Silveraire, LLC
18099 Elmcrest Avenue North
Forest Lake, MN 55025

Installation Procedure: TrickAir Model 2500 Main Landing Gear Skis

Aircraft Make: Piper

Aircraft Models:
PA-20, PA-20-115, PA-20-135, PA-22/20,
PA-22/20-108, PA-22/20-135, PA-22/20-150, PA-22/20-160

Document No. IP-006

Revision: A

Log of Revisions

Approved	Revision	Page(s)	Description	Date
RAD	IR	All	Initial Release	05/01/2010
SWS	A	All	Previously CFMI-123, updated business address	4/24/2016

Table of Contents

1.0 Scope

1.1 The following installation instructions provide detailed information on the correct installation of the TrickAir Model 2500 main landing gear skis for the Piper PA-20 series aircraft and model PA-22 series aircraft with conversion to conventional gear under STC SA45RM (or SA4-1263, PA-22-160 only) or other FAA approved method, and equipped with 8.50-6 wheels and tires under STC SA02672CH or other FAA approved method.

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 43.13-2A

2.3 MIL-STD-2219

2.4 Type Certificate Data Sheet 1A4 or 1A6

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 Tools

3.7 Go-No Go Sleeve Gauge

3.8 Cable Cutter

3.9 Force Scale

3.10 Chalk Line

3.11 Plumb Line

3.12 Grinder

3.13 Welder

3.14 Plywood Spacer Strips ¾” x 2” x 24” (ground clearance spacer)

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 if the main wheel tires size is 8.50-6.

5.2 Inflate tires to manufacturer's rated inflation.

5.3 Ensure the main gear axles are parallel to the floor by rolling the airplane back and forth at least six feet in each direction, end by pulling the aircraft forward.

5.4 Verify landing gear alignment is within the aircraft manufacturers specifications.

NOTE: Do not attempt to weld on brackets until the landing gear has been verified to meet the aircraft maintenance specifications for toe in/out.

6.0 Axle Preparation

6.1 To provide a good surface for welding, remove the paint and/or corrosion from the bottom of the airplane main gear axles, to a distance of at least 0.25” past the intended weld area. This may be accomplished using a sander or fine grit grinder. 3-M Roloc is recommended. Do not sand or grind extensively so as not to damage the landing gear tube structure.

7.0 Establish Aircraft Centerline

7.1 Straighten the tail wheel so it is centered.

7.2 Drop a plumb-bob from each of the front gear leg attach bolts to the floor, use the most forward position of the bolt for your dropping point. Make a mark on the floor for both locations.

7.3 Measure half way between the two plumb-bob marks made in step 7.2 and mark this point on the floor as the front centerline point.

7.4 Attach a chalk line to the center of the tail wheel at the floor and pull the line through your front centerline point marked on the floor in step 7.3. Pull the chalk line past the propeller and snap a line on the floor. This is your aircraft centerline.

7.5 Block the main and tail wheels on each side to secure the aircraft position.

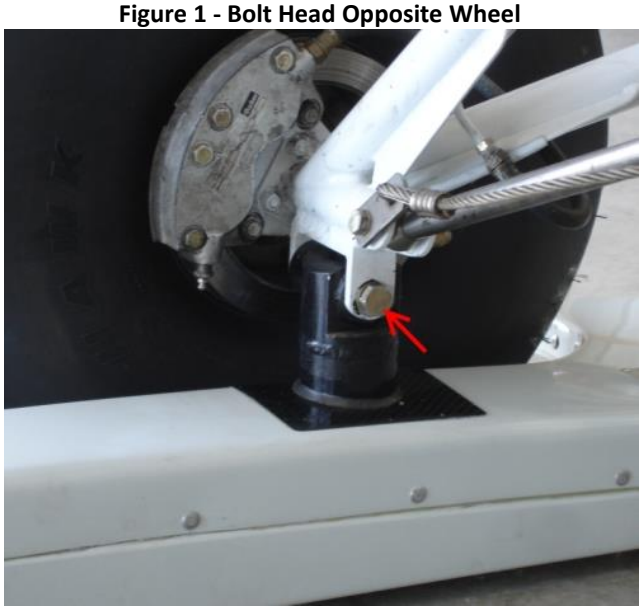
***WARNING*: Ensure the aircraft does not move until all instructions through 9.0 have been completed.**

8.0 Attach Mounting Brackets to the Skis

8.1 Temporarily attach the ski attachment bracket to the ski using an AN8-42 bolt and AN310-8 nut. It is recommended that you clean the inside of the brackets to remove paint before installation.

