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**WINGMAN SYSTEM INSTALLATION INSTRUCTIONS**

**FOR  
AIR TRACTOR AT-602 AIRCRAFT**

**DRAWING #97418**

**Revision: F**

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Approved by: \_\_\_\_\_

**REVISIONS**

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C	3/20/13	Craig Shrum	ALL	Changed :2.1, 2.3, 2.5, 3.3, 3.7, 3.9, 4.2, 4.4, 4.6, 4.7, 5.3, 5.6, 5.7, 7.2, 7.9, 8.16 and add drawing 27450.
D	8/24/16	Craig Shrum	Sect 11	Updated Sect 11
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AIR TRACTOR AT-602**

The 'Wingman System' installation is only to be accomplished by AP mechanics authorized by Transland LLC

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## **WINGMAN SYSTEM INSTALLATION**

The 'Wingman System' installation is only to be accomplished by AP mechanics authorized by Transland LLC

### **SECTION 1            PREPARATION OF THE AIRCRAFT**

1. Disconnect the battery.
2. Remove both the left and right side cowl panels.
3. Remove the upper skin panels on both sides of the hopper.
4. Remove the top cowl assembly.
5. Remove the hopper door, door hinge, side latch, and the two bumper blocks from the right side of the hopper.
6. Remove the hopper rinse tank, P/N 80945-1(if installed).
7. See Section 11 for Drawings applicable to this installation.

### **SECTION 2            MODIFICATION OF THE AIRCRAFT**

1. Fill all the open holes in the door (Air Tractor P/N 80224-1) and hopper(Air Tractor P/N 80978-1) with screws (P/Ns 80861, 80865, 81926) as needed.
2. Locate the 5 1/8 inch diameter hole in the firewall as specified in drawing 97400.
3. Using a rivet squeezer, install the backing plate (17464), on the aft side of the hole with twelve 80711 rivets. Seal backing plate (17363) using Permatex High Temperature Sealant, Permatex P/N 81160(26BR), 81915, 81409(26C), or 85915.
4. Drill two 0.563 holes in the hopper forward wall as shown in drawing 97401
5. Drill two one-half inch holes in the upper forward lip of the hopper as shown in drawing 97401.

### **SECTION 3            AUGER ASSEMBLY INSTALLATION**

1. Use drawings 27438 and 27437 for reference.
2. Attach the Hydraulic Motor to the rear of the frame (57457) using four bolts (80161)and washers (81198) per drawing 27437.
3. Install Auger Tube Weldment (57458) and bearing (47427) using bolt (80127) , washer (81230), and nuts (80559) per drawing 27437.
4. Modify Baffle per drawing 97399.

5. Install rear support brackets (57440 and 57459) clamps (57444), and Dutchman clamps (57441) per drawing (27438).
6. Position modified baffle into the lower part of hopper.  
Note: Do not attach baffle until the auger assembly is installed.
7. Place the Auger Assembly(27437) on the clamps previously installed.
8. Using the hole in the supports (57441 , 57440, 57459) mark location for holes.
9. Remove auger and drill (4) "F" holes thru the frame at marks.
10. Replace auger in hopper and attach to support with faspin (81346).
11. Torque all bolts to standard torque values appropriate for each size bolt. See AC 43.13-1B Table 7.1.

Note Lubricate all SST hardware with anti-sieze.

#### **SECTION 4                      INSTALLATION OF HYDRAULIC POWER PACK**

1. With drawing 27443 as reference, install the Hydraulic Power Pack as Follows.
2. Install bolt (80173) and washer (81230) in 4 holes in Power Pack mount.
3. Slip two clamp (57460) halves over the bolts (80173) in the upper half configuration. Install bushing (17502) between bottom of mount (27435) and clamp (57460).
4. Position the assembly(27435) on the engine mount approximately 26 inches forward of the engine firewall by sliding it fore and aft until the clamps mate correctly with the engine mount tubing.
5. Using a clamp half (57460) as template mark the Hydraulic Power Pack Mount(27435) with the location need for holes to install bolts for clamp half.
6. Remove power pack (27435) from aircraft drill 4 holes (.257 diameter) in mount for mount clamps.
7. Install bolts (80173) and washers (81230) in holes and place top clamp halves on bolt. Ensure bushing (17502) is installed between bottom of mount and clamp.
8. Re-position the assembly (27435) on the engine mount.
9. Mark the position of the clamps (57460) on the tubing with a felt tip marker
10. After removing the assembly (27435), wrap the tubing area just marked with insulating tap to isolate clamps (57460) from engine mount tubing.
11. Install the assembly (27435) on the engine mount.
12. Install the lower halves of the clamps(57460) and secure them with washers (81249) and nuts (80558).
13. Torque all bolts in accordance with the applicable torque specifications. See AC 43.13-1B Table 7-1.

