

Airglas, Inc. ®

**INSTRUCTIONS FOR CONTINUED AIRWORTHINESS
INCLUDING
MAINTENANCE AND SERVICE INSTRUCTIONS**



MANUAL NO. LH4000-106
MODEL LH4000 Ski Kit
For
Cessna 180 and 185 Aircraft

Cage Code 17564

MANUAL REVISION B

December 3, 2012

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.***

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Record of Revision

REV LEVEL	REV DATE	Affected Pages	BY	EXPLANATION OF REVISION
Initial Release	25 Jan 2005	-		Original Document
A	August 21, 2012	ALL	Clifford D. Belleau	Added alternate hydraulic cylinder. Revised rigging instructions.
B	December 3, 2012	7, 9, 11	Clifford D. Belleau	Changed rigging bracket attach drill bit size to #10. Corrected axle to landing gear nut part numbers.

Distribution of Changes

A new 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:

- *Currently there are no components of the LH4000 Wheel Ski Kit that have a time limited mandatory service interval.*

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1.0 INTRODUCTION AND DESCRIPTION

Introduction: Since 1955 **Airglas, Inc.** has designed and manufactured a full line of 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 hydraulic wheel ski kit allows the aircraft to operate on paved or hard surfaces, and snow. The skis are actuated by a hydraulic cylinder on each ski with an electric/hydraulic or hand 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". When the airplane is on snow, deploying to the ski position dramatically improves the takeoff performance (compared to wheel penetration skis). The simplicity of this design allows for a low maintenance high performance ski kit.

Description: The LH4000 ski kit consists of essentially 4 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 pump.
- 3. The Electrical System** – This includes pressure switches, a circuit breaker, wiring, a control switch and indicator lights (the electric pump is covered under the hydraulic system).
- 4. Placards and Markings**– This includes the flight manual supplement, placards, and instrument markings.

Instructions for initial installation of this kit are detailed within manual LH4000-105.

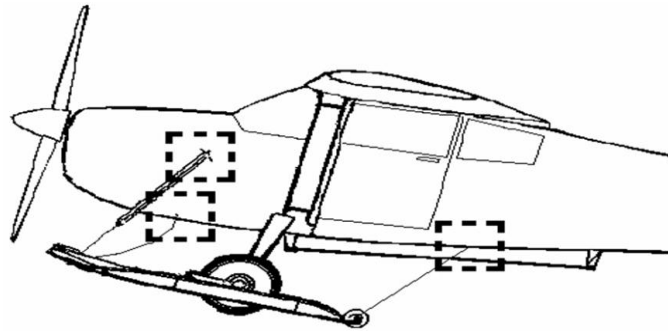
Notes:

1. *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 otherwise specified.*
2. Aircraft must be equipped with 8.50x6 main tires for ski operations.

1.1 SKI RIGGING BRACKETS AND ATTACH FITTINGS

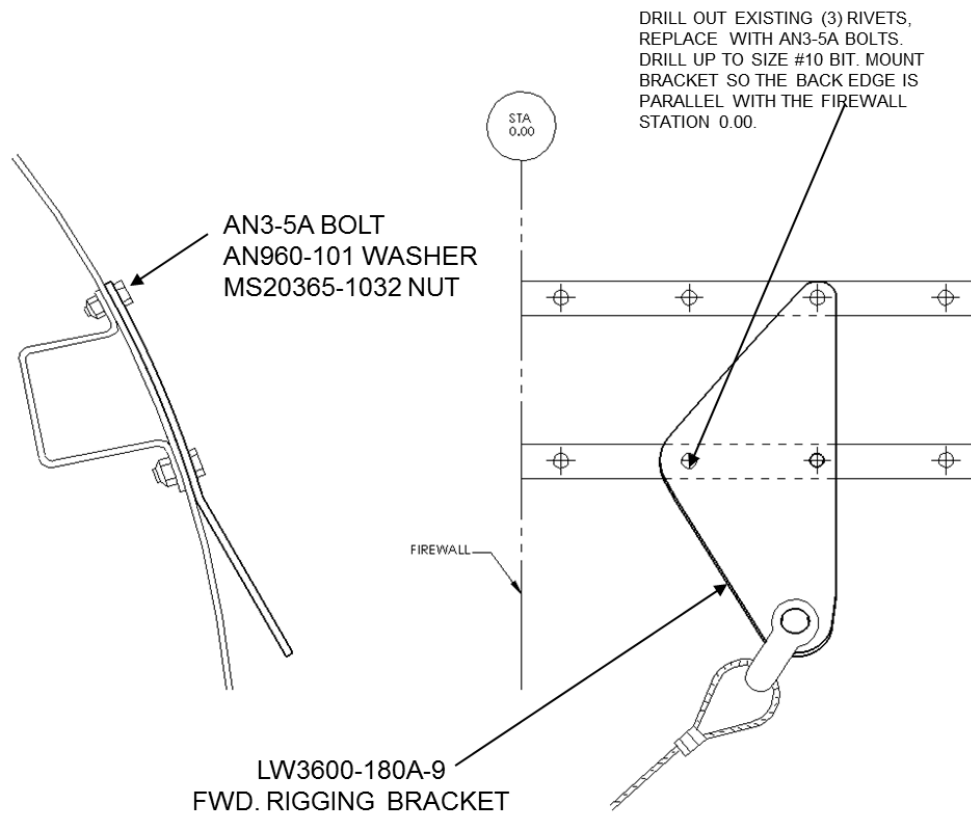
The aircraft must have the brackets and attach fittings installed on the fuselage for the rigging to attach.

