

# ***Airglas, Inc.***

## **Instructions for Continued Airworthiness** Including **Installation, Maintenance and Service Instructions**



### **MANUAL NO. LH4000-GA8-105**

#### **GLH3000 Nose Ski and LH4000 Main Ski For GA8 Series Airplanes**

Cage Code 17564

***Airglas Inc.®***

**MANUAL REVISION (B)**

**December 12, 2018**

THIS MANUAL INCLUDES INFORMATION PROPRIETARY TO ***Airglas, Inc.*** AND SHALL NOT BE USED TO MANUFACTURE OR REPRODUCE ANY PART OR

ASSEMBLY WITHOUT THE PRIOR WRITTEN PERMISSION OF ***Airglas, Inc.***

## Record of Revision

Revision	Date	Affected Pages	Approved	Description of Revision
Original	9/23/17	All	Clifford D. Belleau	Original Document
A	3/12/18	All	Thomas Lawhorn	Installation procedures finalized
B	12/12/18	All	Jim Hammer	Clarification added

**Distribution of Changes**

A copy of the revised manual or affected pages will be maintained on the *Airglas, Inc.* website.

**Airworthiness Limitations**

"The Airworthiness Limitations section is FAA approved and specifies maintenance required under Sections 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been FAA approved."

**Limitations:  
None**

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## **1.0 Introduction & Description**

**Introduction:** Since 1955 **Airglas, Inc.** has designed and manufactured composite skis that dramatically increase the usefulness of the aircraft by allowing it to operate on snow or frozen surfaces. The installation of the LH4000-GA8 hydraulic wheel ski kit allows the GA8 series of aircraft to operate on paved or hard surfaces, and snow. With the ski retracted the tires protrude allowing normal ground operations. When desired, the skis are extended by a hydraulic cylinder on each ski and an electric/hydraulic pump to provide operating pressure. The ski is pushed down as a sliding door closes the opening in the ski and causes the tire to ride up on top of the door. The door closes off the wheel opening, thus creating the performance characteristics of a "straight ski". The simplicity of this design allows for a low maintenance high performance ski kit. This is a design that Airglas, Inc. started in 2004, using the LH4000 installation on Cessna 180/185 aircraft.

**Description:** The LH4000-GA8 ski installation consists of essentially 3 systems;

**1. The Mechanical System** – This includes the ski with all attaching hardware (interface to the gear leg) and the rigging components.

**2. The Hydraulic System** – This includes hydraulic lines (both onboard and external), hydraulic actuating cylinders (on the skis), all the hydraulic fittings on the skis, and the hydraulic pumps.

**3. The Electrical System** – This includes pressure switches, a circuit breaker, wiring, control switches and indicator lights (the electric pumps are covered under the hydraulic system).

Instructions for installation of this kit are detailed within this manual.

## **2.0 Control and Operation Information:**

The doors for the skis are actuated by electric/hydraulic pumps located in the fuselage aft of the baggage compartment. The main skis are actuated by one pump and the nose ski by another pump. Each electric/hydraulic pump is controlled via a 3 position toggle switch and indicator lights that are located on the instrument panel.

1. When the switch is lifted up, the cylinder will extend and slide the door under the tire. While the switch is held up a yellow indicator light will illuminate ("IN TRANSIT TO SKIS") showing the ski position has been selected and the pump is energized. When the pump pressure reaches 500 psi, a green light ("SKIS LOCKED DOWN") will illuminate and stay on to confirm adequate pressure for deployment of the skis has been reached. The switch is released, the IN TRANSIT TO SKIS light will extinguish, but the SKIS LOCKED DOWN light will remain lit as long as the pressure remains above 350 psi. Visual confirmation of the ski position is required of the operator to confirm ski position.
2. When the switch is pressed down, the door will retract and expose the tire. While the switch is held down a yellow indicator light ("IN TRANSIT TO WHEELS") will illuminate showing the wheel position has been selected and the pump is energized. When the pump pressure

reaches 500 psi, a green light ("WHEELS LOCKED DOWN") will illuminate and stay on to confirm adequate pressure for deployment of the wheels has been reached. The switch is released, the IN TRANSIT TO WHEELS light will extinguish, but the WHEELS LOCKED DOWN light will remain lit as long as the pressure remains above 350 psi. Visual confirmation of the ski position is required of the operator to confirm ski position.

**Note:**

**The "Locked" lights only indicate that a preselected hydraulic pressure has been met, not that the skis are in proper configuration. Always visually confirm correct configuration before take-off or landing.**

**CAUTION**

**Operation of ski doors can only be done while the aircraft is stopped. Movement of ski doors when aircraft is moving can damage skis.**

3. Low speed taxiing and steering may be enhanced by applying one brake during the cycling of the main ski door to the open position. Holding the brake will impede the actuation of the door and allow the opposite sliding door to cycle independently. By extending only one wheel at a time, the pilot will have increased maneuvering capability on certain snow conditions. This would be particularly advantageous during solo operations.

**CAUTION**

**Avoid landing on non-frozen surfaces while in the ski configuration. High friction contact on the ski bottoms may cause high drag and increased wear to ski bottoms.**

**WARNING**

**Partial or incomplete actuation of the skis to either configuration is not recommended during landing or take-off procedures.**

### **3.0 Placards and Markings**

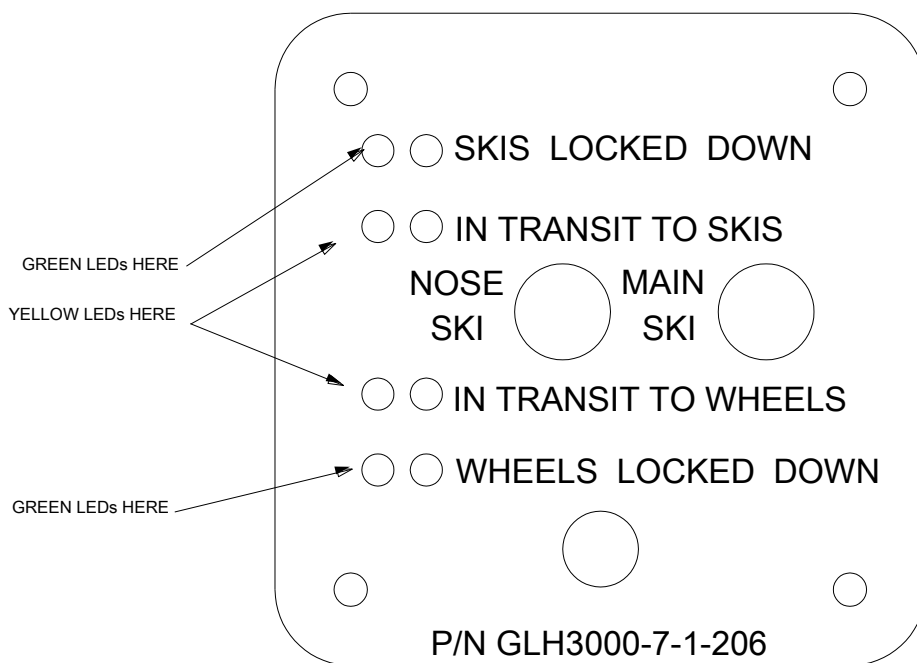
The following information must be displayed in the form of composite or individual placards in addition to those specified in the basic handbook.

