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INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

INLET BARRIER FILTER SYSTEM

for the

Leonardo

A109 Series Helicopters

Model A109E, A109S & AW109SP

FAA STC No. SR02988CH

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Chesterfield, MO 63005-1211

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SIGNATURES

Revision		Name	Signature	Date
Initial Release	Prepared By:	Roger Wallis	Signed copy on file	10-06-2011
	Reviewed By:	Mark Johnson	Signed copy on file	10-06-2011
	Approved By:	Thomas Newman	Signed copy on file	10-06-2011
A	Prepared By:	Roger Wallis	Signed copy on file	06-08-2011
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LOG OF REVISIONS

Revision No.	Revision Description	Release Date
IR	Initial Release	03-03-2011
A	Added Note to Maintainer / Operator, and incorporated dimmer switch.	06-08-2011
B	Add STC number to cover page, and correct schematic in Appendix A, Figure A-34.	10-10-2011
C	Fixed minor typos throughout document. Replaced instances of Aerospace Filtration Systems and AFS with Donaldson Company and DCI throughout document. Replaced instances of Agusta S.p.A. with Leonardo throughout document. Updated webpage link in Section 1.9. Revised Section 6.3.b. Revised Figure 3-3 to Figure 6-3. Reduced required oil amount in Section 7.1.1 and Table 8-3. Added ZOK Cleaner to Section 7.1.2. Added new Figure A-28 and A-29 to add integrated dimming configuration resulting in a numerical increase for subsequent figure numbers and all references throughout document. Fixed incorrect quantities throughout Appendix A. Revised titles for Figure 1-1, Figure A-1 and Figure A-2 to include AW109.	11-27-2020

NOTICE TO THE MAINTAINER / OPERATOR

Any time an engine is replaced after installation of the AW109 IBF System P/N 124000-101, the maintainer/operator shall verify the engine has acceptable initial TOT margin. A Power Assurance Check (PAC) shall be performed and result with at least +15°C TOT margin with clean filters. The temperature margin with a healthy engine must be achieved and recorded in the aircraft log book. Subsequent PAC results shall result in at least +5°C TOT margin as long as the IBF system is installed. If the required temperature margin cannot be achieved and cannot be corrected by filter servicing or replacement, the maintainer/operator shall be responsible for resolving the low temperature margin of the engine by alternate means (engine repair or replacement) as required.

PROPRIETARY DATA STATEMENT

AFFECTIVITY

Affectivity for this ICA is for all Leonardo A109 Series Model A109E, A109S, and AW109SP helicopters with the Donaldson Company, Inc. (DCI) Inlet Barrier Filter (IBF) System installed.

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INSTRUCTIONS FOR CONTINUED AIRWORTHINESS
For the Donaldson Company, Inc. Engine Inlet Barrier Filter System
Installed on the Leonardo A109/AW109 Series Helicopters Model A109E, A109S, and AW109SP

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(Parts Figures)

NOTE: Actual Appendix A page number has “A-“ prefix followed by page number shown above.

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1 INTRODUCTION

1.1 SCOPE OF THIS MANUAL

These Instructions for Continued Airworthiness (ICA) provide the information required to perform the maintenance and repair of the DCI Inlet Barrier Filter (IBF) system installation on the Leonardo A109/AW109 Series Helicopters Model A109E, A109S, and AW109SP. This ICA should be used in conjunction with all pertinent aircraft manuals and all publications listed in the List of Applicable Publications (LOAP).

NOTE

Thoroughly review and become familiar with the Appendix A – Parts Figures section of this ICA before performing maintenance on the IBF system.

1.2 USE OF THIS MANUAL

The instructions that are given in this manual and those that have been changed by revisions, bulletins and/or alerts issued by Donaldson Company, Inc. (DCI), Leonardo or the Airworthiness Directives issued by the local Aviation Authority, shall be strictly followed.

1.3 DEFINITIONS / TERMINOLOGY

Actuator	An electromechanical linear actuator used to open/close bypass door.
Air intake screen	Course screen installed in the engine cowling on baseline configuration aircraft in lieu of EAPS or IBF, to prevent engine foreign object damage.
Brownout	A brownout condition is a zero visibility condition usually caused by hovering in a dusty environment.
Bypass	The bypass is an alternate air intake used only when the main engine air intake through the filter becomes clogged or blocked.
Bypass door assembly	The bypass door assembly is a combination bypass door and filter. There is one assembly for each engine inlet located on either side of a common bypass assembly base plate spanning the central beam within the aft end of the rear upper cowling. When bypass is closed, the auxiliary filter in each bypass door provides additional filtered air to that provided by the primary filter mounted on the engine cowl assembly. Each bypass door can be opened by a separate actuator to allow unfiltered air from the environment around the aircraft to be drawn into the engine should the filters become clogged or blocked. Either bypass door can be opened at any time by the pilot depressing the applicable cockpit indicator switch.

Cockpit indicator/switch	Cockpit indicator/switch is a multi-function device that serves as a push-button switch and a dual function indicator. There is one for each engine intake located on the instrument panel within easy reach of the pilot and labeled “IBF1” and “IBF2”. Each incorporates a push-button switch used to energize the actuator to open or close the applicable bypass door. When the filters on either side accumulate enough dirt/debris that the differential pressure across the filters reaches or exceeds a preset limit, a “FILTER” indication in the upper segment of the indicator will illuminate, and anytime the bypass door is in the full open position, a “BYPASS” indication in the lower segment of the indicator will illuminate.
Differential pressure	Difference between the ambient pressure and the pressure inside the engine intake plenum chamber, which is monitored by a differential pressure switch and a filter maintenance aid.
Filter	Refers to barrier type filter used to remove dust/dirt particulates prior to the air entering the engine intake. Each engine intake plenum has two filters: (1) the primary filter mounted on each engine cowling assembly, and (2) an auxiliary filter in each bypass door assembly.
Filter assembly	Filter media mounted in a structural frame with potting around the perimeter.
Filter downstream side	Side of the filter facing the engine intake plenum, i.e. clean side of the filter media.
Filter media	Multi-layered cotton gauze sandwiched between two stainless steel screens and saturated with specially formulated oil which allows the air to pass through with a very low drop in pressure but traps a very high percentage of the dust/dirt particles.
Filter pleats	Filter pleats are a series of peaks and valleys formed by the two layers of stainless steel screen that hold the media in place and are used to increase the available filter area.
Filter upstream side	Side of the filter facing the outside environment on which any dust/dirt in the air entering the engine intake plenum collects, i.e. dirty side of the filter media.
Inches of water	Unit of measure used for the differential pressure measured across the filter, as measured with a water manometer or similar apparatus.
Inlet	Inlet and intake used interchangeably.
Oiling	Process used to apply a uniform amount of oil on filter media.

On-condition	Indicates that servicing of the filter is based on any of the following: a failed Power Assurance Check (PAC) which is the result of a dirty filter, and/or any "FILTER" indication on the cockpit indicator/switch. A Filter Maintenance Aid (FMA) indication in the area marked in "RED" observed during a preflight or maintenance check is also a basis for servicing of the filter.
Plenum chamber	Area contained between the IBF filter assembly and the engine inlet.
Service cycle	Period starting when a filter is cleaned, oiled and placed into service and ending when the filter is removed for its next cleaning and oiling.

1.4 ACRONYMS

AFS = Aerospace Filtration Systems, Inc.
ATA = Air Transport Association of America, Inc.
DCI = Donaldson Company, Inc.
DP = Differential Pressure
EAPS = Engine Air Particle Separator
FAR = Federal Aviation Regulation
FMA = Filter Maintenance Aid
FMS = Flight Manual Supplement
FOD = Foreign Object Damage
IBF = Inlet Barrier Filter
ICA = Instructions for Continued Airworthiness
IP = Installation Procedures
IPB = Illustrated Parts Breakdown
LOAP = List of Applicable Publications
NVG = Night Vision Goggles
OAT = Outside Air Temperature
PAC = Power Assurance Check
RFM = Rotorcraft Flight Manual
SAE = Society of Automotive Engineers
TCDS = Type Certificate Data Sheet
TIS = Time-In-Service
TOT = Turbine Outlet Temperature

1.5 WARNINGS, CAUTIONS, AND NOTES

Warning, cautions and notes are used throughout this manual to emphasize important and critical instructions.

WARNING

AN OPERATING PROCEDURE, PRACTICE, ETC. WHICH, IF NOT CORRECTLY FOLLOWED, COULD RESULT IN PERSONAL INJURY OR LOSS OF LIFE.

CAUTION

AN OPERATING PROCEDURE, PRACTICE, ETC. WHICH, IF NOT STRICTLY OBSERVED, COULD RESULT IN DAMAGE TO OR DESTRUCTION OF EQUIPMENT.

NOTE

An operating procedure, condition, etc. that is essential to highlight. A note includes supplemental data about the procedure, the practice, the condition, etc for the maintenance task.

1.6 UNITS OF MEASURE

U.S. Standard units of measure have been used in preparation of this manual. Typical units used in this manual include: inches of water measuring differential pressure, inch-pounds of torque, etc.

1.7 REFERENCE PUBLICATIONS

Reserved for future use.

1.8 LIST OF APPLICABLE PUBLICATIONS

Leonardo
A109 Series Technical Publications for Model A109E, A109S, and AW109SP

FAA
FAA Advisory Circular, AC 43.13-1B, Acceptable Methods, Techniques, and Practices – Aircraft Inspection and Repair

FAA Advisory Circular, AC 27-1B, Certification of Normal Category Rotorcraft

NOTE

Unless otherwise specified use standard torque values when tightening bolts. (Refer to Leonardo Maintenance Manual Standard Practices or AC 43.13-1B, Chapter 7)

1.9 DISTRIBUTION OF CHANGES

Changes shall be distributed by posting them on the DCI webpage:
https://www.donaldsonaerospace-defense.com/industries/rotorcraft.

NOTE

This webpage should be checked prior to the performance of any maintenance actions on the IBF system to confirm possession of the latest FAA approved revision. If access to the internet is not possible, contact DCI at (636) 300-5200 for assistance.

1.10 INDICATION OF CHANGES

All changes will be complete revisions with all pages marked with the latest revision letter. All changes since the last revision shall be marked with a black vertical bar on one side of the page.

1.11 SYSTEM DESCRIPTION AND OVERVIEW

a. The Leonardo A109E, A109S, and AW109SP Inlet Barrier Filter (IBF) system is offered to operators in one kit (DCI Kit No. 124000-101) providing a primary filter assembly and bypass system with integrated auxiliary filter to protect each engine inlet (See Figure 1-1).

b. The IBF system primary filter assemblies are located in the same location and in lieu of OEM basic Air Intake Screen (AIS) or Engine Air Particle Separator (EAPS). The IBF provides aircraft owner/operators a high performance engine air filtration option that significantly improves filtration efficiency over the EAPS. The IBF will increase the life of the engine through a dramatic reduction in erosion resulting from the substantial increase in filtration efficiency without significantly degrading engine performance. The DCI IBF system provides dust separation efficiencies exceeding 99% for Society of Automotive Engineers (SAE) AC Coarse and AC Fine dust as defined in specification SAE J726, Air Cleaner Test Code.

c. The IBF is a complete system in which safety, functionality and serviceability were major considerations in the design process. The major kit components include: LH/RH filter assembly, bypass assembly, IBF1/IBF2 cockpit indicator/switch, cowl seal and access (door) assembly. The bypass assembly has the following components for each engine inlet all mounted on a common base plate secured to the central beam and housed in the aft end of the rear upper cowling: bypass door assembly with integrated auxiliary filter, actuator, differential pressure switch, and filter maintenance aid. These components are accessible on the ground via the access door at the aft end of the rear upper cowling. A cowl seal is included in the kit to seal off the interface between the central beam and the upper end of the engine cowl assembly. Located at the end of this chapter in Figure 1-1 is an exploded view of the primary kit components with the exception of the cockpit components. For a detailed illustration of all kit components, see the Parts Figures at Appendix A.

d. The IBF1/IBF2 cockpit indicator/switch serves as both a push-button switch and a dual function indicator. The “FILTER” light alerts the pilot whenever the differential pressure has reached or exceeded a preset limit. The push-button switch energizes the actuator to open or close the respective bypass door. If the pilot elects to open the bypass door to bypass clogged filters, the “BYPASS” light will illuminate when the door reaches the full open position, and the “FILTER” light will go out when the differential pressure returns to within the normal operating range. A three-way toggle switch generally mounted on the overhead panel provides DAY, NIGHT, and NVG dimming for the FILTER/BYPASS indicators in both the IBF1 and IBF2 cockpit indicator/ switch.

e. The IBF system provides a means of monitoring the filter condition both in-flight and on the ground, and provides a bypass capability should flow through the filters for either inlet become restricted. In-flight, a differential pressure switch continuously measures the drop in pressure across the filters for each inlet, and triggers the cockpit indicator/switch to illuminate the "FILTER" indication cautioning the pilot any time the differential pressure across the filters reaches or exceeds a preset limit. At this point, the IBF is operating at approximately the same inlet differential pressure normally experienced with the EAPS installed. However since the EAPS requires the use of purge air, the IBF still has a performance advantage. As long as the FILTER light is illuminated, the pilot is required to monitor engine conditions for signs of engine degradation (i.e. TOT approaching limit, surge, stall, etc.). Although the pilot is able to open or close the bypass door at any time, to prevent possible engine damage it is recommended that the pilot only bypass the filter if engine degradation is observed.

f. A Filter Maintenance Aid (FMA) for each inlet is mounted at the aft end of the rear upper cowling and displays the maximum differential pressure across the filter reached since it was last reset, generally during the last flight. The FMA is only accessible through the access door on the ground, providing the pilot or mechanic the ability to visually gauge the current condition of the filters. This gives the mechanic the ability to forecast when servicing of the filters will be required. FMA can be reset by depressing the yellow button marked "PUSH TO RESET" located on one end of the Filter Maintenance Aid (See Figure 3-1).

g. The design of the bypass system allows the ground crew to cycle either bypass door with power on the aircraft. The button on the cockpit indicator/switch can be depressed to actuate the bypass doors open, and then depressed again to actuate it closed. Full functional verification of the bypass system including all electromechanical components and the filter maintenance aid is possible during routine maintenance (see Chapter 8).

h. Removal of each primary filter assembly for servicing is easily achieved by removal of the attach bolts. Removal of each bypass door assembly with integrated auxiliary filter for servicing is achieved by retraction of the actuator, removal of the actuator attach bolt and removal of the bolts securing the door hinge to the base plate.

NOTE: Cockpit components (cockpit indicator/switches and circuit breakers), some wiring and cowling mod excluded.

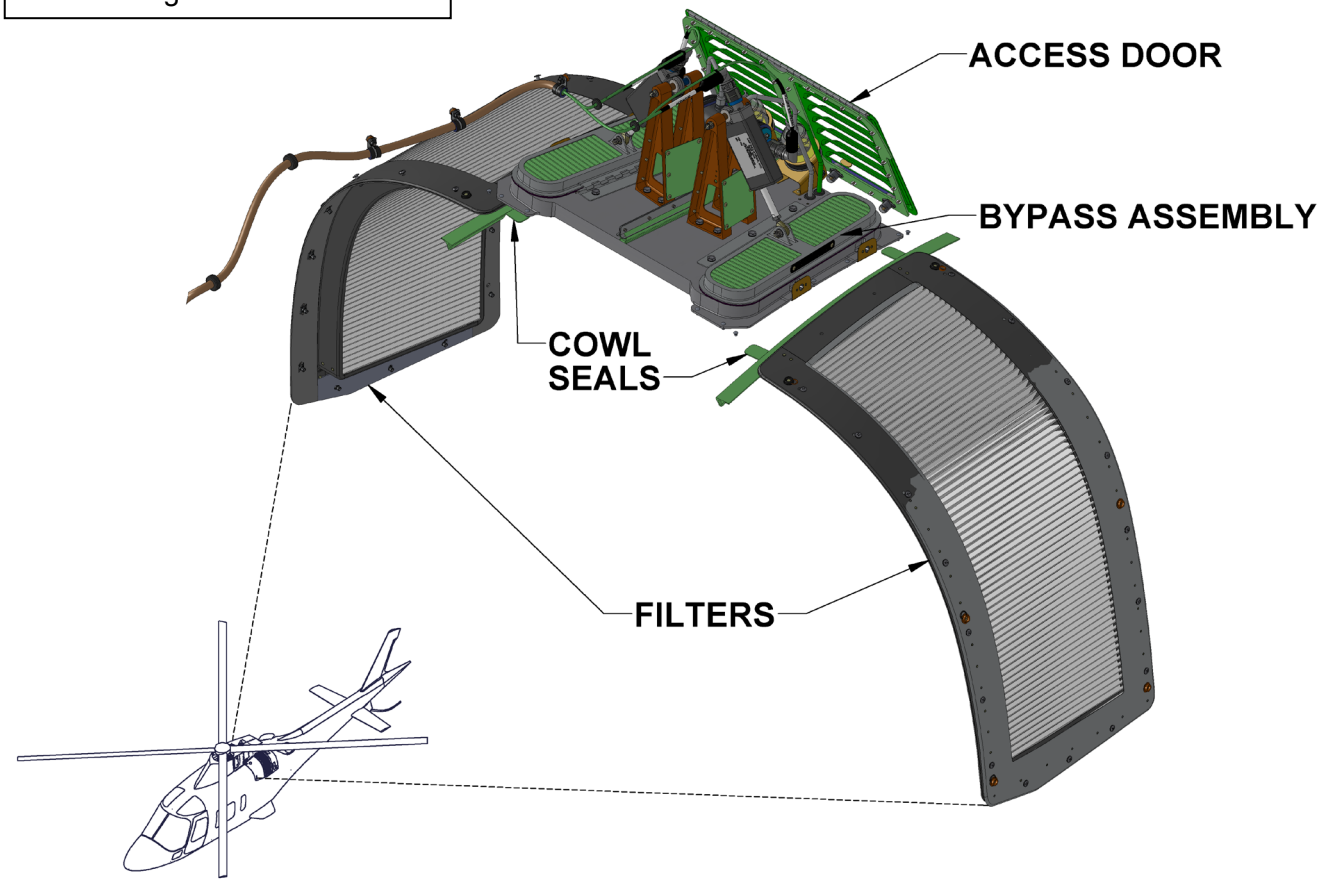


Figure 1-1: A109/AW109 IBF SYSTEM KIT (P/N: 124000-101) PRIMARY COMPONENT INSTALLATION

2 AIRWORTHINESS LIMITATIONS

AIRWORTHINESS LIMITATIONS
FAA APPROVAL BLOCK

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

Revision	Date of FAA Signature	FAA Signature
Initial Release	N/A	Not Signed: Administrative Change
A	08-17-2011	Tim Smyth
B	10-27-2011	Tim Smyth
C	11-24-2021	JOHN M TALLAROVIC Digitally signed by JOHN M TALLAROVIC Date: 2021.11.24 13:15:07 -06'00'

2.1 GENERAL

The Airworthiness Limitations for the DCI Inlet Barrier Filtration system (IBF) as installed on Leonardo model A109E, A109S, AND AW109SP helicopters are FAA approved.

