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Installation Procedure: 1500 Main Landing Gear Skis

Aircraft Make: Cessna

Aircraft Models: 120, 140 and 140A

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## **1.0 Scope**

- 1.1 The following installation instructions provide detailed information on the correct installation of the TrickAir Sport Model 1500 main landing gear skis for the listed Cessna aircraft models equipped with the spring type landing gear and the 6.00-6 wheel and tire assembly.
- 1.2 These installation instructions must be accomplished on a level surface. It is preferable that the surface is concrete or asphalt, and that verification of 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.

## **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 Shell 5 (Mil-G-3545C), Shell 22 (Mil-G-25013E) or equivalent

## **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 manufactures procedures.

## **5.0 Tire Check**

- 5.1 Verify the main wheel tires size is 6.00-6.
- 5.2 Inflate tires to maximum manufacturer's recommended pressure.

## 6.0 Ski Axle Installation

**NOTE:** The ski axle installation requires previous or concurrent accomplishment of Cessna SLN-60 dated July 1, 1949 replacing AN4 axle bolts with AN5 bolts (Ref to Dwg 1500-100).

- 6.1 Jack the aircraft in accordance with the aircraft manufacturer's maintenance manual procedures.
- 6.2 Remove the main wheel axle mount bolts.
- 6.3 Install the AN5-27 bolts with bolts heads facing outboard.
- 6.4 Install the ski axle (MATCO part number A6M) with the axle toward the inboard side of the aircraft.
- 6.5 Bottom bolts will require 1 thin washer and 1 thick washer. The top bolts require 2 thin washers.
- 6.6 Torque all four bolts according to airplane maintenance manual (Figure 1).

**Figure 1 - Axle Installation**



- 6.6 Reinstall brake and wheel assemblies.
- 6.7 Remove aircraft from jacks.

## 7.0 Ski Installation

- 7.1 Slide skis on to 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

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Model 1500 Ski Installation Procedure: Cessna 120, 140 & 140A

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- 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 may be installed between the ski axles and the landing gear attach point to achieve proper alignment.

## 9.0 Ski Rigging Bracket Installation

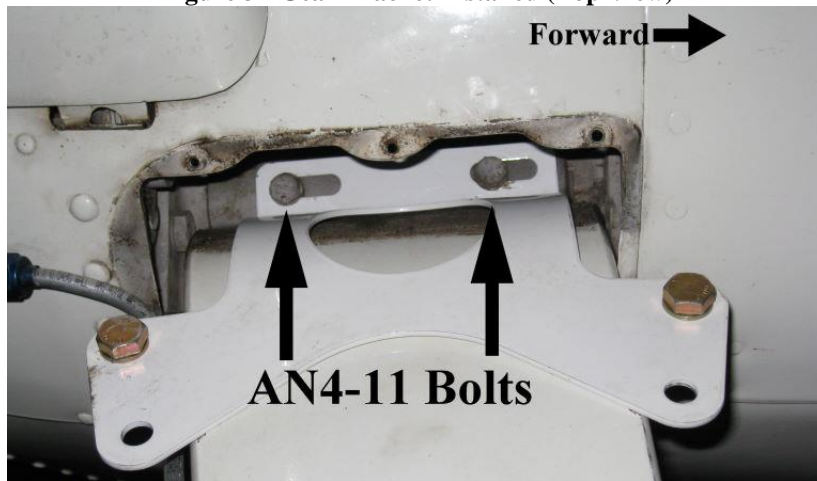
- 9.1 At the top of the gear leg on both sides of the airplane remove the gear inspection plate (Figure 2).

**Figure 2 - Gear Inspection Plate**

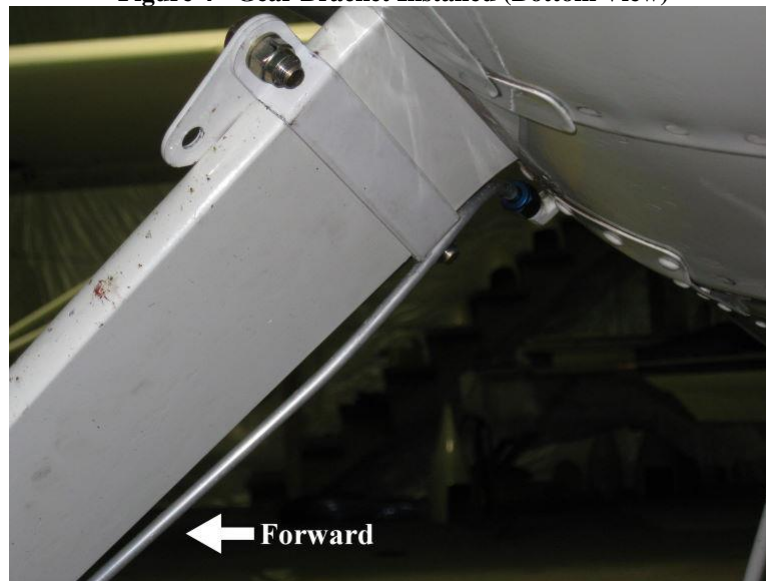


- 9.2 Remove the two (2) AN4 bolts and install the gear bracket (P/N 1500-101) (Figures 3 and 4).