1.1 SKI RIGGING BRACKETS AND ATTACH FITTINGS- CONTINUED



Rigging Bracket Installations
Figure 1

FWD. RIGGING BRACKET



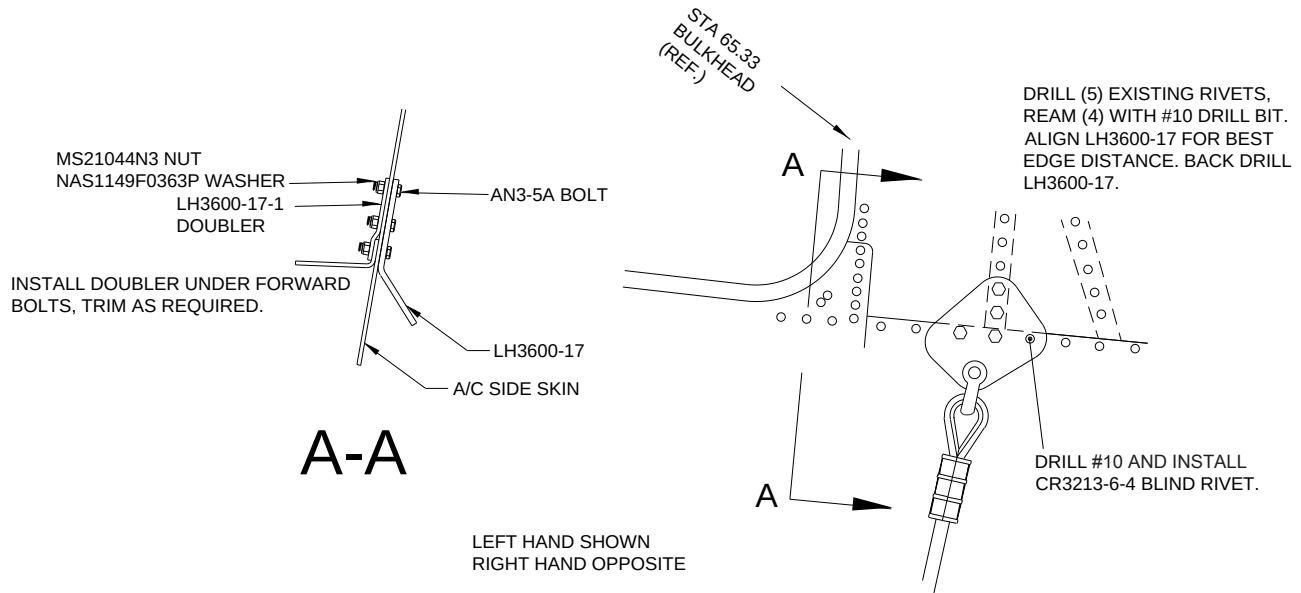
**Left Forward Rigging Bracket Installation (LW3600-180A-10 Opposite)
(See Drawing LW3600-180A-9 & LH3600-17 INST. for 180 thru 180F)
Figure 2**

1.1 SKI RIGGING BRACKETS AND ATTACH FITTINGS-CONTINUED



**LW3600-180A-9 Forward Rigging Bracket Installed (LW3600-180A-10 is opposite)
Photo 1**

1.1 SKI RIGGING BRACKETS AND ATTACH FITTINGS-CONTINUED



LH3600-17 Rear Rigging Bracket Installation (Left Hand Shown- Right Opposite)
Figure 3