NOTE

The retirement life given or the failure to give a retirement life to a component does not constitute a warranty of any kind. The only warranty applicable to any component is the warranty included in the Purchase Agreement for the helicopter or the component.

2.2 FILTER RETIREMENT LIFE

After fifteen (15) cleaning and oiling service cycles, the filter (primary or auxiliary) must be removed from service at the next service interval. The filter data tag is scribed after each cleaning and oiling cycle (see Section 6.2). When all numerals (1-15) on the data tag have been scribed out, the filter shall be removed from service at the next service interval. No further cleaning cycles are authorized.

2.3 LIFE LIMITED COMPONENTS

The only life limited component feature is the maximum number of filter cleanings (see Section 2.2).

3 INSPECTION REQUIREMENTS AND OVERHAUL

3.1 INSPECTION REQUIREMENTS

3.1.1 GENERAL REQUIREMENTS

a. Inspection of the IBF system consists, in general terms, of inspection of the following: the filter assemblies/seals, structural components, and the system and electrical components. These assembly/component inspection intervals are based on hours after initial installation or are "on condition" as required. The components of the system are divided, generally as a scope of work, into Filter Assemblies/Seals, Structural Components, and the Systems and Electrical Components as is done throughout the manual.

b. Refer to the Appendix A - Parts Figures for component illustrations that provide supplemental information relative to proper assembly, configuration, orientation, and locations for all components to be inspected per Chapter 3 and Table 3-1. Refer to Appendix A, Figure A-2 for the primary component kits included in the DCI A109/AW109 IBF Kit P/N 124000-101.

c. Table 3-1 gives a recommended inspection schedule for the components of the system. The Trouble-Shooting Guide, Table 8-1 found near the end of Chapter 8, also gives additional guidance when performing inspections and encountering trouble with the system. Chapter 8 also provides specific inspection guidance and removal/installation procedures for each component and is structured in the same three major groups as discussed above.

3.1.2 FILTER ASSEMBLY/SEAL INSPECTIONS

a. The following inspections pertain to all filter assemblies and associated components including: each primary filter assembly mounted in the engine cowling assembly, each bypass door assembly with integrated auxiliary filters, and all associated seals/fasteners.

b. ON-CONDITION UP TO TIS LIMIT: Any steady illumination of the "FILTER" caution light indication on the IBF cockpit indicator/switch or failed PAC or FMA indication in the "RED" requires a conditional inspection in accordance with Table 3-1.

c. VISUAL: All filter assembly components (including seals and fasteners) are to be visually inspected every annual in accordance with Table 3-1 checking for the following: filter media for tears, punctures, uneven or damaged pleats; seals for tears/damage; frame components for corrosion, cracks, distortions near attach holes, and check for missing or damaged fasteners.

3.1.3 STRUCTURAL COMPONENT INSPECTIONS

VISUAL: All structural IBF components are to be inspected in accordance with Table 3-1 annually. These components and any associated aircraft interface (as applicable) include the following: filter install modifications to the Leonardo engine cowl assembly, bypass assembly components (including base plate, FMA brackets, differential pressure switch brackets, actuator hangar assemblies, bypass door assemblies with integrated auxiliary filters, door seals and web seal), web doublers, access (door) assembly, cowl seal and associated hardware.

3.1.4 SYSTEMS AND ELECTRICAL COMPONENT INSPECTIONS

VISUAL: The systems and electrical components are to be visually inspected in accordance with Table 3-1 at every 300 hours/annual inspection. These components include the following for each engine inlet installation: wiring, connectors, backshells, circuit breaker, dimmer switch if applicable, cockpit indicator/switch, differential pressure switch, actuator, and filter maintenance aid.

FUNCTION CHECK: Certain systems and electrical components are also to be function checked in accordance with Table 3-1 at every annual inspection. These components include the following for each engine inlet installation: circuit breaker, cockpit indicator/switch, differential pressure switch, actuator (i.e. actuation and rigging), dimmer function and filter maintenance aid.

FMA CHECK: The FMA check is performed to ascertain the current condition of the filter (i.e. how dirty the filter is now) or to trend the change in differential pressure across the filter (i.e. how rapidly the filter is approaching the service limit). The FMA check is only a check of the indicator reading (See Figure 3-1). As such it is not considered an inspection of the FMA. The inspection Table 3-1 does not require a specific "inspection" interval of the FMA. The condition of the filter assembly and its accumulation of dirt will show up as an indication on the FMA. Operational environment more so than time-in-service dictate how often the FMA should be checked in order to help determine the next filter assembly service requirement. It is an aid in scheduling servicing of the filter assembly. At any time prior to an FMA indication in the "RED" (See Figure 3-1), failed PAC, or steady illumination of the "FILTER" indication on the cockpit indicator/switch, when maintenance or flight personnel judge it is warranted, the filter may be serviced or replaced. For example servicing of the filter may be warranted based on trend data and the fact that the aircraft will be operated in a remote or off-site location without the ability to readily service the filter. See Section 7.2 for a further description of the use of the FMA as it relates to the filter assembly service interval and Section 7.3 for filter servicing procedures.

NOTE

The Filter Maintenance Aid is designed to hold the highest differential pressure across the filter assembly reached since it was last reset (usually during the last flight), and should be reset after servicing of the filter assembly by depressing the yellow button marked "PUSH TO RESET" located on the end of the filter maintenance aid (See Figure 3-1).

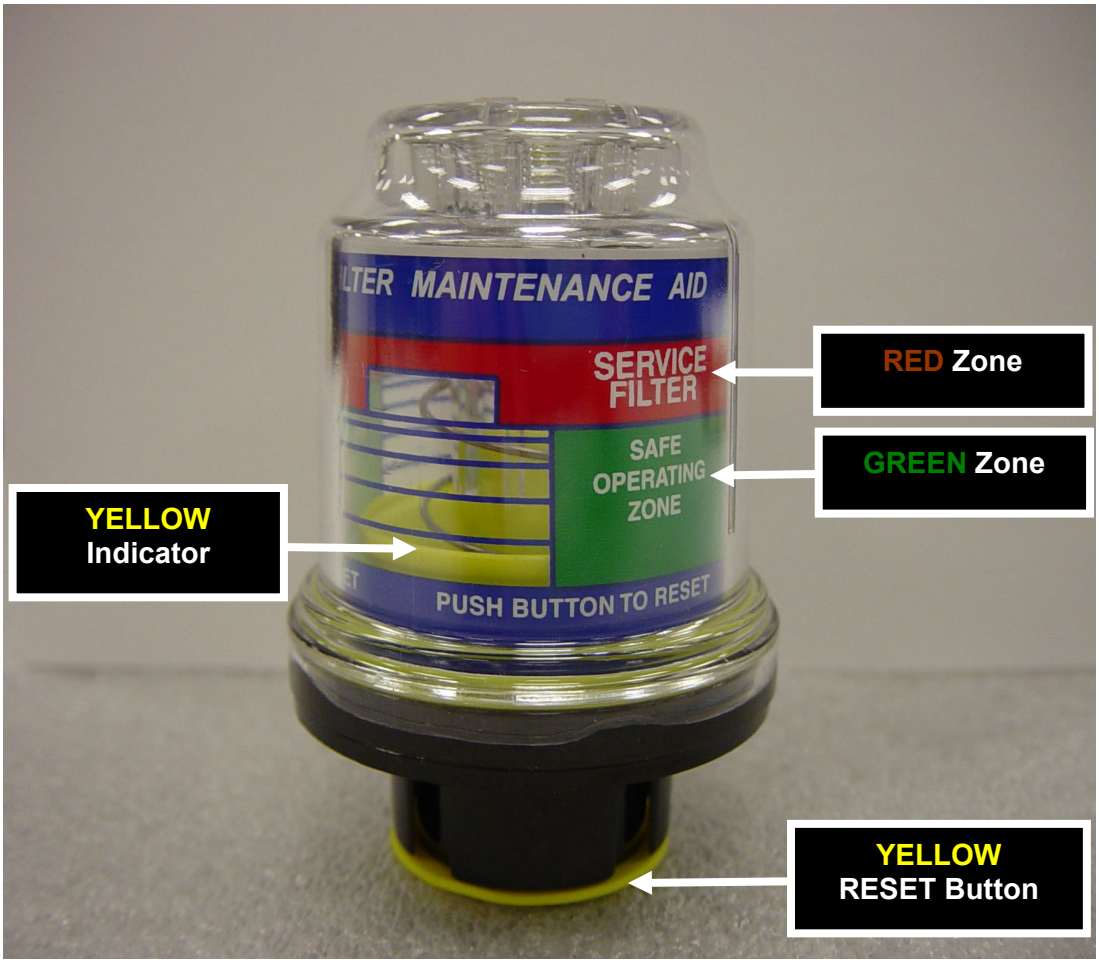


Figure 3-1: FILTER MAINTENANCE AID (FMA)

"YELLOW Indicator" position relative to SAFE OPERATING ZONE ("GREEN Zone") or SERVICE FILTER ("RED Zone") markings defines current filter condition, and pushing "YELLOW RESET Button" resets indicator.

Table 3-1: Inspection Intervals

Components	Inspection Type	Inspection	Inspection Intervals			
			Scheduled		Time-in-Service	Notes
			300 Hrs.	Annual		
Filter Assembly/Seal as defined in sec. 3.1.2.	Conditional	1. On-Condition up to TIS Limit			300 hrs / 1 yr	2, 3, 4, 5, 6, 7
	Scheduled	2. Visual		X		1, 2, 4
Structural Components as defined in sec. 3.1.3.	Scheduled	1. Visual		X		1, 2, 4, 6
Systems and Electrical Components as defined in sec. 3.1.4.	Scheduled	1. Visual	X	X		1, 2, 4
	Scheduled	2. Function Check		X		1, 2, 4, 5

NOTES:

1. Refer to Chapter 8 for specific inspection requirements and functional check procedures.
2. Refer to Chapter 4 for access information.
3. This inspection is required when any steady illumination of the FILTER light indication or failed PAC (where the failed PAC is the result of a dirty filter assembly) or FMA indication in the “RED” occurs.
4. Reference Appendix A - Parts Figures.
5. Reference Trouble-Shooting Guide, Table 8-2 of this manual.
6. Perform a visual inspection checking for deformation, buckling, corrosion, cracks, dents, tears, or other signs of damage. If evidence of damage is found, repair/replace component in accordance with procedures in Chapter 8 or contact DCI for disposition.
7. The maximum filter service interval between cleanings under any conditions is 300 flight hours or 1 year TIS, whichever comes first. Up to the TIS limit, the inspection of the filter assembly is “On-Condition” and required any time one of the following occur: a steady illumination of the “FILTER” light indication on the cockpit indicator/switch, failed PAC (where the failed PAC is the result of a dirty filter assembly), and/or FMA indication in the “RED”.

3.2 OVERHAUL REQUIREMENTS

There are no overhaul intervals or requirements applicable to this product at this time.

3.3 SPECIAL INSPECTIONS (CONDITIONAL INSPECTIONS)

In addition to the inspections required by the aircraft maintenance manuals, the following unscheduled special inspections/checks must be performed after encountering the following condition(s).

3.3.1 HARD LANDING

If a hard landing is suspected or has occurred, the following inspections/checks shall be complied with:

a. Visually inspect filter assemblies, and all structural and systems components (as defined in Sections 3.1.2, 3.1.3 and 3.1.4) for cracks, warping/distortion, and/or loose hardware. Refer to Sections 8.3, 8.4 and 8.5 of this document for inspection guidance. If evidence of damage is found, contact DCI for disposition or replacement.

b. Perform actuator function check to ensure the bypass door is not misaligned and that it operates and seals properly. Refer to Section 8.5 of this document for check/inspection guidance and troubleshooting procedures.

3.3.2 LIGHTNING STRIKE

If a lightning strike is suspected or has occurred, the following inspections/checks shall be complied with:

a. Visually inspect all external surfaces of the filter assemblies, bypass assembly, and louvered access door for damage. Refer to Sections 8.2, 8.3 and 8.4 of this document for inspection guidance. If evidence of damage is found, contact DCI for disposition or replacement.

b. Perform function check of all systems and electrical components. Refer to Section 8.5 of this document for check/inspection guidance and troubleshooting procedures.

4 ACCESS PANELS

4.1 GENERAL DESCRIPTION

This chapter addresses how to access the major IBF system components for servicing or maintenance.

4.2 ACCESS FOR MAINTENANCE

4.2.1 ACCESS TO FMA AND DP SWITCH ASSEMBLIES

Access for maintenance of the FMA (filter maintenance aid) and the DP (differential pressure) switch and related components, is accomplished through the louvered access door at the aft end of the aircraft rear upper cowling or by removing the aircraft rear upper cowling (see Figure 4-1). See Chapter 8 for component removal/installation procedures, adjustment/calibration/repair procedures, inspection criteria, and troubleshooting guide.

4.2.2 ACCESS TO BYPASS ACTUATOR ASSEMBLY

Access for maintenance of the actuator assembly and related components, is generally best accomplished by removing the aircraft rear upper cowling although some minor maintenance/troubleshooting may be accomplished through the louvered access door at the aft end of the rear upper cowling (see Figure 4-1). See Chapter 8 for component removal/installation procedures, inspection, troubleshooting guide, adjustment/calibration/repair procedures.

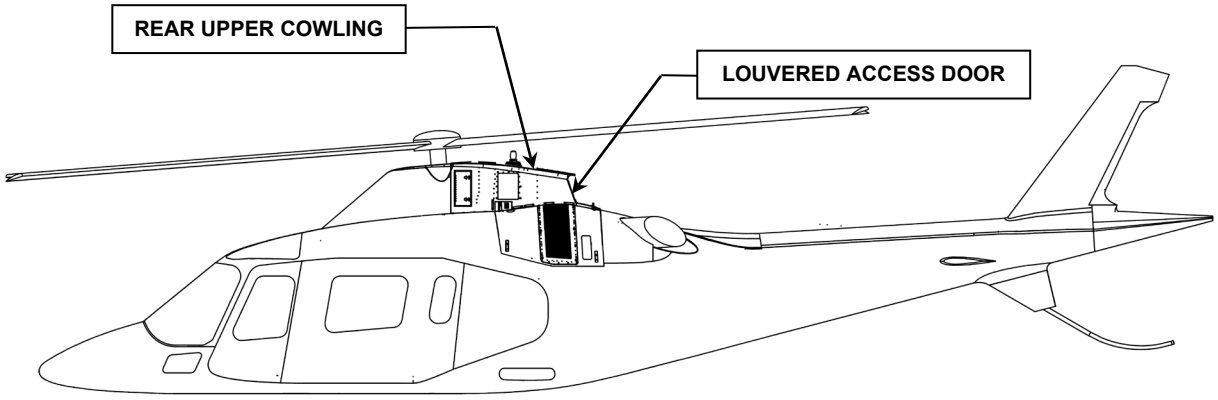


Figure 4-1: COMPONENT ACCESS

5 STORAGE

CAUTION

NEVER INSTALL A FILTER ASSEMBLY AND/OR OPERATE AN AIRCRAFT WITH A FILTER INSTALLED WHERE THE FILTER MEDIA HAS NOT BEEN PROPERLY OILED.

Long-term storage has no effect on filter assembly reliability if stored un-oiled (dry) in a cool, dry location to discourage possible fungus growth. After storage, the only maintenance to be performed on the filter before installation on the aircraft is filter media oiling. Refer to filter servicing Section 7.3.

6 PLACARDS, DATA PLATES, AND MARKINGS

6.1 MARKING – PART NUMBER / PMA / SERIALIZATION

The aircraft IBF system installation is marked on the RH aft edge of the bypass assembly base plate to contain the top level part number, the serial number of the system, and the FAA PMA markings.

6.2 DATA PLATE – FILTER ASSEMBLY

Each IBF primary filter assembly (LH P/N 124300-101 & RH P/N 124300-102) and each bypass door assembly with integrated auxiliary filter (P/N 124375-101) have a data plate similar to that shown in Figure 6-1. Each time a filter assembly is serviced (i.e. cleaned); an "X" must be marked through one of the unmarked "Record No. of Cleanings" boxes on the serviceability tag. When the last unmarked box is crossed through, the filter assembly must be replaced at the next servicing. See Chapter 7 for servicing procedures.