A.) *Markings and Placards:* The airspeed indicator is marked as follows:

- The red radial line is located at 169 MPH.

<p><b>DO NOT EXCEED 169 MPH IAS</b> <b>WITH AIRGLAS SKIS INSTALLED</b></p>
--------------------------------------------------------------------------------

Place Airspeed Restriction Placard on instrument panel immediately adjacent to Airspeed Indicator and **in full view of pilot.**



Located at the ski selector switch.

## 4.0 Initial Installation

Installation of the skis requires the installation of an **Airglas, Inc.** nose fork under STC SA02441AK. The main landing gear axles must be modified by installation of a stub axle and roll pin. 8.50 x 6 tires are required to be installed for this modification.

Refer to drawings:

LH4000-GA8 Sheets 1-10

LH4000-GA8-HYD Sheets 1-3

GLH3000-GA8-7

Installation

Hydraulic System

Electrical Schematic

Note: All hardware in this kit shall be installed and torqued IAW AC 43.13-1B Chapter 7, Par 7-40, Table 7-1 and table 7-2 unless noted. Fluid lines shall be torqued IAW AC 43.13-1B Chapter 9, Par 9-30, Table 9-2.

Note: Use EZ-Turn or other thread lubricant meeting SAE-AMS-G-6032 MIL-G-6032D Am I Type I on all fluid fittings.

### **CAUTION**

**Disconnect aircraft battery and discharge the alternator excitation capacitor IAW the appropriate GippsAero Service Manual chapter 24-00-40 before initiating the installation.**

### **MAIN SKI RIGGING FUSELAGE ATTACH BRACKET INSTALLATIONS**

1. Remove aircraft interior inspection panels at the pilots and co-pilots seats. Remove the left hand and right hand side panel inspection panels at F.S. 44.0. Retain the panels and hardware.
2. Refer to drawing LH4000-GA8 sheet 2 detail A. Locate the LH4000-GA8-9-1L bracket as shown in detail A on the left hand side of the aircraft. Note the rivets that the bracket will cover. Drill out the four existing rivets using a #30 drill bit. Enlarge the forward rivet hole using a #9 drill bit. Install the bracket using an AN525-10R10 screw and MS21044N3 nut with one NAS1149F0363P washer on the back side. Align the bracket so that the top is parallel to the skin lap joint. Using a pancake drill spot locate the two rivet holes using a #30 drill bit. Do not attempt to back drill the stainless bracket in place.



