performance matched. Letter code on piston to match letter code marked on outside of barrel, see McFarlane ICA drawing 7106 for details.



P/N MC0442512-1 installed on a 152

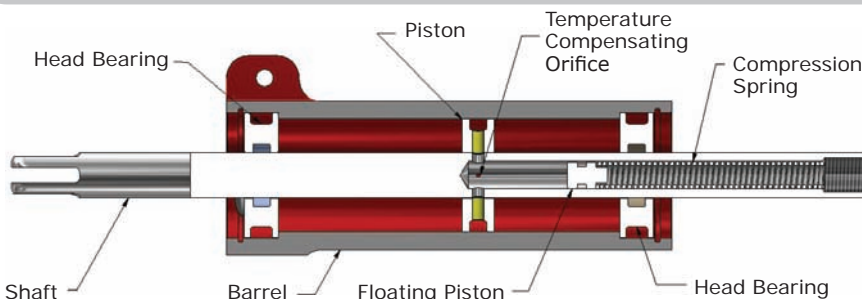
## What Does Temperature Compensated Mean?

By Dave McFarlane

When hydraulic oil changes temperature, the volume of the oil also changes. This volume change from a temperature reduction will create a vacuum in the oil chamber of the original Cessna uncompensated shimmy dampener. This vacuum will cause the oil to vaporize giving the oil a foamy expanded mixture that is compressible. The shimmy dampener action is then drastically degraded. An increase in temperature will increase the oil volume causing a drastic pressurization of the dampener oil chamber. This pressure will force small quantities of oil past the dampener shaft seals. The decrease in oil will then aggravate any temperature reduction with

increased chamber vacuum and related oil vaporization. This process explains why continuous servicing of the original shimmy dampener is required.

The temperature compensation system works by having a small chamber of oil that is spring pressurized through a very small passage into the main dampening restrictive orifice of the shimmy dampener. The spring loaded oil chamber can adjust for oil volume changes as temperature changes. A similar system is built into your car shock absorbers. The temperature compensated hydraulic system requires very little service over extended periods of time and assures stable shimmy dampening action.



## Why is a hydraulic shimmy dampener better than a rubber dampener?

By Dave McFarlane

A rubber based dampener is continuously fatiguing the rubber components as it changes direction of motion. The rubber system depends on stable friction of the rubber riding in a metal tube. This is very difficult to achieve over extended usage. There are inherent differences in static friction of rubber and dynamic friction of rubber that affect dampening performance. Long term use changes the performance of the dampener caused by all of these un-repairable factors. The hydraulic system works in a film of oil with stable performance for long periods of time and it is totally repairable.

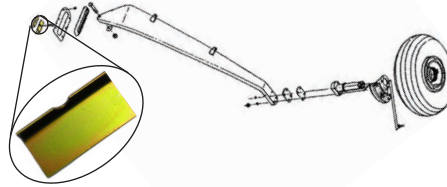
Landing Gear and Nose Wheel Steering Parts

# Landing Gear and Nose Wheel Steering Parts

## Landing Gear Box Shims

P/N ADO441023-2  
.100" tapered shim  
P/N ADO441023-160  
.160" tapered shim  
P/N ADO741022-1  
.040" shim  
P/N ADO741022-2  
.050" shim

- For Cessna aircraft using leaf spring landing gear
- 4130N steel, plated
- FAA-PMA



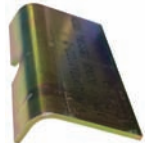
Save \$\$



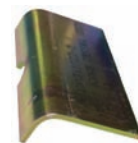
P/N ADO441023-2  
.100" Tapered Shim



P/N ADO441023-160  
.160" Tapered Shim



P/N ADO741022-1  
.040" Shim



P/N ADO741022-2  
.050" Shim

Manufactured by F Atlee Dodge

## Tail Wheel Fork Bearing for Cessna Aircraft

Bearing Cup  
P/N 08231  
Bearing Cone  
P/N 08118  
Direct replacement  
for Cessna  
P/N 0742400-12



## Main Gear Scraper Ring

P/N MS28776M2-18  
Fits Piper Models  
PA28-140,150,151,161,  
PA28-180,181,235,236,  
PA32-260,300



## Main Gear Quad Ring

P/N CA484-769  
Fits Piper Models  
PA-28-140,150,151,160,161,  
PA-28-180,181,235,236,201T,  
PA-32, PA-32-260,300,301,301T



## Nose Gear Quad Ring

P/N CA484-770  
Fits Piper Models  
PA28-140,150,151,160,161,  
PA28-180,181,235,236,  
PA32-260,300,301,301T



Manufactured by PMA Products, Inc.