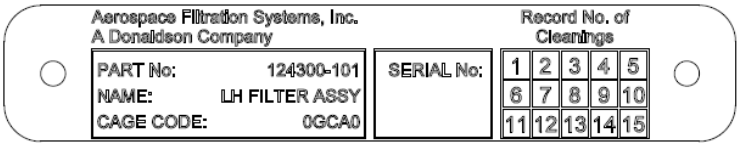


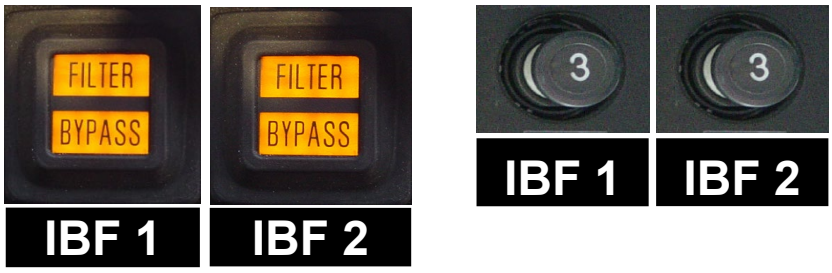
Figure 6-1: EXAMPLE OF LH FILTER ASSEMBLY DATA PLATE

6.3 PLACARDS / MARKINGS - COCKPIT

a. A cockpit indicator/switch for each engine inlet IBF bypass system is located on the center console (instrument panel) within view and easy reach of the pilot and a 3-amp circuit breaker for each engine inlet IBF bypass system circuit is located in the overhead console. As shown in Figure 6-2(A)/(B) markings include an "IBF1" or "IBF2" label below or above the applicable cockpit indicator/switch and circuit breaker.

NOTE

Both the IBF1 and IBF2 cockpit indicator/switch provide "FILTER" and "BYPASS" indications, as shown. However, in normal operations when not illuminated these fields appear black and only one or the other of these indications will normally be illuminated at any one time. See Section 1.11 IBF system description/operation at paragraph d for cockpit indicator/switch function/operation.



(A) Cockpit Indicator/Switch **(B) Circuit Breaker**

Figure 6-2: IBF BYPASS SWITCH AND CIRCUIT BREAKER MARKINGS

b. FOR INDEPENDENT DIMMING CAPABILITY ONLY - A common dimmer switch that controls both the IBF1/IBF2 cockpit indicator/switch is normally located in the overhead console. The alternate location is the console. As shown in Figure 6-3 markings include “IBF MODE” at the top, and markings of “DAY”, “NIGHT” and “NVG”, respectively at the top, middle and bottom switch position.

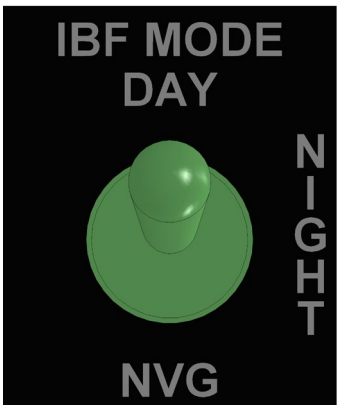


Figure 6-3: IBF DIMMER SWITCH MARKINGS

7 SERVICING

7.1 AUTHORIZED MATERIALS

CAUTION

USE OF ANY OIL OR CLEANER ON THE FILTER NOT AUTHORIZED BY DCI MAY RESULT IN DAMAGE TO THE FILTER AND/OR ENGINE.

NOTE

To order AFS filter oil or cleaner, contact DCI Sales by email at Aerospace.Americas@Donaldson.com **or by phone at (636) 300-5200.**

Service DCI filter assemblies with only DCI authorized oil/cleaner. AFS filter oil and cleaner can be procured as follows:

7.1.1 AFS FILTER OIL

- 8.8 oz. bottle - DCI P/N 100100-088 (size provided with each new primary filter)
- 0.8 oz. bottle - DCI P/N 100100-008 (size provided with each auxiliary filter*)
- 1 gallon container - DCI P/N 100101-000
- 5 gallon container - DCI P/N 100105-000

*Auxiliary filters are located in the bypass door assemblies, P/N 124375-101.

7.1.2 AFS FILTER CLEANER

- 1 gallon container - DCI P/N 100201-000
- 5 gallon container - DCI P/N 100205-000
- 6.6 gallon container - ZOK International Group Ltd P/N ZOK 27

NOTE

Refer to Chapter 8 for removal, inspection, repair and installation of filter assembly. Upon satisfactory inspection and completion of any required maintenance proceed with the rest of the filter assembly servicing instructions.

7.2 FILTER SERVICE INTERVALS

The filter service interval is based on the specific aircraft operating environment. The filter service intervals section is broken up in three parts: general requirements, prepared field operations and severe environment operations.

7.2.1 GENERAL REQUIREMENTS

NOTE

The maximum filter service interval between cleanings under any conditions is 300 flight hours or 1 year Time-In-Service (TIS), whichever comes first. Up to the TIS limit, the filter is considered an "on-condition" item.

NOTE

The FMA is an aid to help maintenance personnel and pilots ascertain the condition of the filters for each inlet at any point in time or to trend the accumulation of dirt on those filters over a period of time.

a. Up to the 300 flight hour/1 year TIS limit, the "on condition" requirement for servicing the filters is any of the following: steady illumination of the "FILTER" light indication on the cockpit indicator/switch, failed PAC (where failure of the PAC is due to an increase in differential pressure across the filter), and/or FMA indication in the "RED".

b. Upon any "FILTER" indication, where the pressure sensor and indicating system are working properly, monitoring of instruments during operation to ensure aircraft/engine limits are not exceeded is required. Service the affected filters as soon as practical. See filter servicing Section 7.3.

c. Upon any FMA indication in the area marked in "RED", servicing of the affected filters as soon as practical is recommended. See filter servicing Section 7.3.

d. The gradual increase in differential pressure across the IBF filters for each engine inlet causes an increase in the Turbine Outlet Temperature (TOT) required to produce a specified torque as measured during the PAC. A failed PAC due to an increase in differential pressure across the filters is cause for servicing of the affected filters. See filter servicing Section 7.3.

e. The filters may also be serviced, or replaced any time maintenance or flight personnel see a trend on the FMA that would warrant servicing of the filters due to operational considerations (i.e. when the aircraft will be operating in a remote or off-site location without the ability to readily service the filter). See filter servicing Section 7.3.

f. The maximum number of service cycles (i.e. cleanings) is limited to 15 for each primary and/or auxiliary filter assembly. Each filter assembly includes a data plate that must be marked to track filter service cycles in accordance with Section 6.2.

7.2.2 PREPARED FIELD OPERATIONS

a. During typical operations in and out of prepared airfields and landing sites, the IBF filter assembly should not require frequent servicing. DCI recommends that the filter maintenance aid (FMA) be checked about every 25 aircraft operating hours following the first installation and operation of an IBF system on an aircraft. This should be done to gauge the rate of engine performance degradation due to changes in engine inlet differential pressure as the filters accumulate dirt in operations considered "prepared fields" operations. Once an interval of time in flight hours is determined that provides discrete changes in the FMA, this interval can be repeated as long as there is no change in the environmental operating conditions.

b. This interval can be extended after sufficient flight data has been accumulated to establish a greater interval. Upon seeing increases in TOT and associated decreases in temperature margin/ available power, the inspection interval should again be shortened to about every 25 hours or less to enable scheduling of filter servicing without interruption of normal operations.

c. Ensure all filter servicing requirements defined in Section 7.2.1 are followed. Refer to Section 7.3 for servicing of the filter assembly.

7.2.3 SEVERE ENVIRONMENT OPERATIONS

a. When operating in an environment of high sand and dust levels, frequent servicing of the filter assembly may be required based on the time exposure and severity of the environment. Any operations in an environment that can result in "brownout" conditions should therefore be minimized or avoided to the maximum extent possible within the constraints of the operation. If extended time is accumulated operating in brownout conditions, monitoring of the FMA between shut down and start up will give an indication of the differential pressure trend based on the severe environment being flown in. Once an interval of time in flight hours is determined that provided discrete changes in the FMA, this interval can be repeated as long as the initial readings remain typical of the current operations.

b. Ensure all filter servicing requirements defined in Section 7.2.1 are followed. Refer to Section 7.3 for servicing of the filter assembly.

7.3 FILTER ASSEMBLY SERVICING

The filter assembly servicing section defines the procedures for pre-cleaning, cleaning, drying, and oiling the filter media in the filter assembly.

7.3.1 FILTER PRE-CLEANING

a. Servicing of the filter assembly is determined by the inspection requirements found in Chapter 3.

b. Prior to any cleaning operation gently brush the dirty side of the filter with a soft bristle brush similar to a soft paintbrush. Remove as much debris as practical from the filter before proceeding to the cleaning procedure.

7.3.2 FILTER CLEANING

CAUTION

DO NOT CLEAN DCI FILTER ASSEMLBIES WITH GASOLINE, SOLVENTS, PARTS CLEANERS, STRONG DETERGENTS, OR CAUSTIC CLEANING SOLUTIONS. USE OF ANY OF THESE WILL DAMAGE THE FILTER MEDIA AND/OR THE FILTER FRAMES.

CAUTION

DO NOT USE STEAM, HIGH-PRESSURE WASHERS OR COMPRESSED AIR TO CLEAN THE DCI FILTER ASSEMBLY. USE OF ANY OF THESE WILL DAMAGE THE FILTER MEDIA AND/OR THE FILTER FRAMES.

a. Spray AFS Air Filter Cleaner liberally onto the entire filter media (both sides) until the filter media is thoroughly soaked. If procured in bulk, transfer a smaller quantity to a spray bottle. A spray bottle provides a more uniform distribution of the cleaning agent.

b. Let the cleaner soak into the contaminants and filter media for 10 minutes.

c. Rinse the filter with low-pressure water. Use water out of a faucet or hose (without nozzle). Rinse opposite the direction of airflow, i.e., from the clean side to the dirty side. Orient the filter so the pleats are vertical, and begin to rinse in a gradual side-to-side motion starting at the top and working downward. Adjust the pace to correspond with the cleanliness of the water runoff. As long as the runoff is filled with debris and oil, do not proceed downward.

d. Upon completion, adjust the filter to clean from the dirty side to the clean side, pleats still vertical.

e. Repeat the rinsing procedure once again, until there is no visible debris on the surface and the runoff water is relatively clean.

f. When finished, flip the filter once again and repeat the rinse from clean side to dirty side.

g. Finally, rotate the filter from top to bottom, and perform the final rinse until the runoff water is free of all debris and oil.

7.3.3 FILTER DRYING

CAUTION

DO NOT USE COMPRESSED AIR TO DRY THE FILTER ASSEMBLY. COMPRESSED AIR WILL DAMAGE THE FILTER MEDIA.

CAUTION

DO NOT USE HEAT FROM ANY SOURCE TO DRY THE DCI FILTER ASSEMBLY. HEAT WILL SHRINK THE FILTER MEDIA AND/OR DAMAGE THE CORING MATERIAL WITHIN THE FILTER FRAMES.

a. After rinsing, shake off the excess water and let the filter assembly dry at room or outside air temperature (above freezing).

b. Ensure dirt or debris does not enter or contact the filter assembly while drying.

c. After filter assembly dries, mark the service cycle on data plate in accordance with the Section 6.2.

7.3.4 FILTER OILING

CAUTION

FILTER MEDIA MUST BE COMPLETELY DRY BEFORE OIL IS APPLIED. APPLYING OIL TO A FILTER THAT IS NOT COMPLETELY DRY CAN RESULT IN OIL NOT BEING ABSORBED INTO THE MEDIA AND THE POSSIBILITY OF OIL RESIDUE ACCUMULATING ON ENGINE COMPONENTS. DRYING TIME CAN VARY DEPENDING ON AMBIENT HUMIDITY LEVELS.

CAUTION

NEVER PUT A DCI FILTER ASSEMBLY IN SERVICE WITHOUT OILING IT.

CAUTION

USE ONLY AFS AIR FILTER OIL OR DCI APPROVED OIL.

NOTE

A squeeze bottle capable of accurately measuring out 8.8 or 0.8 fluid ounce(s) should be used when applying the oil to each primary or auxiliary filter assembly, respectively, as directed below.

NOTE

AFS Air Filter Oil is the only approved oil that includes a fungal inhibiter to help prevent the formation of fungus on the filter media when operating in high humidity environments.

NOTE

To ensure the filter is completely dry before oiling and quicker turn around, use of a spare filter is recommended.

a. The filter will not function properly if other types of oil are used. AFS Air Filter Oil is a unique blend of mineral and organic oil base stocks and special polymers that form a very efficient "tack barrier". Red dye is added to show areas of oil application. Do not use transmission fluid, any kind of motor oil, or diesel fuel to oil the DCI filter. Do not use "WD-40," "LPS," or any other type of lightweight spray lubricants to oil the DCI filter. Any of those products will damage the filter or degrade its filtering ability. A squeeze bottle allows for the controlled application of a specific amount of oil to the filter (See Figure 7-1).

b. Each primary filter requires 8.8 fl oz of filter oil and each auxiliary filter door assembly requires 0.8 fl oz of filter oil. Apply approximately ½ of the total amount of filter oil is to be applied to one side of a clean, dried filter assembly. Gently squeeze a small stream of oil along the entire length of each pleat peak, then flip the filter over and repeat this on the backside. Apply sparingly to ensure coverage of the entire filter.

c. Let the filter assembly sit for 20 minutes as the oil "wicks" into the surrounding filter media. Apply any remaining filter oil to any areas that are still white to complete the application of the appropriate amount of oil from the squeeze bottle.

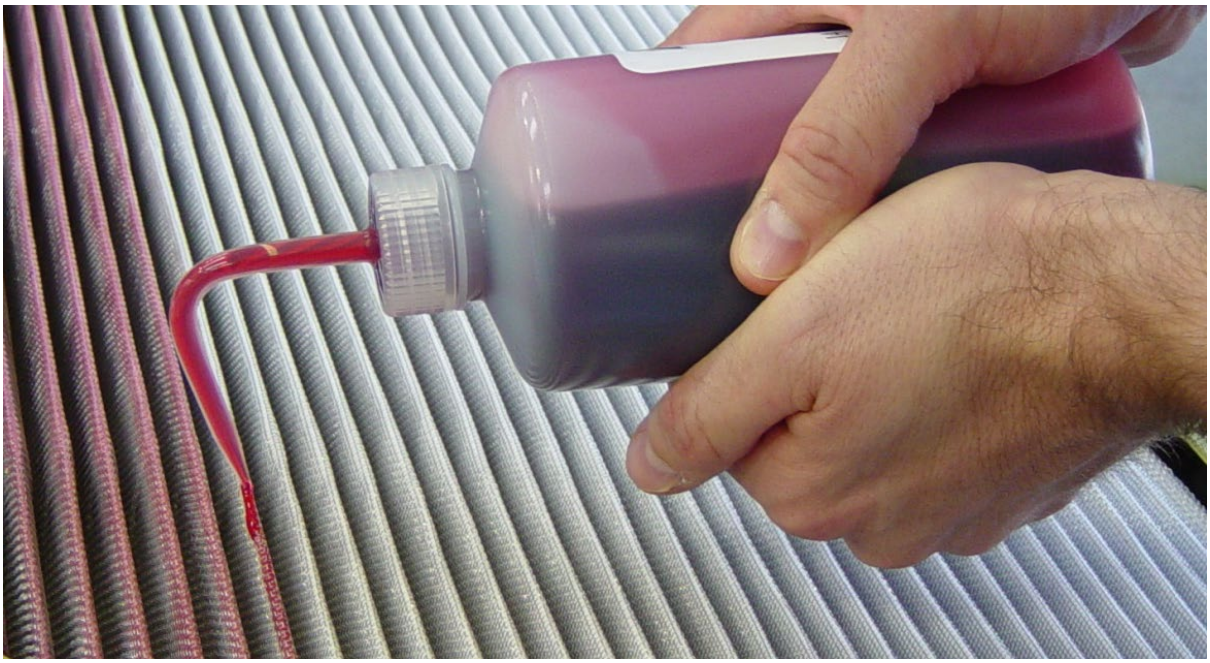


Figure 7-1: METHOD FOR OILING FILER MEDIA

7.4 STRUCTURAL COMPONENT SERVICING

There are no structural components requiring periodic servicing. See Chapter 3 for inspection requirements and Chapter 8 for maintenance requirements.

7.5 SYSTEMS AND ELECTRICAL SERVICING

There are no system and electrical components requiring periodic servicing. See Chapter 3 for inspection requirements and Chapter 8 for maintenance requirements.

NOTE

The Filter Maintenance Aid (FMA) is designed to hold the highest differential pressure reached across the filters for each engine inlet since last being reset (usually during the last flight), and should be reset after servicing of the applicable filters by depressing the yellow button marked "PUSH TO RESET" located on the end of the filter maintenance aid (See Figure 3-1).

7.6 AIRCRAFT WASHING

During aircraft washing the IBF system, including the filter assemblies, should be protected or removed to avoid damaging the filter media with high pressure spray nozzles and to prevent solvents rinsing away the oil in the filter media.

8 TROUBLESHOOTING AND MAINTENANCE

8.1 MAINTENANCE GENERAL

CAUTION

THOROUGHLY REVIEW AND BECOME FAMILIAR WITH APPENDIX A - PARTS FIGURES BEFORE PERFORMING MAINTENANCE ON THE IBF SYSTEM.

