

COMANCHE GEAR



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LANDING GEAR GOTCHA'S

I'M CALLING THIS BRIEF DISSERTATION, "LANDING GEAR GOTCHA'S"; THOSE WHICH ARE LIKELY TO BE ENCOUNTERED WHILE PERFORMING THE SL-782B AND THE ASSOCIATED AD77.13.21 PART A. GOTCHA'S BECAUSE REVEALED HERE WILL BE ITEMS THAT ARE COMMONLY OVERLOOKED, MISUNDERSTOOD IN OVERALL SCOPE, OR INSUFFICIENT ATTENTION PAID TO THE DETAILS. THE RESULT MAY BE AN INCOMPLETELY PERFORMED AD, OR IMPROPERLY ADJUSTED LANDING GEAR RETRACTION SYSTEM, OR OVERLOOKED WORN ITEMS, OR YOU FILL IN THE BLANKS.

I'VE BEEN ASKED MANY TIMES HOW LONG SHOULD THE INFAMOUS THOUSAND-HOUR AD TAKE TO PERFORM. THAT REPEATED QUESTION IS WHAT PROMPTED ME TO SPEND WAY TOO MUCH TIME WRITING THIS [BRIEF!!] AS EDUCATION FOR WHOEVER MAY READ IT. IT'S A 3-DAY'S JOB.

THERE NEEDS TO BE SOME CLARIFICATION CONCERNING REQUIRED PROCEDURES THAT ARE INFERRED WITHIN THE COMANCHE SERVICE MANUALS, WHILE PERFORMING THE AD77.13.21 PART "A". **THE DATA PRESENTED IN THE LATEST VERSIONS OF THE SMS MUST BE ADHERED TO; THIS NEWER INFORMATION THEREIN SHOULD BE APPLIED TO AND IMPLEMENTED DURING THE PERFORMANCE OF SL-782B ETC.** SPECIFICALLY SEE THE WEAR LIMITS PAGES IN SL-782B FOR ONE EXAMPLE.

CONVENTION NOTE: IF A SPECIFIC MANUAL SECTION IS STATED HEREIN, FOR INSTANCE ANYTHING 6-DASH IS FOR THE SINGLES. THE TWINS ARE IN THE 7-DASH RANGE; JUST SO YOU KNOW.

READ SCSM SECTION 6-51, A; "AFTER CHANGING OR ADJUSTING ANY ASSEMBLY OF THE GEAR OR RETRACTION SYSTEM, AN ADJUSTMENT OF ITS FOLLOWING COMPONENT SHOULD BE MADE." SIMPLY STATED, YOU MUST PERFORM THE PRE-LOAD ADJUSTMENT AS PART OF SL-782B.

MY SUGGESTED LANDING GEAR PRELOAD ADJUSTMENT PROCEDURE FOLLOWS, DERIVED FROM THE SMS BUT MOSTLY FROM EXPERIENCE. SOME OF THIS LANGUAGE TO FOLLOW IS EXCERPTED IN PART FROM MY MANUAL FOR INSTALLATION AND ADJUSTMENT OF THE LANDING GEAR PUSH/PULL CABLES, WHERE YOU WILL FIND MORE COMPLETE DETAILS AND PHOTOGRAPHS.

FOLLOWING IS A SERVICE MANUAL QUOTE; IT'S WHERE YOU START THE PRELOAD PROCEDURE.

c. Turn the release tube (19) on actuator screw to maintain a distance of 10.875 inches between the center of the transmission mounting pin (12) and center of the thru bolt (13) connecting the lower portion of the torque arms. This adjustment should allow approximately (a minimum of) 0.125 inch measured along the actuator screw (14) between the roll pin stop (16) and the screw nut (15).