## Axles for Cessna Aircraft

Don't lose an airplane because of a broken aluminum axle!

### Steel axle

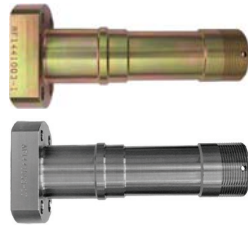
P/N AF1441003-1

- Weighs only 2.28 lbs
- Save hundreds of \$\$

### Titanium axle

P/N AF1441003-1T

- Reduces weight by 2 lbs per A/C vs. steel axles
- Will not rust



Model	Serial Number
170, 170A,B	18000 thru 27169
180, 180A-H	30000 thru 18052284
182, 182A-S	33000 and On
T182, R182, TR182	1820001 thru R18202041
185, 185A-E, A185E-F	1850001 thru 18504448
206, U206, U206A-G, TU206A-G	206-0001 thru U20607020
P206, P206A-E, TP206A-E	P206-0001 thru P20600647
206H, T206H	All

Manufactured by Airforms, Inc.

## Nose Baggage Compartment Cargo Door

### Up Latch for all Cessna 207 Aircraft

No more holding up the door while loading!

P/N AF1213922-1

- Improved strength
- Nickel plated for corrosion resistance



Manufactured by Airforms, Inc.

## High Strength Parts for Helio H-295

### Courier Aircraft

Parts are manufactured from high strength material and machined from a single billet - stronger than original welded assemblies!

Axle P/N AF250-040-495

- Cad plated for increased durability
- Precision fit - drop in direct replacement
- Accommodates wheel-ski installation

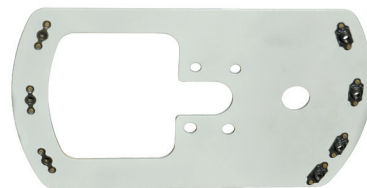


Manufactured by Airforms, Inc.

## Wheel Pant Mounting Plates for Cessna Aircraft

P/Ns MC0441225-1, MC0441225-2,  
MC0541220-1 and MC0541220-2

- Machined from high strength aluminum alloy
- Anodized for corrosion resistance
- Nut plates are riveted in place - ready to install!



### Maintenance Tip:

*Wheel pant mounting plates commonly crack around the axle. If any cracks are present, they should be replaced. The cracks are caused by wheel pant vibration. Assume that the wheel pant axle bolts are tight. Proper wheel balance will lessen wheel pant vibration. See page 263 for a simple but effective wheel balancer.*

Model	Serial Number	Left	Right
150L M	15074851 thru 15079405	MC0441225-1	MC0441225-2
F150L M	F15001014 thru F15001428	MC0441225-1	MC0441225-2
A150L M	A1500430 thru A1500734	MC0441225-1	MC0441225-2
FRA150L M	FRA1500212 thru FRA1500336	MC0441225-1	MC0441225-2
152	15279406 thru 15286033	MC0441225-1	MC0441225-2
A152	A1520735 thru A1521049	MC0441225-1	MC0441225-2
F152	F15201429 thru F15201980	MC0441225-1	MC0441225-2
FA152	FA1520337 thru FA1520425	MC0441225-1	MC0441225-2
172M N,P,Q	17261899 thru 17276673	MC0541220-1	MC0541220-2
172R	17280001 and On	MC0541220-1	MC0541220-2
172S	172S80001 and On	MC0541220-1	MC0541220-2
F172M N,P	F17201035 thru F17202254	MC0541220-1	MC0541220-2
FR172 K	FR17200441 thru FR17200675	MC0541220-1	MC0541220-2
R172K	R17220000 thru R1723454	MC0541220-1	MC0541220-2

■ Partial model eligibility

## Main and Nose Strut Seal and Repair Kits for Piper Aircraft

Precise eligibility for PA-22 thru PA-46 aircraft

McFarlane developed main and nose strut seal and repair kits that are now model and serial number specific giving you only the parts required, saving you time and money. All components are industry standard meeting the applicable MIL-SPEC or original Piper parts.

- Save money!
- Each kit contains exactly the parts required for the job
- Other kits are missing important parts

Now manufactured by  
McFarlane Aviation Products!