***WARNING*: The AN8-42 bolt must be installed with the head of the bolt opposite the wheel assembly to prevent interference with the wheel and brake (Figure 1).**

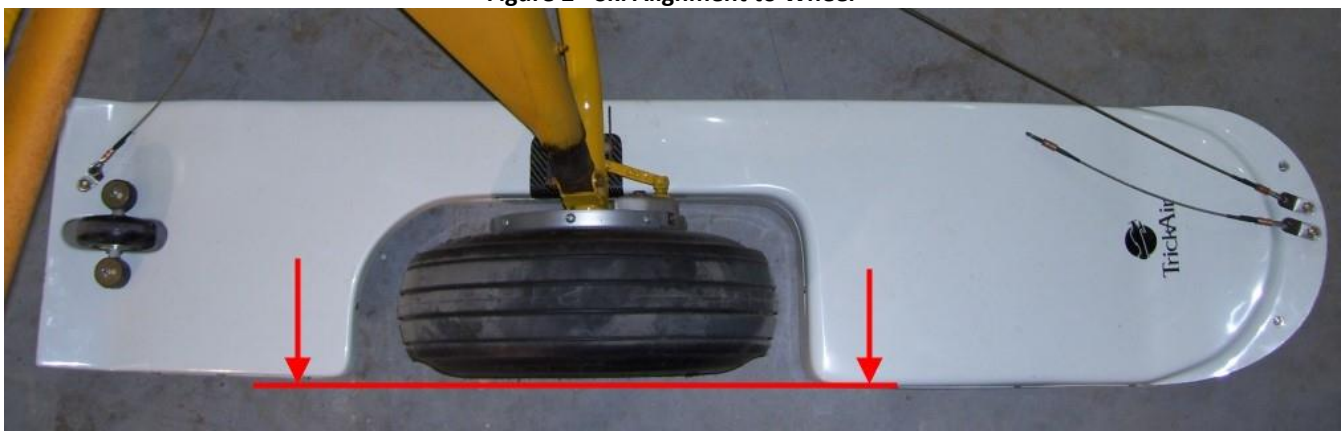
Figure 1 - Bolt Head Opposite Wheel



9.0 Tack Welding Brackets

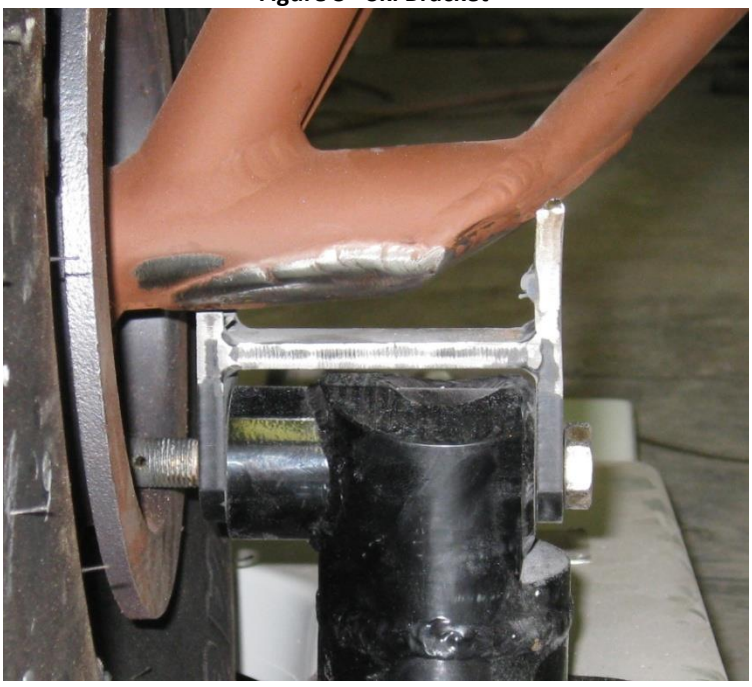
9.1 Move the main wheel ski with bracket attached into place under the main wheel axle parallel to the aircraft centerline drawn in section 7. Using a straight edge placed against the outside of the tire, determine the placement of the ski relative to the wheel assembly. The outside edge of the ski should be near flush with the outside edge of the tire (Figure 2).

