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REPORT NO. PR-206AC-910M

INSTALLATION INSTRUCTIONS

FOR

AIRCONDITIONING SYSTEM

BELL 206 SERIES HELICOPTERS

REVISIONS

Rev.	Date	Description	By
N/C	12/03/93	Original	R.E.B.
A	05/28/96	Removed Fairing Installation, Obsolete	R.E.B.
B	09/03/96	Increased optimum pressure to 350 psig page V-6	R.E.B.
C	06/12/98	Revised to complete data at Master Drawing List, Revision G.	R.E.B.
D	11/20/98	Updated and revised to conform to Master Drawing List, Revision H.	P.R.
E	01/14/00	Updated report to current format.	M.R.
F	08/10/00	Updated precautionary information and Section 3.0.	M.R.
G	04/22/03	Updated initial charge and high pressure range, sections 16.2.3 and 17.2.4 Updated report format and section numbering.	G.P.
H	05/28/03	Added Seco7 seal information to section 10.0, updated Torque table (Table II).	G.P.
J	02/09/06	Revised to flex-hose install. App'l to 206AC-521 RevA ECO3 & subs.	BNS
K	02/04/09	Plenum assy's were attached above the chin bubble upper sill and just forward of the closeout panel (Sec. 8.10 thru 8.12).	REB
L	04/19/2012	Added fwd. evap. duct cover.	L.S.

REFERENCES

1. AC43.13-1a; Acceptable Methods, Techniques, and Practices/Aircraft Inspection And Repair

2. Applicable Bell Maintenance Manual(s)

3. BHT-ALL-SPM Standard Practices Manual

4. Bell Helicopter Textron Technical Bulletin No. 206-81-55

5. Parker Publication NO. 4400-B.1, safety guide for selecting and using Hose, Fittings, and Related accessories

6. SECO 1007 Installation Procedure and Torque Values For Seco7 Seals.

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1.0 INTRODUCTION

1.1 This document is to be used as a guide for installation of the Air Conditioning system using HFC-134a refrigerant, in Bell 206 Series helicopters. These instructions are intended to supplement and aid interpretation of the information contained on the installation drawings.

1.2 Additional information required for operation and maintenance of the aircraft are included with these instructions. Upon completion of this installation, the Flight Manual Supplement is to be removed from this documentation and placed in the SUPPLEMENTS section of the Aircraft Flight Manual. The STC is to be removed from this document and placed in the Flight Manual.

TABLE I

REFERENCE INSTALLATION DRAWINGS

Applicable Aircraft	Air Cond. System	Condenser	Compressor	FWD Evaporators	AFT Evaporator	Plumbing	Electrical
206A/B	206AC-110-1	206AC-210-1	206AC-310-1	206AC-410-1 & -2	206AC-460-1	206AC-510-1	206AC-610-1
206A/B	206AC-110-2	206AC-210-2	206AC-310-2	206AC-410-1 & -2	206AC-460-1	206AC-510-2	206AC-610-1
206A/B	206AC-110-3	206AC-210-2	206AC-310-3	206AC-410-1 & -2	206AC-460-1	206AC-520-1	206AC-610-1
206L, L-1, L-3	206AC-111-1	206AC-211-1	206AC-311-1	206AC-410-1 & -2	206AC-460-1	206AC-511-1	206AC-610-1
206L, L-1, L-3	206AC-111-2	206AC-212-1	206AC-311-1	206AC-410-1 & -2	206AC-460-1	206AC-512-1	206AC-610-1
206L-4	206AC-111-3	206AC-211-1	206AC-311-2	206AC-410-1 & -2	206AC-460-1	206AC-511-1	206AC-610-1
206L-4	206AC-111-4	206AC-212-1	206AC-311-2	206AC-410-1 & -2	206AC-460-1	206AC-512-1	206AC-610-1
206L, L-1, L-3	206AC-111-5	206AC-211-2	206AC-311-3	206AC-410-1 & -2	206AC-460-1	206AC-521-1	206AC-610-1
206L-4	206AC-111-6	206AC-211-2	206AC-311-4	206AC-410-1 & -2	206AC-460-1	206AC-521-1	206AC-610-1

2.0 PRECAUTIONARY INFORMATION

2.1 This air conditioning system uses HFC-134a cooling fluid, not R-12. The molecular structure of HFC-134a is smaller than R-12, this causes it to be more difficult to seal. Therefore, it is very important to follow the precautionary steps listed below in order to minimize leaks.

2.2 Care must be taken to prevent contaminates from entering the system tubing and components through all steps of the installation process.

2.3 Installer fabricated components must be de-burred, cleaned, and burnished prior to installation. (Example, cutting and flaring of supplied tubing).

2.4 All lines and components should remain sealed until final assembly to minimize any contamination.

2.5 Flush all plumbing parts prior to installation. This step can be omitted for all major components (examples, compressor, evaporator), since they are pre-cleaned at the factory.

2.6 AN and SAE flare fittings are used throughout the system. Excessive over-tightening of these fittings may strip the threads and cause leaks. See Table II for Torque Specifications.

2.7 The evaporators are preset at the factory to provide optimal performance. Therefore balancing the evaporators should not be necessary. If needed, follow the Evaporator Balancing Procedure within the System Charging Section.

3.0 AREAS OF ACCESS

NOTE: Most efficient installation of the air conditioning assembly is achieved by first accomplishing the following tasks:

3.1 Disconnect and remove battery.

3.2 Remove cabin seats and interior furnishings to gain access for system installation. See Table I for applicable drawings.

3.3 Remove all cargo compartment inspection panels. See Table I for applicable drawings.

3.4 Remove engine cowling, oil cooler cowling, and #1 tail rotor drive shaft. See Table I and applicable BHT maintenance manuals.

4.0 INTERNAL CONDENSER INSTALLATION

Reference: Dwg. 206AC-210 & 206AC-211

4.1 Referencing View A-A, place the condenser assembly under the aircraft at the indicated location. Mark the cut-out pattern required for condenser insertion. For 206-L Series installation, verify condenser location by temporarily installing the adapter plate if applicable.

4.2 Using a suitable tool, such as a router, cut the honeycomb panel to remove the section through which the condenser will be inserted.

NOTE: Use caution not to damage installed components or baggage floor.

4.3 Temporarily place the condenser assembly into the prepared cut-out. Match-drill mounting holes, 0.193 inch in diameter. Remove the condenser assembly.

4.4 Locate and mark the cut-out patterns for inlet vent installation as shown in the referenced drawings. Using a suitable tool, such as a router, cut the openings per indicated dimensions.

NOTE: Use caution not to damage installed components or the baggage floor.

4.5 Using the inlet vent panels as guides, match drill the screw holes 0.173 inch in diameter.

4.6 Clean and scuff all exposed honeycomb edges, and 1-inch widths around each opening on the inside of the fairing with solvent in accordance with Ref. 3.

4.7 Using Metalset A-4 or equivalent, seal exposed honeycomb edges and bond the indicated fastener strips in location to install the condenser assembly and lower panels.

NOTE: Electrical and plumbing installations should be completed prior to final installation of the condenser assembly

5.0 EXTERNAL CONDENSER INSTALLATION

Reference: Dwg. 206AC-212

NOTE: This installation places the condenser assembly under the aircraft, and has been used when equipment has previously been installed under the Cargo Compartment floor (applicable to 206L, L-1, L-3 and L-4).

5.1 Remove P/N 206-033-099-189 or equivalent fuel cell access panel.

5.2 Referencing View B, cut the panel along a line 0.50 inch aft of the existing center-line screw holes. Drill 0.193 inch diameter hole for clip nut at the center of the cut panel.

5.3 Using only the existing screws forward of the panel centerline, re-install the fuel cell access panel.

5.4 Temporarily install the condenser assembly. Match-drill two holes in the forward edge of the condenser to the screw holes at the aft edge of the cut access panel. Match-mark the remaining hole locations around the top of the condenser assembly. Remove the condenser.

CAUTION: MAXIMUM DRILL DEPTH FOR THE NEXT STEP IS 0.5 INCH. DO NOT DRILL THROUGH THE INNER SKIN OF THE HONEYCOMB PANEL.

5.5 Drill marked hole locations 0.50 inch diameter by 0.350 inch deep.

5.6 Using Metalset A-4 or alternate approved adhesive, install Item 4 inserts (Ref. 3).

5.7 Referencing Section A-A, install Item 3 Adapter.

NOTE: Allow 24 hours minimum adhesive cure prior to condenser assembly installation.

5.8 Using indicated hardware, complete fuel drain hose and condenser assembly installation.

5.9 System operation and leak check should be completed prior to re-installing the interior and the inspection panels.

6.0 ELECTRICAL INSTALLATION

Reference: Dwg. 206AC-610

NOTE: It is probably most efficient to begin installation of the air conditioner electrical system after the modifications necessary for condenser installation have been completed. To avoid unnecessary disassembly it is suggested that electrical system work be interrupted to work on other subsystems as convenient.