More Kits  
Added!

**PSS seal kits contain rubber and plastic parts.  
PSR repair kits contain the required PSS seal kit and commonly needed metal parts.**

Aircraft Model	Serial Number	Main Strut				Nose Strut			
		Seal Kit	Qty per Aircraft	Repair Kit	Qty per Aircraft	Seal Kit	Qty per Aircraft	Repair Kit	Qty per Aircraft
PA-22, PA-22-108, PA-22-135, PA-22-150, PA-22-160 PA-22S-135, PA-22S-150, PA22S-160	All	N/A	N/A	N/A	N/A	PSS-KT-19	1	PSR-KT-31	1
PA-23-235, PA-23-250, PA-E23-250	All	PSS-KT-3	2	PSR-KT-14	3	PSS-KT-3	1	PSR-KT-14	3
PA-24, PA-24-250, PA-24-260	24-1 thru 24-214 24-215 thru 5034	PSS-KT-1	2	PSR-KT-1	2	PSS-KT-1	1	PSR-KT-1	1
PA-24-400	All	PSS-KT-4	2	PSR-KT-15	2	PSS-KT-1	1	PSR-KT-2	1
PA-28-140, PA-28-150, PA-28-160, PA-28-180, PA-28-235	28-01 thru 28-3281, 28-10003 thru 28-10719, 28-20002 thru 28-21639 28-3282 thru 4377, 28-10720 thru 28-7710089, 28-21640 thru 28-7725290	PSS-KT-10	2	PSR-KT-34	2	PSS-KT-18	1	PSR-KT-26	1
PA-28-151	All	PSS-KT-36	2	PSR-KT-58	2	PSS-KT-20	1	PSR-KT-60	1
PA-28-161	2816001 thru 2816119, 2841001 thru 2841365, 28-7716001 thru 28-8616057	PSS-KT-36	2	PSR-KT-58	2	PSS-KT-20	1	PSR-KT-60	1
PA-28-181	2843001 thru 2843999, 28-7690001 thru 28-7790451 2890001 thru 2890231 28-7790452 thru 28-8690062	PSS-KT-36	2	PSR-KT-58	2	PSS-KT-20	1	PSR-KT-60	1
PA-28R-180, PA-28R-200	All	PSS-KT-14	2	PSR-KT-11	2	PSS-KT-4	1	PSR-KT-20	1
PA-28-201T	All	PSS-KT-31	2	PSR-KT-44	2	PSS-KT-37	1	PSR-KT-59	1
PA-28R-201	2844001 thru 2844999 2837001 thru 2837061 28R-7737002 thru 28R-7837317	PSS-KT-4	2	PSR-KT-17	2	PSS-KT-14	1	PSR-KT-10	1
PA-28R-201T	2803001 thru 2803012 28R-7703001 thru 28R-7803373	PSS-KT-11	2	PSR-KT-8	2	PSS-KT-4	1	PSR-KT-18	1
PA-28RT-201, PA-28RT-201T	All	PSS-KT-4	2	PSR-KT-17	2	PSS-KT-11	1	PSR-KT-9	1
PA-28-236	2811001 thru 2811050, 28-7911001 thru 28-8611008	PSS-KT-31	2	PSR-KT-44	2	PSS-KT-20	1	PSR-KT-60	1
PA-30	All	PSS-KT-1	2	PSR-KT-1	2	PSS-KT-1	1	PSR-KT-15	1
PA-31, PA-31-300, PA-31-325	31-2 thru 31-7812120 31-7812121 thru 31-8312016 31-8312017 thru 31-8312019	PSS-KT-35	2	PSR-KT-57	2	PSS-KT-39	1	PSR-KT-61	1