#### **SECTION 5                      DOOR ASSEMBLY INSTALLATION**

1. Referencing drawings 27458 and 27439, assemble the door system as follows:

2. Position the door over the door opening in the hopper.
3. Install the rod ends (86439) in the threaded ends of the Door Frame (57455) using jam nut (80541).
4. Attach the hinge mounts (57426) to the rod end bearings (86439) with two bolts (80335) . Place (4) shim washers (81237) on each side of the rod end ball (86439).
5. Adjust the rod end bearings (86439) until the aft edge of the hinge mount (57426) is even with the threaded end of the door frame (57455).
6. Locate the door assembly (57455) on the door centerline with the forward end of the threaded boss 41934) 1.5 inches forward of the edge of the door.
7. Use a straight edge across both Door Hinges (57426) to ensure alignment.

**Make certain that:**

- The threaded ends of the Door Arms (57455) are 1.5 inches forward of the aft edge of door.
  - The door is centrally aligned in the cutout.
  - The Door Arm (57455) is on the centerline of the door.
  - The Door Arm Hinges (57426) are aligned using a straight edge.
8. Using the Door Arm Hinges (57426) as a template drill (8) x #10 holes.
  9. Use large area washers (81303) inside the door and seal them with PR1422B1/2
  10. Using (8) bolts(80011) and nut (80570) attach the door frame (57455) to the OEM door. Install while sealant is wet.
  11. Make a positioning mark from the screw holes in the left Door Arm Hinge (57426) to the screw holes in right Door Arm Hinge (57426) with a lead pencil. Use this mark for positioning the Door Actuator base (57454).
  12. Position the door actuator base on the aircraft center line, and align the holes in the forward Door Actuator Support (57454) using the pencil mark made in the step above.
  13. Drill (8) x #10 Holes using the Door Actuator Base (57454) as a template, make certain to keep proper alignment.
  14. Place (4) 81303 large area washers under the forward four holes for the Door Actuator plate (57454) using PR1422B1/2 to seal.
  15. Install and Torque four bolts (80013) and nuts (80570) on the forward end of the Door Actuator Base (57454) using the large area washers (81303) previously installed.
  16. Position the Door Backup Plate (57434) inside the hopper to facilitate alignment with the Door Arm Hinges (57426) and the aft Door Actuator Base (57454).
  17. Drill #10 hole in 12 places thru the previously drill holes for the Door Arm Hinges (57426) and the aft Door Actuator Base (57454).
  18. Install and Torque (12)bolts (80013) and nuts (80570) on the Door Arm Hinges (57426) and the aft Door Actuator Base (57454).
  19. Seal under all nuts and between the Door Backup Plate (57434) and the Hopper using PR1422B1/2.