**Figure 3 - Gear Bracket Installed (Top View)**



**Figure 4 - Gear Bracket Installed (Bottom View)**



- 9.3 Reinstall the AN4 bolts and torque according to airplane maintenance manual.
- 9.4 Install two AN6-6A bolts with the appropriate nuts and washers through the top outside bracket holes into the backside bracket (Figures 3 and 4).

## **10.0 Turnbuckle and Ski Tang Attachment**

- 10.1 Attach a turnbuckle to the larger lower forward and aft holes of the gear leg bracket. Fasten and secure with an AN4-6 bolt and AN310 castle nut and cotter pin (Figures 5 and 6).
- 10.2 Attach the shock cord to the smaller middle hole on the forward side of the gear leg bracket (Figure 5).

**Figure 5 - Gear Leg Hardware (Forward)**



**Figure 6 - Gear Leg Hardware (Aft)**



- 10.3 Repeat step 10.1 and 10.2 on the other side of the aircraft.
- 10.4 Attach a 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 7 and 8).

**Figure 7 - Aft Two-Hole Tang**



**Figure 8 - Forward Two-Hole Tangs**

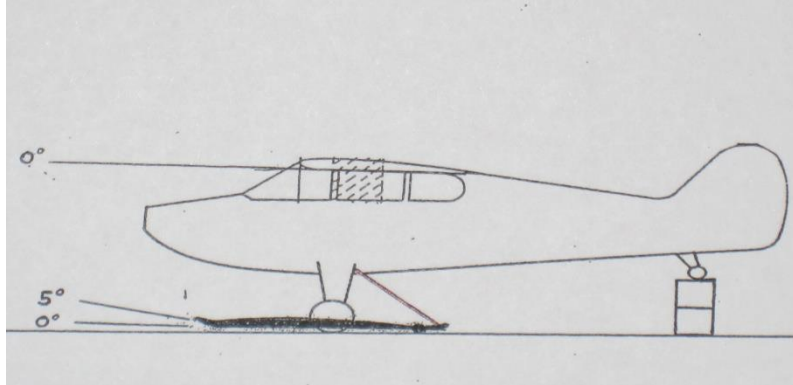


## 11.0 Ski Cable Rigging

- 11.1 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*.
- 11.2 The rear limit (check) cable shall provide a zero to five (5) degree positive ski incidence angle relative to level flight line (reference applicable TCDS) of the aircraft as per AC 43.13-2B Chapter 5.

- 11.2.1 Due to the inward sag of the Cessna gear, you must jack 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 9).

**Figure 9 - Rear Limit Cable Ski Incidence Angle**



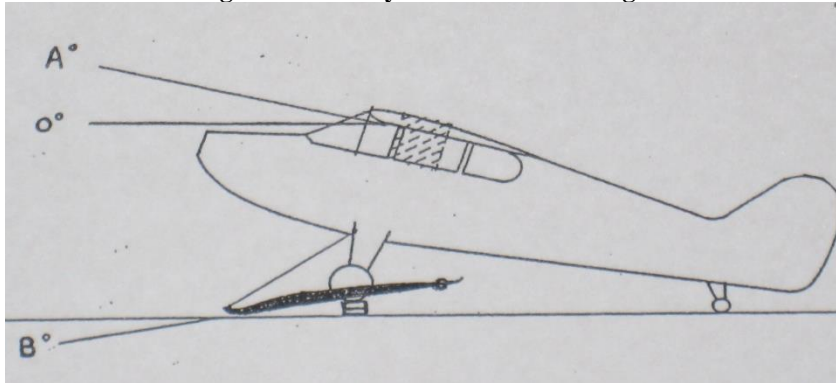
- 11.3 Measure from the empty hole of the attached two-hole tang on the aft end of the ski to the bottom of the turnbuckle attached to the gear leg bracket (Figure 6). This is the length of your rear limit cable. Finish the custom cable fit by completing the cable ends in accordance with section 12 of this installation procedure.
- 11.4 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 gear leg bracket (Figure 5). **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 12 of this installation procedure.
- 11.4.1 A tension of between 20 and 40 lb of force is required to deflect the ski tip down as per AC 43.13-2B Chapter 5. **Verify** that between 20 and 40 lb of downward force at the ski tip has been achieved.
- 11.5 Now you will measure and rig the Safety Cables. The safety cable is installed to provide a maximum negative incidence of 10 to 15 degrees as per AC 43.13-2B Chapter 5.
- 11.6 With the tail down, jack the aircraft allowing the gear legs to sag into flight position. Place 2x4 blocks under the main gear, then gently lower the aircraft so the main gear just touch the blocks. The aircraft's weight is still being supported by the jacks and the gear is still in flight position.
- 11.7 Push the front of the ski down until a maximum negative incidence angle of 10 to 15 degrees is obtained (Figure 10). Measure the negative angle of the bottom inside edge of the ski (Figure 10, Angle B). Measure the positive level flight angle at the upper door sill (per applicable TCDS) in accordance with the aircraft maintenance manual (Figure 10, Angle A). Use the total difference as your negative incidence.
- 11.8 Measure from the empty hole of the attached forward *INBOARD* two-hole tang to the bottom of the turnbuckle attached to the gear leg bracket (Figure 5), this is the length of your