NOTE

Except where otherwise indicated, all torque values shall be in accordance with Leonardo technical manuals or FAA Advisory Circular AC 43.13-1B, Chapter 7.

a. Throughout the manual, the system is divided, generally as a scope of work, into the following major assemblies/components: (1) Filter Assembly/Filter Seal, (2) Structural Components, and (3) Systems / Electrical Components. Refer to Appendix A, Figures A-1 thru A-36. Table 3-1 gives a recommended inspection schedule for the components of the system. The troubleshooting guide in Table 8-2 provides additional guidance for performing inspections when encountering trouble with the system.

b. The maintenance chapter is organized by sub-sections for removal, inspection, troubleshooting, adjustment / calibration / repair, and installation of the major assemblies/components noted above, as applicable to the particular component. For some components a functional check is included. Not all components will require adjustment or calibration, or have any approved functional check or repair procedures. Contact DCI for possible repair and/or disposition when not listed in this manual. In some cases defective components will require replacement.

c. A general overview of the inspection requirements are as follows:

   i. Visually inspect all structural components for oversized or elongated holes, deformation, cracks, corrosion, missing fasteners or components, fretting, galling, etc. Any component exhibiting these conditions requires repair or replacement.

   ii. Visually inspect fasteners for damaged or missing threads, in both the bolt or screw and the nut or nut plate. If a self-locking fastener can be fully threaded by hand, replace the self-locking fastener.

   iii. Visually inspect all electrical connections for security, corrosion, arcing, breakdown of insulation, and overheating. Repair or replace components exhibiting defects. Inspect and repair components per Leonardo technical manuals or AC 43.13-1B, Chapter 11.

8.2 COMPONENTS - GENERAL DESCRIPTION

8.2.1 FILTER ASSEMBLY/FILTER SEAL

(Refer to Appendix A, Figures A-1 through A-5)

NOTE

Each bypass door assembly is also an auxiliary filter allowing additional filtered air to enter the engine air plenum when the bypass door is closed and unfiltered air to enter when the door is open. These filters are composed of the same filter media as the primary filter in each engine cowling assembly.

a. Filter Assembly – The primary filters are mounted on each of the engine inlet cowling assemblies. Each filter assembly is composed of the filter media (stainless steel mesh covering cotton gauze) bonded into the aluminum alloy frame assembly.

b. Filter Seal – Each filter seal is composed of four pieces of silicon sponge with Dacron backing, and is affixed to the engine cowl assembly.

8.2.2 STRUCTURAL COMPONENTS

(Refer to Appendix A, Figures A-1 thru A-4, A-6, A-7, A-15 thru A-17, A-19 and A-20)

The aircraft engine cowl assembly, central beam assembly and rear upper cowling assembly have all been structurally modified by installation of the IBF system kit. The structural components included in each of these mods are as follows:

a. Engine Cowl Assembly Mod – The engine cowl assembly for each engine has been modified by installation of the filter kit. This mod consists of the 19 nut plates (2 top, 7 forward, 7 aft & 3 bottom) riveted around the engine air intake opening to secure the filter assembly to the engine cowl assembly. As such, the modified Leonardo engine cowl assembly is considered a structural component in this chapter.

b. Central Beam Mod – The central beam has been modified by installation of the bypass kit and cowl seal kit. The bypass kit includes installation of the bypass system components for both engine inlets. These components are mounted on a single aluminum base plate spanning the central beam at the aft end of the rear upper cowling, which is riveted in place. The cowl seal kit is made up of a cowl seal affixed to each side of the central beam to seal the gap between the central beam and engine cowl assembly and prevent any leakage into the inlet plenum. Each cowl seal is composed of molded silicon sponge with Dacron backing on the top and bottom. The structural component(s) covered in this chapter include: the bypass doors, bypass door seals, and cowl seals. Each bypass door also serves as a small auxiliary filter when closed.

c. Rear Upper Cowling Mod – The rear upper cowling has been modified by installation of the access door kit and web doubler kit. The aft end of the rear upper cowling has been modified with two rectangular cutouts to allow installation of the access door kit. The kit is primarily made up of the access assembly and a doubler. The access assembly is a single louvered panel (or access door) made from aluminum sheet stock with a hinge at the top securing it to a doubler that is riveted to the aft end of the rear upper cowling. When closed the access door is secured at the lower end of the doubler with four fasteners. The access door allows maintenance personnel access to the bypass system components such as the filter maintenance aid for both engine inlets without removal of the rear upper cowling. The center web in the aft end of the rear upper

cowling has been modified by installation of the web doubler kit to provide clearance for the bypass assembly base plate. Two doublers have been added to the top side of the cutout over the base plate to stiffen the web and to provide a sealing surface for the web seal that runs down the center of the bypass assembly base plate. The structural component(s) covered in this chapter include: access assembly and web doublers.

DCI must be contacted for disposition of any structural components not covered in this chapter.

8.2.3 SYSTEMS AND ELECTRICAL COMPONENTS

(Refer to Appendix A, Figures A-1, A-2, A-8 thru A-14, A-21 thru A-36)

NOTE

Before returning any component, DCI must be contacted to obtain a Return Material Authorization (RMA) number and instructions.

a. Bypass Kit – This kit includes three major components of the bypass system for each engine inlet: the actuator, differential pressure switch, and filter maintenance aid (sometimes referred to as a maintenance indicator).

   i. Actuator – A linear actuator provides mechanical actuation to open or close the bypass door any time the pilot depresses the face of the cockpit indicator/switch. The construction details of the component do not warrant field maintenance. Repair of this component requires it be sent back to DCI for disposition or replaced.

   ii. Differential Pressure Switch - The differential pressure switch is an electromechanical device that provides a signal to the cockpit indicator/switch for annunciation of the "FILTER" light any time the differential pressure across the filter reaches or exceeds the preset limit. The construction details of the component do not warrant field maintenance. Repair of this component requires the component to be sent back to DCI for disposition or replaced.

   iii. Filter Maintenance Aid - The Filter Maintenance Aid (FMA) or maintenance indicator is an aid to help maintenance personnel ascertain the current condition of the filter and/or trend the change in differential pressure (i.e. the accumulation of dirt on the filter) to predict when servicing will be required. The FMA is also used by the flight crew on the ground to ascertain the current condition of the filter during the pre-flight inspection. The construction details of the component do not warrant field maintenance. Repair of this component requires it to be sent back to DCI for disposition or replaced.

b. Fwd Electrical Kit – This kit includes: the cockpit indicator/switch (the other major component of the bypass system for each engine inlet), plus the connector bracket and all associated wiring, connectors, backshells, and circuit breakers. All these components are located at or forward of the connector bracket.

   i. Cockpit Indicator/Switch - The cockpit indicator/switch is an electromechanical device that serves as a push-button switch to allow the pilot to open or close the bypass door and as a dual function indicator. The face of the switch, which normally appears black, is sectioned to provide indications top and bottom. The top half illuminates to display "FILTER" when the differential pressure between ambient and the plenum chamber (i.e. differential pressure across the filter) has reached the preset limit. The bottom section illuminates to display "BYPASS" when the actuator is fully retracted (i.e. the bypass door is in the full open position). The construction details of the component do not warrant field maintenance.

Repair or servicing of this component requires the component to be sent back to DCI for disposition or replaced.

ii. Connector Bracket – Upon installation of the IBF system, the aircraft connector bracket on the RH side of the aircraft was replaced with a new bracket designed to add the IBF DISC connector. In addition to the IBF DISC connector, this bracket on the A109E model aircraft supports the ANTICOLL LT DISC and XMSN DISC connectors and on the A109S/AW109SP model aircraft supports the ANTICOLL LT DISC, XMSN DISC and NR DISC connectors.

iii. Wiring/Connectors/Backshells/Circuit Breaker – The primary electrical system utilizes M27500-22RC type military specification shielded cables. The gauge and marking identification is specified on the wiring diagram. The connectors, backshells, and circuit breaker are military specification components, or where applicable, vendor designed components. The construction details of these components (other than wiring) do not warrant field maintenance.

c. Aft Electrical Kit – This kit includes all associated wiring, connectors, and backshells making up the IBF cable from the connector bracket aft through the rear upper cowling to the differential pressure switch and actuator. Disconnecting the IBF connectors at the bracket, differential pressure switches and actuators allows removal of the rear upper cowling.

i. Wiring/Connectors/Backshells – The primary electrical system utilizes M27500-22RC type military specification shielded cables. The gauge and marking identification is specified on the wiring diagram. The connectors and backshells are military specification components, or where applicable, vendor designed components. The construction details of these components (other than wiring) do not warrant field maintenance.

8.3 FILTER ASSY / FILTER SEAL

(Refer to Appendix A, Figures A-1 through A-5, A-6 through A-8, A-10, and A-12)

8.3.1 FILTER ASSY

NOTE

See 8.4.3 for removal/installation procedures when servicing auxiliary filters in each bypass door assembly. All other procedures in this section (pertaining to inspection, adjustment, and/or repair) also apply to the auxiliary filters in bypass door assemblies.

8.3.1.1 REMOVAL – LH OR RH FILTER ASSY

CAUTION

UPON REMOVAL OF EITHER FILTER ASSEMBLY, COVER THE ENGINE INLET (AS SOON AS THERE IS ACCESS TO THE INLET), TO PREVENT FOREIGN OBJECT DAMAGE (FOD).

a. To remove LH or RH filter assemblies – Remove the 19 (2 top, 7 each side & 3 bottom) bolts and washers that retain each filter assembly to the LH/RH engine cowl. (Refer to Appendix A, Figures A-3 and A-4.)

b. If necessary, use a plastic scraper to gently break any seal between the filter frame and the seal itself. The filter assembly must be carefully removed so as not to damage the filter seal. Inspect seal and remove/replace if damaged per 8.3.2.

8.3.1.2 INSPECTION – FILTER ASSY

NOTE

After servicing of the filter assembly or at any time the filter assembly is inspected, the pleats may require straightening or crimping. If you cannot see the bottom of the pleat, the airflow will be restricted and/or the pleats will adhere to one another when dirt loaded. Any restriction to the flow through the pleats will result in increased differential pressure and reduction in dirt loading capacity. In order to insure ideal flow characteristics through the filter media, the pleats must be straightened or crimped with a hand seamer (see Figure 8-1).

a. Visually inspect the pleats on both sides of the filter. If you cannot see the bottom of the pleat, when sighting the length, or depth of the pleat, straightening of the pleat is required. Refer to "Adjustment" for pleat straightening procedures.

b. If this inspection is in response to a FILTER light indication or failed PAC, perform troubleshooting per Table 8-2. If troubleshooting indicates a dirty filter, service filter per Section 7.3.

c. Inspect the filter assembly frame for cracks, gouges, distortion or deformation, corrosion, loose or missing fasteners, and missing or deteriorated protective coating. Refer to "Repair" for criteria / disposition. (Refer to Appendix A, Figures A-5.)

d. Inspect the filter seal. Refer to "Filter Seal" procedures.

8.3.1.3 ADJUSTMENT - FILTER

CAUTION

HAND SEAMER MUST BE LIMITED TO A MAXIMUM JAW DEPTH OF 1 1/4 INCH. A DEEPER JAW DEPTH CAN RESULT IN DEFORMATION OR DAMAGE TO THE ADJOINING PLEATS.

CAUTION

DO NOT OVER CRIMP AND CRUSH PLEAT; CARE MUST BE TAKEN TO SQUEEZE THE PLEATS WITHOUT DAMAGING THE PLEATED SCREEN. THE RADIUS AT THE TOP OF THE PLEAT SHOULD REMAIN INTACT, NOT CREASED.

a. If you cannot see the bottom of a pleat, use a hand seamer (See Special Tools/Special Equipment, Section 8.8.a.) to crimp and straighten the pleat (See Figure 8-1). Sight down the length and depth of the pleat to confirm the pleat is straightened.

b. Once one side is crimped, flip the filter over and crimp the other side as required following the guidance above. Use caution not to crush the pleats when straightening them. Use care to maintain the original radius, as much as possible, at the top of the pleat.

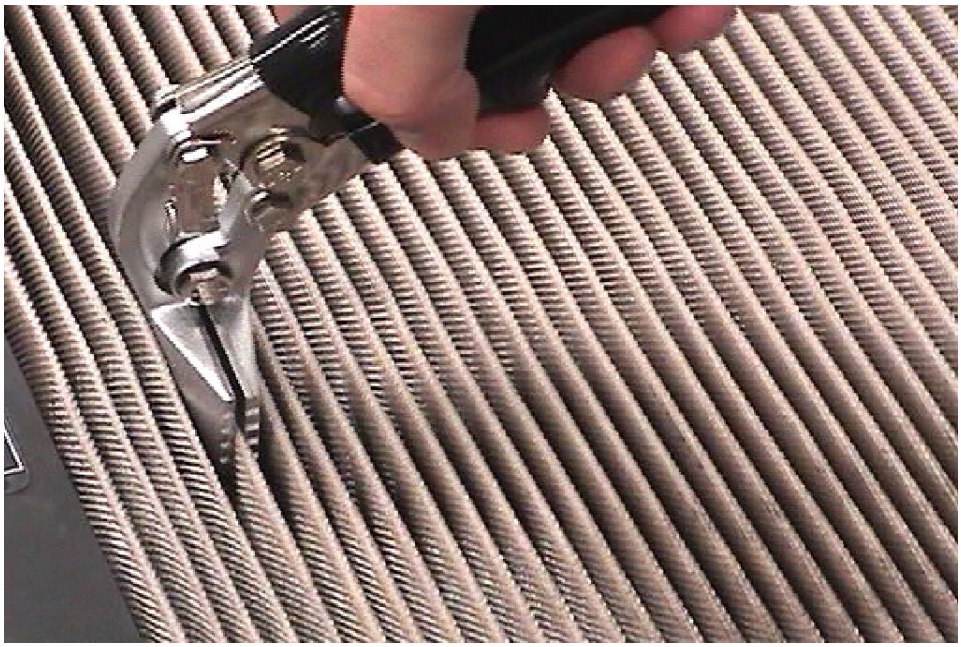


Figure 8-1: METHOD FOR STRAIGHTENING PLEATS WITH HAND SEAMER

8.3.1.4 CALIBRATION

Not applicable.

8.3.1.5 REPAIR - FILTER MEDIA, GENERAL

WARNING

ADHESIVE VAPORS (THAT MAY BE CONTAINED IN SEALING MATERIAL MIL-S-8802B TYPE 2 CLASS A), MAY CAUSE IRRITATION OF EYES, NOSE, AND RESPIRATORY SYSTEM. EYE AND SKIN CONTACT WITH MATERIAL MAY CAUSE IRRITATION. IF INGESTED, MAY CAUSE GASTRIC DISTRESS. FLUSH EYES WITH WATER FOR 15 MINUTES. WASH SKIN WITH SOAP AND WATER. IF INHALED, MOVE TO FRESH AIR. IN ALL CASES GET IMMEDIATE MEDICAL ATTENTION. WORK IN A WELL-VENTILATED AREA. WEAR GLOVES AND SAFETY GLASSES.

NOTE

Repair filter media damage after cleaning but prior to oiling of filters.

8.3.1.6 REPAIR - FILTER MEDIA, SMALL RUPTURES, TEARS, or HOLES

a. In the event of damage to the filter media, ruptures in the filter media may be repaired. Small ruptures defined as smaller than 0.500 inch diameter or length can be sealed shut without degradation of performance to the filter assembly. Each filter assembly may have up to 3 small rupture repairs, but no repair may be within 1" of an adjacent repair.

b. Prior to performing any of these repairs, the filter material must be cleaned of contamination and oil. Refer to Chapter 7 for cleaning of the filter assembly. Perform the repair to a cleaned and dry filter assembly. Each time the entire filter assembly is cleaned, repaired, and oiled, a mark shall be scribed on the filter assembly data plate in accordance with Section 6.2 indicating a cleaning cycle was performed.

c. Trim ruptures, tears, or holes in the filter media being careful not to exceed the 0.500 inches in length or diameter limit to remove loose material (wire or cotton gauze).

d. Seal the affected area using two-part sealant, MIL-S-8802B Type 2 Class A. Allow the sealant to bleed into the filter material and cure. Follow manufacturer's directions for proper mixing, application, and curing of the two-part sealant.

e. Proceed with oiling the filter. Refer to Chapter 7.

8.3.1.7 REPAIR - FILTER MEDIA, LARGE RUPTURES, TEARS, or HOLES

Larger ruptures exceeding 0.500 inch in size are not repairable in the field. Contact DCI for disposition and possible repair procedures, or discard the filter assembly.

8.3.1.8 REPAIR – FILTER ASSY, OTHER DAMAGE

a. The repair procedures defined above are for damage resulting in ruptures, tears, or holes in the filter media. The following is for field repairable damage to the filter assembly frame. Field repairable damage to the filter assembly frame is limited to blending of scratches and gouges, and / or the re-application of protective coatings. See Table 8-1 for application of protective coatings.

b. Any damage to the filter frames such as cracking requires the filter assembly to be returned to DCI for evaluation and disposition, or replacement. Any damage to the filter frames such as warping or distortion (to the extent that a good seal of the filter frame, when properly installed is not possible) requires the filter assembly be returned to DCI for evaluation and disposition, or replaced.

8.3.1.9 INSTALLATION

CAUTION

PRIOR TO INSTALLATION OF EITHER FILTER ASSEMBLY, REMOVE THE FOREIGN OBJECT DAMAGE (FOD) COVER FROM THE ENGINE INLET.

a. Clear intake plenum of any tools/foreign objects/debris before removing FOD cover from engine inlet.

b. Remove FOD cover from engine inlet.

c. Carefully locate filter assembly in intake opening in engine cowl assembly.

d. Properly secure filter assembly to the engine cowl using 19 bolts and washers (2 top, 7 each side & 3 bottom). Torque bolts to within 5-10 in-lbs with a minimum of 1 full thread visible. (Refer to Appendix A, Figures A-3 and A-4)

8.3.2 FILTER SEAL

NOTE

These procedures below pertain to the primary filter seal. See 8.4.4 for procedures pertaining to the bypass door seals.

8.3.2.1 REMOVAL

a. Gain access to the filter seal by removing the filter assembly. Refer to Section 8.3.1.1.

b. Mark outline of existing seal prior to removal for use when installing new seal.

c. Carefully remove the four piece seal (See Appendix A, Figure A-4, Items 6 through 9). Use a plastic scraper or other suitable tool to carefully peel the seal from the engine cowl assembly. Remove any adhesive remaining on the cowl assembly. Discard the removed seal.