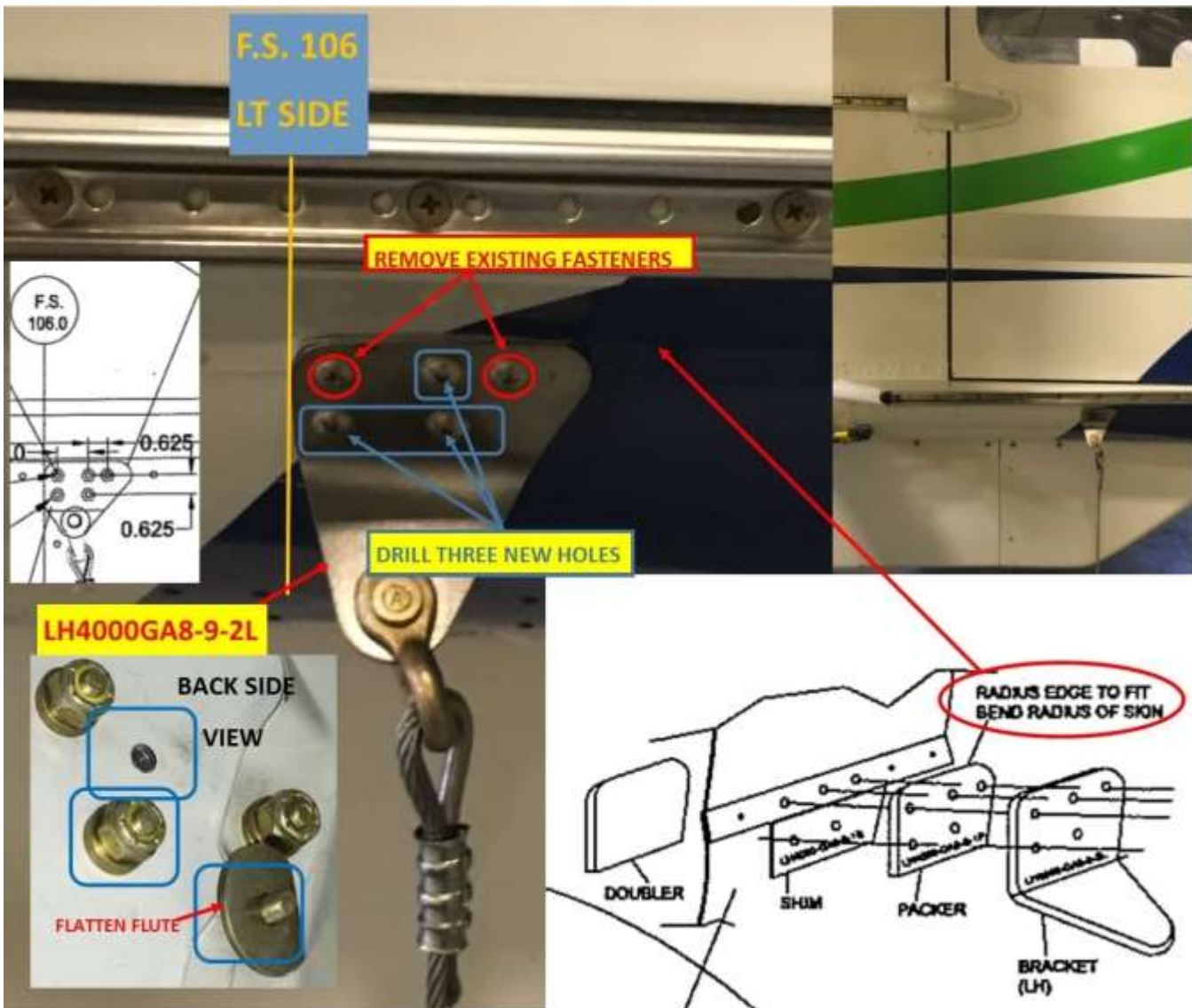


3. Remove the bracket and drill the spot locations with a sharp #30 drill bit. Lay out the two additional fastener locations using detail A. Pilot drill them using the #30 drill bit and then increase the fastener holes in the bracket using the #9 drill bit. Deburr the holes.
4. Using a 100 degree countersink, countersink the aft existing hole that the bracket partially covers. Install an MS20426AD4-X rivet in this location. Note: Rivet should be long enough to have 1.5 diameters, beyond skin thickness.
5. Reinstall the bracket using the forward AN525-10R10 screw, NAS1149F0363P washer, and MS21044N3 nut. Align the bracket horizontally and drill the existing #30 holes in the fuselage out to #9 and install an AN525-10R10 screw, NAS1149F0363P washer, and MS21044N3 nut each location. Vacuum any shavings from the aircraft.
6. Repeat the above procedure on the right hand side of the aircraft using the LH4000GA8-9-1R bracket.



7. Remove the aircraft interior floor inspection panels between FS. 87 and FS. 170. Refer to drawing LH4000-GA8 sheet 2 detail B. Locate the LH4000GA8-9-2L as shown in detail B on the left hand side of the aircraft. Note the rivets that the bracket will cover. Drill out the two existing rivets using a #30 drill bit. Enlarge the forward rivet hole using a #9 drill bit. The top edge of the LH4000GA8-9-2L and the packer part #LH4000GA8-9-1P must be ground to fit

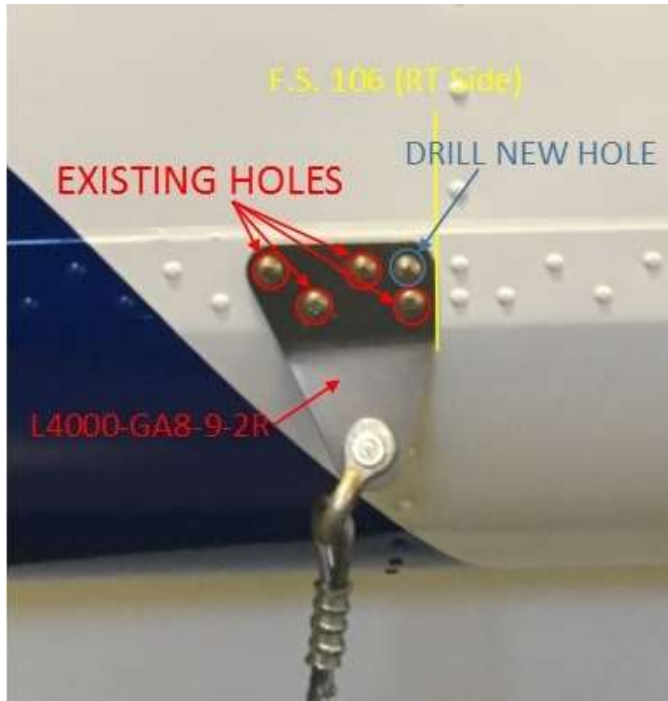
the contour of the fuselage and maintain hole edge distance. Install the bracket using an AN525-10R10 screw and MS21044N3 nut with one NAS1149F0363P washer on the back side, the shim part# LH4000GA8-9-1S goes under the lower 2 holes and tight to the skin lap. It can be held in place with double face tape until all the holes have been drilled. Align the bracket so that the top is parallel to the skin lap joint. Using a pancake drill spot locate the remaining existing rivet hole using a #30 drill bit. Do not attempt to back drill the stainless bracket in place.



8. Remove the bracket and drill the spot locations with a sharp #30 drill bit. Lay out the three additional fastener locations. Pilot drill them using the #30 drill bit and then increase the fastener holes in the bracket using the #9 drill bit. Deburr the holes.
9. Reinstall the bracket using the forward AN525-10R10 screw, NAS1149F0363P washer, and MS21044N3 nut. Align the bracket horizontally and drill the existing #30 holes in the fuselage out to #9. The lower forward hole in the bracket goes through a fuselage bulkhead that is fluted. That flute can be flattened by putting a screw through the bracket, and using a large area washer that has been ground flat on one side, tighten the nut until the flute has been flattened. Remove the large area washer and install the doubler with a AN525-10R10 screw, NAS1149F0363P washer, and MS21044N3 nut each location. Vacuum any shavings from the aircraft.