Safety Cable. Finish the custom cable fit by completing the cable ends in accordance with Section 12 of this installation procedure.

- 11.9 Repeat steps 11.1 to 11.8 for the opposite gear leg.

**Figure 10 - Safety Cable Incidence angle**



NOTE: If the aircraft is equipped with float fittings, they may be used as cable attachment points. Cable lengths must be adjusted to maintain proper specifications as per section 11.

## 12.0 Thimble Eye Splice Procedure

- 12.1 The cable ends will need to be finished to the lengths measured in section 11. The cable ends will need to be thimble-eye spliced using the wire rope sleeves and thimbles provided.
- 12.1.1 First slide the heat shrink tube on to 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 11).
- 12.1.2 Now loop the end of the cable through the turnbuckle and back through the other hole of the wire rope sleeve (Figure 12).

**Figure 11 - Heat shrink & wire rope sleeve**



**Figure 12 - Cable Loop**



- 12.1.3 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 13).

**Figure 13 - Cable Measuring Fixture**



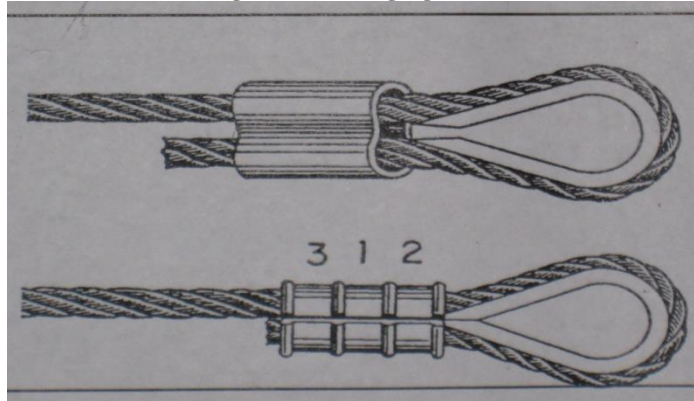
- 12.1.4 Stretch the tape measure out to the desired cable length. Adjust the cable end until the proper length is achieved. The thimble ends should extend into the wire rope sleeve (Figure 14).

**Figure 14 - Measuring Cable to Length**



- 12.1.5 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.
- 12.1.6 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 15).

**Figure 15 - Swaging order**



- 12.1.7 Measure cable to verify length. Measure the crimped wire rope sleeve for proper compression using a Go-No Go Sleeve Gauge.
- 12.1.8 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 16).
- 12.1.9 Tape the loose end of the cable with chafe tape (Figure 17). 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 18).

**Figure 16 - Cable Finished to Length**



**Figure 17 - Chafe Tape Installation**



**Figure 18 - Finished Cable End**



12.1.10 Repeat steps 12.1.1 through 12.1.9 on the other cables.

- 12.2 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.

### **13.0 Aircraft Weight and Balance, Skis Installed**

- 13.1 Re-weigh airplane with the skis attached. Calculate new weight and balance according to Aircraft Corporation maintenance manual.

### **14.0 Post Installation Paperwork**

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- 14.1 This installation must be accomplished by a properly rated Aircraft Technician.
- 14.2 Complete FAA Form 337 and a maintenance records entry for this alteration.
- 14.3 Maintenance must be performed in accordance with the Instructions for Continued Airworthiness.

## **15.0 Post Installation Information**

It is recommended that the aircraft operator read and become familiar with FAA Handbook H-8083-23.

### **15.1 Taxi**

15.1.1 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.

15.1.2 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.

15.1.3 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.

### **15.2 Take off procedures**

15.2.1 Take off from hard surfaces may be accomplished as you would without skis.

15.2.2 Take off performance from snow will depend on the snow conditions. Refer to the Airplane Flight Manual Supplement for airplane performance information.

### **15.3 Landing**

15.3.1 Landing on a hard surface may be accomplished just as you would without skis.

15.3.2 Landing performance on snow will depend on the snow conditions. Refer to the Airplane Flight Manual Supplement for airplane performance information.



#### 15.4 Extended Parking

- 15.4.1 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.