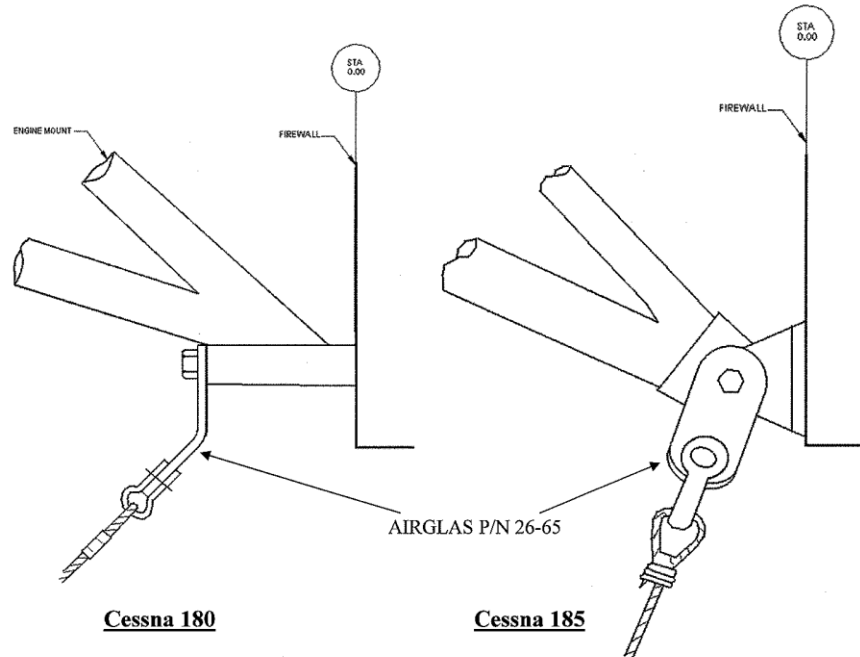


**Rear Rigging Bracket Installation LH3600-17 (LH3600-18 Opposite)
Photo 2**

1.1 SKI RIGGING BRACKETS AND ATTACH FITTINGS-CONTINUED

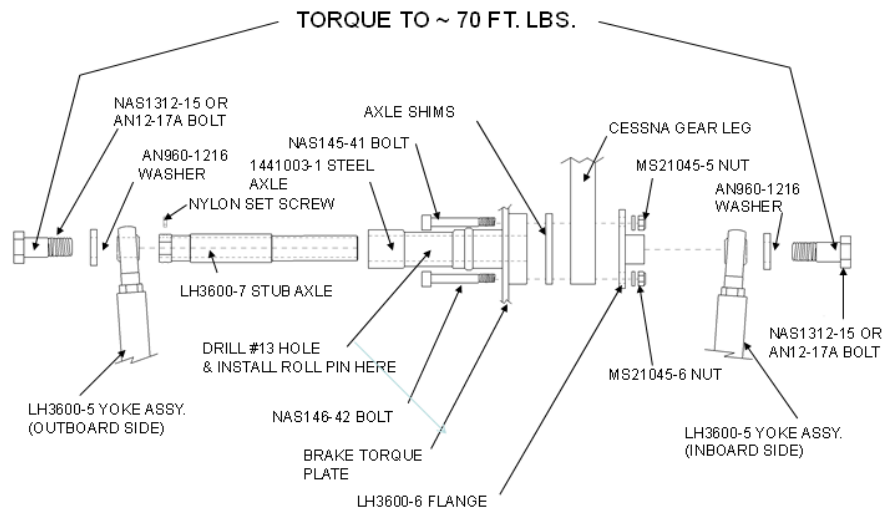


**Rear Rigging Bracket Doubler Installation LH3600-17-1 (LH3600-18-1 Opposite)
Photo 3**



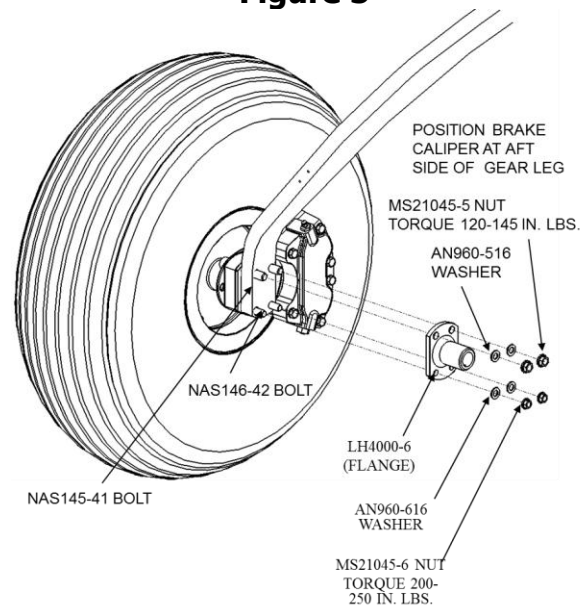
**Front Safety Cable Bracket Installation
Figure 4**