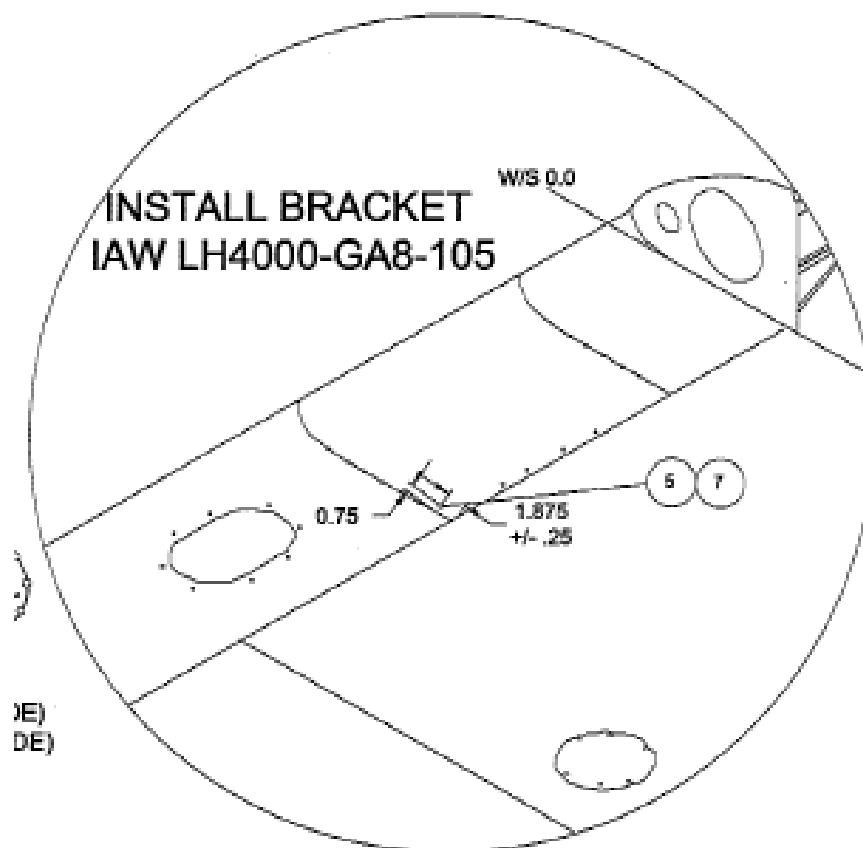
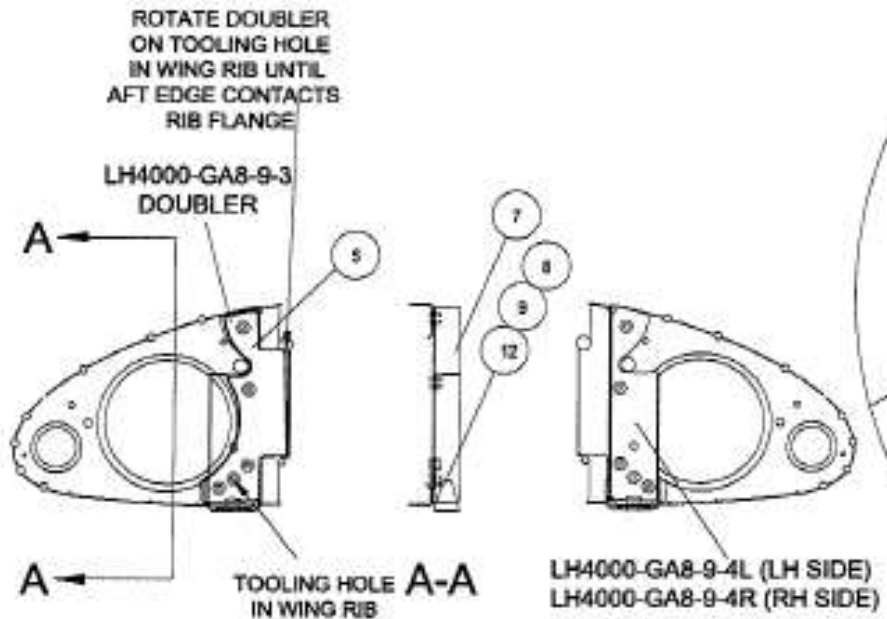
10. Remove the right hand lower interior trim side panel from station FS 87 to FS 157. Locate the LH4000GA8-9-2R as shown in detail C on the right hand side of the aircraft. Note the rivets that the bracket will cover. Drill out the three existing rivets using a #30 drill bit. Enlarge the forward rivet hole using a #9 drill bit. Install the bracket using an AN525-10R10 screw and MS21044N3 nut with one NAS1149F0363P washer on the back side. Using a pancake drill spot locate the two rivet holes using a #30 drill bit. Do not attempt to back drill the stainless bracket in place.



11. Remove the bracket and drill the spot locations with a sharp #30 drill bit. Lay out the two additional fastener locations using detail A. pilot drill them using the #30 drill bit and then increase the fastener holes in the bracket using the #9 drill bit. Deburr the holes.
12. Reinstall the bracket using the AN525-10R10 screw, NAS1149F0363P washer, and MS21044N3 nut. Align the bracket horizontally and drill the existing #30 holes in the fuselage out to #9. Install the doubler with a AN525-10R10 screw, NAS1149F0363P washer, and MS21044N3 nut each location. Vacuum any shavings from the aircraft.

### **MAIN SKI RIGGING WING ATTACH BRACKET INSTALLATIONS**

1. Refer to drawing LH4000-GA8 sheet 2 details D and E. Remove the inspection panel on the left hand wing leading edge closest to the fuselage and retain.



2. Locate the third leading edge rib outboard at WS 23.5. Install doubler LH4000-GA8-9-3.  
Carefully Cleco the doubler in place using the exist tooling hole in the wing rib. Rotate the doubler until it nests between the leading edge flange and the spar flange on the rib. If the doubler does not ride flush against the rib web, carefully trim the doubler until it rides flush. You may need to lift the edge of the wire grommet(s) to allow the doubler to fit flush. Using the doubler as a guide, drill the four .1875" diameter holes in the wing rib.
3. Remove the LH4000-GA8-9-3 and deburr the holes.
4. Install the LH4000-GA8-9-3 doubler and the LH4000-GA8-9-4L assembly in the wing, and secure with five AN3-4A bolts, NAS1149F0363P washers, and MS21044N3 nuts.
5. Using the LH4000-GA8-9-4L as a guide, center-punch the lower skin from the inside. Using a stepped drill bit with a 3/8" thin washer as a stop, drill a .375" diameter hole in the bottom of the wing skin. Vacuum all shavings from wing.
6. Install an AN46-6A eye bolt into the LH3600-GA8-9-4L with one NAS1149D0632J washer. Torque eye bolt (minimum of 95 in. lbs. maximum 190 in. lbs.) and align the tab parallel to the slip stream. Use additional NAS1149D0632J washers if needed to align the eyebolt.



7. Repeat steps 12 thru 17 on the right side of the aircraft.
8. Reinstall all inspection panels using retained hardware.