Figure 2 - Ski Alignment to Wheel



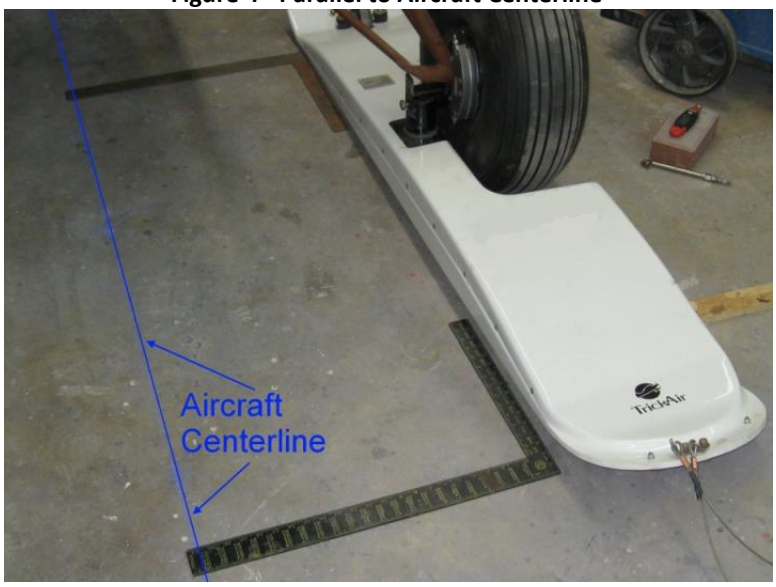
9.2 Place the ¾" x 2" x 24" plywood spacer under the ski, located 16 inches back from the front tip of the ski. The ski attachment bracket should touch the axle (Figure 3). The bracket may be rotated forward or back to get a proper clearance; the position of the bracket should be at an angle no greater than 45° to the vertical center of the main gear tube. CAUTION: Do not force the ski/bracket assembly into place; this will cause misalignment.

Figure 3 - Ski Bracket



9.3 Measure from the inside edge of the ski to the centerline on the floor to verify the ski position is parallel to the centerline of the aircraft. The measurements must be taken at the rear of the ski and near the front of the ski (behind the radius) on the flat ski surface near the location of the plywood spacer (Figure 4).

Figure 4 - Parallel to Aircraft Centerline



9.4 Using the measurements taken in step 9.3, position the ski so it is parallel to the aircraft centerline (**not** the main wheel). When adjusting the ski position be sure to maintain outside ski edge location relative to the main wheel as established in step 9.1.

9.5 Cover the ski and landing gear components to protect them from weld splatter; tack-weld the bracket into place.

9.6 Recheck the position of the ski relative to the aircraft centerline.

9.7 Remove the ski from the bracket.

9.8 Repeat steps 9.1 through 9.7 for the opposite ski.

10.0 Finish Weld, Prime and Paint

10.1 The finish weld procedure should be accomplished with the landing gear main wheel removed and the brake assembly secured away from the immediate weld area.