20. Torque all bolts to standard torque values appropriate for each size bolt. See AC 43.13-1B Table 7-1.

## **SECTION 6 DOOR ASSEMBLY ADJUSTMENT**

1. Referencing drawings 27439, 27458, and 27430; assemble the door system as follows:
2. Adjust the rod end bearings (86439) as required to fit the door in the hopper opening.
3. Remove or insert shim washers (81233) on each side of the Spherical Rod End (86429) as required to locate the door in the center of the opening.
4. Install elbows (81060) in the ports of the hydraulic actuator (86654).
5. Secure the forward end of the actuator (86654) using bolt (80124). Torque to ensure that the actuator (86654) is able to move on the bolt (80124).
6. Adjust the rod end bearing (86429) on the actuator (86654) to its fully extended position, and position the rod end (86429) so it contacts the aft end of the slot on the Arm Slot bracket, approximately 1/16 inches before the maximum extended position of the actuator. Then secure the jam nut (80525) on the rod end (86429). Place the Door Latch Rod (57428) in the Door Arm, passing the aft end through the Door Latch Support. Secure the aft end of the Actuator (86654) to the Actuator Base (57454), using a bolt (80124), washers (81227), and nut (80559). Do not over torque, as the actuator must be able to move.
7. Check that the aft end of the Door Latch Rod (57428) extends  $1/4" \pm 1/16"$  inches at maximum aft travel. If these tolerances are not obtained, The Door Latch Rod (57428) must be re-fitted.
8. Slide the Door Latch Rod (57428) and the actuator rod end to the full forward position. With the Door Latch Rod protruding  $1/4"$ , position the Door Latch Box (57415) with the forward edge even with the aft end of the Door Latch Rod (57428) and with the slot in the Door Latch Box (57415) aligned with Door Latch Rod (57428). Drill two # 10 holes through the holes in the bottom of the Door Latch Box (57415) and through the hopper.
9. Because of the difference in thickness of the hopper door gasket, the Door Latch Box (57415) may be shimmed to proper height in relation to the door washers (81303). Attach to hopper with screws (80865), washers (81219), and nuts (80570). Seal under the washer (81303) and the nuts with PR1422B1/2.
10. Door Latch Box to be assembled per drawing 27430. Ensure Spring (80347) is formed per drawing 80347, spring leg lengths are to be cut to length at assembly.

## **SECTION 7 ELECTRICAL SYSTEM INSTALLATION**

1. Reference Drawings 97409 and 97410.
2. Install the main power cable (P/N 60302-901) from post 'A2' on the aircraft Master Circuit Breaker to the circuit breaker P/N 86494, post 'X1'. Attach the main power cable (P/N 60302-902) to the circuit breaker P/N 86494, post 'X2', and route the cable upward and along side of the existing starter-generator cables securing them with cable ties.

- Attach the other end to post 'A1' on the SM Relay R-3 (P/N 85453). Attach cable(P/N 60302-905) to Post 'A2' on the SM relay (R3) and route the cable upward and along side of the existing starter-generator cables securing them with cable ties. Attach the other end to 'A1" post of the PMR solenoid ( R1).
3. Take the wire in the wiring harness P/N 27450 labeled #5 and connect to aft solenoid control post X2 on the RMR relay. Mount the end of the short PMR ground cable (P/N 60302-903) to the PMR 'G' post. Attach the lower end of the cable to the hole on the left side of the aft mount angle (G2).
  4. Install PMR ground cable (P/N 60302-904) from aft bolt of the Dutchman clamp on the port side of the PMR mount (G2) down to the upper inboard battery box mount bolt (G3).
  5. Using the drawing 97413 as a reference, drill (5) 0.50" holes on the right side of instrument panel.
  6. Install the placard P/N 97425.
  7. Install the switches, circuit breaker, and the indicator lights as shown in Drawing 97413.
  8. Connect 14 Ga. Wire P/N 60302-910 to an available terminal on the aircraft cockpit bus, and the other end to post X1 on the circuit breaker located in wiring harness P/N 27450.
  9. Take wire #3 on wiring harness P/N 27450, route down the right side of the aircraft and connect to the PMR solenoid (R1) control post X1. Using wire #1 on the wiring harness P/N 27450, route it down the right side of the aircraft and attach to the sequence valve solenoid (DIN). Ground the other post of the DIN connector to the same #4 bolt as described in step 3 with wire P/N 60302-915. Route wire # 4 from the wiring harness along wire #3 and attach to PMR post A2. Secure all wiring to the aircraft structure with cable ties.
  10. Attach the wire #2 of the wire harness P/N 27450 to the aircraft battery box ground (G3). Attach the wire P/N 60302-921 to post X1 of PMR solenoid and to terminal X1 of the SM relay (R3). Attach wire P/N 60302-922 to post X2 on the PMR solenoid to post X2 of the SM relay (R3). Attach harness wire #6 to post A2 of SM relay R3.