8.3.2.2 INSPECTION

Inspect the filter seal for any tears, nicks, gouges, missing pieces or a permanent set or flattening of the seal. If the seal exhibits any of these conditions, repair or replace the seal.

8.3.2.3 TROUBLESHOOTING/ADJUSTMENT/CALIBRATION

Not applicable.

8.3.2.4 REPAIR

WARNING

ADHESIVE/SEALANT VAPORS MAY CAUSE IRRITATION OF EYES, NOSE, AND RESPIRATORY SYSTEM. EYE AND SKIN CONTACT WITH MATERIAL MAY CAUSE IRRITATION. IF INGESTED, MAY CAUSE GASTRIC DISTRESS. FLUSH EYES WITH WATER FOR 15 MINUTES. WASH SKIN WITH SOAP AND WATER. IF INHALED, MOVE TO FRESH AIR. IN ALL CASES GET IMMEDIATE MEDICAL ATTENTION. WORK IN A WELL-VENTILATED AREA. WEAR GLOVES AND SAFETY GLASSES.

a. Small tears, nicks, or gouges in the seal may be repaired using MIL-A-46146B3 Group II Type I OR MIL-A-46106B3 Group II Type I adhesive/sealant. Use a wooden tongue depressor, cotton swab, or similar tool to dab a small amount of sealant on the damage to repair tears, nicks, or gouges in the seal. Smooth sealant over damaged area to create a smooth flush repair similar to the original seal cross section. Allow to dry before re-installing filter. If the repair prevents the filter from properly sealing, replace the seal.

b. If the seal exhibits extensive tears, deep nicks or gouges, or missing pieces that would prevent the filter from properly sealing, replace the seal.

8.3.2.5 INSTALLATION

a. Gain access to the filter seal.

b. Mark outline of existing seal prior to removal. Refer to filter assembly removal and filter seal removal.

c. To install the new seal, apply MIL-A-46146B3 Group II Type I OR MIL-A-46106B3 Group II Type I adhesive/sealant to the foam side of the seal. Locate and apply the seal to the clean dry surface on the engine cowl assembly and press in place.

8.4 STRUCTURAL COMPONENTS

(Refer to Appendix A, Figures A-1 thru A-5, A-6 thru A-10, A-15 thru A-17, A-19 and A-20)

CAUTION

DURING ANY MAINTENANCE OPERATION WHERE REMOVAL OF THE FILTER ASSEMBLY OR OPENING / REMOVAL OF THE BYPASS DOOR IS REQUIRED, ACCESS AND COVER ENGINE INLET TO PREVENT FOREIGN OBJECT DAMAGE (FOD).

NOTE

Although not specifically stated in the following procedures, removal of the engine cowl assembly, rear upper cowling assembly and/or central beam from the aircraft may be required for maintenance or repair of the IBF structural components.

8.4.1 LEONARDO ENGINE COWL ASSEMBLY (FILTER INSTALL MOD)

(Refer to Appendix A, Figures A-1 thru A-5)

8.4.1.1 REMOVAL

a. Remove engine cowl assembly from aircraft per procedures in Leonardo maintenance manual.

8.4.1.2 INSPECTION

a. The area around the engine intake opening in the engine cowl assembly has been modified with addition of 19 nut plates (2 top, 7 forward, 7 aft & 3 bottom) to allow installation of the filter assembly. See Appendix A, Figures A-1 thru A-5. At these attach locations inspect for chafing or fretting, elongation of fastener holes, damage to nut plates and/or fasteners, corrosion, cracking, and deformation. Inspect seal between engine cowl assembly and filter assembly while installed on aircraft.

b. Inspection for the above conditions and any other conditions that may be applicable are defined in the Leonardo Helicopter technical manuals except as noted below.

c. Cracking. Visually inspect the attachment of all filter assembly nut plates for cracking using a 10x magnification glass at the corners, radiuses, and transitions in part thickness. Inspect suspect areas carefully using the 10x magnification. No cracks are allowed.

d. Warping or distortion. Visually inspect the assembly for any warping or distortion that keeps prevents proper sealing between the filter assembly and the engine cowl assembly.

e. Missing, damaged or loose associated components. Visually inspect the assembly for missing, damaged or loose nut plates.

8.4.1.3 TROUBLESHOOTING/ADJUSTMENT/CALIBRATION

Not applicable.

8.4.1.4 REPAIR

a. Cracks. No cracks are allowed in any part of the engine cowl assembly interface to the filter assembly. Cracks are not repairable. If crack exists in the nut plate, nut plate must be replaced. Any crack in the engine cowl assembly where nut plate is located requires disposition instructions from DCI.

b. Warping or distortion. Any warping or distortion of the engine cowl assembly that prevents the filter assembly from creating a proper seal to the cowl requires disposition instructions from DCI.

c. Missing, damaged or loose associated components. Replace missing or damaged components. Secure loose components.

8.4.1.5 INSTALLATION

a. Install engine cowl assembly to aircraft per procedures in Leonardo maintenance manual.

8.4.2 COWL SEAL

(Refer to Appendix A, Figures A-1, A-2, A-19 & A-20)

8.4.2.1 REMOVAL

a. Gain access to the cowl seal(s) on either side of the central beam being careful not to damage bypass assembly components and/or damage/contaminate filter(s).

b. Carefully remove cowl seal(s) from central beam. (Refer to Figure A-20)

c. Remove any remaining adhesive residue from the central beam.

8.4.2.2 INSPECTION

a. The central beam has been modified by installation of the cowl seal kit. This kit incorporates two seals with one on each side of the central beam and spanning the distance across the engine inlet plenum (Refer to Appendix A, Figure A-20). Each cowl seal has two tabs attached to the bottom of the central beam where the seals at the top of the forward and aft firewalls in the engine plenum mate. The cowl seal prevents leakage that may otherwise bypass the filter into the engine plenum due to existing gaps between the central beam and the engine cowl assembly.

b. Inspect each seal for any tears, nicks, gouges, missing pieces or a permanent set or flattening of the seal that would allow leakage. If the seal exhibits any of these conditions, repair or replace the seal.

8.4.2.3 TROUBLESHOOTING/ADJUSTMENT/CALIBRATION

Not applicable.

8.4.2.4 REPAIR

WARNING

ADHESIVE/SEALANT VAPORS MAY CAUSE IRRITATION OF EYES, NOSE, AND RESPIRATORY SYSTEM. EYE AND SKIN CONTACT WITH MATERIAL MAY CAUSE IRRITATION. IF INGESTED, MAY CAUSE GASTRIC DISTRESS. FLUSH EYES WITH WATER FOR 15 MINUTES. WASH SKIN WITH SOAP AND WATER. IF INHALED, MOVE TO FRESH AIR. IN ALL CASES GET IMMEDIATE MEDICAL ATTENTION. WORK IN A WELL-VENTILATED AREA. WEAR GLOVES AND SAFETY GLASSES.

a. Small tears, nicks, or gouges in the seal may be repaired using MIL-A-46146B3 Group III Type I or MIL-A-46106B3 Group III Type I adhesive/sealant. Use a wooden tongue depressor, cotton swab, or similar tool to dab a small amount of sealant on the damage to repair tears, nicks, or gouges in the seal. Smooth sealant over damaged area to create a smooth flush repair similar to the original seal cross section. Allow to dry. If the repair prevents proper sealing, replace the seal.

b. If the seal exhibits extensive tears, deep nicks or gouges, or missing pieces that would prevent proper sealing, replace the seal.

8.4.2.5 INSTALLATION

a. Carefully fit cowl seal(s) on side of central beam trimming tabs as necessary to get a snug fit. (Refer to Appendix A, Figure A-20)

b. Clean and prepare mating surfaces using applicable primer coat per adhesive/sealant manufacturer's instructions.

c. Coat mating surfaces using with MIL-A-46146B3 Group III Type I or MIL-A-46106B3 Group III Type I adhesive/sealant.

d. Install seals as depicted in referenced figure and gently clamp in place until cured.

e. Re-install any aircraft components removed to gain access per procedures in Leonardo maintenance manual being careful not to damage bypass assembly components or damage/contaminate filter(s) and ensure that all IBF connectors are re-connected.

8.4.3 BYPASS DOOR ASSEMBLY

(Refer to Appendix A, Figures A-1, A-2, A-6 thru A-10)

NOTE

Each bypass door assembly is also an auxiliary filter allowing additional filtered air to enter the engine air plenum when the bypass door is closed and unfiltered air to enter when the door is open. These filters are composed of the same filter media as the primary filters located in each engine cowling assembly.

NOTE

Use the procedures at 8.3.1 to inspect, adjust, and/or repair the filter portion of the bypass door assembly.

CAUTION

USE CAUTION NOT TO DAMAGE FILTER MEDIA WHEN REMOVING BYPASS DOOR ASSEMBLY.

8.4.3.1 REMOVAL

a. Turn aircraft electrical power ON.

b. Depress cockpit indicator/switch to retract actuator and open bypass door.

c. Turn aircraft electrical power OFF.

d. Gain access to engine cowling assembly and cover engine inlet to protect against FOD.

e. Gain access to bypass assembly located on the central beam through access door at aft end of rear upper cowling being careful not to damage bypass assembly components or damage/contaminate filters.

f. Remove cotter pin, nut, bolt and washers securing the actuator to bypass door clevis.

g. Remove bolts and washers securing hinge of bypass door assembly to base plate.

h. Remove bypass door assy.

8.4.3.2 INSPECTION

a. The bypass door assembly is attached to the base plate and actuator (Refer to Appendix A, Figures A-8 & A-10). At these attach locations, inspect for chafing or fretting, elongation of fastener holes, damage to nut plates and/or fasteners, corrosion, cracking, and deformation. Condition of seal between bypass door and base plate should also be inspected at this time per 8.4.4.2. Condition of filter media in each bypass door assembly should be inspected at this time per 8.3.1.2.

b. This should include inspection for any of the conditions as defined below:

c. Cracking. Visually inspect the assemblies for cracking using a 10x magnification glass at the corners, radiuses, and transitions in part thickness. Inspect suspect areas carefully using the 10x magnification. No cracks are allowed. If cracks are found, bypass assembly base plate must be replaced.

d. Warping or distortion. Visually inspect the assembly for warping or distortion. Any warping or distortion that keeps the bypass assembly base plate from creating a seal to area around the engine intakes on central beam and/or between base plate and bypass doors requires disposition instructions from DCI or replacement.

e. Protective Coatings. Where applicable, visually inspect the assembly for missing, damaged, or "scratched through" protective coatings. Re-apply protective coatings per Table 8-1 of this chapter.

f. Corrosion. Visually inspect the assembly for corrosion in accordance with Chapter 6 of AC 43.13-1B, plus Table 8-1of this document.

g. Missing, damaged or loose associated components. Visually inspect the assembly for missing, damaged or loose components.

8.4.3.3 TROUBLESHOOTING/ADJUSTMENT/CALIBRATION

Not applicable.

8.4.3.4 REPAIR

a. Cracks. No cracks are allowed in any part of the bypass door assembly or interface to base plate. Cracks are not repairable. If cracks exist, disposition instructions from DCI or replacement is required.

b. Warping or distortion. Any warping or distortion that keeps the bypass door from creating a seal to the base plate requires disposition instructions from DCI or replacement.

c. Protective Coatings. Re-apply protective coatings per Table 8-1 of this chapter.

d. Corrosion. Treat corrosion in accordance with AC 43.13-1B, Chapter 6 and Table 8-1.

e. Missing, damaged or loose associated components. Replace missing or damaged components. Secure loose components.

f. Any damage to filter media in each bypass door assembly should be repaired per 8.3.1.5 through 8.3.1.8.

8.4.3.5 INSTALLATION

a. Locate bypass door assembly to base plate.

b. Install bolts and washers securing hinge of bypass door assembly to base plate.

c. Install cotter pin, nut, bolt and washers securing the actuator to bypass door clevis.

d. Re-install any aircraft components removed to gain access per procedures in Leonardo maintenance manual being careful not to damage bypass assembly components or damage/contaminate filter(s) and ensure that all IBF connectors are re-connected.

e. Turn aircraft electrical power ON.

f. Perform actuator function check per Section 8.5.3.7.

g. Upon completion ensure bypass door is CLOSED, secure access door at aft end of rear upper cowling, remove cover over engine inlet, and turn aircraft electrical power OFF.

8.4.4 BYPASS DOOR SEAL

(Refer to Appendix A, Figures A-1, A-2, A-6 thru A-10)

8.4.4.1 REMOVAL

a. Turn aircraft electrical power ON.

b. Depress cockpit indicator/switch to retract actuator and open bypass door.

c. Turn aircraft electrical power OFF.

d. Gain access to bypass assembly located on the central beam, as follows, being careful not to damage bypass assembly components and/or damage/contaminate filter(s).

i. Remove forward upper cowling per procedures in Leonardo maintenance manual.

j. Disconnect and stow IBF DISC at bracket on RH side of aircraft forward of rear upper cowling.

k. Reaching through access door at aft end of rear upper cowling, disconnect and stow connectors from differential pressure switch and actuator.

l. Being careful not to damage bypass assembly components, remove rear upper cowling from aircraft per procedures in Leonardo maintenance manual.

e. Remove bypass door assembly per 8.4.3.1.

f. Remove door seal using a plastic scraper being careful not to damage mating surface on bypass base plate.

g. Remove any remaining adhesive residue.

8.4.4.2 INSPECTION

a. The bypass door seal is attached to bypass base plate and provides a seal between the bypass door and base plate any time the bypass door is closed (Refer to Appendix A, Figure A-8 & A-9).

b. Inspect each seal for any tears, nicks, gouges, missing pieces or a permanent set or flattening of the seal that would allow leakage. If the seal exhibits any of these conditions, repair or replace the seal.

8.4.4.3 TROUBLESHOOTING/ADJUSTMENT/CALIBRATION

Not applicable.

8.4.4.4 REPAIR

WARNING

ADHESIVE/SEALANT VAPORS MAY CAUSE IRRITATION OF EYES, NOSE, AND RESPIRATORY SYSTEM. EYE AND SKIN CONTACT WITH MATERIAL MAY CAUSE IRRITATION. IF INGESTED, MAY CAUSE GASTRIC DISTRESS. FLUSH EYES WITH WATER FOR 15 MINUTES. WASH SKIN WITH SOAP AND WATER. IF INHALED, MOVE TO FRESH AIR. IN ALL CASES GET IMMEDIATE MEDICAL ATTENTION. WORK IN A WELL-VENTILATED AREA. WEAR GLOVES AND SAFETY GLASSES.

a. Small tears, nicks, or gouges in the seal may be repaired using MIL-A-46146B3 Group III Type I or MIL-A-46106B3 Group III Type I adhesive/sealant. Use a wooden tongue depressor, cotton swab, or similar tool to dab a small amount of sealant on the damage to repair tears, nicks, or gouges in the seal. Smooth sealant over damaged area to create a smooth flush repair similar to the original seal cross section. Allow to dry. If the repair prevents proper sealing, replace the seal.

b. If the seal exhibits extensive tears, deep nicks or gouges, or missing pieces that would prevent proper sealing, replace the seal.

8.4.4.5 INSTALLATION

a. Carefully locate bypass door seal(s) on mating surface of base plate. (Refer to Appendix A, Figure A-9)

b. Clean and prepare mating surfaces using applicable primer coat per adhesive/sealant manufacturer's instructions.

c. Coat mating surfaces using with MIL-A-46146B3 Group III Type I or MIL-A-46106B3 Group III Type I adhesive/sealant.

d. Install seals (Dacron side up) as depicted in referenced figure and gently clamp in place until cured.

e. Re-install bypass door assembly and any aircraft components removed to gain access per 8.4.3.5 including performance of a function check of the actuator.

f. Upon completion, ensure bypass door is CLOSED, rear upper cowling aft access door is secured, and aircraft electrical power is OFF.

8.4.5 ACCESS ASSEMBLY

(Refer to Appendix A, Figures A-1, A-2, A-15 thru A-18)

8.4.5.1 REMOVAL

a. Gain access to access assembly located at aft end of rear upper cowling assembly being careful not to damage bypass assembly components and/or damage/contaminate filter(s).

b. Determine construction of rear upper cowling. If cowling is composite refer to Figure A-16 or if cowling is titanium refer to Figure A-17.

c. Open access door by removing four (4) fastener studs at bottom of door from their receptacles.

d. Remove rivets (and washers if composite cowling) securing access door hinge to top of the doubler and aft end of rear upper cowling assembly.

e. Remove access assembly.

8.4.5.2 INSPECTION

a. The area at the aft end of the rear upper cowling has been modified by installation of the access door kit including access (door/hinge) assembly, doubler and four fasteners/spacers/receptacles (Refer to Appendix A, Figures A-15 thru A-17). At these attach locations, inspect for chafing or fretting, elongation of fastener holes, damage to receptacles and/or fasteners, corrosion, cracking, and deformation. Inspect while installed on aircraft.

b. Inspection for the above conditions and any other conditions that may be applicable are defined in the Leonardo Helicopter technical manuals.

c. This should include inspection for any of the conditions as defined below:

d. Cracking. Visually inspect the assemblies for cracking using a 10x magnification glass at the corners, radiuses, and transitions in part thickness. Inspect suspect areas carefully using the 10x magnification. No cracks are allowed. If cracks are found, access door component must be replaced.

e. Warping or distortion. Visually inspect assembly for warping or distortion. Minor warping or distortion not affecting ability to properly secure fasteners is acceptable since this is a louvered door and sealing is not required. Major warping or distortion affecting ability to properly secure fasteners requires disposition instructions from DCI or replacement.

f. Protective Coatings. Where applicable, visually inspect the assembly for missing, damaged, or “scratched through” protective coatings. Re-apply protective coatings per Table 8-1 of this chapter.

g. Corrosion. Visually inspect the assembly for corrosion in accordance with Chapter 6 of AC 43.13-1B, and Table 8-1of this document.

h. Missing, damaged or loose associated components. Visually inspect the assembly for missing, damaged or loose components.