10.2 Jack the aircraft in accordance with the aircraft manufacturer's maintenance manual procedures.

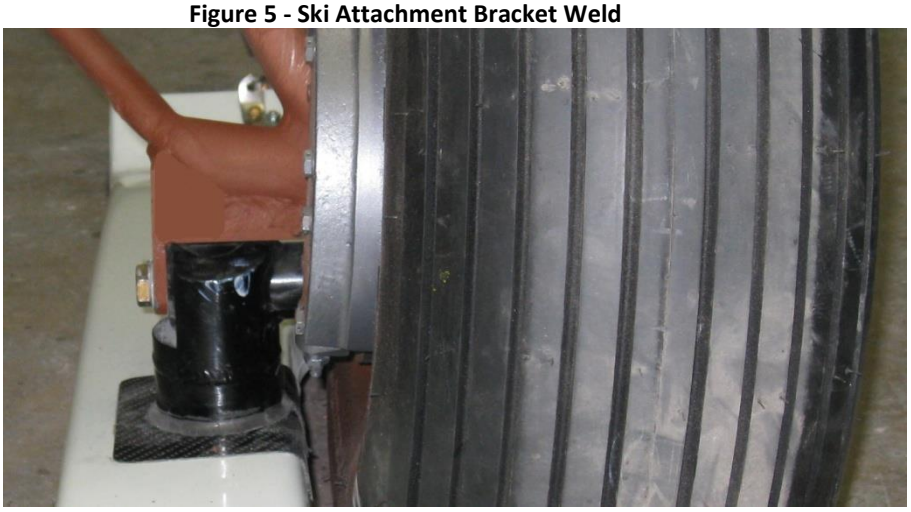
10.3 Remove the wheel from the axle.

10.4 If you have disk brakes remove the brake assembly from the axle and secure away from the immediate weld area. Cover the brake assembly and the surrounding axle area to protect from weld splatter.

10.5 Insert the furnished spacer tube with a short .5-inch bolt to hold it inside the bracket. This will prevent any distortion of the bracket ears during the welding process.

10.6 Finish weld in accordance with MIL-STD-2219 or equivalent for Class B weld. Allow the weld to air-cool, do not quench (Figure 5).

Figure 5 - Ski Attachment Bracket Weld



10.7 Remove spacer tube; wire brush and clean weld area. When weld is cool inspect with a 10x magnifying glass.

10.8 After welding is complete and cooled, clean the welded area.

10.9 Coat with epoxy primer and paint to match the landing gear or aircraft color.

10.10 Reinstall the main landing gear axle strut, brake and wheel assembly in accordance with Aircraft Maintenance Manual.

10.11 Repeat steps 10.2 through 10.10 for the remaining ski attachment bracket.

10.12 Remove the aircraft from jacks in accordance with the aircraft manufacturer's maintenance manual procedures.

11.0 Installing Ski to Landing Gear Brackets

11.1 Pre-grease the ski pedestal bushing.

11.2 Slide the ski into position under the bracket, and install the AN8-42 bolt, AN960-816 washers and AN310-8 nut, and secure with the cotter pin.

11.3 Inspect installation to ensure the ski is properly aligned and free to pivot.

12.0 Fuselage Tang Installation

12.1 On one side of the airplane remove the bolt from the front gear leg pivot. Insert the provided AN6-27 bolt into the hole with the threads facing forward. Slide the provided three-hole tang on the bolt, replace the castle nut and torque according to the airplane maintenance manual and secure with a cotter pin (Figure 6).

Figure 6 - Forward Three-Hole Tang Installation

12.2 Remove the bolt from the rear gear leg pivot in the same manner as the front bolt was removed in step 12.1. Insert the provided AN6-30 bolt in the hole with the threads facing aft. Slide the provided two-hole tang on the bolt, replace the castle nut and torque according to the airplane maintenance manual and secure with a cotter pin (Figure 7).

Figure 7 - Aft Two-Hole Tang Installation

12.3 Repeat 12.1 and 12.2 on the opposite gear leg.

13.0 Turnbuckle and Ski Tang Attachment

13.1 Attach a shock cord and a turnbuckle to the three-hole tang on the forward side of the gear leg. The turnbuckle attaches to the inboard hole, the shock cord attaches to the outboard hole. Use an AN4-6 bolt and AN310-4 nut provided (Figure 6).

13.2 Attach a turnbuckle to the two-hole tang on the aft side of the landing gear. Use an AN4-6 bolt and AN310-4 nut provided (Figure 7).

13.3 Repeat steps 13.1 and 13.2 on the other side of the aircraft.

13.4 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 8 and 9).