REFER TO SECTION 6-54, C QUOTED ABOVE AND REFERRING TO ILLUSTRATION 6-14. SETTING THIS DISTANCE TO 10.875" IS **CRUCIALLY IMPORTANT** FOR SUCCESS OF THIS ENTIRE PROCESS. AT THE VERY LEAST YOU MUST MEASURE ACCURATELY AND ADJUST YOUR TRANSMISSION ACCORDINGLY BY TURNING THE RUBBER COUPLING. IF YOU HAVE A **LOOSE BEARING** IN THE TRANSMISSION WHICH IS MUCH TOO COMMON AND OVERLOOKED FROM LACK OF KNOWLEDGE [SEE THE APPROPRIATE SERVICE MANUAL SECTION MENTIONED EARLIER TO CHECK FOR THIS]. ALSO IF YOU ARE INTERESTED IN A VIDEO, I HAVE A FEW POSTED ON MY WEBSITE AND ONE POSTED ONE ON WWW.YOUTUBE.COM - SEARCH FOR **COMANCHE TRANSMISSION**. IF YOU DO FIND A **LOOSE BEARING** IN THE TRANSMISSION YOU MUST USE THIS SETTING GAUGE IN PLACE OF THE TRANSMISSION OR YOU WILL BE REPEATING THE ADJUSTMENTS WHEN YOU REPLACE THE TRANSMISSION WITH A SERVICEABLE ONE. *NOTE - TO CONSTRUCT THIS SETTING GAUGE USE 1-FT OF 1" SQUARE ALUMINUM TUBING; DRILL 2X 3/8" HOLES @ 10.875" CENTER TO CENTER DISTANCE AND SLOT ONE OF THE THROUGH-HOLES DOWNWARD TO MIMIC THE OPENING IN THE TRANSMISSION RELEASE ARM.*

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TO GAIN ACCESS TO THE TRANSMISSION, THE SINGLES MUST HAVE THE FLOOR FORWARD CENTER SECTION REMOVED. TO ACCOMPLISH THAT TASK YOU NEED THE FRONT SEATS AND INBOARD SEAT BELTS, SEAT TRACKS, AND THE CARPET REMOVED IF IT INTERFERES. THE TWINS AND THE "C" MODEL SINGLES HAVE A LARGER ACCESS PANEL FOR THE TRANSMISSION AREA, BUT DON'T BE FOOLED. TO REMOVE THE TRANSMISSION YOU HAVE TO REMOVE THE COTTER PIN AND CLEVIS PIN AT THE REAR OF THE TRANSMISSION WHERE IT MOUNTS TO THE BRACKET; THAT JOB REQUIRES GOOD ACCESS. AND WHY YOU ASK DOES THE TRANSMISSION NEED TO BE REMOVED. THE BASIC GEOMETRY FOR THE LANDING GEAR SYSTEM IS ESTABLISHED WITH THE DIMENSION 10.875" BETWEEN THE TRANSMISSION MOUNTING BRACKET AND THE CROSS BOLT BETWEEN THE TORQUE LINKS. WITHOUT THAT BEING SET CORRECTLY YOU ARE HEADED FOR AN INCORRECT ADJUSTMENT PROCEDURE OUTCOME. TO REPEAT, ANOTHER PITFALL IS END-PLAY IN THE TRANSMISSION BEARING HOUSING, SEE SCSM 6-44 E. IF THAT CONDITION EXISTS IT WILL BE NEARLY IMPOSSIBLE TO ADJUST THE PRELOADS; AND A TRANSMISSION WITH THAT CONDITION IS NOT SERVICEABLE. PONDER THIS; HOW ARE YOU GOING TO MEASURE AND SET THE 10.875" DIMENSION WITH THE TRANSMISSION INSTALLED? YOU CAN'T IS THE ANSWER.

PRIOR TO PERFORMING THE MAIN GEAR PORTION OF THE PRELOAD ADJUSTMENT, DISCONNECT THE NOSE GEAR PUSH-PULL CONTROL ROD AT THE DRAG LINK CLEVIS. ADJUST THE POSITION OF THE MAIN GEAR ROD END BEARING TO ALLOW FREE INSERTION OF THE 1/4" BOLT. NOW PUSH UPWARD [LIGHT FORCE TO CHECK FOR MOVEMENT] AT THE JUNCTION OF THE DRAG LINKS [WHERE THE SWITCH MOUNTING BRACKET IS LOCATED]; ANY MOVEMENT MUST BE REMOVED BY MOVING THE ROD END BEARING OUTBOARD. THE POSITION WHERE THE BOLT CANNOT BE EASILY INSERTED SHOULD BE CONSIDERED THE "NO FREE-PLAY AND NO PRELOAD" CONDITION; YOU'VE JUST REMOVED THE "BACKLASH" FROM THE SYSTEM. NOW TURN THE ROD END BEARING OUTBOARD 1 REVOLUTION [PER SM FOR NEW CONDUITS, 1/2 TURN FOR USED CONDUITS] AND THE PROPER PRELOAD IS NOW SET. REMOVE THE AN26 SCREW AND DISCONNECT THE DRAG LINK FROM THE SIDE BRACE STUD. REPEAT THIS PROCEDURE FOR THE OPPOSITE GEAR. DO NOT FINALLY INSTALL THE MAIN GEAR ROD END BEARINGS TO THE DRAG LINKS UNTIL AFTER THE NOSE GEAR PUSH-PULL CONTROL ROD PRELOAD ADJUSTMENT HAS BEEN PERFORMED.