6.1 Install breaker (Item 19) and placard (Item 5), in overhead breaker panel. Connect breaker to aircraft bus.

6.2 From control panel location through windshield center post:

6.3 Route wire from breaker to main switch on control panel.

6.4 Route wire from the control panel to the evaporators (hi/lo) and to the condenser/compressor installations.

6.5 Complete routing of dryer, compressor, and condenser wires to respective locations.

6.6 Referencing sheet 2, temporarily install upper left-hand side of console panel. Mark and drill appropriate fastener locations for the panel. Remove panels and install cinch nuts if required. Temporarily reinstall panels using existing and indicated hardware as required.

NOTE: Solder connections are required for completion of wiring to the switch panel. Protect solder connections with heat shrinking tubing per drawing. Install switches in the control panel and complete control panel assembly.

6.7 As identified components are installed, complete electrical connections with specified hardware and provide adequate grounding. Use existing grounding terminals when possible.

6.8 Perform electrical system function check of air conditioner master switch, forward evaporator controls, condenser fan, and aft evaporator control before proceeding to charge the system.

NOTE: Compressor clutch will not engage when system is not charged. To verify circuit operation it is necessary to temporarily jumper the pressure switch on the dryer bottle.

6.9 Install compass placard in a conspicuous place on or near the magnetic compass.

7.0 COMPRESSOR INSTALLATION

Dwg. 206AC-310, 311 Installations

7.1 Refer to BHT-206-MM-7 to remove the number 1 tail rotor drive shaft from the oil cooler fan shaft.

7.2 Install the support angle assembly and firewall doubler as shown, drilling out the necessary rivets and match-drill the support angle and doubler to existing rivet holes. Remove, clean, & de-burr, install support angle and doubler using indicated hardware.

7.3 Locate the bracket support on the engine drain pan (206B only).

7.4 Locate the bracket support on the engine drain pan, forward of the access panel's upper flange as shown (206L Series only).

7.4.1 Match-mark and drill the bottom flange of the support to the two existing screw locations in each access panel and rivet location on left-hand outboard channel of drain pan. Remove the access panels from the drain pan and trim to remove the top flange. This allows aircraft maintenance access as necessary.

7.4.2 Reinstall the access panels and support using existing access panel hardware.

7.5 Locate and drill rivet holes through the support as shown using equal spacing and maintaining minimum edge distance. Remove support bracket, de-burr, clean, and complete support installation.

7.6 Temporarily install the compressor mount bracket assembly to the support angle. Install spacer(s) as required. Match-mark and drill the previously installed support to the compressor mount bracket. Remove bracket and enlarge holes in support to indicated size, then clean & de-burr parts.

7.7 Reinstall oil cooler blower assembly if necessary (Ref: Bell maintenance manual). Install compressor drive pulley assembly as applicable. If applicable install P/N 206-040-328-003 over aft end of oil cooler shaft before tightening the assembly to ensure freedom of movement on splines. Torque nuts on through shaft (2) to 25 in-lb.

7.8 Complete compressor mount bracket installation with indicated hardware.

7.9 Reinstall the #1 TR driveshaft and drive belt.

7.10 Temporarily install the compressor assembly in the mount bracket using indicated hardware. Allow compressor to pivot on mount plate.

NOTE: Before placing the compressor in the mount bracket, the drive belt must be placed over the compressor pulley.

7.11 Install the belt tensioner.

7.12 With belt tensioner adjusted to maximum length slide adjustable plate on compressor mount to adjust compressor alignment to the TR drive pulley. Apply tension to drive belt by hand and tighten mount plate bolts. This is where the compressor will be permanently mounted.

NOTE: Use shims under mounting bracket to align compressor with the drive shaft.

7.13 Assure that adequate cowling clearance can be achieved with belt under full tension. Be sure to allow for belt stretch.

7.14 Remove compressor and match-drill sliding plate to base plate of compressor mounting bracket assembly through 2 x Ø0.257" holes in sliding plate.

7.15 Disassemble mount plate, de-burr holes and reassemble using the attach bolts through match-drilled holes.

7.16 Reinstall compressor and drive belt.

7.17 Temporarily install restraint and placard with indicated hardware.

7.18 Assure tail rotor driveshaft, forward oil cooler shaft bearing housing, and compressor installations are complete. Tighten the drive belt to 35 pounds tension by adjusting the tensioner. A "KRIKIT" belt tension gauge (GATES P/N 91107) is useful to accurately set belt tension. Lock the belt tension adjustment using the jam nuts.

NOTE: Bearing run-in must be accomplished per Bell instructions before the final compressor drive belt installation.

WARNING: **DO NOT OVER-TIGHTEN THE BELT**. Over tightening puts excessive strain on the tail rotor drive train and may result in premature bearing failure. Over tightening the belt also will shorten belt life and may damage compressor clutch bearings. Insufficient belt tension will result in belt slippage, excess heat, and reduced belt life. A "KRIKIT" belt tension gauge (Gates P/N 91107) or equivalent tool should be used to check belt tension.

7.19 Torque all remaining compressor attachment hardware and safety wire as required.

7.20 Check security of all hardware installations, and seal all adjoining firewall surfaces using MIL-S-8802F Class B2 or equivalent.

NOTE: For drive belt replacement, the following procedure may be used:

7.20.1 Loosen the compressor mounting and tensioner bolts to remove the belt from the compressor pulley.

7.20.2 Remove the #1 TR driveshaft. Install the new belt onto the drive pulley.

7.20.3 Reinstall the Thomas coupling hardware #1 TR drive shaft in reverse of removal, and torque the bolts in accordance with BHT-206-MM-7 and applicable drawing (206AC-310-(X), 206AC-311-(X)).

7.20.4 Check belt alignment and correct as necessary.

7.20.5 Complete the compressor installation in accordance with the steps (7.18 through 7.19) above.

7.21 Complete electrical and plumbing installation.

8.0 FORWARD EVAPORATOR INSTALLATION

Reference: Dwg. 206AC-410

NOTE: Follow steps 8.1 – 8.11 for both right side and left side evaporator installations.

8.1 Remove two (2) rivets from the center of the vertical channel on left side of the console at F.S. 15, W.L. 32.5.

8.2 Temporarily assemble left-hand angle to left-hand support beam. Locate angle in center of the vertical channel and the left-hand support beam on the sill above the chin bubble.

8.3 Level beam and match-drill angle to console. Match-drill hole in the sill. Disassemble and remove the beam. De-burr the holes and install angle with indicated rivets.

8.4 Temporarily install evaporator assembly to left-hand support beam and angle. Install lower support angle on evaporator.

8.5 Set face of evaporator to vertical and mark rivet locations on console for lower angle attachment.

NOTE: Ensure that evaporator will drain when the aircraft is on level ground.

8.6 Remove evaporator assembly. Drill, de-burr, and install inlet vent support angle using indicated hardware.

8.7 The evaporator assembly may be temporarily reinstalled at this time. It is convenient to remove the assembly to facilitate work on electrical and plumbing installations.

8.8 Locate and drill ∅0.812 inch hole in chin bubble where evaporator will drain best and install grommet. Install drain hose through grommet in chin bubble. Seal grommet installation with MIL-S-8802F Class B2 sealant or equivalent.

8.9 Complete evaporator installation.

8.10 **Caution: Assure clearance of fastener locations from installed components before drilling holes.** Reference View B-B'. Using plenum assembly as template, mark hole locations. Drill (Ø0.250) holes on either side of the instrument panel to mount the plenum assemblies in the indicated positions.

8.11 Install the indicated rivnuts and attach the plenum assemblies with the indicated screws. Install flexible duct between the evaporator and plenum on each side.

8.12 Install optional duct cover as follows:
1) Using talcum powder coat at least 6" of the duct on one end.
2) Using a needle, thread string or twine through end of the scat tube to make a loop and tie off. The string should be about 60" long to run through the tube and the cover (you may need to weight the string to get it to travel through each item well).
3) Start the cover on the end of the scat tube and have another person pull on the string through the cover working to keep the end of the cover from rolling up.
4) Work the tube until the desired length is covered, remove string, trim off excess cover length and install duct.

8.13 Ensure that the duct does not interfere with pilot/copilot's ability to operate tail rotor pedals. Secure duct using the provided adel clamp and ty-wraps.

9.0 AFT EVAPORATOR INSTALLATION

Reference: Dwg. 206AC-460

9.1 Determine installation configuration required by the aircraft interior.

9.1.1 Aircraft with installed Bell Bleed Air Heater Kit must incorporate the -2 evaporator installation and the standard air outlet plenum installation. This installation cannot be made when a center shoulder harness is installed.

9.1.2 Aircraft with a center shoulder harness requires use of existing heat ducts or installation of ducts and outlets in available space. An alternate to the Bell Bleed Air Heater system is recommended.

9.1.3 Use of existing ducts is recommended when practical. Ducts which exit to the front seats should be blocked off in the aft overhead panel.