Figure 8 - Aft Two-Hole Tang

Figure 9 - Forward Two-Hole Tangs

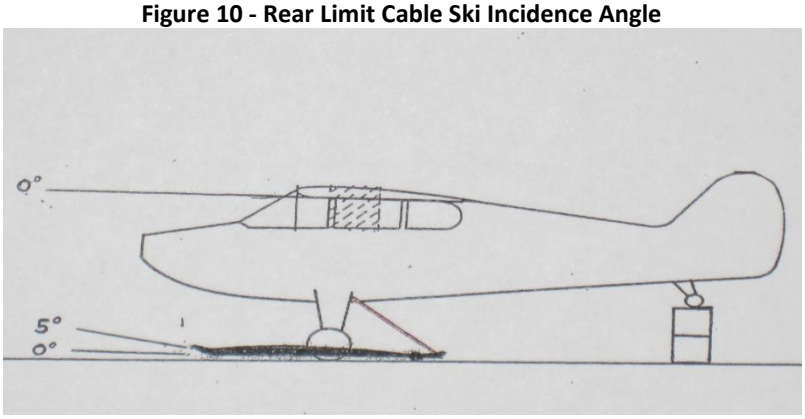
14.0 Ski Cable Rigging

14.1 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.*

14.2 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 1A4 or 1A6).

14.2.1 Due to the inward sag of the landing 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 10).

Figure 10 - Rear Limit Cable Ski Incidence Angle



14.3 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 two-hole tang (Figure 7). This is the length of your rear limit cable. Finish the custom cable fit by completing the cable ends in accordance with section 15 of this installation procedure.

14.4 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 6). **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 15 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 14.4.1 and AC 43.13.*

14.4.1 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.

14.5 Now you will measure and rig the forward safety cable. The safety cable is installed to provide a maximum negative incidence of 10 to15 degrees as per AC 43.13-2B Chapter 5.

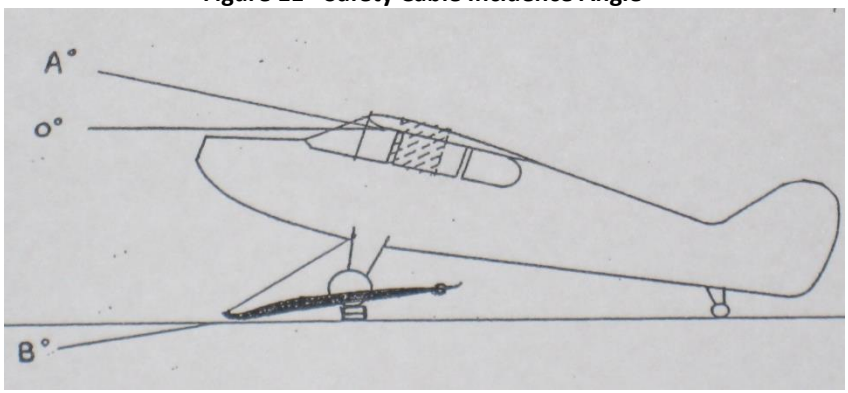
14.6 With the tail down, raise the aircraft, allowing the gear legs to sag into flight position. Place 2x4 blocks under the main gear, and then gently lower the aircraft so the main gear touches the blocks, however, the aircraft's weight is still being supported by the jacks and the gear is still in flight position.

14.7 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 1A4 or 1A6) (Figure 11, Angle A). Use the total difference as your negative incidence.

14.8 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 6), this is the length of your Safety Cable. Finish the custom cable fit by completing the cable ends in accordance with Section 15 of this installation procedure.

14.9 Repeat steps 14.1 to 14.8 for the opposite gear leg.

Figure 11 - 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 14.

15.0 Thimble Eye Splice Procedure

15.1 The cable ends will need to be finished to the lengths measured in section 14. The cable ends will need to be thimble-eye spliced using the wire rope sleeves and thimbles provided.

15.1.1 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 12).

15.1.2 Now loop the end of the cable through the turnbuckle and back through the other hole of the wire rope sleeve (Figure 13).

15.1.3 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

15.1.4 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).

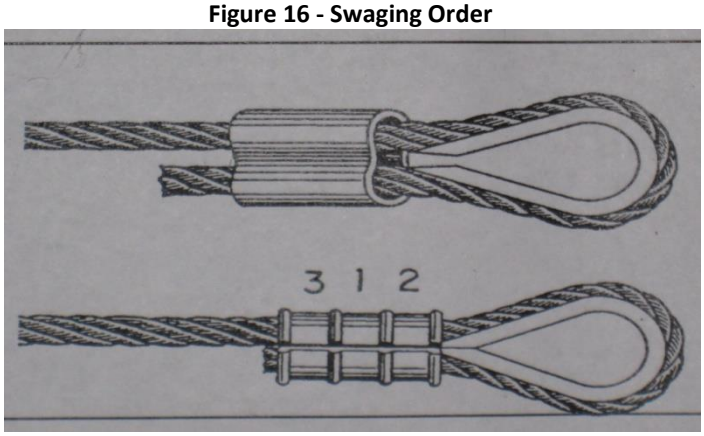
Figure 15 - Measuring Cable to Length

15.1.5 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.