1.1 OUTBOARD AND INBOARD STUB INSTALLATION



Stub Axle Breakdown

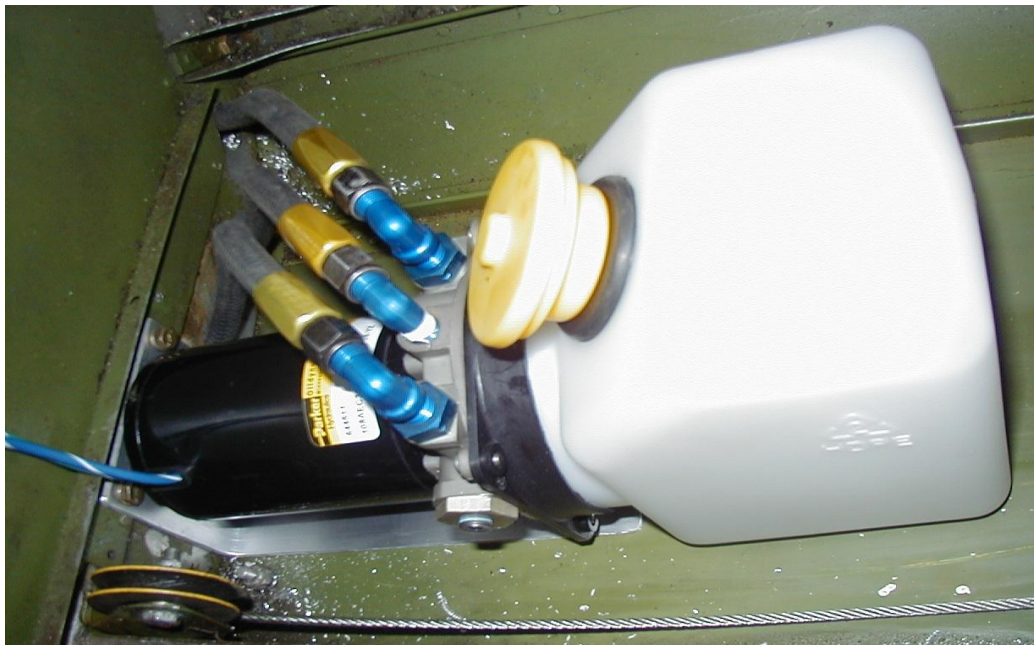
Figure 5



Inboard Stub Axle Installation-Figure 6

Note: It is suggested that the aircraft wheel alignment is confirmed using Cessna service instructions prior to installation of the skis.