8.4.5.3 TROUBLESHOOTING/ADJUSTMENT/CALIBRATION

Not applicable.

8.4.5.4 REPAIR

a. Cracks. No cracks are allowed in any part of the assembly and/or the interface to the rear upper cowling. Cracks are not repairable. If cracks exist, component must be replaced.

b. Warping or distortion. Major warping or distortion affecting ability to properly secure fasteners requires disposition instructions from DCI or replacement.

c. Protective Coatings. Re-apply protective coatings per Table 8-1 of this chapter.

d. Corrosion. Treat corrosion in accordance with Chapter 6 of AC 43.13-1B and Table 8-1 of this document.

e. Missing, damaged or loose associated components. Replace missing or damaged components. Secure loose components.

8.4.5.5 INSTALLATION

a. Determine if rear upper cowling construction is composite (if so refer to Figure A-16) or titanium (if so refer to Figure A-17).

b. Position access (door/fastener/hinge) assembly on doubler.

c. Install rivets (and washers if composite cowling) securing access assembly hinge to doubler and aft end of rear upper cowling assembly.

d. Secure access door closed by attaching four (4) fastener studs at bottom of door to their respective receptacles.

e. Re-install any aircraft components removed to gain access per procedures in Leonardo maintenance manual being careful not to damage bypass assembly components or damage/contaminate filter(s) and ensure that all IBF connectors are re-connected.

8.5 SYSTEMS AND ELECTRICAL COMPONENTS

(Refer to Appendix A, Figures A-1, A-2, A-8 thru A-14, A-21 thru A-36)

This section includes the following systems and electrical components: the differential pressure switch, filter maintenance aid (or maintenance indicator), actuator, cockpit indicator / switch, dimmer switch, circuit breaker and wiring / connectors / backshells / bracket. These components can be found in the bypass kit, forward electrical kit, and / or aft electrical kit. The bypass kit components include: the differential pressure switch, filter maintenance aid (or maintenance indicator), and the actuator. The forward electrical kit components include: the cockpit indicator/switch, dimmer switch, circuit breaker and wiring / connectors / backshells / bracket. The aft electrical kit components include: wiring / connectors / backshells.

8.5.1 DIFFERENTIAL PRESSURE SWITCH

(Refer to Appendix A, Figures A-8 and A-13)

8.5.1.1 REMOVAL

a. Access through access door at aft end of rear upper cowling.

b. Disconnect and secure connector.

c. Remove tube assembly (i.e. front/back ferrules, nut and tube) from switch and grommet.

d. Loosen clamp and remove switch.

8.5.1.2 INSPECTION

a. Inspect for general serviceability, damage, corrosion, and missing components.

b. Inspect the attaching hardware for security.

c. Inspect the tube assembly for debris and insure that the tube is clear and unobstructed.

8.5.1.3 TROUBLESHOOTING

See Table 8-2 for troubleshooting guidance.

8.5.1.4 ADJUSTMENT / CALIBRATION / REPAIR

The construction details of the component do not warrant field maintenance. Repair of this component requires the component to be sent back to DCI for disposition.

8.5.1.5 FUNCTION CHECK

CAUTION

THIS PROCEDURE INTRODUCES THE POSSIBILITY OF ENGINE FOD.

CAUTION

IMPROPER USE OF THE ALTIMETER TEST SET COULD RESULT IN DAMAGE TO THE SWITCH CALIBRATION.

CAUTION

IMPROPER USE OF THE ALTIMETER TEST SET COULD RESULT IN DAMAGE TO THE SWITCH.

CAUTION

TESTING TO AN ALTITUDE OF GREATER THAN 1880 FEET ABOVE FIELD ELEVATION WILL DAMAGE THE DIFFERENTIAL PRESSURE SWITCH.

a. Access switch through access door at aft end of rear upper cowling.

b. Holding switch in place, remove bolt from clamp and remove clamp from switch.

c. With tube assembly still attached to switch, carefully remove tube from grommet in base plate.

d. Connect a Barfield (or equivalent) altimeter test set vacuum system to end of tube assembly on switch, by slipping a piece of 3/16 inch ID vinyl tubing over the end of the tube assembly. Ensure that the fit between the tubing and tube assembly is tight, i.e. no leakage.

	Test Station Elevation (ft)					
Test Method	**0**	**2000**	**4000**	**6000**	**8000**	**10000**
Low Pressure Calibrator (inches of H_2O)	9.0 ± 0.9					
Altimeter Test Set (ft above test station elevation)	620±60 ft	660±60 ft	700±70 ft	740±70 ft	790±80 ft	840±80 ft

e. Ensuring that aircraft electrical power is ON, operate the test set to the minimum indicated altitude in feet above field elevation per the table above and gradually increase altitude. The differential pressure switch should actuate and send a signal to the cockpit indicator/switch illuminating the light before the indicated altitude exceeds the maximum indicated altitude in feet above field elevation per table above. (e.g. If the field elevation is 0 feet (or SL), operate the test set to an indicated altitude of 560 feet above the field elevation and gradually increase altitude. The differential pressure switch should actuate and send a signal to the cockpit indicator/switch illuminating the light before the indicated altitude exceeds 680 feet.)

f. If the cockpit indicator/switch does not illuminate, pull IBF circuit breaker and remove connector from differential pressure switch. With the test set altimeter still set at the maximum indicated altitude in feet above field elevation (e.g. 680 ft at SL), check for continuity across the terminals (i.e. pins A and B) of the differential pressure switch. If continuity is present, the differential pressure switch function is acceptable and the rest of the circuit is suspect. Upon completion of testing, ensure that IBF circuit breaker is reset and aircraft electrical power is OFF. Perform troubleshooting as required. (Refer to Table 8-2.)

CAUTION

APPLYING A VACUUM GREATER THAN 221 IN-H_2O (8 PSI) MAY RESULT IN DAMAGE TO THE DP SWITCH.

g. If a Barfield altimeter test set vacuum system is not available, a handheld vacuum pump (as illustrated in Figures 8-2 and 8-3 below) can be used. Either of these test setups can be used to functionally check both the differential pressure switch and the IBF "FILTER" Cockpit Indicator.

When using a handheld vacuum pump, verify switch closes illuminating “FILTER” indication on cockpit indicator/switch within low pressure calibrator limits in table above.

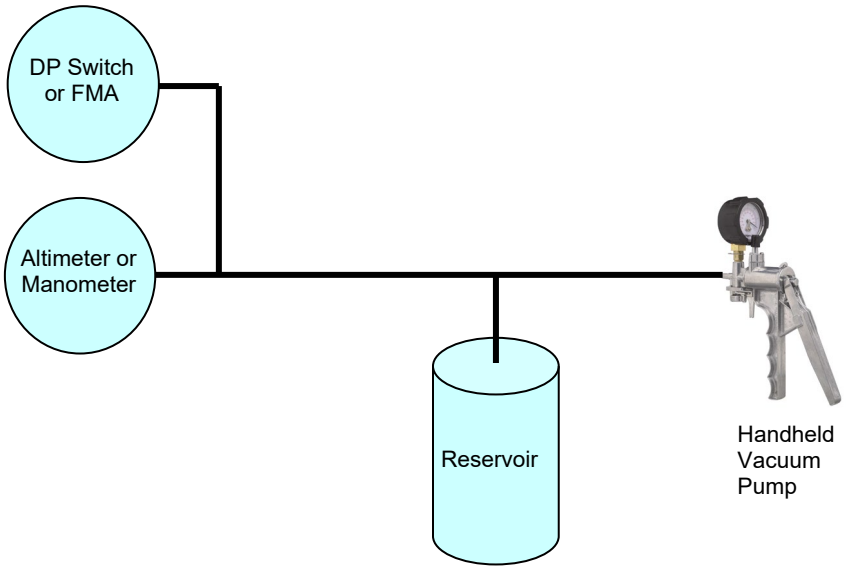


Figure 8-2: TEST EQUIPMENT SETUP

Figure 8-3: EXAMPLE OF TEST SETUP WITH MANOMETER

8.5.1.6 INSTALLATION

a. Prior to installation, perform function check of differential pressure switch and cockpit indicator/switch (Refer to Sections 8.5.1.5 and 8.5.4.5).

b. Access bypass system assembly through access door at aft end of rear upper cowling.

c. Place differential pressure switch in position in clamp and secure clamp (Refer to Appendix A, Figures A-8 and A-13).

d. Carefully insert tip of tube assembly in grommet.

e. Maintaining proper orientation, secure tube assembly to switch.

f. Connect and secure connector.

8.5.2 FILTER MAINTENANCE AID (FMA)

(Refer to Appendix A, Figures A-8, A-9 and A-14)

8.5.2.1 REMOVAL

NOTE

Upper and lower cushions are secured by adhesive to retainer and bracket, respectively.

a. Access Filter Maintenance Aid (FMA) through access door at aft end of rear upper cowling.

b. Remove tube assembly (i.e. front/back ferrules, nut and tube) from FMA and grommet.

c. Remove bolts securing retainer to bracket.

d. Remove retainer and upper cushion.

e. Remove FMA from bracket and lower cushion.

8.5.2.2 INSPECTION

a. Inspect the Filter Maintenance Aid (FMA) for discoloration affecting readability, cracks, deformation, missing or damaged components, and serviceability.

b. Inspect the FMA tube assembly for debris and insure that the tube is clear and unobstructed.

c. Inspect the associated components, such as the retainer, bracket and hardware for missing components, cracks, distortion or deformation, scratches or gouges, or missing protective coatings. If FMA retainer is cracked, part must be replaced. If FMA bracket is cracked or nut-plates are unserviceable, drill out the attaching rivets that secure the component and obtain new component and re-attach using same type rivets.

8.5.2.3 TROUBLESHOOTING

See Troubleshooting Guide, Table 8-2.

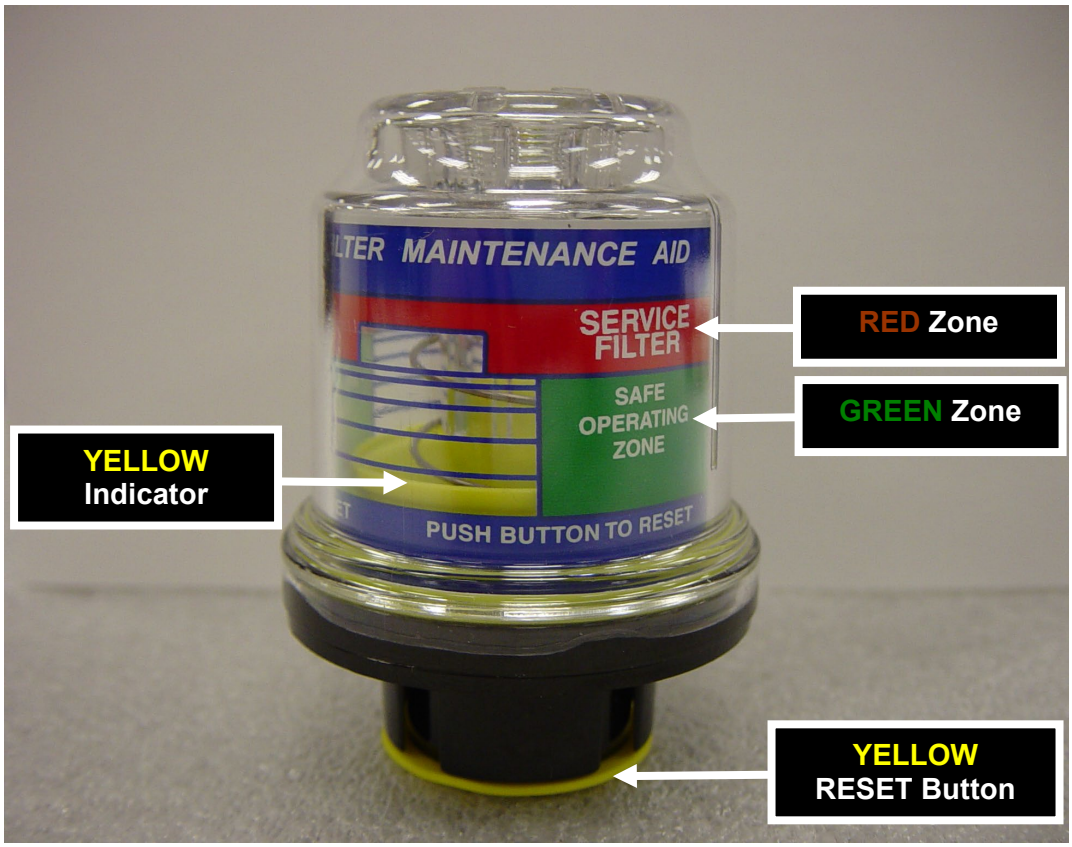


Figure 8-4: USE OF FILTER MAINTENANCE AID (FMA)
(ABOVE) "YELLOW Indicator" position relative to SAFE OPERATING ZONE ("GREEN Zone") or SERVICE FILTER ("RED Zone") markings defines current filter condition, and pushing "YELLOW RESET Button" resets indicator.

8.5.2.4 ADJUSTMENT / CALIBRATION / REPAIR

The construction details of the component do not warrant field maintenance. Repair of this component requires the component to be sent back to DCI for disposition, or replaced.

8.5.2.5 Adjustment

NOTE

FMA unit for each engine inlet bypass system is mounted on the inboard aft end of the bypass assembly and is accessed through access door on the aft end of the rear upper cowling.

The Filter Maintenance Aid (FMA) is designed to hold the highest differential pressure across the filter assembly reached during the last flight, and can be reset by depressing the yellow button marked "PUSH TO RESET" located on the end of the filter maintenance aid (See Figure 8-4).

8.5.2.6 REPAIR

a. The construction details of the Filter Maintenance Aid (FMA) do not warrant field maintenance. Repair of this component requires the component to be sent back to DCI for disposition, or replaced.

b. If the FMA fails the function check, disconnect the tube assembly, and check tube for obstructions. Remove obstructions as required. Reattach tube assembly and perform function check (Refer to Section 8.5.2.7). If it fails function check, replace FMA.

c. Replace damaged sheet metal components (retainer or bracket) and missing or damaged hardware.

d. Re-apply corrosion protection to mount hardware per Table 6.

8.5.2.7 FUNCTION CHECK

CAUTION

THIS PROCEDURE INTRODUCES THE POSSIBILITY OF ENGINE FOD.

CAUTION

IMPROPER USE OF THE ALTIMETER TEST SET COULD RESULT IN DAMAGE TO THE FILTER MAINTENANCE AID.

CAUTION

IMPROPER USE OF THE ALTIMETER TEST SET SUCH AS PULLING AN ALTITUDE OF GREATER THAN 1880 FEET ABOVE FIELD ELEVATION WILL DAMAGE THE FILTER MAINTENANCE AID.

a. Access FMA through access door at aft end of rear upper cowling.

b. Holding FMA in place, remove bolts securing retainer to bracket.

c. With tube assembly still attached to FMA, carefully remove tube from grommet in base plate.

d. Connect the Barfield (or equivalent) altimeter test set vacuum system to end of tube assembly on FMA, by slipping a piece of 3/16 inch ID vinyl tubing over the end of the tube assembly. Ensure that the fit between the tubing and tube assembly is tight, i.e. no leakage.

e. Reset the Filter Maintenance Aid by depressing the yellow button marked “PUSH TO RESET” located on the end of the filter maintenance aid (See Figure 8-4).

f. The FMA should indicate in the red zone within the following range:

	Test Station Elevation (ft)					
Test Method	**0**	**2000**	**4000**	**6000**	**8000**	**10000**
Altimeter Test Set (ft above test station elevation)	620±60 ft	660±60 ft	700±70 ft	740±70 ft	790±80 ft	840±80 ft

8.5.2.8 INSTALLATION

NOTE

Upper and lower cushions are secured by adhesive to retainer and bracket, respectively.

a. Prior to installation, perform function check of Filter Maintenance Aid (FMA) (Refer to Section 8.5.2.7).

b. Access FMA bracket on base plate through access door at aft end of rear upper cowling.

c. Position the FMA into the lower cushion/bracket assembly.

d. Position the retainer/upper cushion assembly over top of FMA.

e. Install hardware securing retainer to bracket.

f. Carefully insert tube assembly (i.e. front/back ferrules, nut and tube) in grommet in base plate.

g. Properly position tube and connect tube assembly to top of FMA.

8.5.3 ACTUATOR

(Refer to Appendix A, Figures A-8, A-10 thru A-12)

CAUTION

WHEN REMOVING THE ACTUATOR USE CAUTION NOT TO DAMAGE OR CONTAMINATE THE FILTERS IN THE BYPASS DOOR ASSEMBLY.

8.5.3.1 REMOVAL

m. Turn aircraft electrical power ON.

n. Depress cockpit indicator/switch to retract actuator and open bypass door.

o. Turn aircraft electrical power OFF.

p. Remove forward upper cowling per procedures in Leonardo maintenance manual.

q. Disconnect and stow IBF DISC at bracket on RH side of aircraft forward of rear upper cowling.

r. Reaching through access door at aft end of rear upper cowling, disconnect and stow connectors from differential pressure switch and actuator.

s. Being careful not to damage bypass assembly components, remove rear upper cowling from aircraft per procedures in Leonardo maintenance manual.

t. Remove cotter pin, nut and bolt securing the actuator to bypass door clevis.

u. Remove cotter pin, nut, bolt, and associated washers/spacers securing the actuator to hanger assembly.

v. Remove Actuator.

8.5.3.2 INSPECTION

a. Inspect actuator for cracks, damage, corrosion, and serviceability.

b. Inspect the connector for damage, security, corrosion and serviceability.

c. Inspect the actuator hanger assembly and clevis on bypass door for cracks, damage, corrosion, security, and serviceability.