9.2 Locate and install mount brackets and shims to the shelf behind the hat-bin. Install the evaporator assembly onto the brackets.

NOTE: Assure proper drainage of evaporator with the aircraft on a level surface.

9.3 Referencing the hat-bin and insulation blanket views, temporarily place the duct and the adapter on evaporator inlet. Temporarily install insulation blanket and mark inlet doubler location. Remove blanket and cut hole. Seal blanket with duct tape or equivalent. Install doublers to blanket and apply Velcro using the adapter as a template. Remove the duct adapter and the duct, reinstall the blanket.

9.4 Temporarily install hat-bin with several screws. Locate hole for meshed screen. Remove hat-bin, cut openings.

9.5 Install inlet screen, filter, and frame per referenced drawing.

9.6 Route drain line to right-hand side of aircraft. Drill hole in the deck, install grommet, and elbow per referenced drawing. Locate and drill hole in baggage compartment floor assuring

clearance for the right-hand baggage compartment cover panel. Seal exposed honeycomb per Ref. (4).

NOTE: Allow seal to cure before final drain hose installation.

NOTE: Complete plumbing and electrical installation before proceeding to the next step.

9.7 Cold Air Ducting:

9.7.1 For standard outlet duct installation remove overhead panel.

9.7.1.1 Locate duct assembly in center of overhead panel as far aft as possible. Drill 0.128-inch diameter holes evenly spaced at six locations through overhead panel and top panel of duct. Install Item 1 rivets.

9.7.1.2 Reinstall overhead panel.

9.7.1.3 Locate and cut opening in top center of hat-bin for duct installation.

9.7.1.4 Attach duct to evaporator outlet, route to outlet duct installation. Install clamps as necessary to hold flexible ducting in place.

9.7.2 For installation in overhead ducts, follow these steps:

9.7.2.1 The tee adapter should be used, with aeroduct as required, for installation to the existing 3-inch diameter duct. An adapter is provided for use with the aeroduct as required for installation to the existing 2.5-inch duct or for installation in available space.

9.7.2.2 Place the appropriate tee adapter on top of the evaporator outlet with a short length of 3 inch diameter duct. Ty-rap the flexible duct in place.

9.7.2.3 If existing duct is available in cabin overhead, install appropriate size flexible duct between the tee and the overhead duct. Ty-rap and clamp in place. Block passages which lead to heater outlets beneath the forward seats.

9.7.2.4 If existing duct is not available in cabin overhead use the appropriate alternative installation for the air outlets.

NOTE: Review the appropriate view for installation in older style interiors. Later styles incorporate provisions for heater ducts in the center section of the overhead panel. Air conditioning ducting installation is similar in most aircraft.

9.7.3 Complete aft evaporator installation.

9.7.4 System operation should be completed prior to reinstalling interior and inspection panels.

9.7.5 Reinstall hat-bin and all other parts removed for evaporator installation.

10.0 PLUMBING INSTALLATION

10.1 Precautionary Information

10.1.1 Care must be taken to avoid contamination of the plumbing and system components during installation. End plugs, found in components should not be removed before final assembly of plumbing lines.

10.1.2 The "Plumbing" installation consists of flex lines and/or aluminum tubing sections joined to components using flare fittings. It is not possible to provide all pre-assembled refrigerant line components, and sufficient lengths of necessary refrigerant line have been provided to complete the installation. Refer to drawing detail T for refrigerant line construction. Tube bending and SAE 37 degree flaring tool are required.

NOTE: Before final tube assembly installation flush with cleaning fluid and compressed air (see consumables list in Section 12.3).

NOTE: A smooth burnished flared surface is critical to obtain a good seal.

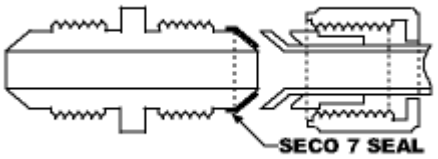
10.1.3 To preclude saturation of the desiccant, the dryer bottle caps should not be removed until just prior to evacuation and charging of the system.

10.1.4 Seco7 seals are provided with the plumbing installation hardware. These are a soft, malleable crush washer designed for MS, AN, and JIC standard 37 degree flared fitting assemblies. They provide a lower yield gasket material to the interface periphery of the tube flare and fitting and are designed to compensate for minute imperfections in the fittings' and tubes' mating surfaces. The installation procedure for these seals is as follows:

10.1.4.1 Referring to the installation drawings, select the correct size seal for the flared fitting.

10.1.4.2 Clean all fittings thoroughly, coat fitting threads at cone end of connector sparingly with SP-20 or equivalent oil compatible with refrigerant HFC-134a.

10.1.4.3 Install Seco7 seal onto male flare portion of fitting.



10.1.4.4 Thread tube nut onto male fitting several turns with fingers until connection is snug. If tube nut cannot be tightened snugly with fingers, disassemble and correct problem to prevent assembly damage to Seco7 seal.

10.1.4.5 Tighten tube nut to torque value specified in Table II.

10.1.4.6 Allow fifteen seconds elapsed time for compression of Seco7 seal to occur.

10.1.4.7 Retighten tube nut to torque value specified in Table II in order to compensate for the compression yielding of the Seco7 Seal.

NOTE: Do not attempt to correct any leakage or misalignment of the joint by over-torquing. Instead, disassemble and check for nicks, burrs, dirt, etc. Reassemble joint using new parts if necessary. Seco7 seals must be replaced if the joint is disassembled.

10.1.5 It is acceptable to assemble the flared fittings without the use of Seco7 seals. In this case the following procedure should be observed:

10.1.5.1 Clean the fitting thoroughly and apply a light coat of SP-20 or equivalent oil compatible with refrigerant HFC-134a to flare surfaces.

10.1.5.2 Carefully aligned Flare fitting ends and hand-tightened to seat the flare, then torqued per Table II.

10.1.5.3 Heat fitting using a shop heat gun and then re-torque per Table II to ensure a proper seal.

10.2 206AC-510, 206AC-511, 206AC-512 Installations
References: Dwgs. 206AC-510, 206AC-511, 206AC-512

10.2.1 Referencing views for compressor plumbing, install stiffeners and fittings with indicated hardware and reducer. Verify compressor hose lengths, assemble hoses, fittings if required, and complete final installation.

10.2.2 Referencing appropriate views, complete dryer bottle installation using indicated hardware.

10.2.3 Referencing appropriate views locate and drill holes for fittings using the doubler as a pattern. Seal the honeycomb with metalset A4 per Ref. (3). Bond stiffeners in place.

10.2.4 Complete line and fitting installations between the compressor, the condenser, and the dryer bottle. Assembly and installation of the lines leading to the aft evaporator may also be completed at this time.

10.2.5 Complete installation of the exterior lines leading to the forward evaporators, paying attention to routing and insert locations. Allow 24 hour cure time for the insert adhesive prior to final assembly of the exterior lines.

NOTE: Install hoses on evaporators with fittings oriented as desired, then install evaporators and complete connections to the tee's.

10.3 206AC-520, 206AC-521 Installations
Reference: Dwgs. 206AC-520, 206AC-521

NOTE: Tube fabrication is detailed on the last page of the drawing package.

10.3.1 Ensure that all air-conditioning components are installed prior to plumbing installation. This includes the condenser, the compressor and AFT evaporators. The FWD evaporators are to be installed temporarily only.

10.3.2 Install the dryer bottle (ES43050-2) to the top right side of the bulkhead as shown in the installation drawings.

10.3.3 Locate and drill holes in engine drain pan, forward firewall, and deck, aft of baggage compartment, as shown. Install indicated fittings.

10.3.4 Using ½ inch and 3/8 inch tubing, respectively, complete condenser to compressor connections, and condenser to dryer bottle connections.

10.3.5 Using 3/8 inch tubing complete dryer bottle to aft evaporator and engine drain pan connections.

10.3.6 Connect engine drain pan to the firewall using 206AC-5017-9 tubing. Complete compressor hose installations. Install ¾ inch return line from the firewall to the drain pan fitting.

10.3.7 Install 206AC-5017-7 return line from servo mount to engine firewall. Locate and install insert on transmission deck for best positioning of the return line and secure as shown.

10.3.8 Connect the condenser to the compressor using ½ inch tubing as shown. Route tubing aft of the condenser, up fuselage contour to bulkhead fitting. Route tubing from bulkhead fitting to appropriate fitting on engine drain pan. Connect drain pan fitting to compressor outlet using the indicated hose.

10.3.9 Connect the condenser to the dryer bottle using ½ inch tubing as shown. Route tubing aft of the condenser, up fuselage contour to 90º fitting on the inlet side of the dryer bottle.

NOTE: Dryer bottle uses 45º flared fittings.

10.3.10 Using ½ inch tubing connect aft evaporator to engine drain pan as shown.

10.3.11 Reference fabrication instructions contained in Ref. (5) to this document (see pg. ii), fabricate flex-hose line to extend from transmission deck (item 9 tube) through the servo mount and vertical control tube tunnel.