THE NOSE GEAR PRELOAD ADJUSTMENT PROCEDURE IS SIMILAR BUT MUST BE PERFORMED WITH THE MAINS DISCONNECTED. EMPLOYING A SIMILAR TECHNIQUE AS WITH THE MAINS, THE NOSE GEAR PUSH-PULL ROD MUST BE **SHORTENED** 1 TURN FOR PROPER PRELOAD.

IF YOU PERFORM THE PRELOAD ADJUSTMENT AS JUST OUTLINED, THE GEARS WILL BE "SYNCHRONIZED" AS STATED IN THE SMS. REMEMBER, ADJUST ONE GEAR'S PRELOAD AT A TIME AND THEN DISCONNECT THAT GEAR BEFORE PROCEEDING TO THE NEXT GEAR.

IN SL-782B ITEM 5: READ "**NOTE**" CONCERNING THE NOSE GEAR DRAG LINKS. THIS DEALS WITH THE NOSE GEAR DRAG LINKS SYNCHRONIZATION. IF YOU ARE NOT FAMILIAR OR HAVE NOT PREVIOUSLY PERFORMED THIS OPERATION PLEASE CAREFULLY READ AND UNDERSTAND THE APPROPRIATE SM SECTION. THIS IS ANOTHER POTENTIAL TIME-CONSUMING "GOTCHA".

ITEMS #10, #11, AND #12 ON THE NOSE GEAR WEAR LIMITS PAGE ARE PART OF THIS AD. THAT MEANS THE COMPLETE NOSE GEAR ASSEMBLY MUST COME OUT OF THE AIRPLANE, AND THAT MEANS REMOVING THE COWLING FOR THE SINGLES. AND YOU BETTER HOPE YOUR TWIN DOESN'T HAVE A MILLER NOSE FOR THIS PORTION OF THE JOB.

SL-782B ITEM 8: **DISCONNECT** AND INSPECT THE MAIN GEAR PUSH/PULL CABLES; THAT MEANS **BOTH ENDS**. ANOTHER INDICATION OF REQUIRED ACCESS TO THE TRANSMISSION AREA.

SL-782B, PAGE 2, ITEM [LETTER] "I" UNDER MATERIAL REQUIRED: "...; REPLACE COMPONENTS EXCEEDING SPECIFIED WEAR LIMITS". THERE IS A LITTLE NOTE ON THE BOTTOM OF PAGE 3 IN THE SL-782B AS FOLLOWS. "ABOVE DATE REFLECTS JUNE 1976 PA-24 AND PA-30/39 SERVICE MANUAL INFORMATION". WELL GUESS WHAT'S MISSING? SL-782B, BY VIRTUE OF THE DATE THAT IT WAS WRITTEN, DOES NOT CONTAIN THE NOTES FROM THE SMS CONCERNING THE WEAR LIMITS FOR THE NOSE GEAR SPRINGS AND MAIN GEAR SPRINGS. THE REVISED SM VERSIONS LIST THE SPRINGS AS ITEMS TO CHECK. **REF 3RD PARAGRAPH ON PAGE ONE.**

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TO CONTINUE, "REPLACE COMPONENTS EXCEEDING SPECIFIED REPAIR LIMITS". OK BUT DID YOU ACTUALLY CHECK THE NOSE GEAR AND MAIN GEAR SPRINGS AS SPECIFIED; I WOULD WAGER FEW DO SO. THE MAIN GEAR'S SPRINGS ARE SUPPOSED TO BE REPLACED AT EACH BUNGEE CHANGE [SECTION 6-33, NOTE FOLLOWING (LETTER) "I"]; JUST REPLACE THEM IF THEY DON'T LOOK NEW. THE \$50 NOSE GEAR SPRINGS ARE SUPPOSED TO BE CHECKED FOR PROPER TENSION. REFERENCE THE "NOSE GEAR WEAR LIMITS" IN THE APPROPRIATE SM WHERE IT IS STATED THUSLY. "SPRING IS SERVICEABLE WHEN A 45 +/- 5 POUND TENSION LOAD EXTENDS THE SPRING TO 4 INCHES [MEASURED AT THE INSIDE OF THE LOOP ENDS.]" ALSO KEEP IN MIND THE SMS SPECIFICALLY STATE TO CHECK THE ASSIST SPRINGS FOR CORROSION. IN A RECENT BATCH OF 6 USED SPRINGS THAT I INSPECTED, ALL HAD CORROSION AND 5 WERE DISCARDED FAILING THE TENSION INSPECTION. THE ONE WILL BE REUSED AFTER CADMIUM PLATING. THOSE LITTLE BEAUTIES ARE \$50 EACH, AND THANKFULLY STILL AVAILABLE FROM PIPER. I MENTION THIS LITTLE ITEM ABOUT SPRINGS TO MAKE YOU AWARE OF BOTH, TENSION AND CORROSION.

