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Installation Procedure: Model 3000-01(A) Main Landing Gear Skis

Aircraft Make: Maule

Aircraft Models:

MX-7-180AC, MX-7-180C, MX-7-160C, M-7-235C, M-7-260C, M-8-235

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Model 3000 Ski Installation Procedure: MX-7-180AC, MX-7-180C, MX-7-160C, M-7-235C, M-7-260C, M-8-235

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1.0 Scope

- 1.1 The following installation instructions provide detailed information on the correct installation of the TrickAir Model 3000 main landing gear skis for the listed Maule aircraft models equipped with the spring type landing gear and the 8.50-6 wheel and tire assemblies.
- 1.2 These installation instructions must be accomplished on a level surface. It is preferable that the surface is concrete or asphalt, and that the surface level is verified prior to beginning this procedure. Proper alignment and ground clearance of the skis is critical for proper performance. These installation instructions must be accomplished as outline for correct ski installation. Deviations to these installation instructions will require additional FAA approval.
- 1.3 It is important to completely read and understand each section of these instructions before starting the installation.

2.0 Reference Documents

- 2.1 AC 43.13-1B
- 2.2 AC 43.13-2B
- 2.3 MIL-STD-2219
- 2.4 Applicable Type Certificate Data Sheet

3.0 Equipment

- 3.1 Level working area- concrete floor or blacktop is recommended.
- 3.2 Carpenters 4' level or smart level
- 3.3 General Hand Tools
- 3.4 Wing Stands and Aircraft Jacks
- 3.5 Torque Wrench
- 3.6 Swaging Tool
- 3.7 Go-No Go Sleeve Gauge
- 3.8 Cable Cutter
- 3.9 Force Scale
- 3.10 Grinder
- 3.11 Welder

4.0 Weight and Balance

- 4.1 Verify the airplane weight and balance is current. If necessary, weigh the airplane in accordance with the airplane manufacture's procedures.

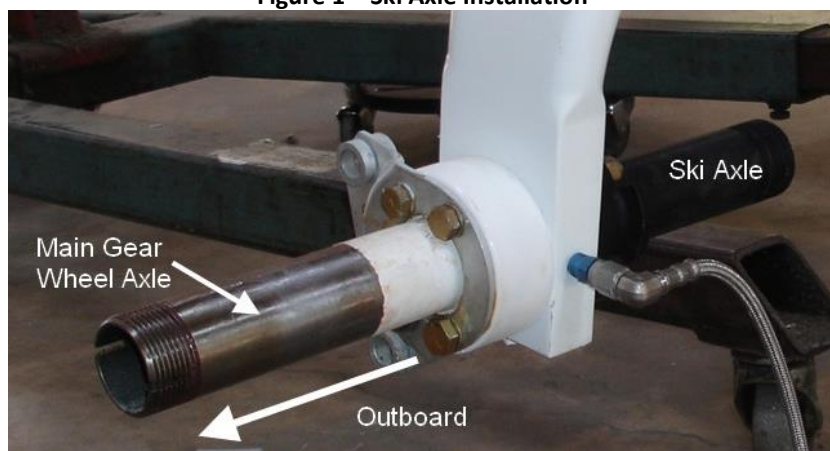
5.0 Tire Check and Alignment

- 5.1 Verify the main wheel tire size is 8.50-6.
- 5.2 Inflate tires to manufacturer's rated inflation pressure.
- 5.3 Ensure the main gear axles are parallel to the floor by rolling the airplane back and forth 6 to 10 feet, while checking the alignment according to aircraft maintenance manual. Always finish by pulling forward.