1.2 HYDRAULIC INSTALLATION-FUSELAGE

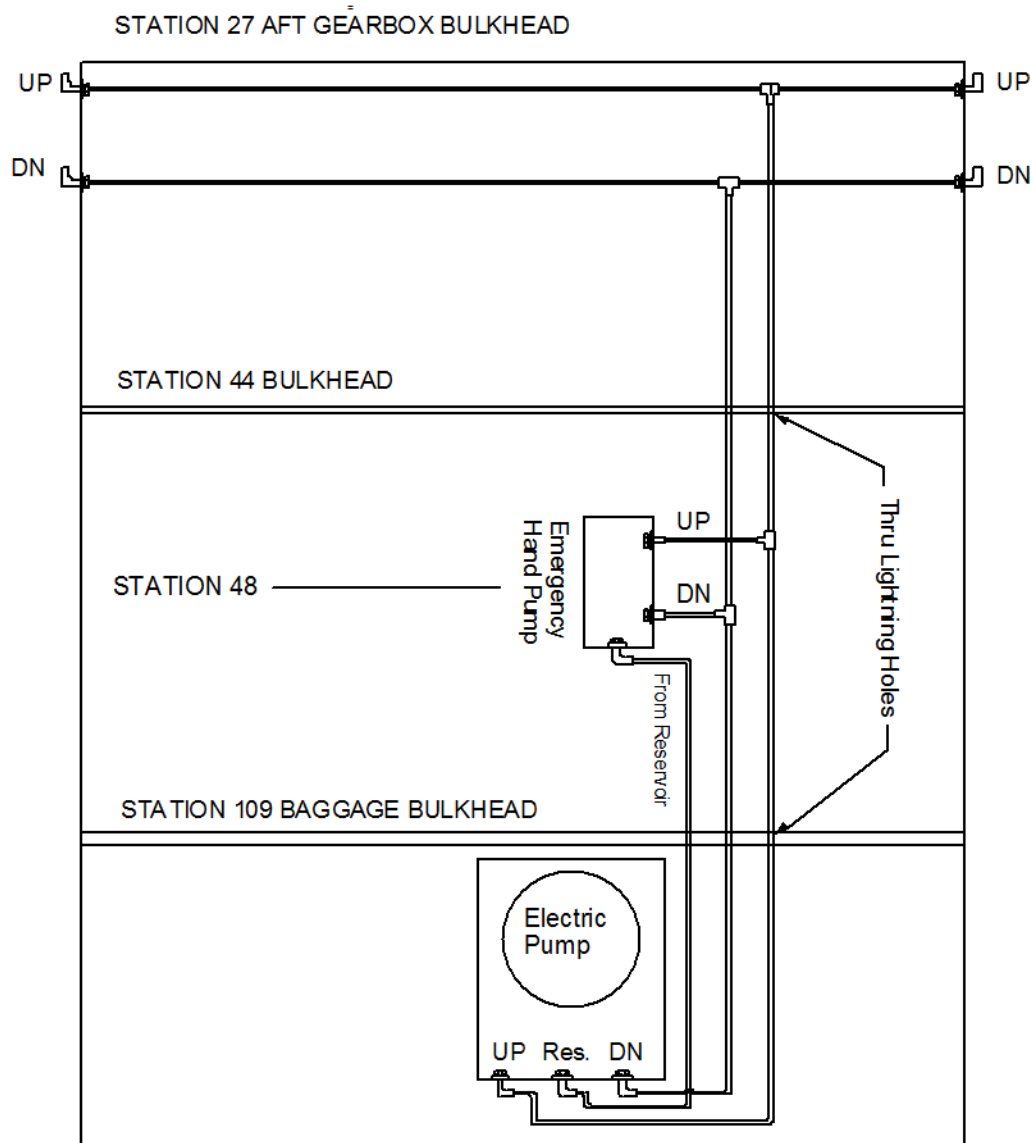


Electric Pump Mounting -Photo 5



Optional Hand Pump Mounting - Photo 6

1.2 HYDRAULIC INSTALLATION-FUSELAGE-CONTINUED

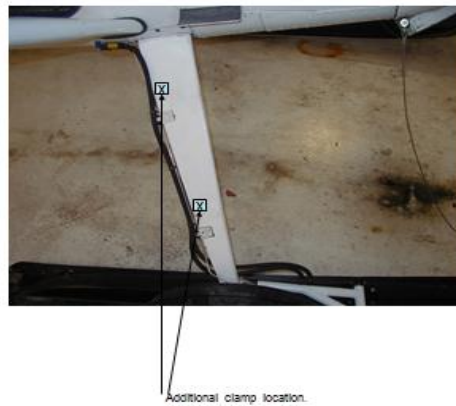


Hydraulic Schematic – Figure 7

NOTE:

The optional hand pump installation location may vary from aircraft to aircraft.