NOW LET'S COVER SOME DETAILS AND RECOMMENDATIONS ABOUT REPLACING THE BUSHINGS. IN GENERAL IF A BUSHING IS A PRESS-FIT AND THE COMPONENT CAN BE HEATED THEN IT'S AN EXCELLENT IDEA TO HEAT PRIOR TO REMOVING A BUSHING. I USE 100% SYNTHETIC AUTOMOTIVE ENGINE OIL IN A DEEP-FAT FRYER; THEY'RE NOT EXPENSIVE. A SMALL PART NEEDS 5 MINUTES AND YOU'LL FIND IT RELEASES WELL; USE LEATHER GLOVES TO HANDLE THE HOT COMPONENT. IF YOU'RE DOING THE LARGE BUSHING IN A STRUT/OLED HOUSING, THEN YOU'LL NEED MORE TIME TO HEAT. I'VE NEVER BEEN ABLE TO EVEN BUDGE ONE OF THESE LARGE BUSHINGS WITHOUT HEATING AS ABOVE; THEY JUST WON'T GRACEFULLY MOVE. LIKewise HEATING AND FIXTURING FOR ALIGNMENT IS IMPORTANT FOR INSTALLATION OF A NEW BUSHING. IF YOU BROACH THE BORE IN THE ALUMINUM WHILE INSTALLING A NEW BUSHING YOU QUITE POSSIBLY HAVE DESTROYED THE "FIT" AND THE PART WILL BE NON-SERVICEABLE. IF YOU CHOOSE TO NOT HEAT AS SUGGESTED THEN YOU CHANCE DAMAGING THE COMPONENT BORE AS THE STEEL BUSHING IS PRESSED OUT; SOME ALUMINUM MATERIAL MAY ADHERE TO THE STEEL BUSHING. THEN AGAIN YOU HAVE POSSIBLY COMPROMISED THE "FIT". WE'RE ALL LOOKING AT THE USED MARKET AS PARTS SOURCES HERE; PLEASE DON'T SHORT-CUT AND RUIN A COMPONENT WHICH OTHERWISE COULD BE MAINTAINED AS SERVICEABLE.

ALSO IF YOU USE PIPER'S BUSHINGS [MY PREFERENCE] FOR THE ALUMINUM COMPONENTS, YOU'LL NEED TO REAM FOR PROPER CLEARANCE. THAT SHOULD BE CONSIDERED AN ADVANTAGE BECAUSE YOU CAN MAKE THE CLEARANCE AS TIGHT AS THE SL ALLOWS. IN ADDITION I USE A FLEXIBLE BALL HONE AFTER REAMING TO IMPART A CROSS-HATCH FINISH FOR BETTER LUBRICITY. THE HONED FINISH WILL ALSO ALLOW THE MALE COMPONENT, BOLT OR STUD, A LITTLE LESS WEAR OVER TIME. THE AS-REAMED BUSHING I.D. FINISH MAY HAVE SMALL RIDGES WHICH CAN WEAR THE MALE PART MORE AGGRESSIVELY. YOU CAN WITNESS THIS ON THE SIDE BRACE STUD ESPECIALLY IF THE BUSHINGS WERE NOT HONED. THAT'S AN EXPENSIVE PART TO THROW AWAY PREMATURELY. LIKewise THE PIVOT BOLTS WITH THE GREASE FITTINGS IN THE NOSE GEAR.