10.3.12 Complete transmission deck fittings installation.

CAUTION: Assure proper fit before flaring. Use heat shrink and chafe tape as required to protect tube and structure. Clamps are provided to eliminate tube movement in control tube tunnel area.

10.3.13 Locate and cut-out the web under pilot's seat area as shown. Assure clearance for flex hoses and throttle cable housing. Install grommet.

10.3.14 Fabricate and route flexible hoses from forward evaporators' tees to the bottom right side of the vertical control tube tunnel.

10.3.15 Fabricate ¾ inch and 3/8 inch tube assemblies to connect upper and lower vertical control tube tunnel plumbing as shown.

10.3.16 Cut out the vertical control tube tunnel inspection panel as specified on the drawing. Install doubler on the panel and install the panel. Secure plumbing as shown.

10.3.17 Determine flex hose length with evaporators temporarily installed. Fabricate hoses per instructions in Ref. (5). Remove the evaporators. Install hoses on the evaporators and tighten the fittings in the correct position determined during evaporator installation. Reinstall the evaporator and complete manifold connections.

NOTE: Do not complete interior installation prior to a system leak check and functional test to assure correct system operation.

10.3.18 Verify that the plumbing installation is complete and all fittings are tight.

10.3.19 Trim seat box inspection panel at lower vertical control tube tunnel to allow for plumbing installation.

10.3.20 Trim the right side of the vertical control tube tunnel plenum to accommodate the plumbing installation.

10.3.21 Install insulation tape (Item 94) to forward evaporator lines ref. Detail H, Detail J on drawing.

11.0 SYSTEM CHECK-OUT

Reference: Troubleshooting Chart as necessary

11.1 It is good practice to thoroughly inspect all connections and line routing before proceeding to charge the system.

11.2 Perform an electrical system function check of the forward and aft evaporator controls, the compressor clutch, and the condenser fan. Reference Troubleshooting Table IV.

11.3 Charge and operate the system according to the procedures contained in Sections 12 through 16 of this document and in the Flight Manual Supplement (Appendix A).

11.4 If the installer does not have the necessary equipment or expertise to flush and test the system, then a local air conditioning firm should be utilized prior to reinstallation of all cowlings, panels, and interior components.

11.5 Re-install all panels, cowling and hardware removed during installation.

11.6 Compressor drive belt tension should be checked after system run-up and operation check, and again after the first 2 hours of operation. Reference Compressor Installation.

WARNING: **DO NOT OVER-TIGHTEN THE BELT**. Over tightening puts excessive strain on the Tail Rotor drive train and may result in premature bearing failure. Over tightening the belt also will shorten belt life and may damage compressor clutch bearings. Insufficient belt tension will result in belt slippage, excess heat, and reduced belt life. A "KRIKIT" belt tension gauge (Gates P/N 91107) or equivalent tool should be used to check belt tension.

12.0 SYSTEM CHARGING COSIDERATIONS

12.1 Safety Precautions

12.1.1 The refrigerant used in the air conditioner system is HFC-134a. Other refrigerants, such as R-12, must not be introduced into the system.

12.1.2 HFC-134a has been shown to be nonflammable at ambient temperature and atmospheric pressure. However, tests have indicated that at pressures above atmospheric and with air concentrations greater than 60% by volume, combustible mixtures can be formed. Under no circumstance should any bulk storage cylinder, filling equipment, charging or refrigerant reclaim or recovery system be pressure tested with AIR/HFC-134a mixtures. NEVER charge an air conditioning system which has not been evacuated first. This does not mean that additional charge cannot be added, but all lines should be vented so that they are filled with refrigerant before adding charge to the system. NEVER use compressed air to flush the refrigerant from an air conditioning system.

NOTE: Servicing of CFC and HCFC systems should be performed by licensed, qualified personnel only.

The following further precautions should be observed:

12.1.3 The work area should be well ventilated. Route relief and purge vent piping outdoors, away from air intakes. Be certain that the work area is clear of vapors prior to beginning work.

WARNING: INTENTIONAL INHALATION MAY CAUSE DEATH WITHOUT WARNING.

12.1.4 Always wear protective clothing when there is a risk of exposure to liquid refrigerant. Wear eye protection and a face shield when servicing any part of the refrigerant system. Liquid refrigerant at atmospheric pressure evaporates quickly and rapidly cools anything that it contacts. To avoid frostbite, care must be taken to prevent liquid refrigerant contact with skin or eyes. If contact does occur, seek medical attention as soon as possible.

12.1.5 Avoid operations with high temperatures, such as welding or baking of aircraft finish in the immediate area of any part of the air conditioning system or refrigerant supply tank.

WARNING: AVOID AREAS WHERE OPEN FLAME OR CHEMICAL VAPORS ARE PRESENT WHEN USING REFRIGERANT.

12.2 Tools and Consumables

Servicing of an air conditioning system requires the use of certain special tools and consumables, and they are:

12.2.1 Tools

12.2.1.1 Service Manifold with "high" and "low" side gages. This item is used to evacuate the system, to install refrigerant, and to read system pressure following system charging.

12.2.1.2 Charging Cylinder equipped with an electrically powered heating element. This is used to charge the system with a measured amount of refrigerant. The heating element raises the gas pressure so that it will flow into the system. Charging cylinders are available from most automotive supply centers.

12.2.1.3 Electronic Leak Detector for HFC-134a. (TIF 5550 is suitable).

12.2.1.4 Vacuum Pump.

12.2.1.5 Heat Exchanger Cooling Fin Comb.

12.2.2 Consumables

12.2.2.1 HFC-134a, bulk cylinder.

12.2.2.2 Refrigerant Oil; Sanden SP-10 or SP-20 PAG oil, or equivalent.

12.2.2.3 Pro-Seal 890 or equivalent.

12.2.2.4 HYSOL EA9309 Adhesive, alt. A-4 Metal set or equivalent; SMOOTH ON, INC.

12.2.2.5 Contact Cement, Scotch 1300L or equivalent.

12.2.2.6 0.032" Stainless Lock Wire. Ref. MS20995C32.

12.2.2.7 Virginia # D10E1 cleaning solvent (Flushing Parts) or equivalent.

13.0 SYSTEM LUBRICATION

13.1 Recommended system oil charge should be 7.5± 0.5 oz. Compressors are factory charged with 3.5 oz. of oil. An additional 4 oz. of oil should be added to the discharge line prior to charging a new installation.

13.2 Care should be taken to avoid spilling any of the compressor oil charge during installation. If this should occur, drain the oil and recharge to 3.5 oz.

14.0 DRYER BOTTLE

14.1 The dryer bottle is located between the condenser and the expansion valve. It contains a desiccant (XH-9) which serves to absorb moisture from the system. To preclude saturation of the desiccant, the dryer line caps should not be removed until just prior to evacuation and charging of the system. The dryer bottle should be replaced whenever the system is discharged.

CAUTION: Before draining or charging any refrigeration system read safety precautions in paragraph 12.1.

15.0 SYSTEM LEAK CHECK

15.1 A system which contains a partial charge can be leak tested and recharged, without evacuating the system. A system which has been evacuated should be filled to a pressure of at least 50 psig, if using an electronic leak detector, or higher if using a detector solution.

15.2 All leak checks should be conducted with the air conditioner "OFF". Since refrigerant is heavier than air, leaks are most likely detected on the underside of hoses and fittings. Refrigerant will collect in low areas and may provide an erroneous leak indication. The shop area should be well-vented prior to checking for leaks.

15.3 If a leak is detected at a fitting, check tightness and security of the fitting, check for leaks again and if the fitting still leaks drain the system down. Clean and inspect the fitting and tube assembly for defects. If a defective component or fitting is found, replace. Install a new Seco7 seal and reassemble fitting per Section 10.1.4.

15.4 A small amount of leakage (one ounce per year) past the compressor shaft seal is normal. Most leak detectors are sensitive enough to show a leak of this magnitude.

15.5 Special Tools and/or Equipment Required:

The following tools and/or equipment are required to leak check a refrigerant plumbing system.

15.5.1 Gaseous dry nitrogen, regulated source (0-500 psig).

15.5.2 R-134a refrigerant charging manifold with gauges and hoses.

15.5.3 Leak check fluid, (soap solution).

15.5.4 Assorted hand tools.

15.5.5 Hand and eye protection.

15.5.6 Thread sealant, P/N 55431. (Loctite).

15.6 Leak Check Procedure

NOTE: These instructions give procedures applicable to a manually operated refrigerant manifold/supply system. If automatic recovery/recycling/recharging equipment is used follow equipment manufacturer's recommendations.

15.6.1 Remove all shrouds, panels, flooring and any other covering which prevents access to refrigerant fittings, connections or components.

15.6.2 Verify all aircraft and/or ground power is off.

15.6.3 Remove service port caps from the A/C system. The high and low pressure service ports are located on the compressor suction header.