1.2 HYDRAULIC INSTALLATION-EXTERNAL



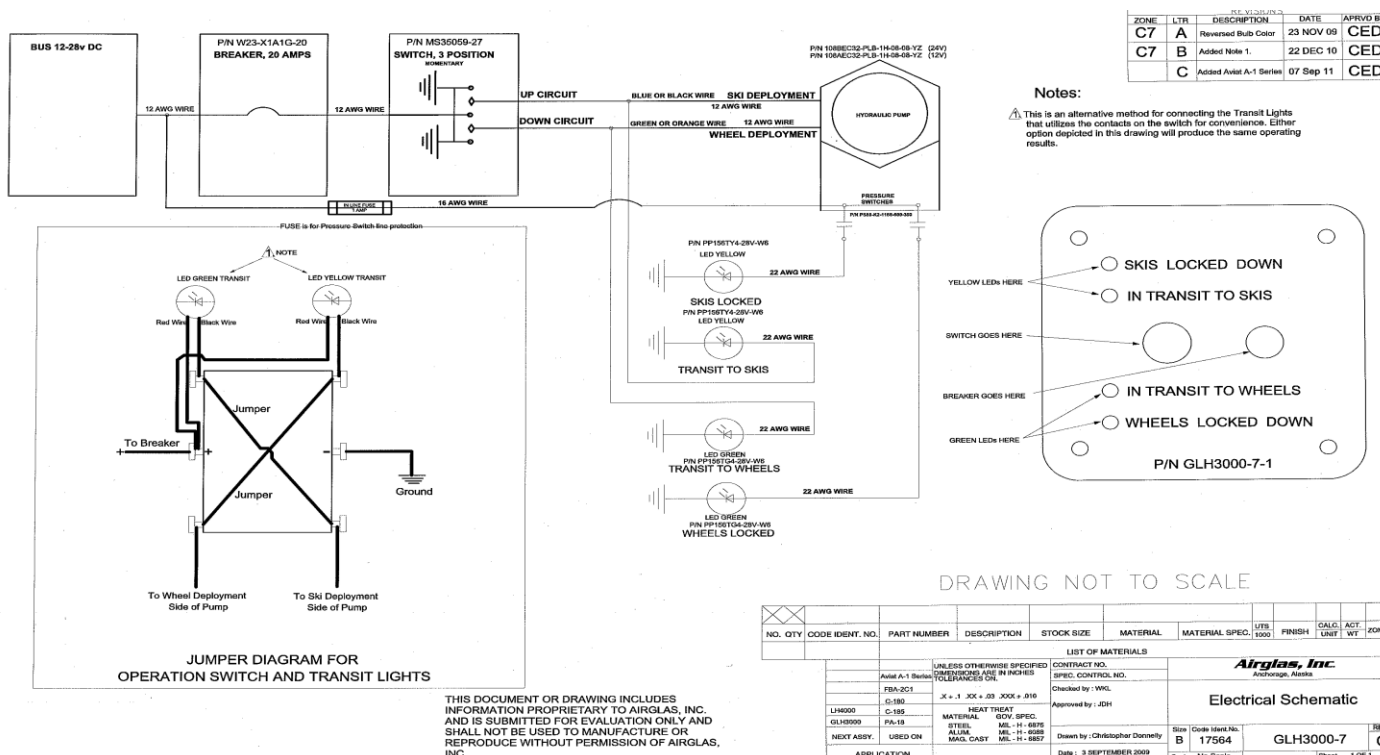
Additional Clamp Installation-Photo 7

1.3 ELECTRICAL INSTALLATION



Ski Pump Switch Installation-Photo 8

1.3 ELECTRICAL INSTALLATION-CONTINUED



Ski Pump Electrical Schematic-Figure 8

Note: Wiring instructions for the Parker-Electro/Hydraulic pump.

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.
 - c. Make sure the “UP” Port on the pump goes to the FWD fitting on the ski actuator cylinder.
 2. When arranging the switch and indicator lights on the control panel, make sure that the switch “UP” position is for Skis (Yellow Lights) and switch “DOWN” is for Wheels (green lights).
- NOT following these instructions WILL make the system OPERATE INCORRECTLY.**

2.0 PLACARDS AND MARKINGS

PLACARDS

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

DO NOT EXCEED **150 KIAS**
WITH AIRGLAS LH4000 SKIS INSTALLED

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

AVOID SLIPS WITH FLAPS EXTENDED WHEN
AIRGLAS LH4000 SKIS ARE INSTALLED

Place placard on instrument panel **in full view of pilot.**

DO NOT EXTEND OR RETRACT SKIS AT SPEEDS ABOVE 125
KNOTS

DO NOT EXTEND OR RETRACT SKIS WHILE IN MOTION ON
THE GROUND

Place placard on instrument panel **in full view of pilot.**

IN FLOATPLANE, AMPHIBIAN AND SKIPLANES EQUIPED WITH
AIRGLAS LH4000 RETRACT FLAPS TO 20° IMMEDIATELY AFTER
APPLYING POWER FOR BALKED LANDING GO-AROUND

Place placard on instrument panel **in full view of pilot.**

DO NOT LAND ON SNOW WITH TIRES DOWN WHEN AIRGLAS LH4000
SKIS ARE INSTALLED

Place placard on instrument panel **in full view of pilot.**

3.0 SKI REMOVAL

1. Retract the skis (tires down)
2. Pull the ski pump circuit breaker and remove the ski indicator light circuit inline fuse. Secure the pump circuit breaker with a ty-wrap to prevent accidental activation. Placard the ski pump breaker and the ski selector switch "Disabled".
3. Remove the rear check cables and the forward safety cables from the fuselage by removing the AN395-17 clevis pins. Retain the pins for future use.
4. Disconnect the ski hydraulic hoses from the fuselage at the bulkhead fittings. Cap the fittings and plug the hoses with AN929 and AN806 caps and plugs respectively. Install two ty-wraps around one of the fitting and hose pairs on each side to reduce the re-installation time. Remove the ski hydraulic hoses from the landing gear.
5. Hoist or jack the aircraft to attain clearance enough to allow the bungee assembly's to slacken, and remove the bungee assembly's from the aircraft by removing the AN395-17 clevis pins. (If there is no lift available: use a bungee stretcher to slacken the cable, remove the tail wheel assembly's and roll the aircraft back off the skis. Reinstall tail wheels after the skis are removed.)
6. Remove the bolts securing the yoke to the inboard flange and outboard stub axle. Repeat for the other ski. Secure the AN960-1216 washers to the yoke in the order of their removal.
7. Remove the LH3600-10 yoke restraining cable form the LH3600-7 stub axle by removing the AN3 bolt. Retain the bolt for future use.
8. Remove the skis from under the aircraft and lower the aircraft to the ground.
9. Ensure that the aircraft weight and balance reflect the removal of the skis.
10. Make an entry in the aircraft maintenance records recording the removal of the skis.