### **MAIN SKI ATTACHMENT**

1. The aircraft will need to be hoisted or jacked. Use caution and jack IAW chapter 7-10-00 of the appropriate GippsAero service manual.
2. Remove the two AN5-23A bolts holding the main landing gear axle onto the main gear leg. Install the LH3600-6-GA8 flange on the inside of the main landing gear. Install two AN5-26A bolts wet with PRC 3204 B1/2 (or equivalent) with new MS21042-5 nuts to secure the flanges.
3. Deflate the main tire. Remove the axle cotter-pin, drill out the part number GA8-321023-31 axle sealing plug and remove (Note: use a  $\frac{3}{4}$ " stepped drill bit and it will often spin out on its own), remove axle nut and retain. Remove the brake pad retaining bolts, and remove the wheel (retain bolts and wheel). Install the LH3600-7-GA8 stub axle in the axle. Cross drill with a #13 drill bit so that the roll pin is located under the outer wheel bearing (the wheel bearing acts as a safety to prevent the roll pin from backing out). Insert a 3/16 x 1 1/2 roll pin (MS171599) and drive flush. Lightly file any burrs off to allow the wheel to be installed.
4. Reinstall the wheel and brake assembly. Tighten the axle retaining nut until slight bearing drag is felt when wheel is rotated. Loosen nut to nearest alignment hole and install an LW2500-21 axle nut retainer clip on the axle nut. Re-inflate the tire. Slide the ski beneath the tire. Once the ski is positioned, the aircraft may be lowered to the ground.
5. The rod ends on the yoke can next be thru-bolted to the stub axles using the NAS1312-15 bolts. Install AN960-1216(L) and AN960-1216 washers as needed to center the tire in the ski. Adjust the rod ends in the yoke assembly (LH3600-5-GA8) and align the skis parallel to the aircraft centerline. (up to 1.5" toe-in is acceptable)
6. Remove the NAS1312-15 bolts and insert the nylon set screws into the inboard flange and stub axles until the nylon screw just protrudes below the minor diameter of the  $\frac{3}{4}$ " threads. Reinstall the NAS1312-15 bolts and torque to 280 to 300 ft-lbs. (Note: Subsequent reinstallation requires new set screws)
7. Hoist or jack the aircraft until the bungee cable assembly can be attached to the wing attach point (a bungee stretcher can also be used). Attach the tab to the I-bolt using the AN396-15 clevis and cotter pin.
8. Lower the aircraft to the ground. Attach the rear check cable and forward safety cables.
9. Hoist or jack the aircraft and confirm the skis are at +1.5° tip up in the ski position in flight with the ski in the down position. (Measure relative to aircraft horizontal level position)
10. Make sure all hardware is installed, torqued, and cotter pinned as necessary.



### **NOSE SKI ATTACHMENT**

1. The aircraft will need to be hoisted or jacked to install the nose ski. Use caution and jack IAW chapter 7-10-00 of the appropriate GippsAero service manual.
2. Referencing drawing PA32-206LA, remove the AN365-524 nuts, washers, PA32-206L-5 spacers, PA32-206L-4 axle rod and PA32-206L-6 buckets from the nose fork. (Discard) Ensure that the MS171596 roll pins are installed in each PA32-206L-6-GLH bucket. Install the PA32-206L-6-GLH buckets and PA32-206L-4-GLH axle rod on the PA32-206LA nose fork. Adjust the bearing pre load of the nose wheel bearings. Slip heat shrink or rubber tubing over the .032" safety wire where it will ride on the nose fork before and safety the buckets to the nose fork to prevent their turning.
3. Slide the ski beneath the tire. The rod ends on the yoke can next be bolted to the PA32-206L-6-GLH buckets with two AN6H25A bolts thru the GLH3000-NG-LR1-1L and -1R rigger brackets. Place one NAS1149F0663P washer on each side of the rod end. Leave the bolts loose, and install the GLH3000-NG-LR1-3(L or R) straps IAW drawing GLH3000-GA8 sheet 4. Install the brackets using four AN6-24A bolts on the right side and AN6-25A bolts on the left, install the MS21045-6 nuts on each bolt but just finger tight.
4. Adjust the rod ends to center the tire in the yoke assembly (GLH3000-5) and align the ski parallel to the aircraft centerline. Move the rod ends in to provide additional clearance on the rear of the door opening if needed.
5. Lift the ski up until the ski stops contact the rigger brackets and block it in position. Remove the AN6-25A bolts on the top left hand side, and gently rotate the rigger bracket aft until you can install the GLH3000-NS-14 bungee assembly using one each AN6-25A bolt, PA32-206 spacer, NAS1149F0663P washer, and MS21045-6 nut.
6. Rotate the rigger upward and install the forward safety cable assy. using one AN6-25A bolt thru the forward hole of the GLH3000-NG-LR1-3L strap, NAS1149F0663P washer, and MS21045-6 nut. INSERT PHOTO HERE. Install the rear safety cable using one AN6-25A bolt thru the aft hole in the GLH3000-NG-LR1-3L strap. Secure the AN6-25A bolt with the NAS1149F0663P washer, and MS21045-6 nut. Remove the blocking.
7. Install the rigger on the right hand side of the nose fork using the middle hole in the GLH3000-NG-LR2-2 bracket. Place one AN970-6 washer under the bolt head and one NAS1149F0663P washer between the rod end and the bracket. Secure with one AN6-24A bolt NAS1149F0663P washer, and MS21045-6 nut. Torque all nuts. INSERT PHOTO HERE
8. Lower the aircraft to the ground and with the nose tire protruding, adjust the rigger until the nose ski tail wheel tire contacts the ground with enough pressure to slightly move the ski up



stop off the rigger bracket on the left hand side. Hoist the nose ski clear of the ground and confirm nose ski tip up angle is no greater than  $+3.5^{\circ}$  with the ski in the retracted position (tire protruding). (Measure relative to aircraft horizontal level position)

9. Make sure all hardware is installed, torqued, safety-tied, and cotter pinned as necessary.
10. Remove aircraft from hoist or jacks.

### **SPOT MIRROR INSTALLATION**

1. Remove the wing access plate from the right hand wing IAW drawing LH4000-GA8 sheet 9.
2. Install the mirror on the cover plate with one screw. Reinstall the access plate on the wing. Rotate the mounting plate to align the pilots view to contain both the main and nose ski. Drill the second hole.
3. Remove the access plate and install the additional fastener. Reinstall the access plate.
4. Repeat for the left side, with the exception that you must install MS21078-3 nutplates. After the alignment holes have been drilled, drill the mounting holes for the nutplates, dimple the access panel, countersink the nutplates, and rivet them on with the AN426AD-3-4 rivets.
5. The left side requires the access panel to be in place before attaching the mirror.

### **HYDRAULIC PUMP & LINE ROUTING**

1. Remove the fuselage interior panel at FS 170.29, retain the panel and hardware. Some aircraft have a cargo bin in place of the interior panel, remove the bin as above. Remove the fuselage access panel from fuselage belly between FS 195.29 and FS 207.29, retain panel and all fasteners. Remove the fuselage floor inspection panels from FS 82.31 to FS 170.29, retain the panels and all fasteners.
2. Locate the LH3600-20-GA8 pump mounting plate in accordance with drawing LH4000-GA8-HYD detail E.
3. Drill the MS20470AD4 rivets from the side channels, vacuum any drill shavings from the area and place the LH3600-20-GA8 mounting plate in the fuselage. Back drill the plate using the existing rivet holes along the sides. Cleco the plate as you go. Layout and drill a forward, aft, row of rivets with a similar spacing and pump mounting holes IAW drawing LH4000-GA8-HYD. Remove the mounting plate, deburr the holes, vacuum any drill shavings. Rivet the plate to the fuselage using MS20470AD4 rivets IAW drawing LH4000-GA8-HYD.