15.6.4 Close all manifold gauge valves and verify hose connections are tight.

15.6.5 Connect R-134a refrigerant charging manifold. R-134a service gauges contain quick-connect fittings to minimize refrigerant loss. To install quick-connect, push on firmly until locked (a “clicking” sound is heard). Hold the grip ring and pull to remove quick-connect fittings.

15.6.6 Connect yellow charging hose to a regulated dry nitrogen source.

NOTE: An adapter is required to connect yellow charging hose to the nitrogen source.

15.6.7 Regulate nitrogen source to a pressure of 200 PSIG maximum.

CAUTION: Do not exceed 200 psi nitrogen pressure during leak check procedure or damage to expansion valve will result.

15.6.8 Verify all plumbing connections are tight.

15.6.9 Slowly open high pressure (red) manifold valve and allow system pressure to increase gradually until a pressure of 200 psig is achieved. Allow time for system pressure to equalize across expansion valve and note final system pressure.

CAUTION: During this procedure protective eye wear and gloves should be worn to prevent operator injury.

15.6.10 Apply soapy leak check fluid to each connection to locate leaks.

CAUTION: Do not use any leak dye in R-134a system or damage to system may result.

15.6.11 Use thread sealant on all male fitting threads (sparingly), staying off the first two (2) threads near sealing surface. A light coating of R-134a refrigerant oil must be applied to flare to prevent metal galling damage.

CAUTION: Do not apply oil to fitting threads.

15.6.12 Tighten joints as required to stop leaks. Reference Table II.

CAUTION: Do not over tighten plumbing connections. Stripped threads or cracked flares may result.

15.6.13 With system leak tight, turn off nitrogen source, disconnect yellow charging hose from source and slowly release nitrogen pressure to zero.

CAUTION: Vent system pressure very slowly to assure that compressor oil is not vented with the nitrogen. Do not let air enter the system.

15.6.14 Evacuate system to prepare for charging.

15.6.15 Close manifold valve.

16.0 SYSTEM EVACUATION AND CHARGING PROCEDURES

NOTE: If a previously charged system is low on refrigerant, the system should be checked for leaks.

NOTE: These instructions give procedures applicable to a manually operated refrigerant manifold/supply system. If automatic recovery/recycling/recharging equipment is used follow equipment manufacturer's recommendations.

NOTE: Air Conditioner System charging should take place in an area where the helicopter can be run for final charge determination.

16.1 Evacuating The System

16.1.1 Connect the service manifold and vacuum pump to service fittings on compressor.

NOTE: Follow Vacuum Pump Manufacturer’s recommendations for operation.

16.1.2 Turn on vacuum pump and open both valves to evacuate system. System absolute pressure, before charging, should be less than ½ in. Hg.

NOTE: Absolute pressure of ½ in Hg. corresponds to about 29.4 inch VACUUM at sea level. The corresponding VACUUM pressure will drop about 1.1 inch per thousand feet of elevation.

16.1.3 When system evacuation is complete, first turn off both manifold valves. Then turn off the vacuum pump. Allow the system to set for 4 hours. If system vacuum does not remain constant, check all fittings and hoses for leaks.

16.2 Charging An Evacuated System

16.2.1 Fill charging cylinder with at least 2.75 lbs. of HFC-134a liquid. Plug in heater and wait until pressure in the cylinder reaches 150-200 psig.

16.2.2 Connect the charging cylinder to the service manifold. Open the valve on the charging cylinder. Loosen the charging line connector at the service manifold to purge air from the line. Re-tighten connector.

16.2.3 Open high-pressure valve at compressor discharge, on manifold, and watch for indication of pressure on low-pressure gage (this proves that the expansion valves are opening). Slowly open low-pressure valve to increase charging rate. Initial charge of 2.0 lb. is recommended.

16.2.4 Final charge determination should be accomplished with the helicopter running, and evaporators in operation. Close all valves before helicopter run up.

16.2.5 Use an electronic leak detector to check at each fitting assembly. If a leak is found, it must be corrected.

16.3 Determining Optimum Refrigerant Charge

16.3.1 Ground-run the helicopter at 100% N_2, and allow the air conditioning system to operate for 10 minutes to stabilize.

NOTE: Outside air temperature should be at least 75ºF, and all doors should be left open.

16.3.2 Measure the difference between evaporator's inlet and outlet air temperatures after stabilization at initial charge.

16.3.3 Add a small amount of refrigerant, and allow the system to re-stabilize.

16.3.4 Re-measure the difference between evaporator's inlet and outlet air temperatures. At this time the difference in temperatures will probably have increased.

16.3.5 Repeat steps 16.3.2 through 16.3.4 until addition of refrigerant causes reduced temperature difference between inlet and outlet airflow. This indicates that optimum refrigerant charge has been exceeded.

16.3.6 Recover the refrigerant overcharge.

16.3.7 Close service manifold valves, and disconnect both service lines being careful to lose as little refrigerant as possible. Replace caps on service fittings.

16.4 Adding Refrigerant to an Existing Partial Charge:

NOTE: A partial system charge can be restored to "full charge" without discharging and evacuating the system. This procedure is described in this section.

16.4.1 Check for and correct any leaks found in the system.

16.4.2 Connect the manifold system to the refrigerant tank and to the service fittings. The connections at the service fittings should be loose.

16.4.3 Slowly open the tank valve and bleed air from between the tank and the service manifold, tighten fittings.

16.4.4 Slowly open the manifold valves, allowing refrigerant to purge the air from the lines.

16.4.5 Tighten the line fittings and close valves on manifold.

16.4.6 Follow procedure in section 16.3 to optimize refrigerant charge and remove the charging equipment.

CAUTION: Do not open the discharge valve to the refrigerant tank, to avoid tank rupture. Avoid drawing liquid refrigerant into compressor suction port; this may cause hydraulic lock and failure of compressor.

17.0 SYSTEM TROUBLE SHOOTING

17.1 Prior to troubleshooting a defective system, conduct a visual inspection for general condition. Check circuit breakers and fuses in system power circuits.

17.2 The following step-by-step procedure lists the easiest checks, and most likely problem sources, first. Use this guide in conjunction with troubleshooting Table IV and a ground power source.

17.2.1 Electrical - Make sure evaporator blowers work in HI and LOW modes. Check that the condenser blower is working and that the compressor clutch is engaged. (Bypass Hi-Lo Switch to engage clutch).

17.2.2 System Charge - Connect service manifold to service fittings and purge the air from the manifold lines. The static pressure should read approx. 57 psig (60°F, Sea Level) to 104 psig (90°F, Sea Level). Gage pressure increases by about ½ psi per thousand feet. Linear interpolation for expected pressure is acceptable. If the pressure is significantly lower than expected, the system may be leaking. The system should be checked with the compressor running. See paragraph 16.4. “Adding Refrigerant to an Existing Partial Charge.”

17.2.3 Expansion Valve Malfunction - If the cooling loss is limited to only one evaporator it is most likely a defective expansion valve. Confirmation of an expansion valve (TXV) problem can be made by touching the valve during system operation. If the system pressures are correct, and the TXV is warm, the problem is in the valve.

Loss of cooling in all evaporators (assuming that there were no problems identified during previous steps), could be caused by refrigerant flow blockage at the expansion valves. This blockage could be due to ice or dirt (See paragraph 16.2. “Charging an Evacuated System”).

17.2.4 Compressor Malfunction - When the compressor is running, HI/SIDE pressure should be in the range of 240 to 270 psig. and LOW/SIDE pressure should be no more than about 30 psig. If the system will not maintain the pressure differential, and there are no

system leaks, the problem could be a failed compressor. The compressor must then be replaced.

17.2.5 Dryer Bottle "HI-LO" Switch - If system charge falls below 28 psi or exceeds 384 psi the dryer bottle "HI-LO" switch will open and interrupt power to the compressor clutch. Reset values for the switch are 29 psi and 256 to 340 psi respectively. This indicates improper system charge. Refer to Charging Instructions for further action.

18.0 EVAPORATOR BALANCING PROCEDURE

NOTE: Evaporator balancing is required on all systems with multiple evaporator modules. This process balances refrigerant flow between evaporators to achieve equal evaporator air outlet temperatures.

CAUTION: Eye and hand protection should be worn during this operation.

18.1 Access all evaporator modules and measure/record outlet air temperatures.

18.2 Adjust the expansion valve on the evaporator with the highest outlet air temperature ¼ revolution in a CW direction. This will increase the refrigerant flow and reduce the outlet air temperature.

18.3 Adjust the remaining evaporator(s) with a lower outlet air temperature ¼ revolution CCW.

18.4 Allow system to stabilize, recheck the evaporator outlet temperatures and repeat adjustment procedure if required. Evaporator outlet temperatures should be within 1-3°F of each other.

NOTE: Proper evaporator balancing should not result in a change of the compressor suction pressure. Verify system pressures are within values shown in Section 17.2.