6.0 Ski Axle Installation

- 6.1 Jack the aircraft in accordance with the aircraft manufacturer's maintenance manual procedures.
- 6.2 Remove the wheel and brake assembly in accordance with the aircraft manufacturer's maintenance manual procedures.
- 6.3 Remove the main wheel axle mount bolts.
- 6.4 Install the ski axle (MATCO P/N: WHLA6M) with the axle toward the inboard side of the aircraft. **Note: shims maybe required to adjust for toe in or toe out conditions.**
- 6.5 Install the provided AN5 bolts in the top-hole locations, and the AN6 bolts in the bottom-hole locations. Bolts heads must be facing outboard.
 - 6.5.1 Bolt lengths may vary and is dependent upon the wheel axle and gear leg combination.
- 6.6 Bottom bolts will require 1 thin washer and 1 thick washer. The top bolts require 2 thin washers.
 - 6.6.1 Washer quantity may vary and is dependent upon the wheel axle and gear leg combination.
- 6.7 Torque all four bolts in accordance with the aircraft maintenance manual.
- 6.8 Reinstall brake and wheel assemblies.
- 6.9 Repeat steps 6.2 through 6.8 for the opposite side.
- 6.10 Remove aircraft from jacks.

Figure 1 – Ski Axle Installation



7.0 Ski Installation

- 7.1 Grease ski axle surfaces and slide skis onto ski axles.
- 7.2 Install retaining nut and cotter pin.
- 7.3 Inspect installation to ensure the ski is free to pivot.

8.0 Ski Alignment Check

- 8.1 Ensure ski ground clearance is 0.50 to 0.75 inch.
- 8.2 Skis should be parallel laterally (camber) to the ground with the airplane loaded for normal operation (full fuel and one person).
- 8.3 Check for toe-in by measuring between the rear and at the front skis. The dimension may narrow at the front by no more than 1 inch, and the toe-in should equal between the left and right ski.
- 8.4 Shims (Maule part number 4123B-() and 4124B-() (the open dash number indicates shim thickness) may be installed between the ski axles and the landing gear attach point to achieve proper alignment. No more than one of each part number shim may be installed per landing gear.

9.0 Engine Mount Tang Installation

- 9.1 Remove the engine cowling.
- 9.2 Remove Gascolator heat shield.
- 9.3 Remove extension from Gascolator.
- 9.4 Remove the left hand lower engine mount bolt that goes through the engine mount and the firewall.
- 9.5 Install an AN6-45 bolt through the tang, and then through the left hand engine mount and firewall. If spacing is needed use AN960-616 washers. Install an AN365-624A nut. Torque according to the aircraft maintenance manual.
- 9.6 Reinstall the drain valve directly onto Gascolator and perform leak check of the Gascolator.
- 9.7 Reinstall the Gascolator heat shield
- 9.8 Repeat step 9.4 and 9.5 for right side.

Figure 2 – Forward Tang Installation



Figure 3 – Tang Installation



Figure 4 – Gascolator Heat Shield



10.0 Engine Cowl Trim for Bracket Clearance

- 10.1 Mark the engine cowl (e.g.; masking tape) for tang cut out.
- 10.2 Trim the cowl to prevent interference with the newly installed tang. Trim only enough cowl material to prevent chaffing of the bracket and cowl (Figure 5).

Figure 5 – Cowl Trimming



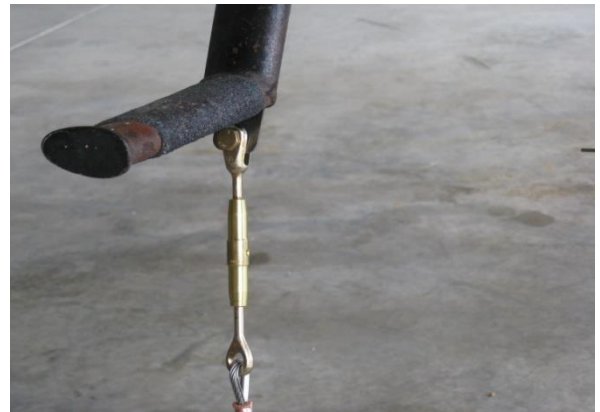
11.0 Rear Ski Attach Bracket Installation

- 11.1 Remove paint from the inboard side of step legs. Clamp a single-hole tang to the inside of each step leg and weld in place.
- 11.2 Clean the weld area, prime and paint to match aircraft color.
- 11.3 Apply sealant across top of bracket if not fully welded.