4. Drill a .125" diameter drain hole in the fuselage belly just aft of F.S. 182.79.
5. Install the pressure switches and hydraulic fittings on the pumps and install the pumps in the aircraft IAW drawing LH4000-GA8-HYD. One pump is used for the main skis and one is used for the nose ski.
6. Drill the holes for the 6 bulkhead fittings at FS 87.125 IAW drawing LH4000-GA8-HYD detail C, and D. Install each of the AN833-4D bulkhead fittings from the outside with one NAS1179D0763J washer on the outside and one on the inside. Secure each with one AN924-4D nut.
7. Install two aluminum doublers at FS 157.29 bulkhead IAW drawing LH4000-GA8-HYD figure B-B using MS20470AD4 rivets. Drill 0.4375 holes through the bulkhead and doublers. Insert the AN832-4D bulkhead fittings thru the FS 157.29 bulkhead from aft to front. Install an NAS1149D0763J and AN924-4D nut on the fitting and tighten.
8. Install the 5052-O 1/4" x .035 aluminum tubes IAW drawing LH4000-GA8-HYD table on sheet 3 of the hydraulics. Route the tubes IAW sheet 3 LH4000-GA8-HYD. Flare each tube IAW AC43.13-1B chapter 9 paragraph 9-30. Confirm they are in the correct sequence and orientation. It is easier to "TEE" the main ski tubes aft of F.S. 170 and run them forward then to try and cross the fuselage further forward. Two tubes are installed in the left hand side of the fuselage (LH main) and four are installed in the right hand side (RH main & nose). The "UP" port on the pumps goes to the forward fitting on the cylinder. INSERT PHOTO HERE
9. Secure the lines with friction tape and cushioned clamps at intervals no greater than 18" intervals IAW drawing LH4000-GA8-HYD Sheets 1 thru 3. Ensure the tubes do not interfere with flight controls and are not able to chafe.
10. Fabricate two tubes from the FS 82.31 lower AN833-4D fittings to the FS 0.0. Route these tubes along the fuselage exterior skin IAW drawing LH4000-GA8-HYD figure F. Attach two AN815-4D unions to the forward end. Secure the lines with friction tape and cushioned clamps at intervals no greater than 18" intervals IAW drawing LH4000-GA8-HYD figure E.
11. Fabricate the 6 flexible hoses IAW drawing LH4000-GA8-HYD table 1 and AC43.13-1B chapter 9 figure 9-8 or the hose manufacturer's instructions.
12. Connect the nose ski hoses IAW drawing LH4000-GA8-HYD schematic 1 with the hose from tube #1 to the forward ski hydraulic fitting and tube 2 to the aft fitting. Secure the hoses with friction tape and cushioned clamps as shown in photo 1.

13. Connect the main ski hoses IAW drawing LH4000-GA8-HYD schematic 2 with the hoses from tubes 3 connected to the forward ski hydraulic fittings, and tube 4 to the aft fitting. Secure the hoses with friction tape and cushioned clamps as shown in photo 2.

### **COCKPIT CONTROLS**

1. Select an appropriate location for the control panel in the cockpit.  
*(Usually an unoccupied instrument hole is sufficient.)*
2. Determine the lengths of wire required to reach the master side of the bus and route the wires IAW AC 43.13 chapter 11 recommended practices. Route the pump power supply and control wires for the pumps through the aircraft IAW AC 43.13 chapter 11 recommended practices.
3. Install the wiring IAW GLH3000-GA8-7 wiring diagram.

### **Installation instructions for the Parker-Electro/Hydraulic pump.**

**The pump direction is changed by reversing the polarity to the pump. While not intuitive, the pump must be connected with the correct polarity and both electrically and hydraulically. The pump must be plumbed with the "UP" port connected to the forward fitting on the ski cylinder.**

1. Make sure that the polarity for the pump is correct.  
BLUE 12 V or Black 24V (SKIS)      GREEN 12V or Orange 24 V (WHEELS)

a. Switch sends power to blue or black wire during "Ski" selection.  
This will pressurize the "UP" port of the pump.

b. Switch sends power to the green or orange wire when "Wheels" are selected.  
This will pressurize the "DOWN" side of the pump.

Make sure the "UP" Port on the pump goes to the FWD fitting on the deployment Cylinder.

2. When arranging the switch and indicator lights on the control panel, make sure that the switch "UP" position is for Skis (green Lights) and switch "DOWN" is for Wheels (green lights).

**NOT following these instructions WILL make the system OPERATE INCORRECTLY.**

### **FUNCTION AND LEAK CHECK**

1. To prevent overfilling, top off the hydraulic reservoirs with the skis in the deployed position (tires retracted). Use only MIL-H-5606 or equivalent.
2. Service main and nose tires to 35 psi.

3. With external power applied to the aircraft, select skis and ensure deployment of all three skis. Confirm transit to skis lights illuminate while pumps are running. Confirm that skis locked lights illuminate when skis reach full deployment and pumps stop. Deployment will take approximately 90 seconds. (do not allow pumps to run dry)
4. Select wheels and ensure the doors retract and the tires protrude on all three skis. Confirm transit lights illuminate while pumps are running. Confirm that wheels locked lights illuminate when wheels reach full extension and pumps stop. Retraction will take approximately 90 seconds. (do not allow pumps to run dry)
5. Check for leaks of the system, and service pump reservoirs.
6. Reinstall any inspection or interior panels that were removed.

### **AIRCRAFT RECORDS AND WEIGHT AND BALANCE**

1. Place a copy of the AFMS in the aircraft flight manual.
2. Apply the placards and markings called out in the AFMS on the instrument panel. If the airspeed indicator is marked on the glass, ensure that a slip mark on the glass is incorporated.
3. Revise aircraft weight and balance and equipment list to reflect installation.
4. Prepare and file FAA Form 337. Make appropriate entry in the aircraft maintenance records.

## **6.0 Removal-**

During removal, note and record the location of any packing washers between rod-ends and axle flanges, stubs, or buckets. Retain all hardware for future reinstallation.

### **6.1 Main Skis**

1. Hoist or jack the aircraft.
2. Remove the rigging from the fuselage attach points.
3. Disconnect and cap all hydraulic lines and fittings.
4. Remove the NAS1312 bolts form the inboard flange and stub axle.(main skis)
5. Remove the main skis from the aircraft.