18.5 If evaporator outlet temperatures are equal and suction pressure meets Section 17.2 servicing is complete. If not, repeat Sections 18.2. and 18.3. or refer to Troubleshooting Chart.

18.6 Shut system off and replace all shrouds, enclosures, ducting as required and remove charging manifold gauges and hose assembly.

19.0 EXPANSION VALVE ADJUSTMENT PROCEDURE

NOTE: Even though the automatic expansion valve is set at the factory there may be times when it must be adjusted to assure proper refrigerant flow at the desired evaporating temperature, due to excessive pressure drop for long suction line runs. Any adjustment must not affect desired suction and discharge pressures.

19.1 Special Tools and/or Equipment:

19.1.1 The following tools and/or equipment are required to perform expansion valve adjustment:

19.1.1.1 Inspection mirror, adjustable.

19.1.1.2 Thermometer, 0-150°F.

19.1.1.3 Flashlight or service lamp.

19.1.1.4 134a service manifold and gauge set.

19.1.1.5 Hand tools.

19.2 Expansion Valve Adjustment

CAUTION: Eye and hand protection should be worn during this operation.

The expansion valve adjustment shall be performed in accordance with, but not limited to the following:

19.2.1 Verify that system leak check and refrigerant charging has been performed and system is operating satisfactorily.

19.2.2 Remove all shrouds, covers or enclosures, which prevent access to the evaporator expansion valve adjustment knob.

19.2.3 Remove expansion valve protective cap.

19.2.4 Verify that inlet to evaporator coil and blower ducting are free of any contamination or restrictions which could alter air flow.

19.2.5 Verify the blower speed switch is in the high position.

19.2.6 Verify R-134a manifold gauges and hoses are connected to the compressor service valves and system is operating normally.

19.2.7 With cabin doors open allow system to operate for 5 minutes.

19.2.8 Record compressor suction and discharge pressures and evaporator air inlet and outlet temperatures.

19.2.9 If suction pressure is higher than values outlined in Section 17.2 the expansion valves must be turned CCW in ½ revolution increments, waiting 2-5 minutes for valve to stabilize, until desired value is obtained and/or air outlet temperature is the lowest possible.

19.2.10 If suction pressure is lower than values outline in Section 17.2 the expansion valve must be turned CW in accordance with the same procedure previously discussed in this section.

19.2.11 Allow system to operate for 5-10 minutes after expansion valve adjustment to verify setting.

19.2.12 After satisfactory results have been achieved shut system off and replace all shrouds, enclosures, ducting as required and remove charging manifold gauges and hose assembly.

20.0 WARRANTY CONSIDERATIONS

Component warranty may be denied should any of the following conditions occur:

20.1 Component damage resulted from mishandling or negligence.

20.2 Component disassembled.

20.3 Component altered in configuration

20.4 Component failure due to refrigerant system contamination or improper charge.

20.5 Component not serviced or maintained correctly.

20.6 Component out of warranty.

20.7 Component not returned in proper shipping container (use same container that the unit was shipped in).

20.8 Component repaired with parts not FAA/PMA or OEM approved.

20.9 Component ports not capped.

20.10 Component warranty claim not filed correctly.

20.11 Use of non-approved refrigerant oil.

20.12 Uses of liquid dye leak check fluid.

TABLE II
TORQUE RECOMMENDATION

TUBE SIZE (IN.)	FITTING TORQUE (IN.-LB.) WITH SECO7 SEAL	FITTING TORQUE (IN.-LB.) WITHOUT SECO7 SEAL
1/4	40 - 60	132 - 180
3/8	75 - 115	216 - 300
1/2	150 - 225	432 - 540
5/8	200 - 315	642 - 765
3/4	300 - 450	852 – 1,164

TABLE III
PERIODIC INSPECTION SCHEDULE

ITEM	PRIOR TO COOLING SEASON	EVERY 100 HR OPERATION
Check Evap. Blower HI/LOW	X	X
Check Condenser Blower Operation	X	X
Belt Wear and Tension	X*	X*
Placards	X	
System Components for Security and Integrity of Mountings and Hardware	X	X
Compressor Mount for Cracks	X	X

* The belt tension on a newly installed belt should be reset after the first two hours of operation. Replace the belt based on condition. Reference the compressor installation section of this document.

TABLE IV
TROUBLESHOOTING

There may be a time when the system does not operate and/or perform in accordance with information contained herein. Therefore, it is necessary for the service personnel to diagnose the discrepancy by troubleshooting the system and its components. To assist in this diagnosis the following troubleshooting list is provided.

INDICATION	PROBABLE CAUSE	POSSIBLE SOLUTION
A. No system power	1. Gnd power not connected 2. Aircraft power switch off	1. Plug in gnd power cart 2. Energize power switch
B. Power on but system will not operate	1. Air cond. CB off 2. Air cond. CB failed 3. Aircond. mode SW failed 4. Vented system	1. Energize aircond. CB 2. Replace 3. Replace 4. Evacuate and charge system
C. System operates but does not cool.	1. Low refrig. Charge 2. Overcharged system cutout (Hi-Low Switch) 3. Failed compressor 4. Broken belt 5. Failed expansion valve(s) 6. Evap. blower switch(s) failed 7. Evap. blower(s) motor failed 8. Evap. blower(s) fuses blown 9. Evap. module air inlet clogged 10. Ex. valve inlet clogged 11. Excessive moisture in system 12. Excessive oil in system	1. Charge as required 2. Reclaim refrig. overcharge as required 3. Replace 4. Replace 5. Replace 6. Replace 7. Replace 8. Replace 9. Remove debris 10. Remove debris 11. Replace dryer assy. 12. Drain excessive oil
D. Evaporator noisy	1. Blower Wheel hitting scroll 2. Defective blower motor bearing 3. Air inlet clogged	1. Replace 2. Replace motor 3. Remove blockage
E. No low evap. fan speed (hi speed ok)	1. Failed switch 2. Failed resistor	1. Replace 2. Replace
F. No evaporator(s) air flow	1. C.B. off 2. C.B. failed 3. Mode SW failed 4. Fan speed SW failed 5. Seized motor(s) 6. Blower wheel failed 7. Blocked air outlet duct 8. Blocked air inlet duct 9. Aircraft power not on 10. Ground power not on	1. Turn on 2. Replace 3. Replace 4. Replace 5. Replace 6. Replace 7. Remove debris 8. Remove debris 9. Turn on 10. Turn on

TABLE IV
TROUBLESHOOTING (Cont'd)

INDICATION	PROBABLE CAUSE	POSSIBLE SOLUTION
G. Evap. module coil(s) freezing	1. Expansion valve clogged with ice, debris or failed. 2. Expansion valve setting low	1. Remove debris or replace valve. 2. Ref. 12.0 for suction pressure
H. Pressure switch cycles (high press. Cutout)	1. System over charged 2. Cond. coil inlet air extremely hot 3. Cond. inlet clogged 4. Compressor discharge hose clogged or kinked 5. Excessively high ambient temperature	1. Reclaim refrig. 2. Normal condition with High O.A.T. 3. Remove debris 4. Replace hose 5. Normal condition
I. Compressor will not operate	1. C.B. failed on off 2. Hi-Lo pressure switch failed 3. Broken clutch power wire 4. Low refrigerant charge 5. Loose belt tension or broken belt 6. Clutch failure	1. Turn on or replace 2. Replace Hi-Lo switch 3. Replace wire 4. Re-charge system 5. Tighten or replace belt 6. Replace compressor
J. Drive Belt Failure	1. Worn or deteriorated belt 2. Improper belt tension 3. Poor belt alignment 4. System over charge 5. Compressor failure	1. Replace 2. Replace belt, follow correct belt tension procedure 3. Re-align compressor 4. Correct system charge 5. Replace
K. Condensor Fan will not run	1. No power to condenser 2. Fan motor failed 3. Poor ground 4. Broken power wire	1. Turn on system power or C.B. 2. Replace fan assembly 3. Properly ground fan 4. Replace wire
L. Condenser Fan Noisy	1. Retainer clip broken 2. Exhaust screen bent or loose	1. Replace clip and damaged components 2. Replace or straighten screen

TABLE V
WEIGHT AND BALANCE DATA

INSTALLATION	WEIGHT. (LB.)	F.S. (IN.)	B.L. (IN.)
206AC-110-1	90.1	121.0	-2.8
206AC-110-2	80.0	117.9	-2.7
206AC-110-3	77.4	117.6	-2.8
206AC-111-1	90.2	139.3	-2.8
206AC-111-2	93.7	134.6	-2.7
206AC-111-3	90.2	137.3	-2.8
206AC-111-4	93.7	134.3	-2.7
206AC-111-5	81.0	134.2	-2.8
206AC-111-6	81.0	135.0	-2.8

- This data is generally applicable. Due to normal variation of actual components weights and locations which occur when equipment is installed, actual aircraft weight and center-of-gravity must be verified by weighing after system installation and refrigerant charging. Refer to BHT-206A/B M&O-1, BHT-206L-MM-1, BHT-206L1-MM-1, BHT-206L3-MM-1, or BHT-206L4-MM-1 as applicable.