4.0 SKI RE-INSTALLATION

1. Hoist or jack the aircraft. (If there is no lift available, remove the tail wheel assembly's and roll the aircraft on the skis. Reinstall tail wheels after the skis are installed. Use a bungee stretcher to install the bungee cable assembly.)
2. Install new nylon set screws in the stub axle and inboard flange. Install the screws so that they are just flush with the minor diameter of the threads of the stub and flange.
3. Slide the skis under the aircraft and install the LH3600-10 yoke restraining cable on each LH3600-6 stub axle. Align the LH3600-5 yoke with the LH3600-7 stub axle and LH3600-6 inboard flange. Re-install the AN960-1216 washers in the order removed and install the two NAS1312-5 (or AN12-17A alternate) bolts. Torque the NAS1312-5 (or AN12-17A alternate) bolts to 70 ft. lbs. Repeat for the other ski.
4. With the ski retracted (tires down), confirm the skis are parallel with the fuselage centerline.
5. Hoist the aircraft high enough to install the LH3600-14 bungee cable assy. and the LH3600-15 safety cable assy. If there is not enough lift available to allow the cable to be installed, the bungee must be stretched using a mechanical bungee tool. Use caution when stretching the

4.0 SKI RE-INSTALLATION-CONTINUED

- bungee. Ensure the bungee has at least one full twist when installed. Repeat for the other ski.
6. Lower the aircraft to the ground and install the LH3600-13 rear check cables.
 7. Install the hydraulic hoses at the fuselage. Secure the hoses to the landing gear using the clips and ty-wraps.
 8. Remove the ty-wrap from the ski pump circuit breaker and reinstall the fuse to the ski indicator lights. Remove the "disabled" placards.
 9. Service the ski pump reservoir with MIL-H-5606 or equivalent fluid.
 10. Hoist the aircraft and raise the tail of the aircraft until it is in the level flight attitude with the tires retracted (skis deployed).
 11. Confirm the skis are installed with a +1.5° tip up in the ski position in level flight attitude.
 12. Confirm that the tension on the bungee cable is at least 80 lbs. Ensure the bungee has at least one full twist when installed.
 13. Make sure all hardware is installed, torqued, and cotter pinned as necessary.
 14. Cycle the skis to remove any entrapped air. (fill the reservoir with the ski retracted, tires protruding)
 15. Lower the aircraft to the ground and ensure the skis will cycle. Confirm the indicator lights work correctly.
 16. Confirm the aircraft weight and balance and equipment list reflect the ski installation.
 17. Confirm the Skiplane Model 180/185 Approved Flight Manual Supplement is in the aircraft flight manual.
 18. Confirm the placards and markings called out in the Skiplane Model 180/185 Approved Flight Manual Supplement are correctly located in the aircraft.
 19. Record installation of the skis in the aircraft maintenance records.

5.0 CONTROL AND OPERATION

Control and Operation Information: The door for the LH4000 Ski Kit is actuated by the electric/hydraulic pump (preferred) or a manually operated hand pump in the cockpit. The 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 an operation indicator yellow light will illuminate showing the ski position is selected and the pump is cycling. When the cycle is complete, a second (Skis Locked) yellow light will illuminate and stay on to confirm full deployment of the skis. As the switch is released the operation light will extinguish, but the position locked light will remain lit as long as the skis are extended.
2. When the switch is pressed down, the door will retract and expose the tire. While the switch is held down an operation indicator green light will illuminate showing the wheel position is

5.0 CONTROL AND OPERATION-CONTINUED

selected. When the cycle is complete, a second (Wheels Locked) green light will illuminate and stay on to confirm retraction of the skis. When the switch is released the selector light will extinguish, but the position locked light will remain lit as long as the skis are retracted.

6.0 SERVICING INFORMATION

Mechanical System – The skis themselves are virtually maintenance free with the top of the ski constructed of a thermal plastic composite and the bottom of the ski is Ultra High Molecular Weight Poly-ethylene (UHMW). The ski bottom has two runners that run the forward length of the ski and are made out of ¼" UHMW. Replaceable stainless steel runners are provided at the aft end of the ski. The runners are designed to give tracking stability to the ski and protect the bottom of the ski. When the runners have worn to a thickness of less than .125", 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 (LH3600-5), 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 Chromalloy steel and is heat treated after welding (no field repairs are allowed). 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 6" aluminum wheels with a solid urethane tires. The cartridge wheel bearings cannot be serviced and should be replaced when worn. When the tire is worn to a thickness of less than .25" the wheel should be replaced.

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 5/32 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.