15.1.6 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



15.1.7 Measure cable to verify length. Measure the crimped wire rope sleeve for proper compression using a Go-No Go Sleeve Gauge.

15.1.8 Cut off excess cable from the salvage end. ¾" of cable should extend from the finished crimped wire rope sleeve to allow for full strength of the assembly (Figure 17).

15.1.9 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).

Figure 17 - Cable Finished to Length

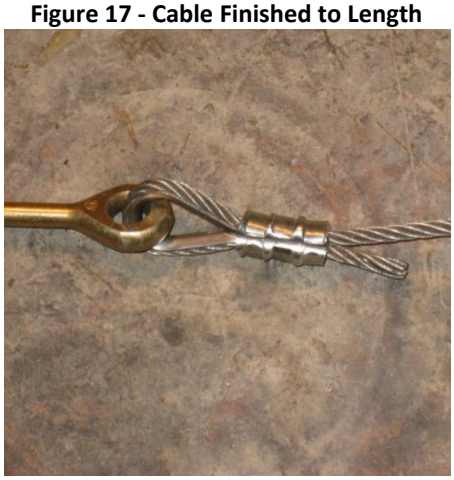


Figure 18 - Chafe Tape Installation

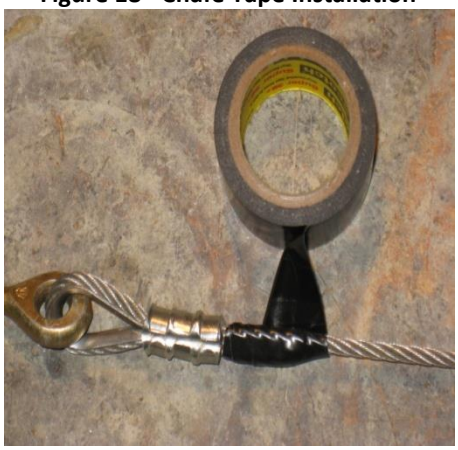
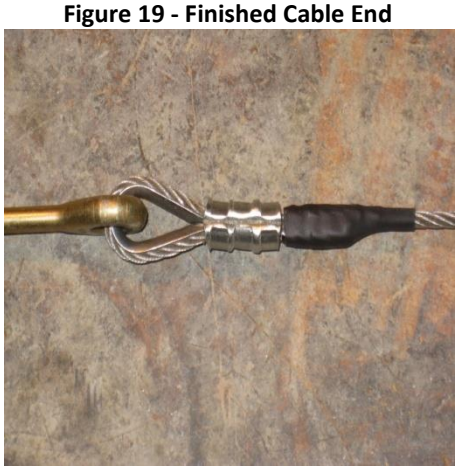


Figure 19 - Finished Cable End



15.1.10 Repeat steps 15.1.1 through 15.1.9 on the other cables.

15.2 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.

16.0 Aircraft Weight and Balance, Skis Installed

16.1 Re-weigh airplane with the skis attached. Calculate new weight and balance according to aircraft manufacturer's maintenance manual.

17.0 Post Installation Paperwork

17.1 This installation must be accomplished by a properly rated Aircraft Technician.

17.2 Complete FAA Form 337 and a maintenance record entry for this alteration.

17.3 Maintenance must be performed in accordance with the Instructions for Continued Airworthiness.

17.4 After the initial installation, the pilot is required to make a log book entry when the skis are installed or removed.

17.5 Install applicable placards on the instrument panel in accordance with the Airplane Flight Manual Supplement.

18.0 Post Installation Information

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

18.1 Taxi

18.1.1 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.

18.1.2 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.

18.1.3 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.

18.2 Take off procedures

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

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

18.3 Landing

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

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

18.4 Extended Parking

18.4.1 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.