Figure 6 – Single-hole tang welded to step



Figure 7 – Turnbuckle installed



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12.0 Turnbuckle and Ski Tang Attachment

- 12.1 Attach a shock cord and a turnbuckle to the forward three-hole tang. The turnbuckle attaches to the larger inboard hole, the shock cord attaches to the smaller outboard hole. Use the AN4-6 bolt and AN310-4 nut provided (Figure 2).
- 12.2 Attach a turnbuckle to the single-hole tang on the fuselage step (Figures 6 and 7). Use the AN4-6 bolt and AN310-4 nut provided.
- 12.3 Repeat steps 12.1 and 12.2 on the other side of the aircraft.
- 12.4 Attach a stainless steel two-hole bent tang to the AN5 bolts, two on the forward end of the ski and one on the aft end of the ski (Figures 8 and 9).

Figure 8 - Aft Two-Hole Tang



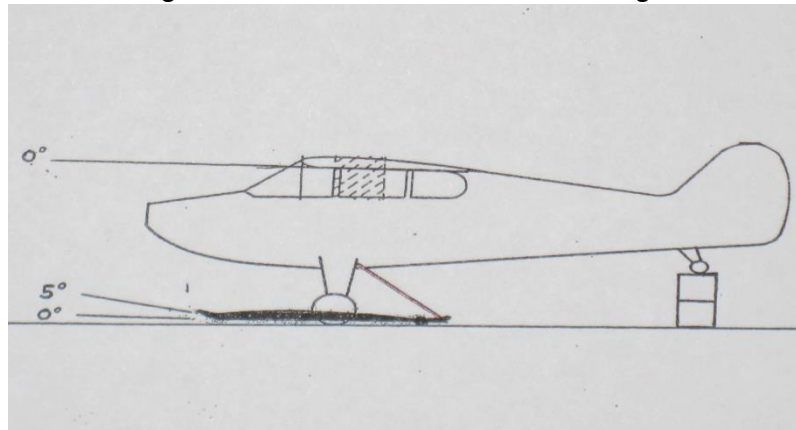
Figure 9 - Forward Two-Hole Tangs



13.0 Ski Cable Rigging

- 13.1 All skis are shipped with the necessary materials to make the rear limit, forward safety and crust cutter cables. The installer will be required to measure, cut and thimble eye splice each cable end. Review for FAA acceptable procedures for cable terminations can be found in AC 43.13-1B, Chapter 7, Section 8 *Inspection and Repair of Control Cables and Turnbuckles*.
- 13.2 The rear limit (check) cable shall provide a zero to five (5) degree positive ski incidence angle (reference AC 43.13-2B Chapter 5) relative to level flight line of the aircraft (reference TCDS 3A23).
- 13.2.1 Due to the inward sag of the landing gear, you must raise the aircraft main gear off the ground and raise the tail of the airplane until between zero and 5 degrees in flight positive ski incidence angle is obtained (Figure 10).

Figure 10 – Rear Limit Cable Ski Incidence Angle



- 13.3 Measure from the empty hole of the attached two-hole tang on the aft end of the ski to the bottom of the turnbuckle attached to the aft single-hole tang (Figure 6). This is the length of your rear limit cable. Finish the custom cable fit by completing the cable ends in accordance with section 14 of this installation procedure.
- 13.4 Next, with the aircraft still in level flight position, measure from the empty hole of the attached forward *OUTBOARD* two-hole tang to the bottom of the shock cord attached to the forward three-hole tang (Figure 4). **NOTE: Turnbuckles are not used on Crust Cutter Cables.** Subtract three inches from your measurement*; this will be your cable length. Finish the custom cable fit by completing the cable ends in accordance with section 14 of this installation procedure.