8.5.3.3 TROUBLESHOOTING

a. Refer to Table 8-2 for troubleshooting guidance.

b. Perform Function Check. If function check indicates a discrepancy with the actuator replace the actuator.

8.5.3.4 ADJUSTMENT

CAUTION

THIS PROCEDURE INTRODUCES THE POSSIBILITY OF ENGINE FOD. COVER ENGINE INLET PRIOR TO PERFORMING THIS PROCEDURE.

The actuator is adjusted to the nominal dimension prior to shipment. The seal under the bypass door on each side of the bypass assembly base plate should be uniformly and slightly compressed with no visible gaps. Use care not to damage the seal when checking for gaps/compression of the seal. In the event adjustments are required in the field, perform the following steps:

a. Access the actuator through the access door at the aft end of the rear upper cowling.

b. Clear the area of the bypass door of any tools, hardware, or other obstructions.

c. Ensure aircraft power is ON and depress the cockpit indicator/switch to open bypass door.

d. Remove the cotter pin, nut and bolt that connect actuator rod end to the bypass door clevis (Refer to Appendix A, Figure A-10).

e. Loosen the jam nut securing the actuator rod end position (Refer to Figure 8-5).

CAUTION

TO PREVENT INTERNAL DAMAGE TO ACTUATOR, ENSURE ROD END IS PROPERLY ALIGNED AND DOES NOT ROTATE WHILE LOOSENING, TIGHTENING, OR APPLYING TORQUE TO JAM NUT.

f. Adjust as necessary by extending or retracting actuator rod end relative to actuator rod.

g. Re-connect actuator rod end to bypass door clevis and close bypass door.

h. Depress the cockpit indicator/switch to close bypass door.

i. Check for uniform seal compression (should be approximately 15-20% of its non-compressed cross-section).

j. Repeat adjustments as necessary until a uniform complete seal has been formed between the seal on the base plate opening and the contacting surface of the bypass door.

k. After final adjustments are made, tighten the jam nut and torque (25 to 30 inch-pounds).

l. Tighten the nut on the bolt that connects the actuator rod end to the bypass door clevis and insert cotter pin.

m. Perform function check (Refer to Section 8.5.3.7) and then ensure aircraft power is OFF.

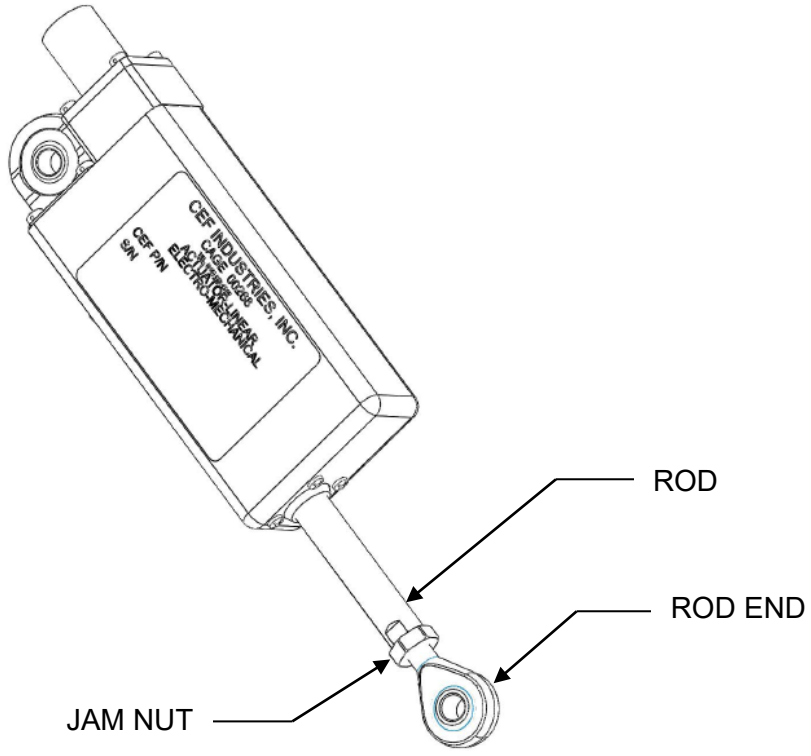


Figure 8-5: ACTUATOR ADJUSTMENT COMPONENTS

8.5.3.5 CALIBRATION

Not applicable.

8.5.3.6 REPAIR

a. Repair of the actuator is limited to removal of minor surface corrosion from the actuator shaft using very fine sandpaper or crocus cloth (Table 8-3).

b. Damage to the actuator, such as cracking of the attachment lug, distortion, warping, or failure to actuate requires disposition by DCI or replacement.

8.5.3.7 FUNCTION CHECK

a. Clear the area of the bypass door of any tools, hardware, or other obstructions.

b. Ensure that aircraft power is ON.

c. If bypass door is open, depress the cockpit indicator/switch to extend the actuator and close the bypass door. Otherwise continue.

d. Inspect bypass door to verify seal is slightly compressed and in contact with the entire perimeter of the bypass door with no visible gaps and seal compression should be approximately 15-20% of its non-compressed cross-section.

e. If seal is not properly compressed or if any gaps exist, perform adjustment procedure per Section 8.5.3.4. Otherwise continue.

f. Depress the cockpit indicator/switch again to retract the actuator and open the bypass door.

g. Verify BYPASS light on cockpit indicator switch illuminated when actuator is fully retracted.

h. Depress the cockpit indicator/switch; actuator should extend and return bypass door to the closed position.

i. Verify BYPASS light on cockpit indicator/switch is no longer illuminated.

j. Ensure aircraft power is OFF.

8.5.3.8 INSTALLATION

CAUTION

THIS PROCEDURE INTRODUCES THE POSSIBILITY OF ENGINE FOD. ENSURE ENGINE INLET IS COVERED PRIOR TO PERFORMING THIS PROCEDURE.

a. With rear upper cowling removed and actuator retracted, position actuator lug in actuator hanger assembly and secure using bolt, washers, spacers, nut and cotter pin (Refer to Appendix A, Figure A-10).

b. Position actuator rod end in bypass door clevis and secure using bolt, nut and cotter pin (Refer to Appendix A, Figure A-10).

c. Being careful not to damage bypass assembly components, install rear upper cowling on aircraft per procedures in Leonardo maintenance manual.

d. Reaching through access door at aft end of rear upper cowling, secure connectors to differential pressure switch and actuator.

e. Connect IBF DISC at bracket on RH side of aircraft forward of rear upper cowling.

f. Perform actuator function check per Section 8.5.3.7 and then continue.

g. Upon completion of the actuator function check remove cover over engine inlet.

h. Install forward upper cowling per procedures in Leonardo maintenance manual.

i. Secure access door at aft end of rear upper cowling.

j. Ensure aircraft power is OFF.

8.5.4 COCKPIT INDICATOR/SWITCH

(Refer to Appendix A, Figures A-21 thru A-27)

8.5.4.1 REMOVAL

a. Gain access to the back of the instrument panel.

b. Remove quik-connect plug at back of cockpit indicator/switch.

c. Remove mounting sleeve from back of indicator/switch.

d. Slide indicator/switch out of panel.

e. Tag and secure wiring.

8.5.4.2 INSPECTION

a. Inspect cockpit indicator/switch for proper functioning. (Refer to Section 8.5.4.5 for function check and to Table 8-2 for troubleshooting.)

b. Inspect cockpit indicator/switch for security, damage, overheating, corrosion, or distortion. Replace defective component or contact DCI for disposition.

8.5.4.3 TROUBLESHOOTING

See Table 8-2 for troubleshooting guide.

8.5.4.4 ADJUSTMENT / CALIBRATION / REPAIR

Not applicable. Replace defective component or contact DCI for disposition.

8.5.4.5 FUNCTION CHECK

a. Verify bypass door is in closed position and aircraft electric power is ON.

b. Open access door on aft end of rear upper cowling.

c. Disconnect harness connector from associated pressure switch.

d. Short across Pin A and Pin B on harness connector.

e. Verify cockpit indicator/switch “FILTER” amber light illuminates.

f. Remove short from across Pin A and Pin B on harness connector.

g. Reconnect harness connector to pressure switch.

h. Depress cockpit indicator/switch to open the bypass door.

i. Verify bypass door opens and “BYPASS” light illuminates.

j. Depress cockpit indicator/switch to close bypass door.

k. Verify bypass door closes and “BYPASS” light extinguishes.

l. Turn aircraft electric power OFF.

m. Secure access door on aft end of rear upper cowling.

n. Remove engine inlet cover.

8.5.4.6 INSTALLATION

a. Slide cockpit indicator/switch into panel opening.

b. Secure cockpit indicator/switch to panel with mounting sleeve.

c. Attach quik-connect plug at rear of cockpit indicator/switch.

d. Perform cockpit indicator/switch function check.

8.5.5 CIRCUIT BREAKER

(Refer to Appendix A, Figures A-21 thru A-27)

8.5.5.1 REMOVAL

a. Locate IBF circuit breakers in overhead circuit breaker panel.

b. Gain access to the back of the overhead circuit breaker panel.

c. Remove terminal connectors at back of circuit breaker.

d. Remove nut from circuit breaker face.

e. Remove circuit breaker from panel.

f. Tag and secure wiring.

8.5.5.2 INSPECTION

a. Inspect circuit breaker for proper functioning. Refer to Table 8-2 for troubleshooting.

b. Inspect circuit breaker for security, damage, overheating, or corrosion. If component is suspect, replace defective component or contact DCI for disposition.

8.5.5.3 TROUBLESHOOTING

See Table 8-2 for troubleshooting guide.

8.5.5.4 ADJUSTMENT / CALIBRATION / REPAIR

Not applicable. Contact DCI for disposition of defective component or replace.

8.5.5.5 INSTALLATION

a. Place circuit breaker into panel opening in correct orientation.

b. Secure circuit breaker to circuit breaker panel with nut.

c. Secure terminal connectors at rear of circuit breaker.

8.5.6 WIRING / CONNECTORS / BACKSHELLS / BRACKET

(Refer to Appendix A, Figures A-21 thru A-36)

8.5.6.1 REMOVAL

a. Prepare aircraft for work performed on the electrical system by disconnecting the battery.

b. Remove hardware, clamps, spiral wrap from component, as applicable. Tag interfacing components for later installation. Remove affected components.

8.5.6.2 INSPECTION

The IBF wiring, wiring harness and associated components is constructed of standard aircraft wire and connectors. Standard aircraft maintenance procedures should be used for inspections and repair of the harness and connectors. Routine aircraft maintenance should include visual inspection for evidence of chafing, damage, corrosion and insuring the circuit breaker and all pins, connectors, and backshells are secure. Inspect wiring, wiring harness and associated components per AC 43.13-1B, Chapter 11.

8.5.6.3 TROUBLESHOOTING

a. See Table 8-2 for troubleshooting guidance.

b. See Appendix A, Figures A-21 thru A-36 for wiring diagram, wire marking and identification, routing, and installation information.

8.5.6.4 ADJUSTMENT / CALIBRATION

Not applicable.

8.5.6.5 REPAIR

Standard aircraft maintenance procedures should be used for repair of the wiring, wire harness and associated components. See Appendix A, Figures A-21 thru A-36 for wiring diagram, wire marking and identification, routing, and installation information. Perform repairs to affected components per AC 43.13-1B, Chapter 11.

8.5.6.6 INSTALLATION

a. Prepare aircraft for work performed on the electrical system by disconnecting the battery.

b. Install affected component using appropriate hardware.

c. Connect wiring per wiring diagram (See Appendix A, Figures A-21 thru A-36).

d. Install clamps, spiral wrap and heat shrink as applicable to affected components per AC 43.13-1B, Chapter 11.

8.6 PROTECTIVE TREATMENT

a. The assemblies and structural components of the IBF system are composed primarily of aluminum alloy materials. All components, except for standard hardware components and fasteners, and vendor components, are coated with an epoxy primer. Scratched or damaged aluminum components should be touched up with a small paint brush dipped in epoxy primer. Prepare epoxy primer per manufacturer's instructions.

b. Aircraft finishes scratched or damaged should be recoated with the finish specified in the aircraft maintenance records and maintenance manual.

c. For the systems and electrical components, there are no protective treatments specified. Contact DCI for disposition of damaged components, or replace the damaged component.

Table 8-1: Protective Treatment for Components

Component	Material	Limits of Damage	Protective Treatment
Filter Assembly	Alum. Alloy	Scratches, pitting, gouges must be less than 20% of part thickness. See note.	Chemical conversion coating. Re-apply Epoxy Primer & Top Coat Ref Table 8-3
Bypass Assembly Base Plate	Alum. Alloy	Scratches, pitting, gouges must be less than 10% of part thickness. See note.	Chemical conversion coating. Re-apply Epoxy Primer & Top Coat Ref Table 8-3
Actuator Hanger Assembly	Alum. Alloy	Scratches, pitting, gouges must be less than 10% of part thickness. See note.	Chemical conversion coating. Re-apply Epoxy Primer & Top Coat Ref Table 8-3
Bypass Door Assembly	Alum. Alloy	Scratches, pitting, gouges must be less than 10% of part thickness. See note.	Chemical conversion coating. Re-apply Epoxy Primer & Top Coat Ref Table 8-3
Access Assembly	Alum. Alloy Sheet Stk.	Scratches, pitting, gouges must be less than 10% of part thickness. See note.	Chemical conversion coating. Re-apply Epoxy Primer & Top Coat Ref Table 8-3
Filter Maintenance Aid Bracket	Alum. Alloy Sheet Stk.	Inspect for Serviceability	Chemical conversion coating. Re-apply Epoxy Primer & Top Coat Ref Table 8-3
Electrical Connector Bracket	Alum. Alloy Sheet Stk.	Scratches, pitting, gouges must be less than 10% of part thickness. See note.	Chemical conversion coating. Re-apply Epoxy Primer & Top Coat Ref Table 8-3

Note: Contact DCI for disposition instructions for components with more severe discrepancies or replace.

8.7 TROUBLESHOOTING GUIDE

The following table defines the probable cause, remedy, and ICA reference to the applicable procedure for correcting the trouble listed in the table. Multiple failures are not addressed in this table such as a failed actuator and failed wiring existing at the same time.

Table 8-2: Troubleshooting Guide

TROUBLE	PROBABLE CAUSE	REMEDY	ICA REF
FILTER light fails to illuminate	Faulty connector/circuit	Check connectors, circuit continuity and repair	Para. 8.5.6
	Faulty circuit breaker	Check circuit breaker and reset or replace.	Para. 8.5.5
	Faulty cockpit ind/switch	Perform function check; replace cockpit indicator/switch.	Para. 8.5.4
	Faulty delta P switch	Perform function check; replace differential pressure switch.	Para. 8.5.1
FILTER light illuminates	Obstructed air intake	Clear air intake	
	Dirty filters	Verify by checking FMA & inspect filters; service filters.	Para. 7.3
FILTER light stays illuminated	Obstructed bypass/inlet	Clear bypass/inlet	
	Faulty delta P switch	Replace differential pressure switch.	Para. 8.5.1
BYPASS light fails to illuminate	Faulty connector/circuit	Check connectors, circuit continuity and repair	Para. 8.5.6
	Faulty circuit breaker	Check circuit breaker and reset or replace.	Para. 8.5.5
	Faulty cockpit ind/switch	Perform function check; replace cockpit indicator/switch.	Para. 8.5.4
	Faulty actuator	Perform function check; replace actuator	Para. 8.5.3
BYPASS light stays illuminated	Faulty actuator	Perform function check; replace actuator.	Para. 8.5.1
Bypass door fails to close	Faulty connector/circuit	Check connectors, circuit continuity and repair	Para. 8.5.6
	Faulty circuit breaker	Check circuit breaker and reset or replace.	Para. 8.5.5
	Faulty cockpit ind/switch	Check switch continuity; replace cockpit ind/switch.	Para. 8.5.4
	Faulty actuator	Perform function check; replace actuator.	Para. 8.5.3
Bypass door fails to open	Faulty connector/circuit	Check connectors, circuit continuity and repair	Para. 8.5.6
	Faulty circuit breaker	Check circuit breaker and reset or replace.	Para. 8.5.5
	Faulty cockpit ind/switch	Check switch continuity; replace cockpit ind/switch.	Para. 8.5.4
	Faulty actuator	Perform function check; replace actuator.	Para. 8.5.3
FILTER or BYPASS light is too dim or too bright for selected IBF MODE	Faulty connector/circuit	Check connectors, circuit continuity and repair	Para. 8.5.6
	Faulty cockpit ind/switch	If dimmer switch checks out; replace cockpit indicator/switch.	Para. 8.5.4
Engine fails initial PAC with <+20 degrees C for new or replacement engine install or fails subsequent PAC with <+5 degrees C	Obstructed inlet	Clear engine inlet.	
	Dirty filters	Verify PAC results, check FMA, & inspect filters; service filters.	Para. 7.3
	Faulty engine	Check engine; repair or replace engine	

8.8 SPECIAL TOOLS / SPECIAL EQUIPMENT

NOTE
Standard Aircraft Mechanic Tools are not listed.

a. Hand Seamer – 1 1/4 inch maximum jaw depth. Hand seamers are available through many commercial aircraft supply stores and also through commercial heating and air conditioning supply stores. Recommend the following: Malco Tools "Hand Seamer with Forged Steel Jaw", Catalog # S2, S3 and S6. The S3 model is also available through Wicks Aircraft Supply, Part Number TP44-0, "Offset Hand Seamer".

b. Barfield or Equivalent Manufacturer Altimeter Test Set

8.9 CONSUMABLE MATERIALS, SUPPLIES, AND PROTECTIVE TREATMENTS

Table 8-3: Consumable Materials, Supplies and Protective Treatment Specifications