THIS NEXT PART OF THIS DISCUSSION APPLIES TO THE NOSE GEAR DRAG LINKS. DON'T JUST STICK THE REAMER IN THE HOLE AND TURN IT. BE SENSIBLE AND LOOK AHEAD. THE BUSHING HOLES NEED TO BE ALIGNED WITH THE OPPOSITE-SIDE COMPONENT. IF YOU REAM ONE "CROOKED" THEN THAT COMPONENT WILL POSSIBLY BE IN A "BIND" AND SUBSEQUENTLY CAUSE MISALIGNMENT AFTER ASSEMBLY, AND THEN YOU'LL HAVE A PROBLEM WITH SYNCHRONIZING THE NOSE GEAR OVER-CENTER ADJUSTMENT FOR THE NOSE GEAR DRAG LINKS. READ THE PARAGRAPH ON PAGE 2 AGAIN STARTING, "IN SL-782B ITEM 5".

FOR REPLACING THE BUSHINGS AT THE NOSE PIVOTS IN THE STEEL TUBE MOUNT I USE A BALL-BEARING THRUST WASHER WITH A GRADE-8 BOLT AND A SHOULDERED MANDREL THAT FITS INSIDE THE BUSHING AND A RECEIVER FOR THE BUSHING TO ENTER DURING EXTRACTION. YOU DON'T WANT TO START HAMMERING ON THIS ONE. INSERTION IS SIMILAR AND THANKFULLY THIS BUSHING DOES NOT REQUIRE REAMING. THE LEFT SIDE BUSHING AT THIS TUBE STRUCTURE TAKES A LOT OF LOAD AND CONSEQUENTLY WEARS. THE AFT BUSHINGS IN THE AFT DRAG LINKS ARE PASSIVE BUSHINGS; THE BOLTS DO NOT TURN IN THOSE BUSHINGS; SO LESS WEAR SHOULD BE EXPECTED.

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AND HERE'S A NOTE CONCERNING THE BUSHINGS IN THE BRACKET ASSEMBLIES FOR THE SIDE-BRACE STUDS.

THESE BUSHING ARE SUPPOSED TO HAVE A FIT OF APPROXIMATELY 0.0025" WITH ALL NEW COMPONENTS. WHEN REPLACING THE BUSHINGS BE AWARE THAT HEATING THE ALUMINUM BEFORE REMOVAL AND INSTALLATION IS IMPORTANT, OTHERWISE IT IS POSSIBLE TO DAMAGE THE BORE, AND THE RESULT CAN BE THE NEW BUSHING MAY NOT HAVE THIS REQUIRED FIT. THESE FORGINGS WERE BRUTALLY EXPENSIVE [\$448] IN 1998 WHEN PIPER DISCONTINUED THEM; BE CAREFUL, THEY ARE CURRENTLY NLA AND YOU MAY BE STUCK WITH PURCHASING AN UNKNOWN SALVAGE PART. ALSO IMPORTANT TO KNOW, AFTER INSTALLATION OF THE NEW BUSHINGS IN THE SIDE BRACE SUPPORT, THEY WILL REQUIRE REAMING TO SIZE AND FOR HOLE ALIGNMENT; THAT'S WHY PIPERS' BUSHINGS ARE UNDER-SIZE ON THE I.D. WHY BOTH BUSHINGS? IT IS INAPPROPRIATE TO REPLACE JUST ONE; YOU WILL NEVER HAVE ALIGNMENT OF THE INTERNAL BORES UNLESS YOU REPLACE BOTH IN ONE BRACKET, FOLLOWED BY THE REAMING OPERATION. YOU SIMPLY MUST REAM THEM OR THE INTERNAL BORES WILL NOT BE IN ALIGNMENT; THINK ABOUT IT! AGAIN USE A FLEXIBLE BALL HONE AFTER REAMING TO IMPART A CROSS-HATCH FINISH FOR BETTER LUBRICITY.

ANOTHER AD97-01-01-R1 COVERS THE SIDE BRACE STUD WHICH IS A PART OF THIS SUPPORT ASSEMBLY; LIKewise IT HAS A 1000 HOUR PERIOD AND APPLIES TO THE ENTIRE FLEET. SEND THE SIDE BRACE STUDS OUT FOR MPI [BETTER THAN THE DYE PENETRANT METHOD] AND YT FROM A RECOGNIZED QUALIFIED VENDOR; THAT WILL TAKE CARE OF THE 2ND AD. IT MAKES GOOD SENSE TO DO BOTH AD'S CONCURRENTLY. AIRCRAFT SPECIALTIES SERVICES IN TULSA, OK CHARGES \$15 PER STUD; BE SURE TO TELL THEM THE P/N OF THE STUDS YOU ARE SENDING.

THAT'S ALL COMRADES.