PA-31-350	31-5001 thru 31-8352036 31-8352037 thru 8553002	PSS-KT-23	2	PSR-KT-56	2	PSS-KT-34	1	PSR-KT-52	1
PA-31-350 (T1020)	All	PSS-KT-32	2	PSR-KT-48	2	PSS-KT-34	1	PSR-KT-53	1
PA-31P	All	PSS-KT-22	2	PSR-KT-47	2	PSS-KT-16	1	PSR-KT-68	1
PA-31P-350	All	PSS-KT-13	2	PSR-KT-67	2	PSS-KT-33	1	PSR-KT-49	1
PA-31T	31T-7400002 thru 31T-8120050 31T-8120051 thru 31T-8120104 31T-1104004 thru 31T-7804000	PSS-KT-22	2	PSR-KT-47	2	PSS-KT-34	1	PSR-KT-53	1
PA-31T1	31T-7804001 thru 31T-8104055 31T-8104056 thru 31T-8304003	PSS-KT-35	2	PSR-KT-54	2	PSS-KT-33	1	PSR-KT-49	1
PA-31T2	31T-1166001 thru 31T-8166000 31T-8166001 thru 31T-8166013 31T-8166014 thru 31T-8166076	PSS-KT-35	2	PSR-KT-55	2	PSS-KT-34	1	PSR-KT-49	1
PA-31T3	All	PSS-KT-32	2	PSR-KT-54	2	PSS-KT-33	1	PSR-KT-49	1
PA-32-260	32-1 thru 32-505 32-506 thru 32-1110 32-1111 thru 32-7800008	PSS-KT-32	2	PSR-KT-45	2	PSS-KT-33	1	PSR-KT-49	1
PA-32-300	32-40000 thru 32-40565 32-40566 thru 32-7940290	PSS-KT-12	2	PSR-KT-32	2	PSS-KT-2	1	PSR-KT-13	1
PA-32-301, PA-32-301T	All	PSS-KT-9	2	PSR-KT-33	2	PSS-KT-17	1	PSR-KT-24	1
PA-32-301FT, PA-32-301XTC	All	PSR-KT-50	2	PSR-KT-58	2	PSS-KT-8	1	PSR-KT-30	1
PA-32R-300	All	PSS-KT-4	2	PSR-KT-22	2	PSS-KT-15	1	PSR-KT-12	1
PA-32R-301, PA-32R-301T	3213001 thru 3213103 3229001 thru 3229003 3246001 thru 3246999 3257001 thru 3257999 32R-8013001 thru 32R-8613006 32R-8029001 thru 32R-8629008	PSS-KT-5	1	PSR-KT-5	1	PSS-KT-15	1	PSR-KT-23	1
PA-32RT-300, PA-32RT-300T	All	PSS-KT-28	2	PSR-KT-40	2	PSS-KT-5	1	PSR-KT-23	1
PA-34-200	All	PSS-KT-9	2	PSR-KT-33	2	PSS-KT-5	1	PSR-KT-23	1
PA-34-200T	All	PSR-KT-50	2	PSR-KT-58	2	PSS-KT-20	1	PSS-KT-38	1
PA-34-220T	3447001 thru 3447029 3449001 thru 3449999 3448001 thru 3448079 3433001 thru 3433172 34-8133001 thru 34-8633031	PSS-KT-4	2	PSR-KT-22	2	PSS-KT-14	1	PSR-KT-10	1
		PSS-KT-28	2	PSR-KT-40	2	PSS-KT-4	1	PSR-KT-20	1
		PSS-KT-28	2	PSR-KT-40	2	PSS-KT-28	1	PSR-KT-20	1
		PSS-KT-14	2	PSR-KT-11	2	PSS-KT-11	1	PSR-KT-9	1
		PSS-KT-11	2	PSR-KT-8	2	PSS-KT-7	1	PSR-KT-29	1
				PSR-KT-7		PSS-KT-7	1	PSR-KT-27	
				PSR-KT-5 <sup>1</sup>	2			PSR-KT-27 <sup>2</sup>	1
				PSR-KT-6 <sup>2</sup>				PSR-KT-28 <sup>1</sup>	