### **6.2 Nose Ski**

1. Hoist or jack the aircraft.
2. Disconnect and cap all hydraulic lines and fittings.
3. Remove the rigger, safety, and check cables from the GLH3000-NG-LR1-1 and -2 rigger attach brackets.
4. With a helper, rotate the left hand rigger aft and downward while lifting the ski to reduce the tension on the bungee. When the GLH3000-NS-14 bungee is slacked, remove the AN6-23A bolt, NAS1149F0663P washer, and the MS21044N6 nut securing the top of the bungee assembly to the rigger attach bracket.
5. Lower the ski gently and remove the AN6H25A bolts from the attach brackets. Gently lower the nose ski yoke arms. Remove the ski from the aircraft.
6. Remove the four AN6-23A bolts and MS21044-6 nuts holding the GLH3000-NG-LR1-1 and -2 rigger attach brackets to the nose fork. Remove the rigger attach brackets.

### **6.3 Cockpit**

1. Pull the hydraulic pump circuit breaker and secure with a ty-wrap. Placard the breaker "disabled"
2. Placard the ski selector "disabled"
3. Revise the aircraft weight and balance and equipment list to reflect removal of the skis.
4. Make an entry in the aircraft records reflecting the removal of the skis.

### **6.0 Reinstallation**

1. Hoist or jack the aircraft.
2. Take note of the packing washer locations from the previous removal and ensure all washers are returned to their proper locations. Replace all self-locking nuts, safety wire, and cotter-pins with new for each installation.
3. Slide main skis under main wheels.
4. Install the NAS1312 bolts in the inboard flanges and stub axles securing the main ski yokes. (Use new nylon lock screws.)

5. Install the GLH3000-NG-LR2-1 AND -2 rigger brackets using the GLH3000-NG-LR1-3 straps IAW drawing LH4000-GA8 sheet 4. Install the brackets using four AN6-23A bolts, MS21044N6 nuts.
6. Slide the nose ski beneath the tire. The rod ends on the yoke can next be bolted to the PA32-206L-6-GLH buckets with two AN6H25A bolts. Torque the bolts and safety with .032 safety wire to the nose fork.
7. With a helper, rotate the tip of the ski down and raise the tail of the ski up until the ski stops contact the rigger brackets. Install the GLH3000-NS-14 bungee assembly using one each AN6-23A bolt, NAS1149F0663P washer, and MS21044-6 nut.
8. Rotate the tip of the ski upward and install the forward safety cable assy.
9. Install the rigger and the rear check cable. Connect all hydraulic lines.
10. Install the forward bungee/safety cable assemblies on the main skis.
11. Lower the aircraft and install the rear check cables on the main skis.
12. Remove the ty-wrap on the hydraulic pump circuit breaker and reenergize. Remove the "disabled" placard from the breaker.
13. Remove the "disabled" placard from the ski selector.
14. Confirm that the AFMS is in the aircraft flight manual and that all placards and markings required by the ski installation are legible and correct.
15. Confirm skis ride in flight attitude limits in accordance with section 4.
16. Confirm bungee force is a minimum of 80lbs. to slacken the rear safety cable (main skis).
17. Confirm rigger force is a minimum of 80 lbs. to deflect nose ski.
18. Perform functional and leak checks in accordance with section 4.
19. Confirm the aircraft weight and balance and equipment list to reflect installation of the skis.
20. Confirm the tires are serviced to 35 psi.
21. Make an entry in the aircraft records reflecting the installation of the skis.

## **7. Servicing Information**

**Mechanical System Nose Ski**—The nose skis are virtually maintenance free with the top of the ski constructed of carbon fiber, and fiber glass and the bottom of the ski is Ultra High Molecular Weight poly-ethylene (UHMW). The ski bottom has two runners that run the full length of the ski and are made out of ¼" UHMW. The runners are designed to give tracking stability to the ski and protect the bottom of the ski. When the runners have worn down more than 50%, they will need to be replaced. Waxing the ski bottoms for decreased friction and improved glide is recommended, especially in wet snow.

The Yoke Assembly (GLH3000-5), and Retaining Rod (GLH3000-5-6) need to be checked for security and proper lubrication. Yoke pivots require light greasing (with any multipurpose heavy duty wheel bearing grease) every 25 hours and the HMX-6G rod ends will need light oiling (with LPS-2 or equivalent low viscosity oil) every 25 hours. The yoke is made out 4130 Chromoly Steel. The (GLH3000-NS-14) bungee assembly is designed to keep the yoke in contact with the ski and incorporates a safety cable that prevents the yoke from traveling over-center in the event of a bungee failure.

The Tail Wheel Bracket Kit (LW2500-18) is made of stainless steel angled brackets with a 5" aluminum wheel with a solid urethane tire. The cartridge wheel bearings are sealed and require no servicing. Replace tire if less than .25" thickness remains. Replace cartridge bearings if worn.

The rigging is made up of galvanized steel 5/32 cable for the safety cable, and check cable assembly. A coil spring rigger assembly provides a spring loaded force on the ski to maintain flight attitude. Swaged ends and cables should be inspected for fraying and slippage. Hardware should be inspected for security. Replace any damaged components.

**Mechanical System Main Ski**—The main skis are virtually maintenance free with the top of the ski constructed of carbon fiber, polypropylene, and fiber glass and the bottom of the ski is Ultra High Molecular Weight poly-ethylene (UHMW). The ski bottom has two runners that run the full length of the ski and are made out of ¼" UHMW. The runners are designed to give tracking stability to the ski and protect the bottom of the ski. When the runners have worn down more than 50%, they will need to be replaced.

The Yoke Assembly (LH3600-5-GA8), and Retaining Rod (LH3600-5-5) need to be checked for security and proper lubrication. Yoke pivots require light greasing (with any multipurpose heavy duty wheel bearing grease) every 25 hours and the rod ends will need light oiling (with LPS-2 or equivalent low viscosity oil) every 25 hours. The yoke is made out 4130 Chromoly Steel. The (LH3600-10) Yoke Safety Restraining Cable system is designed to keep the yoke from traveling over-center in the unlikely event of a rigging failure.

The Tail Wheel Bracket Kit (LH3600A-12) is made of stainless steel angled brackets with two 6" aluminum wheels with solid urethane tires. The cartridge wheel bearings are sealed and require no servicing. Replace tire if less than .25" thickness remains. Replace cartridge bearings if worn.