APPENDIX A

FLIGHT MANUAL SUPPLEMENT

APPENDIX B

SUPPLEMENTAL TYPE CERTIFICATE

APPENDIX C

PARKER PUBLICATION NO. 4400-B.1

PARKER SAFETY GUIDE

For Selecting and Using Hose, Fittings, and Related Accessories

Parker Safety Guide
for Selecting and Using Hose, Fittings, and Related Accessories

Parker Publication No. 4400-B.1
Revised: April 1997

⚠ **DANGER:** Failure or improper selection or improper use of hose, fittings, or related accessories can cause death, personal injury and property damage. Possible consequences of failure or improper selection or improper use of hose, fittings, or related accessories include but are not limited to:

- Fittings thrown off at high speed.
- High velocity fluid discharge.
- Explosion or burning of the conveyed fluid.
- Electrocution from high voltage electric power lines.
- Sparking or explosion while paint or flammable liquid spraying.
- Dangerously whipping hose.
- Contact with conveyed fluids that may be hot, cold, toxic or otherwise injurious.
- Sparking or explosion caused by static electricity buildup or other sources of electricity.
- Injections by high-pressure fluid discharge.
- Contact with suddenly moving or falling objects that are controlled by the conveyed fluid.

Before selecting or using any Parker hose or fittings or related accessories, it is important that you read and follow the instructions below.

1.0 GENERAL INSTRUCTIONS

1.1 Scope: This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) hose (including all rubber and/or plastic products commonly called "hose" or "tubing"), fittings (including all products commonly called "fittings" or "couplings" for attachment to hose), and related accessories (including crimping and swaging machines and tooling). This safety guide is a supplement to and is to be used with, the specific Parker publications for the specific hose, fittings and related accessories that are being considered for use.

1.2 Fail-Safe: Hose and hose assemblies can and do fail without warning for many reasons. Design all systems and equipment in a fail-safe mode, so that failure of the hose or hose assembly will not endanger persons or property.

1.3 Distribution: Provide a copy of this safety guide to each person that is responsible for selecting or using hose and fitting products. Do not select or use hose and fittings without thoroughly reading and understanding this safety guide as well as the specific Parker publications for the products considered or selected.

1.4 User Responsibility: Due to the wide variety of operating conditions and uses for hose and fittings, Parker and its distributors do not represent or warrant that any particular hose or fitting is suitable for any specific end use system. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The user, through its own analysis and testing, is solely responsible for:

- Making the final selection of the hose and fitting.
- Assuring that the users requirements are met and that the use presents no health or safety hazards.
- Providing all appropriate health and safety warnings on the equipment on which the hose and fittings are used.

1.5 Additional Questions: Call the appropriate Parker technical service department if you have any questions or require any additional information. See the Parker publication for the product being considered or used, for telephone numbers of the appropriate technical service department.

2.0 HOSE AND FITTING SELECTION INSTRUCTIONS

2.1 Electrical Conductivity: Certain applications require that a hose be nonconductive to prevent electrical current flow. Other applications require the hose to be sufficiently conductive to drain off static electricity. Extreme care must be exercised when selecting hose and fittings for these or any other applications in which electrical conductivity or nonconductivity is a factor.

For applications that require hose to be electrically nonconductive, including but not limited to applications near high voltage electric lines, only special nonconductive hose can be used. The manufacturer of the equipment in which the non-conductive hose is to be used must be consulted to be certain that the hose and fittings that are selected are proper for the application. Do not use any Parker hose or fitting for any such application requiring nonconductive hose, including but not limited to applications near high voltage electric lines, unless (i) the application is expressly approved in the Parker technical publication for the product, (ii) the hose is both orange color and marked "nonconductive," and (iii) the manufacturer of the equipment on which the hose is to be used specifically approves the particular Parker hose and fitting for such use.

The electrical conductivity or nonconductivity of hose and fittings is dependent upon many factors and may be susceptible to change. These factors include but are not limited to the various materials used to make the hose and the fittings, manufacturing methods (including moisture control), how the fittings contact the hose, age and amount of deterioration of damage or other changes, moisture content of the hose at any particular time, and other factors.

Parker manufactures a special hose for conveying paint in airless paint spraying applications. This hose is labeled "Electrically Conductive Airless Paint Spray Hose" on its layline and on its packaging. This hose must be properly connected to Parker fittings and properly grounded in order to dissipate dangerous static charge buildup which occurs in all airless paint spraying. Do not use any other hose, even if electrically conductive, for airless paint spraying. Use of <u>any</u> other hose or failure to properly connect the hose can cause a fire or an explosion resulting in death, personal injury, and property damage.

Parker manufactures a special hose for certain compressed natural gas (CNG) applications where static electricity buildup may occur. Parker CNG hose assemblies comply with AGA Requirements 1-93, "Hoses for Natural Gas Vehicles and Fuel Dispensers". This hose is labeled "Electrically Conductive for CNG Use" on its layline and on its packaging. This hose must be properly connected to Parker fittings and properly grounded in order to dissipate dangerous static charge buildup which occurs in, for example, high velocity CNG dispensing or transfer. Do not use any other hose, even if electrically conductive, for CNG transfer where static charge buildup may occur. Use of <u>any</u> other hose in such application or failure to properly connect this hose can cause a fire or an explosion resulting in death, personal injury, and property damage. Care must also be taken to protect against dangerous gas permeation through the hose wall. See section 2.6, Permeation, for more information.

Parker CNG hose is intended for dispenser and vehicle use at maximum temperature of 180°F. Parker CNG hose should not be used in confined spaces or areas exceeding 180°F. Final Assemblies must be tested for leaks. **Caution:** Matches, candles, open flame or other sources of ignition shall not be used for this purpose. Leak check solutions should be rinsed off after use. Special care should be taken to ensure the hose is not kinked, twisted, torque, exposed to abusive environmental conditions specified in Section 2.9, or exceed the pressure requirements specified in Section 2.2, "Pressure". Hose assemblies should be tested on at least a monthly basis per Section 4.2 "Visual Inspection Hose/Fitting". Recommended procedures are to pressurize the hose and check for leaks and to visually inspect the hose for damage. Hose assemblies should be tested on a monthly basis for conductivity per AGA 1-93.

2.2 Pressure: Hose selection must be made so that the published maximum recommended working pressure of the hose is equal to or greater than the maximum system pressure. Surge pressures in the system higher than the published maximum recommended working pressure will cause failure or shorten hose life. Do not confuse burst pressure or other pressure values with working pressure and do not use burst pressure or other pressure values for this purpose.

2.3 **Suction:** Hoses used for suction applications must be selected to insure that the hose will withstand the vacuum and pressure of the system. Improperly selected hose may collapse in suction application.

2.4 **Temperature:** Be certain that fluid and ambient temperatures, both steady and transient, do not exceed the limitations of the hose. Temperatures below and above the recommended limit can degrade hose to a point where a failure may occur and release fluid. Care must be taken when routing hose near hot objects (e.g. manifolds) to properly insulate and protect the hose.

2.5 **Fluid Compatibility:** Hose selection must assure compatibility of the hose tube, cover, reinforcement, and fittings with the fluid media used. See the fluid compatibility chart in the Parker publication for the product being considered or used. This information is offered only as a guide. Actual service life can only be determined by the end user by testing under all extreme conditions and other analysis.

2.6 **Permeation:** Permeation (that is, seepage through the hose) will occur from inside the hose to outside when hose is used with gases, liquid and gas fuels, and refrigerants (including but not limited to such materials as helium, fuel oil, natural gas, or freon). This permeation may result in high concentrations of vapors which are potentially flammable, explosive, or toxic, and in loss of fluid. Dangerous explosions, fires, and other hazards can result when using the wrong hose for such applications. The system designer must take into account the fact that this permeation will take place and must not use hose if this permeation could be hazardous. The system designer must take into account all legal, government, insurance, or any other special regulations which govern the use of fuels and refrigerants. Never use a hose even though the fluid compatibility is acceptable without considering the potential hazardous effects that can result from permeation through the hose assembly.

Permeation of moisture from outside the hose to inside the hose will also occur in hose assemblies, regardless of internal pressure. If this moisture permeation would have detrimental effects (particularly but not limited to refrigeration and air conditioning systems), incorporation of sufficient drying capacity in the system or other appropriate system safeguards should be selected and used.

2.7 **Size:** Transmission of power by means of pressurized fluid varies with pressure and rate of flow. The size of the components must be adequate to keep pressure losses to a minimum and avoid damage due to heat generation or excessive fluid velocity.

2.8 **Routing:** Attention must be given to optimum routing to minimize inherent problems (kinking or flow restriction due to hose collapse).