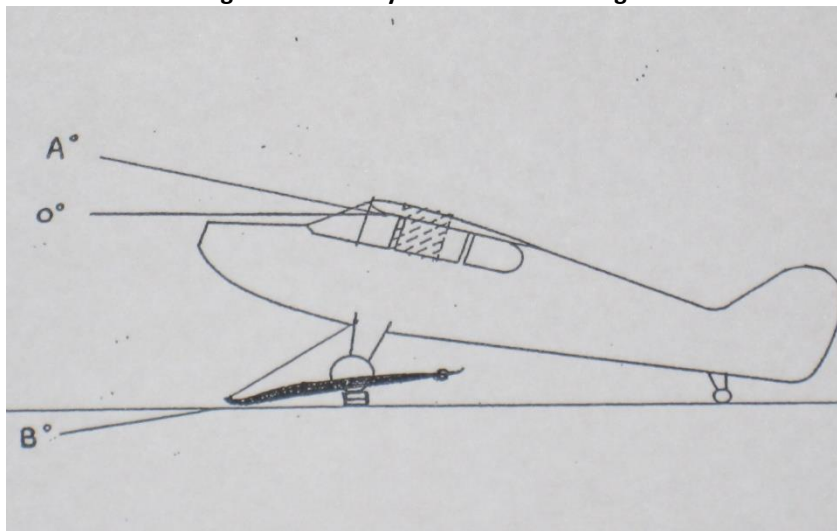
**Subtracting three inches from your measurement is a starting point and should/can be adjusted to achieve the proper load set forth in step 13.4.1 and AC 43.13.*

- 13.4.1 A tension of between 20 and 40 lbs of force is required to deflect the ski tip down as per AC 43.13-2B Chapter 5. **Verify** that between 20 and 40 lbs of downward force at the ski tip has been achieved without causing excessive toe-in of the skis.

Note: Excessive shock cord tensions may produce deformation of shock cord ends or excessive toe-in of skis. Do not over tighten shock cords.

- 13.5 Now you will measure and rig the forward safety cable. The safety cable is installed to provide a maximum negative incidence of 10 to 15 degrees as per AC43.13-2B Chapter 5.
- 13.6 With the tail down, raise the aircraft, allowing the gear legs to sag into flight position. Place 2x4 blocks under the main gear, and then gently lower the aircraft so the main gear touches the blocks, however, the aircraft's weight is still being supported by the jacks and the gear is still in flight position.
- 13.7 Push the front of the ski down until a maximum negative incidence angle of 10 to 15 degrees is obtained (Figure 11). Measure the negative angle of the bottom inside edge of the ski (Figure 11, Angle B). Measure the positive level flight angle (reference TCDS No. 3A23) (Figure 11, Angle A). Use the total difference as your negative incidence.
- 13.8 Measure from the empty hole of the attached forward *INBOARD* two-hole tang to the bottom of the turnbuckle attached to the firewall tang (Figure 5), this is the length of your Safety Cable. Finish the custom cable fit by completing the cable ends in accordance with Section 14 of this installation procedure.

Figure 11 – Safety Cable Incidence Angle



- 13.9 Repeat procedure on the opposite gear leg.

14.0 Thimble Eye Splice Procedure

- 14.1 The cable ends will need to be finished to the lengths measured in section 13. The cable ends will need to be thimble-eye spliced using the wire rope sleeves and thimbles provided.
 - 14.1.1 First slide the heat shrink tube onto the unfinished cable. Next slide an oval wire rope sleeve over the unfinished cable end keeping it positioned in one of the two openings (Figure 12).
 - 14.1.2 Now loop the end of the cable through the turnbuckle and back through the other hole of the wire rope sleeve (Figure 13).
 - 14.1.3 Attach a rigid nail or screw to an open work bench area. Place a finished cable eye over the nail so that the thimble contacts the nail; make sure the two-hole tang does not interfere with the thimble. Use the nail as a starting point for your tape measure (Figure 14).

Figure 12 - Heat Shrink & Sleeve



Figure 13 - Cable Loop



Figure 14 - Cable Measuring Fixture



- 14.1.4 Stretch the tape measure out to the desired cable length. Adjust the cable end until the proper length is achieved. The thimble ends should extend into the wire rope sleeve (Figure 15).