The rigging is made up of galvanized steel 5/32 cable for the ice cutter, safety cable, and natural rubber 8020CW cold weather bungee rings for the front assembly and 3/16 cables for the check cable assembly. The bungees should be kept out of direct sunlight and must not come in contact with fuel or other chemicals. Any fraying of the sheathing should be noted and inspected for rubber strand damage or degradation. Swaged ends and cables should be inspected for fraying and slippage. Hardware should be inspected for security. Replace any damaged components. Bungee's should be replaced after 5 years in service or when defects are noted.

**Hydraulic System** – The hydraulic system supplied with the skis uses two Electric/Hydraulic pumps, to pump fluid to a hydraulic actuating cylinders mounted on the skis. The Electric/Hydraulic pumps are intended to be mounted behind the cabin area. The air is bled from the hydraulic system by cycling the skis several times. The electric pumps are self bleeding. MIL-H-5606 or compatible hydraulic fluid is required for servicing the system. The fluid level should not be lower than 1/3 full in the reservoir, and should only be serviced with the cylinder fully extended (tires retracted) to prevent overflow.

## **6.0 Instructions for Continued Airworthiness**

### **MAINTENANCE AND GROUND HANDLING RESTRICTIONS**

- 1. DO NOT – Push or Pull on skis to move aircraft.**
- 2. DO NOT – Subject to flame or high heat.**
- 3. DO NOT – Attempt to jack aircraft using the skis for a Jack Point.**
- 4. DO NOT – Subject to harsh solvents or caustic chemicals.**
- 5. DO NOT – Use skis as a tie down for the aircraft.**
- 6. DO NOT – Attempt to change a tire with the skis installed.**
- 7. DO NOT – Rely on standard wheel chocks with skis installed (Wrap rope around the tires where they contact the ground).**

### **DAILY PREFLIGHT CHECK**

**(May be performed by an appropriately rated pilot)**

- 1. CHECK** – Bungees, cables, clevis pins, cotter pins, nuts, bolts and attach fittings for security.
- 2. CHECK** – Cylinders for leaks at the seals and fittings.
- 3. CHECK** – Hydraulic pump fluid levels and inspect for leaks, and wiring connections.
- 4. CHECK** – Skis for cracks, excessive wear, fractures, abrasions, and delamination.
- 5. CHECK** – Door guides for cleanliness, wear and security. Lube with silicone spray or wax.



**6. CHECK** – Tire pressures are 35 psi.

**INSPECTION CRITERIA**

**100/Annual**

**(100 hour or Annual inspection interval)**

In addition to the daily preflight check above:

**1. INSPECT** – The LH4000-GA8 ski kit for:

Cracks, wear, fractures and abrasions. Inspect the bottom for cracks, scratches, delamination, and excess wear. If fibers are exposed or damaged, consult **Airglas Inc.** If ski shows signs of delamination, contact **Airglas Inc.** Inspect the door guides for cleanliness, wear and security. Lubricate guides with silicone spray or wax.

**2. INSPECT** – The forward Bungee/safety cable assy. and rear check cable assy. for integrity, wear, abrasion and fraying. Inspect all associated hardware for security. Replace bungees when frayed or tension is less than 70 pounds in most slack position.

**3. INSPECT** – The landing gear hardware and ski attach brackets for cracks, bends, and corrosion. The yoke assembly for bends, cracks, dents and corrosion. Grease the pivots and inspect for wear. Apply light penetrating oil to the rod ends and inspect for wear. The Axle restraining cable for security.

**4. INSPECT** – The hydraulic cylinder. Inspect for damage, corrosion or leaking seals. Replace components and/or seals as necessary.

**5. INSPECT** – The Electric/Hydraulic pumps for secure mounting, wiring condition, reservoir for contaminants or sediment, and leaks. Inspect internal and external hydraulic lines for security, chafing, and leaks. Service with MIL-H-5606 Hydraulic Fluid.

**6. INSPECT** – The ski tail wheel (LW2500-18 or LH3600A-12) for wear. Replace tire if less than .25" thickness remains. Replace cartridge bearings if worn.

**7. INSPECT** – The ski rigging angles to insure a minimum angle of +1.5° tip up in the ski position in flight. (It may be necessary to lift the aircraft to confirm this)

**8. INSPECT** – The doors for integrity, wear, and delamination. Door guides for dirt and fluid contamination. Clean any spilled petroleum products from guides immediately.

- 9. INSPECT** – The operation of the ski system. Confirm full deployment and retraction of both main and nose skis. Confirm operation and position locked indicator lights are functional and accurate. (Allow adequate clearance for the aircraft while performing operational checks) Check fluid level at the reservoirs with the ski retracted (tires protruding).

## 9.0 Ski Specifications

**Ski Specifications are as follows:**

	<b>GLH3000-NS</b>	<b>LH4000-GA8</b>
<b>Length</b>	<b>74"</b>	<b>84"</b>
<b>Width</b>	<b>20"</b>	<b>24"</b>
<b>Height</b>	<b>3.625" TO TOP OF TUNNEL</b>	<b>7" TO TOP OF TUNNEL</b>
<b>Weight</b>	<b>Use actual weight</b>	<b>Use actual weight</b>
<b>Surface area in<sup>2</sup></b>	<b>1435</b>	<b>1920</b>
<b>Center of Gravity</b>	<b>8" FWD OF AXLE</b>	<b>_____ " FWD OF AXLE</b>

## 10.0 Trouble Shooting

**Problem:** Indicator lights illuminate inaccurately or erratically.

**Correction:** Reconnect the hydraulic supply lines to opposite ports on the pump and reverse the pump power polarity.

**Problem:** Skis do not cycle smoothly, or have pulsing or incomplete actuation.

**Correction:** Hydraulic Fluid (MIL-H-5606) level is too low.

**Problem:** Hydraulic fluid overflows from reservoir when skis are retracted.

**Correction:** Reservoir filled while skis were deployed. (Always fill with skis retracted)

**Problem:** Skis try to dive in flight.

**Correction:** Skis are rigged at too low angle of attack, or bungees are deteriorated.

## Drawings and Diagrams

### Installation, Operation, and Maintenance Documents:

ICA, Installation & Maintenance	LH4000-GA8-105
Ski Installation	LH4000-GA8
Flight Manual Supplement	LH4000-GA8-AFMS
Hydraulic System	LH4000-GA8-HYD
Electrical Schematic	GLH3000-GA8-7

Current drawings and manuals are available on the Airglas, Inc. website [www.airglas.com](http://www.airglas.com)  
Always use the current manual or drawing.

— END —