2.9 **Environment:** Care must be taken to insure that the hose and fittings are either compatible with or protected from the environment (that is, surrounding conditions) to which they are exposed. Environmental conditions including but not limited to ultraviolet radiation, sunlight, heat, ozone, moisture, water, salt water, chemicals, and air pollutants can cause degradation and premature failure.

2.10 **Mechanical Loads:** External forces can significantly reduce hose life or cause failure. Mechanical loads which must be considered include excessive flexing, twist, kinking, tensile or side loads, bend radius, and vibration. Use of swivel type fittings or adapters may be required to insure no twist is put into the hose. Unusual applications may require special testing prior to hose selection.

2.11 **Physical Damage:** Care must be taken to protect hose from wear, snagging and cutting, which can cause premature hose failure.

2.12 **Proper End Fitting:** See instructions 3.2 through 3.5 below. These recommendations may be substantiated by testing to industry standards such as SAE J517.

2.13 **Length:** When establishing a proper hose length, motion absorption, hose length changes due to pressure, and hose and machine tolerances must be considered.

2.14 **Specifications and Standards:** When selecting hose and fittings, government, industry, and Parker specifications and recommendations must be reviewed and followed as applicable.

2.15 **Hose Cleanliness:** Hose components may vary in cleanliness levels. Care must be taken to insure that the assembly selected has an adequate level of cleanliness for the application.

2.16 **Fire Resistant Fluids:** Some fire resistant fluids require the same hose as petroleum oil. Some use a special hose, while a few fluids will not work with any hose at all. See instructions 2.5 and 1.5. The wrong hose may fail after a very short service. In addition, all liquids but pure water may burn fiercely under certain conditions, and even pure water leakage may be hazardous.

2.17 **Radiant Heat:** Hose can be heated to destruction without contact by such nearby items as hot manifolds or molten metal. The same heat source may then initiate a fire. This can occur despite the presence of cool air around the hose.

2.18 **Welding or Brazing:** When using a torch or arc-welder in close proximity to hydraulic lines, the hydraulic lines should be removed or shielded with appropriate fire resistant materials. Flame or weld spatter could burn through the hose and possibly ignite escaping fluid resulting in a catastrophic failure. Heating of plated parts, including hose fittings and adapters, above 450°F (232°C) such as during welding, brazing, or soldering may emit deadly gases.

2.19 **Atomic Radiation:** Atomic radiation affects all materials used in hose assemblies. Since the long term effects may be unknown, do not expose hose assemblies to atomic radiation.

3.0 HOSE AND FITTING ASSEMBLY AND INSTALLATION INSTRUCTIONS

3.1 **Pre-Installation Inspection:** Prior to installation, a careful examination of the hose must be performed. All components must be checked for correct style, size, catalog number, and length. In addition, the hose must be examined for cleanliness, obstructions, blisters, cover looseness, or any other visible defects.

3.2 **Hose and Fitting Assembly:** Do not assemble a Parker fitting on a Parker hose that is not specifically listed by Parker for that fitting unless authorized in writing by the chief engineer of the appropriate Parker division. Do not assemble a Parker fitting on another manufacturers hose or a Parker hose on another manufacturers fitting unless (i) the chief engineer of the appropriate Parker division approves the assembly in writing, and (ii) the user verifies the assembly and the application through analysis and testing. See instruction 1.4 above.

The Parker published instructions must be followed for assembling the fittings on the hose. These instructions are provided in the Parker fitting catalog for the specific Parker fitting being used.

3.3 **Related Accessories:** Do not crimp or swage any Parker hose or fitting with anything but the proper listed Parker swage or crimp machine and dies and in accordance with Parker published instructions. Do not crimp or swage another manufacturers hose fitting with a Parker crimp or swage die unless authorized in writing by the chief engineer of the appropriate Parker division.

3.4 **Parts:** Do not use any Parker hose fitting part (including but not limited to socket, shell, nipple, or insert) except with the correct Parker mating parts, in accordance with Parker published instructions, unless authorized in writing by the chief engineer of the appropriate Parker division.

3.5 **Reusable/Permanent:** Do not reuse any reusable hose product that has blown or pulled off a hose. Do not reuse a Parker permanent (that is, crimped or swaged) hose fitting or any part thereof.

3.6 **Minimum Bend Radius:** Installation of a hose at less than the minimum listed bend radius may significantly reduce the hose life. Particular attention must be given to preclude sharp bending at the hose/fitting juncture.

3.7 **Twist Angle and Orientation:** Hose installations must be such that relative motion of machine components does not produce twisting.

3.8 **Securement:** In many applications, it may be necessary to restrain, protect, or guide the hose to protect it from damage by unnecessary flexing, pressure surges, and contact with other mechanical components. Care must be taken to insure such restraints do not introduce additional stress or wear points.

3.9 **Proper Connection of Ports:** Proper physical installation of the hose requires a correctly installed port connection insuring that no twist or torque is transferred to the hose.

3.10 **External Damage:** Proper installation is not complete without insuring that tensile loads, side loads, kinking, flattening, potential abrasion, thread damage, or damage to sealing surfaces are corrected or eliminated. See instruction 2.10.

3.11 **System Checkout:** All air entrapment must be eliminated and the system pressurized to the maximum system pressure and checked for proper function and freedom from leaks. Personnel must stay out of potential hazardous areas while testing and using.

3.12 **Routing:** Hose should be routed in such a manner so if a failure does occur, oil mist will not come into contact with hot surfaces, open flame, or sparks, and the chance of personal injury is minimized.

4.0 HOSE AND FITTING MAINTENANCE INSTRUCTIONS

4.1 Even with proper selection and installation, hose life may be significantly reduced without a continuing maintenance program. Frequency should be determined by the severity of the application and risk potential. A maintenance program must be established and followed by the user and, at minimum, must include instructions 4.2 through 4.7, listed below.

4.2 **Visual Inspection Hose/Fitting:** Any of the following conditions require immediate shut down and replacement of the hose assembly:
- Fitting slippage on hose,
- Damaged, cut or abraded cover (any reinforcement exposed);
- Hard, stiff, heat cracked, or charred hose;
- Cracked, damaged, or badly corroded fittings;
- Leaks at fitting or in hose;
- Kinked, crushed, flattened or twisted hose; and
- Blistered, soft, degraded, or loose cover.

4.3 **Visual Inspection All Other:** The following items must be tightened, repaired or replaced as required:
- Leaking port conditions;
- Remove excess dirt buildup;
- Clamps, guards, shields; and
- System fluid level, fluid type and any air entrapment.

4.4 **Functional Test:** Operate the system at maximum operating pressure and check for possible malfunctions and freedom from leaks. Personnel must avoid potential hazardous areas while testing and using the system.

4.5 **Replacement Intervals:** Specific replacement intervals must be considered based on previous service life, government or industry recommendations, or when failures could result in unacceptable downtime, damage, or injury risk. See instructions 1.2 above.

4.6 **Inspecting a Pressurized System:** Hydraulic power is accomplished by utilizing high-pressure fluids to do work. Hoses, fittings, and hose assemblies all contribute to doing work by transmitting fluids at high pressures. Fluids under pressure can be dangerous and potentially lethal and, therefore, extreme caution must be exercised when working with fluids under pressure and handling the hoses transporting the fluids. From time to time, hose assemblies will fail. Usually these failures are the result of some form of misapplication, abuse, or simply wear. When hoses fail, generally the high-pressure fluids inside escape in some sort of stream which may or may not be visible to the user. Under no circumstances should the user attempt to locate the leak by "feeling" with their hands or any other part of their body. High-pressure fluids can and will penetrate the skin and cause severe tissue damage and possibly loss of limb. Even seemingly minor hydraulic fluid injection injuries must be treated by a physician with knowledge of the tissue damaging properties of hydraulic fluid.

If a hose failure occurs, immediately shut down the equipment and leave the area until pressure has been completely released from the hose assembly. Simply shutting down the hydraulic pump may or may not eliminate the pressure in the hose assembly. Many times check valves, etc., are employed in a system and can cause pressure to remain in a hose assembly even when pumps or equipment are not operating. Tiny holes in the hose, commonly known as pinholes, can eject small, dangerously powerful but hard to see streams of hydraulic fluid. It may take several minutes or even hours for the pressure to be relieved so that the hose assembly may be examined safely.

Once the pressure has been reduced to zero, the hose assembly may be taken off the equipment and examined. It must always be replaced if a failure has occurred. Never attempt to patch or repair a hose assembly that has failed. Consult the nearest Parker distributor or the appropriate Parker division for hose assembly replacement information.

Never touch or examine a failed hose assembly unless it is obvious that the hose no longer contains fluid under pressure. The high-pressure fluid is extremely dangerous and can cause serious and potentially fatal injury.

4.7 **Refrigerant gases:** Special care should be taken when working with refrigeration systems. Sudden escape of refrigerant gases can cause blindness if the escaping gases contact the eye and can cause freezing or other severe injuries if it contacts any other portion of the body.