## **SECTION 8                   HYDRAULIC PLUMBING AND ADJUSTMENT**

1. Refer to drawings 97407, 97408, and 27460.
2. Use tefelon tape on all pipe thread fittings.
3. O-rings must be used on all sequence valve and hydraulic motor fittings.
4. All the rigid tubing must be removed after setting the ferrules to verify sufficient penetration of the tubing through the ferrule.
5. Install P/N 86483 baffle fitting through the front of the hopper. Install O-Ring (P/N 86427), Coupling (P/N 86434), Coupling (P/N 86435), and Adapter (P/N 86489) to baffle. See drawing 97401. Install fittings with PR1422B1/2 sealant.
6. Install Assembly 97402 thru the top of hopper. See Drawing 97402 and Drawing 97401. Install fittings with PR1422B1/2 sealant.
7. Using drawing 97407 and 97408 route and form tubing from supplied material.

8. Install formed tubes.
9. Torque all fittings and nuts as required to prevent leakage
10. Install Covers (P/Ns 17492 and 17493) with grommets, P/N 85394 over the 5-1/8 hole in the firewall. See Drawing 97400.
11. Secure all rigid tubing with Adel clamps every 16 inches.
12. Install hoses (P/N 29261) from adapter P/N 86489 located at fire wall to adapter 86492 located on Auger motor.
13. Install hoses (P/N 29262) from elbow assembly (97402) located on top of hopper to elbow (81060) located on door cylinder (86654).
14. Add one quart of Dextron II or III automatic fluid to the reservoir of the power pack.
15. Turn on the Master Power Switch.
16. Adjust the sequence valve as described below:
  - Use drawing 86430 for reference
  - With a hydraulic pressure gauge temporarily installed into the door closing side of the cylinder, adjust the relief valve on the PMR unit to between 2000- 2800 PSI while the door in the close cycle.
  - Adjust the needle valve 7A and 7B, turn clockwise until they are bottomed. (torque = 6 in-lbs. max.)
  - Now turn 7A and 7B counter clockwise ¼ turn. This is the setting point for further adjustments.
  - Use the needle valve 7A to adjust the door opening speed.
  - Use the needle valve 7B to adjust the door closing speed.
  - While cycling the door up and down adjust the respective needle valve until opening and closing speeds are between 2.5 and 3.5 seconds each.
  - Adjust the sequence valve adjustment (right side of the valve) clockwise until the auger does not rotate while the door is opening.
  - Remove the gauge and reinstall the flex hose.
  - Cycle the system several times to remove any trapped air and ensure proper operation.
  - Add fluid if necessary.
17. Turn off the Master switch.

## **SECTION 9                    SYSTEM OPERATIONAL TEST**

1. Turn on the Master Switch.
2. Set System Switch to OPEN/RUN position.
3. Move the pump switch to the ON position and observe the following.
  - Door opens in 2.5 to 3.5 seconds. (If the door opens outside this envelope, see Section 8 for adjustment instructions)



- As the door opens completely, the auger begins to run. (If auger starts to run before the door is fully open, see Section 8 for adjustment instructions)
  - Both indicator lights are illuminated while PUMP switch is held in the ON position and both lights are extinguished when the switch is released.
  - If either light does not illuminate, press to check the bulbs. If the lights remain on, check the solenoid for that light is operating correctly.
4. Set position switch to CLOSE/STOP position.
  5. Move PUMP switch to ON position.
    - Door closes in 2.5 to 3.5 seconds.(If the door does not close within this time see Section 8 for adjustment instructions)
    - Auger does not run (If the auger turns more than one half revolution, see Section 8 for adjustment instructions.
    - After the door closes , the latch rod moves into the rod holder and locks the door close( If the door does not lock, See Section 6 for door assembly adjustments)
    - Both indicator lights are illuminated while the PUMP switch is ON, and both extinguish when the switch is released.

## **SECTION 10 CLOSING OF THE AIRCRAFT**

1. Replace the hopper rinse tank, if removed per Section 1.
2. Reinstall all doors/panels/cowlings removed per Section 1.
3. Make aircraft log entry for system installation.