Hydraulic System – The hydraulic system supplied with the skis uses an Electric/Hydraulic Pump, (a hand pump is optional but not offered through Airglas, Inc.) to pump fluid to a hydraulic actuating cylinder mounted on the ski. The Electric/Hydraulic Pump is intended to be mounted behind the cabin area aft of station 108. Hydraulic lines are routed through the aircraft under the floor and out to the gear legs. The air is bled from the hydraulic system by

6.0 SERVICING INFORMATION-CONTINUED

cycling the skis several times. The electric pump is self bleeding. MIL-H-5606 or compatible hydraulic fluid is required for filling, operating, and 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 retracted to prevent overflow. (Note: Some aircraft utilize an existing handpump)

7.0 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.**

MAINTENANCE OPERATIONAL CHECKS

10-14 Check* (10 hours of operation or 14 day inspection)

- 1. CHECK –** Bungees, cables, clevis pins, cotter pins, nuts, bolts and attach fittings for security. Ensure the bungee has at least one full twist when installed.
- 2. CHECK –** Cylinders for leaks at the seals and fittings.
- 3. CHECK –** Hydraulic pump fluid level and inspect for leaks, and wiring connections.
- 4. CHECK –** LH4000 ski kit for cracks, excessive wear, fractures, abrasions, and delamination.
- 5. CHECK –** Door Guides for wear and security. Lube with silicone spray or wax.

*preventative maintenance may be performed by an appropriately rated airman

INSPECTION CRITERIA

100/ANNUAL

(100 hour or Annual inspection interval)

- 1. INSPECT –** The LH4000 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. If ski shows signs of delamination, contact Airglas. Inspect the door guides for wear and security. Replace all damaged components. Lubricate guides with silicone spray or wax.

- 2. INSPECT –** The LH3600-14 bungee cable assembly, LH3600-15 safety cable assembly,

7.0 INSTRUCTIONS FOR CONTINUED AIRWORTHINESS-CONTINUED

INSPECTION CRITERIA 100/ANNUAL-CONTINUED

LH3600-13) check cable assembly, and the LH3600-10 yoke restraining cable 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. Ensure the bungee has at least one full twist when installed. The (GLH3500-5) 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. Replace all damaged components.

- 3. INSPECT** – The main landing gear hardware and ski weldments for cracks, bends, and corrosion. Replace all damaged components.
- 4. INSPECT** – The (LH3600-9A) hydraulic cylinder. Inspect for leakage, cracks, abrasion, and damage to components. Replace all damaged components. Replace leaking seals.
- 5. INSPECT** – The Electric/Hydraulic pump for secure mounting, wiring condition, reservoir contaminants or sediment, and leaks. Inspect internal and external hydraulic lines for security, chafing, and leaks. Service with MIL-H-5606 hydraulic fluid. Service only when the skis are retracted (tires protruding). Replace all damaged components.
- 6. INSPECT** – The ski tail wheel (LH3600A-12) tail wheel assembly for wear. Replace tire if worn to a thickness of less than .25", 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 with the aircraft in level flight attitude. (It may be necessary to lift the aircraft to confirm this) Correct any rigging angle deviation before flight.
- 8. INSPECT** – The doors for integrity, wear, and delamination. Replace all damaged components.
- 9. INSPECT** – The operation of the ski system. Confirm full deployment and retraction of both skis. Confirm transit and position locked indicator lights are functional and accurate. (Allow adequate clearance for the aircraft while performing operational checks) Repair or replace all damaged components.

8.0 SKI SPECIFICATIONS

Ski Specifications are as follows:

Length=	84"
Width=	24"
Height=	5" TO TOP OF TUNNEL (7" at axle centerline)
Weight=	73 lbs. (each ski)
Square Inches=	1435 (each ski)
Center of Gravity=	12.5" FWD OF AXLE

9.0 TROUBLE SHOOTING

- Problem:** Indicator lights illuminate inaccurately or erratically.
- Correction:** Reconnect the hydraulic supply lines to opposite ports on the pump and/or 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. (Tires extended)
- Correction:** Reservoir filled while skis were deployed. (Always fill with skis retracted, tires extended)
-
- Problem:** Skis try to dive in flight.
- Correction:** Skis are rigged at too low angle of attack, or bungees are too weak.
-
- Problem:** Bungee's vibrate in flight.
- Correction:** Ensure the bungee has at least one full twist when installed.

10.0 DRAWINGS AND DIAGRAMS

Descriptive Data List No. LH3600-1

Installation Manual	LH4000-105	Rev C	December 3, 2012
Instructions for Continued Airworthiness	LH4000-106	Rev. B	December 3, 2012
Ski Installation and Assembly (side cylinder skis)	LH3600A-1 Sheets 1 thru 6	Original	9 Dec 2011
Ski Installation and Assembly (center cylinder skis)	LH3600-1 Sheets 1 thru 4	Rev A	6 Aug 2009
Skiplane Flight Manual Supplement	MODEL 180/185 SERIES	Original	June 8, 2005
Electrical Schematic	GLH3000-7	Rev C	07 Sep 2011

— END —