Eligibility continued on the next page

- <sup>1</sup> Use only when bearing has O-ring groove on ID
- <sup>2</sup> Use only when bearing has T-seal and backup ring

# Landing Gear and Nose Wheel Steering Parts

Aircraft Model Continued from previous column	Serial Number	Main Strut				Nose Strut			
		Seal Kit	Qty per Aircraft	Repair Kit	Qty per Aircraft	Seal Kit	Qty per Aircraft	Repair Kit	Qty per Aircraft
PA-39	All	PSS-KT-1	2	PSR-KT-1	2	PSS-KT-1	1	PSR-KT-15	1
PA-42, PA-42-720, PA-42-720R	All	PSS-KT-40	2	PSR-KT-63	2	PSS-KT-42	1	PSR-KT-65	1
PA-42-1000	All	PSS-KT-41	2	PSR-KT-64	2	PSS-KT-42	1	PSR-KT-65	1
PA-44-180	4495001 thru 4495013 44-7995001 thru 44-8195026 4496001 thru 4496999	PSS-KT-4	2	PSR-KT-40	2	PSS-KT-28	1	PSR-KT-51	1
PA-44-180T	All	PSS-KT-4	2	PSR-KT-40	2	PSS-KT-25	1	PSR-KT-41	1
PA-46-310P	All	PSS-KT-29	2	PSR-KT-36	2	PSS-KT-28	1	PSR-KT-51	1
PA-46-350P (w/G1000)	All	PSS-KT-24	2	PSR-KT-37	2	PSS-KT-27	1	PSR-KT-35	1
PA-46-350P (w/o G1000)	4622001 thru 4622200 4636001 thru 4636195 4636196 thru 4636999	PSS-KT-24	2	PSR-KT-36	2	PSS-KT-27	1	PSR-KT-35	1
PA-46R-350T (w/G1000)	All	PSS-KT-21	2	PSR-KT-43	2	PSS-KT-27	1	PSR-KT-35	1
PA-46R-350T (w/o G1000)	All	PSS-KT-21	2	PSR-KT-43	2	PSS-KT-30	1	PSR-KT-35	1
PA-46-500TP (with or without G1000)	All	PSS-KT-21	2	PSR-KT-43	2	PSS-KT-27	1	PSR-KT-35	1

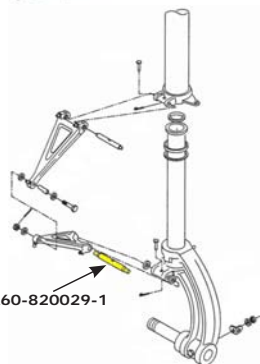
- 1 Use only when bearing has O-ring groove on ID
- 2 Use only when bearing has T-seal and backup ring

## Main and Nose Strut Seal Kit for Beechcraft Aircraft

Aircraft	Main P/N	Nose P/N
B-33, F-33, V-35B, 36, A36, G36, A36TC, B36TC	JMBZMS	JMBZNS

## Tow Pin for Beechcraft Aircraft

P/N RA60-820029-1



RA60-820029-1

Aircraft
35-A33, 35-B33, 35-C33, 35-C33A, E33, F33, G33, E33A, F33A, F33C
N35, P35, S35, V35, V35A, V35B, 36, A36, A36TC, B36TC,
95-55, 95-A55, 95-B55, 95-C55, D55, E55
56TC, A56TC
58, 58TC, 58P
B60
Manufactured by Rapco

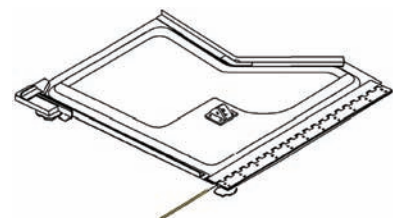


## Main Gear Door Hinge Pin for Cessna Citation 550 and 560 Aircraft

P/N MS20253-2-2050

- Corrosion resistant
- Two required per aircraft
- Direct replacement

Save \$\$



Manufactured by PMA Products, Inc.

## Nose Gear Torque Link Assemblies

Improved to reduce wear and prevent cracks  
Upper P/N AF2643084-1  
Lower P/N AF2643084-2

- Approved for all 208 and 208B aircraft
- Hard aluminum surface to reduce wear
- Precision fit - drop in direct replacement
- Designed to prevent cracking in threaded grease fitting holes
- Ready for installation
- Durable powder coating finish



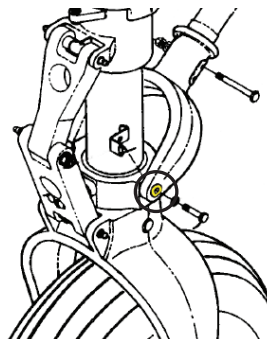
P/N AF2643084-1 (Upper)

P/N AF2643084-2 (Lower)

## Nose Gear Spring Fork Needle Bearing for Caravan Aircraft

P/N MS24462-5

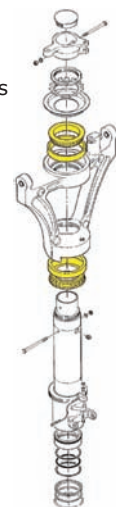
- Fits all Cessna 208 models
- 2 required per aircraft
- Save 30%