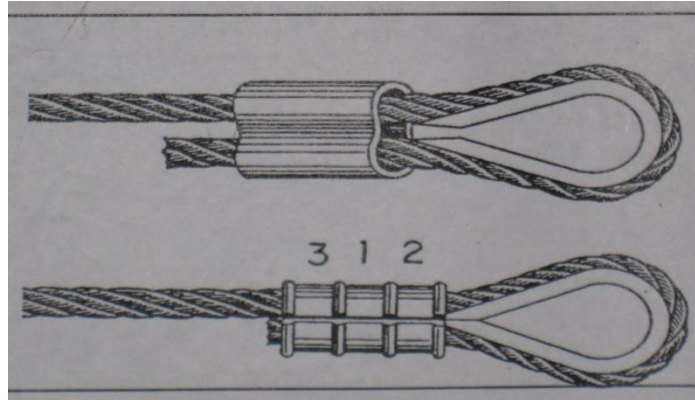
Figure 15 - Measuring Cable to Length



- 14.1.5 Hold the sleeve and thimble together so that the cable does not slip. Lay the wire rope sleeve into the proper notch of the swaging tool for the size of sleeve you are using. *Note: TrickAir uses only "O" oval type sleeves on their cables.* The sleeve should be centered in the jaws of the swaging tool for the first swage.

14.1.6 After the first swage has been made move on to the front of the cable for the second and to the rear for the third (Figure 16).

Figure 16 - Swaging Order



14.1.7 Measure cable to verify length. Measure the crimped wire rope sleeve for proper compression using a Go-No Go Sleeve Gauge. Cut off excess cable from the salvage end. $\frac{3}{4}$ " of cable should extend from the finished crimped wire rope sleeve to allow for full strength of the assembly (Figure 17).

14.1.8 Tape the loose end of the cable with chafe tape (Figure 18). Slide the heat shrink tube up over the taped area until it is in contact with the wire rope sleeve. Heat the tubing to shrink it in place (Figure 19).

14.1.9 Repeat steps 14.1.1 through 14.1.8 on the other cables.

Figure 17 – Finished Cable End



Figure 18 - Chafe Tape Installation



Figure 19 - Finished Cable End



14.2 Install the finished cables on the aircraft. Adjust turnbuckles as necessary to obtain the same angle on both skis. Safety wire turnbuckles after adjustments are complete.

15.0 Aircraft Weight and Balance, Skis Installed

- 15.1 Re-weigh airplane with the skis installed and calculate the new weight and balance according to aircraft maintenance manual.

16.0 Post Installation Paperwork

- 16.1 This installation must be accomplished by a properly rated Aircraft Technician.
- 16.2 Complete FAA Form 337 and a maintenance record entry for this alteration.
- 16.3 Maintenance must be performed in accordance with the Instructions for Continued Airworthiness.
- 16.4 After the initial installation, the pilot is required to make a log book entry when the skis are installed or removed.
- 16.5 Install applicable placards on the instrument panel in accordance with the Airplane Flight Manual Supplement.

17.0 Post Installation Information

- 17.1 It is recommended that the aircraft operator read and become familiar with FAA Handbook H-8083-23.
- 17.2 Taxi
 - 17.2.1 Taxi on pavement or other hard surfaces as normal. Taxi just as you would without the skis attached with the exception of extremely tight turns. Extremely tight turns will cause the tail wheels to scuff and wear prematurely.
 - 17.2.2 Taxi on snow requires slightly more power depending on the snow condition. Turning radius will be greater but you still have the aid of your brakes to assist you in turns and stopping.
 - 17.2.3 If your airplane has been sitting still on snow be sure your skis are not frozen in. Usually stepping on them and or giving them a gentle kick will free them in the event they are frozen. Some pilots will carry wooden blocks to place under the skis to prevent them from freezing in-place.
- 17.3 Take off procedures
 - 17.3.1 Take off from hard surfaces may be accomplished as you would without skis.
 - 17.3.2 Take off performance from snow will depend on the snow conditions. Refer to the Airplane Flight Manual Supplement for airplane performance information.
- 17.4 Landing
 - 17.4.1 Landing on a hard surface may be accomplished just as you would without skis.
 - 17.4.2 Landing performance on snow will depend on the snow conditions. Refer to the Airplane Flight Manual Supplement for airplane performance information.
- 17.5 Extended Parking
 - 17.5.1 It is a good idea to disconnect the shock cords when not in use. Rubber tends to lose its elasticity in cold weather. It also is easier to move the airplane around by hand if the shock cords are not attached.