## Nose Gear Shock Strut Bearing Cups and Cones for Caravan Aircraft

Bearing Cup  
P/N L217813  
Bearing Cone  
P/N L217849

- Fits all Cessna 208 models
- 2 required per aircraft

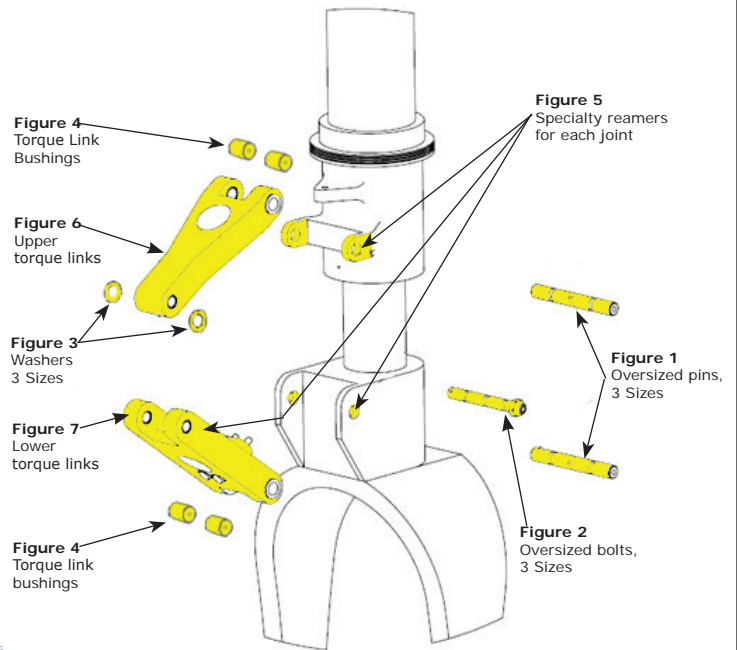


FAA-PMA Approved

## Cessna Caravan Torque Link Repair STC

Minimal downtime repair to keep  
208/208B nose gears shimmy-free  
This STC will dramatically reduce nose gear swaps

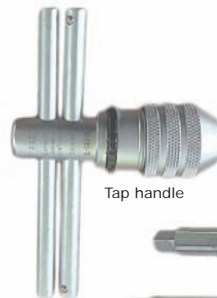
- Save over \$15K and be flying the same-day
- Reduce downtime by repairing in the field
- Convenient tool kit allows for on-airplane repair
- EASA approved



P/N AF2643092-1010, BOLT

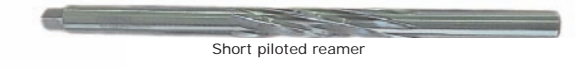


P/N AF2643091-1010, PIN



Tap handle

**Tool kits contain:**  
Short and long piloted reamers and tap handle



Short piloted reamer



Long piloted reamer

**Eligible model series:**  
Fits all Cessna 208/208B with "double lug" torque links. Includes all S/N's after 2080133/208B0098 or earlier S/N's equipped with SK208-51.

Figure	Part Number	Description	Approval Type
5	TOOL KIT + .010	REAMERS, Oversized .010 - short and long piloted reamers + tap handle	STC
5	TOOL KIT + .020	REAMERS, Oversized .020 - short and long piloted reamers + tap handle	STC
5	TOOL KIT + .030	REAMERS, Oversized .030 - short and long piloted reamers + tap handle	STC
5	TOOL KIT 32-604-56-01	REAMERS, all three sizes	STC
6	AF2643084-1	Upper Torque Link	PMA
7	AF2643084-2	Lower Torque Link	PMA
1	AF2643091-1	PIN, Nominal	PMA
1	AF2643091-1010	PIN, Oversize .010	PMA
1	AF2643091-1020	PIN, Oversize .020	PMA
1	AF2643091-1030	PIN, Oversize .030	PMA
2	AF2643092-1	BOLT, Nominal	PMA
2	AF2643092-1010	BOLT, Oversize .010	PMA
2	AF2643092-1020	BOLT, Oversize .020	PMA
2	AF2643092-1030	BOLT, Oversize .030	PMA
3	32-604-37-22005	WASHER, .005 thickness	STC
3	32-604-37-22010	WASHER, .010 thickness	STC
3	32-604-37-22015	WASHER, .016 thickness	STC
4	AF2643085-200	BUSHING, Torque Link	PMA
	STC-TORQUE LINK	Torque Link STC	STC

Landing Gear and Nose Wheel Steering Parts