Item	Description	Specification / Part No.
	Consumables	
1	Sealant	MIL-S-8802B Type 2 Class A
2	Adhesive-Sealant	MIL-A-46146 B3 Group II Type I or MIL-A-46106B3 Group II Type I
3	Sand paper 400-600 grit	Commercially available
4	Crocus Cloth	Commercially available
	Supplies	
5	Air Filter Oil	0.8 oz. bottle - DCI P/N 100100-008
5.1	Air Filter Oil	8.8 oz. bottle - DCI P/N 100100-088
5.2	Air Filter Oil	1 gallon container - DCI P/N 100101-000
5.3	Air Filter Oil	5 gallon container - DCI P/N 100105-000
6	Air Filter Cleaner	1 gallon container – DCI P/N 100201-000
6.1	Air Filter Cleaner	5 gallon container – DCI P/N 100205-000
6.2	ZOK 27 Cleaner	6.6 gallon container - ZOK International Group Ltd P/N ZOK 27
	Protective Treatment Specs	
7	Epoxy Primer	MIL-PRF-23337J Type I Class C2 or MIL-PRF-85582D1 Type I Class C2
8	Epoxy Top Coat	MIL-PRF-85285D3 Type I Class H (Color 37038 per FED-STD-595)
9	Chemical Conversion Coating	MIL-C-5541E Class 1A (One commercial trade name, "Alodine")
10	Aircraft Finish	See Aircraft Records for appropriate Finish / Top Coat

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APPENDIX A

PARTS FIGURES

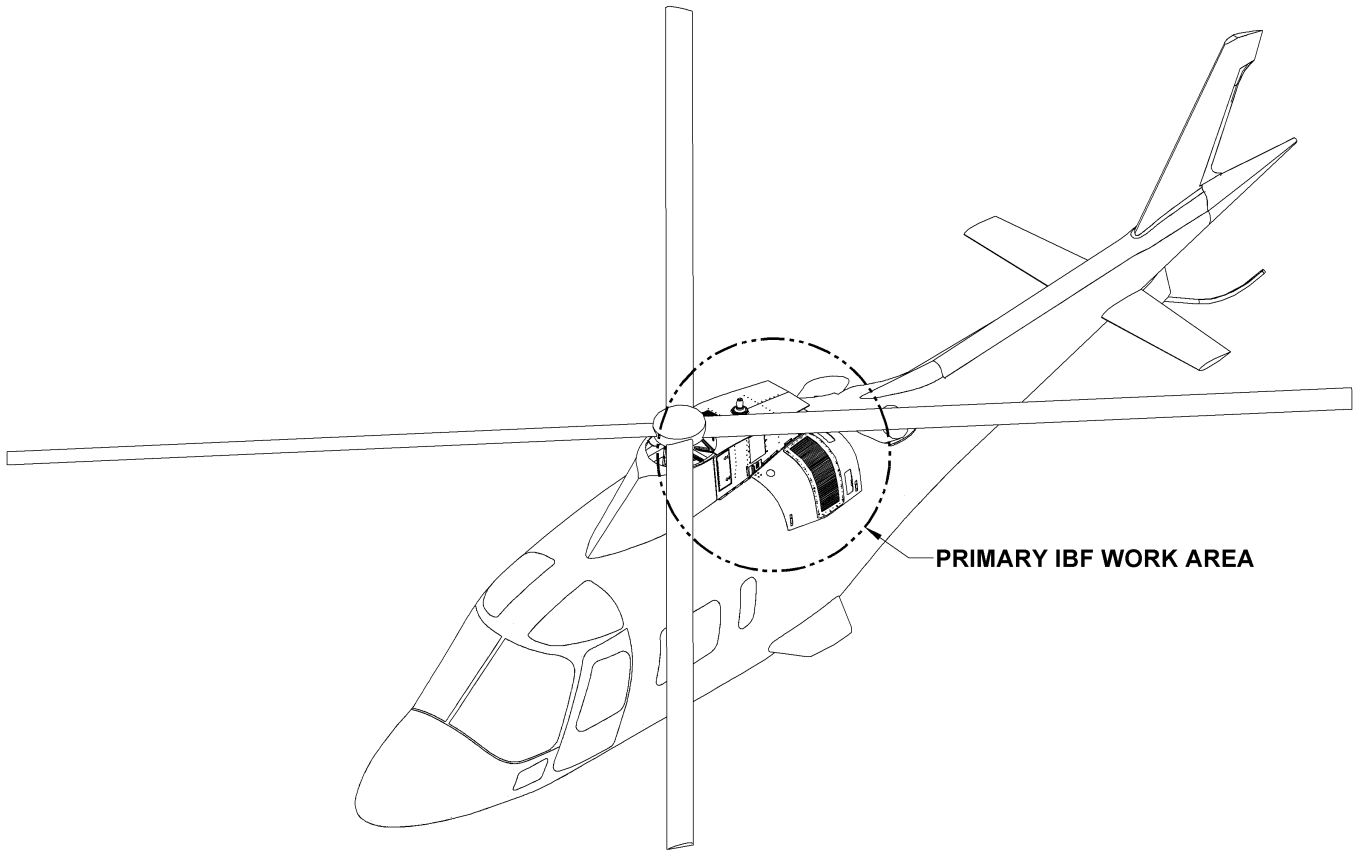


Figure A-1: A109/AW109 IBF Kit (Primary Work Area)

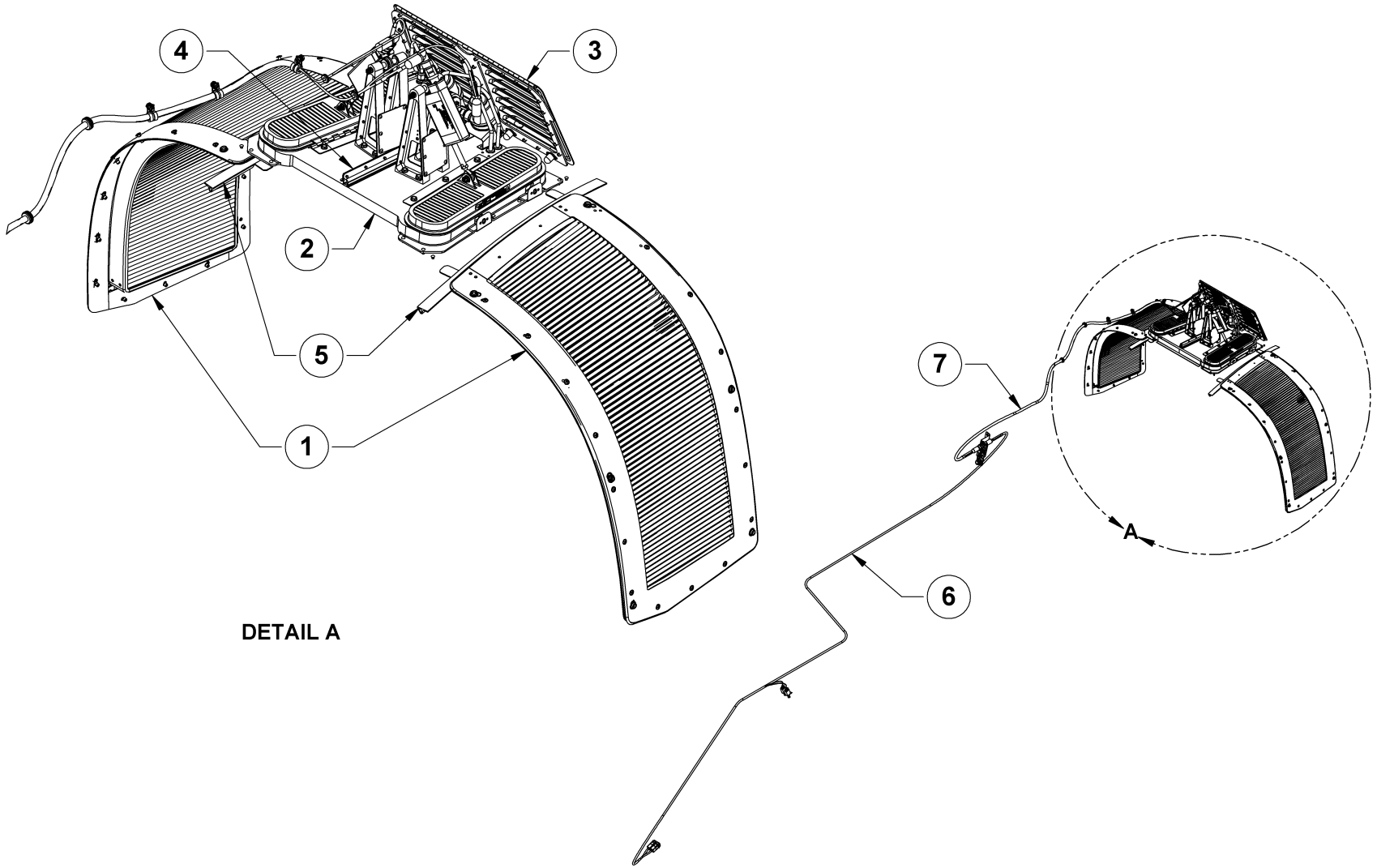


Figure A-2: A109/AW109 IBF Kit (Component Kits excluding cockpit)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figures A-1 thru A-2: A109/AW109 IBF Kit		
	124000-101	Kit – IBF, A109		P
1	N/A	Kit – Filter (Figures A-3 thru A-5)	1	NP
2	N/A	Kit – Bypass (Figures A-6 thru A-14)	1	NP
3	N/A	Kit – Door, Access (Figures A-15 thru A-18)	1	NP
4	N/A	Kit – Doubler, Web (Figures A-15 thru A-17)	1	NP
5	N/A	Kit – Seal, Cowl (Figures A-19 thru A-20)	1	NP
6	N/A	Kit – Electrical, Fwd (Figures A-21 thru A-29)	1	NP
7	N/A	Kit – Electrical, Aft (Figures A-30 thru A-36)	1	NP
		AVAIL CODE DEFINITION P Procurable NP Non Procurable SP Normal stock/procurable See introduction on availability codes for additional information.		

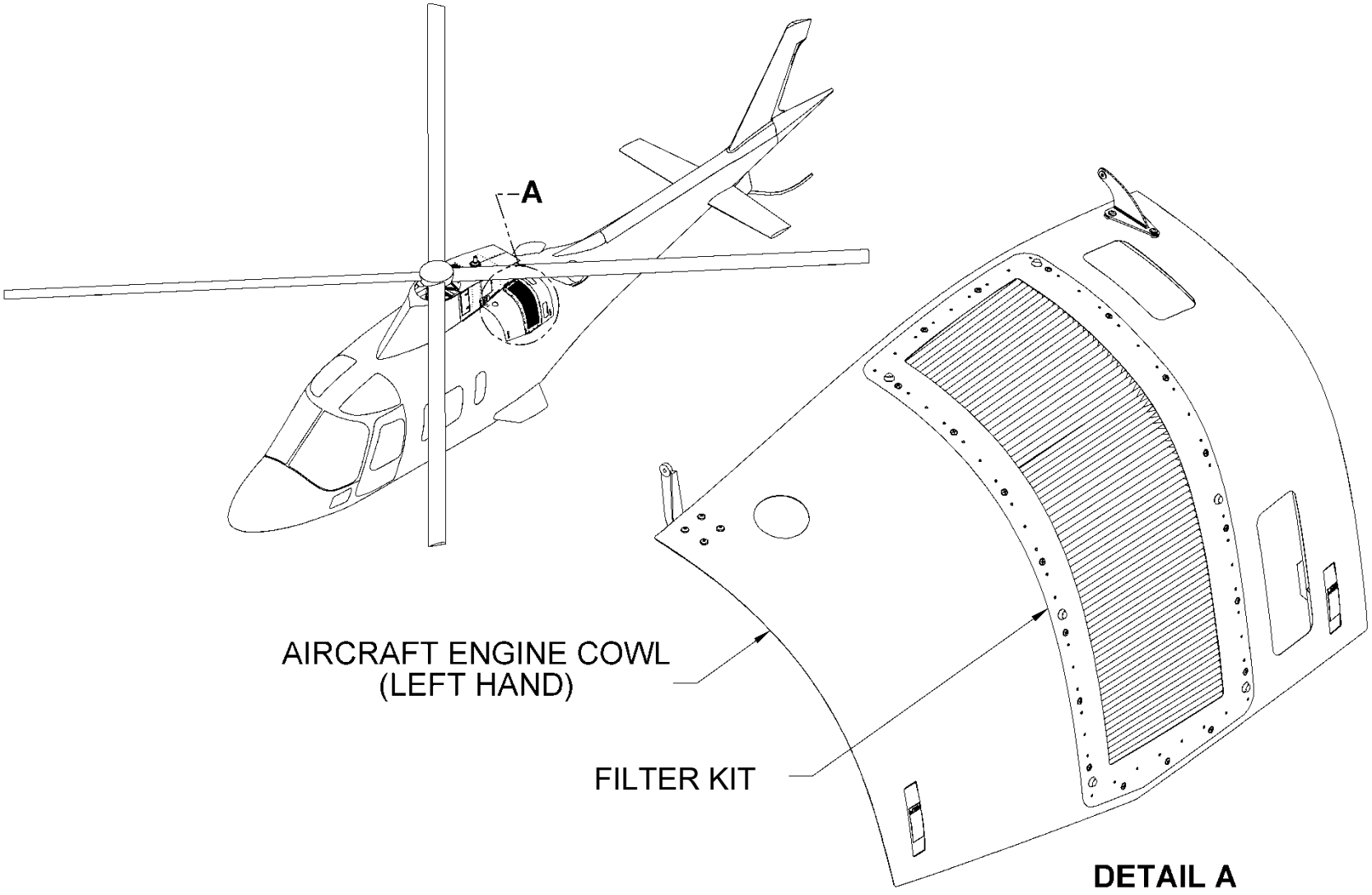


Figure A-3: Filter Kit (A/C Location)
(LH Shown/RH Opposite)

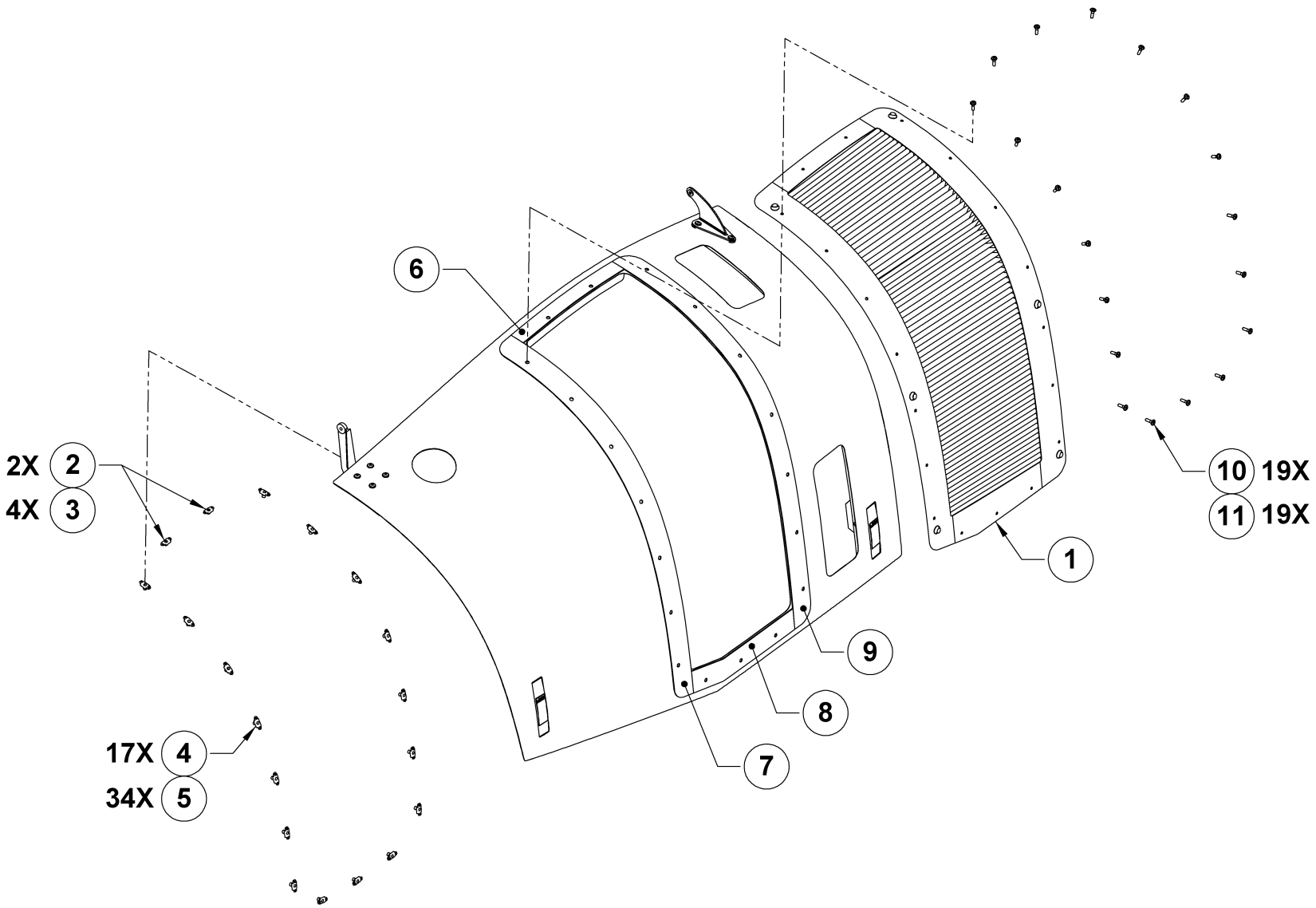


Figure A-4: Filter Kit (Exploded View)
(LH Shown/RH Opposite)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figures A-3 thru A-4: Filter Kit		
	N/A	Kit – Filter		NP
1	124300-101/-102	Assy – Filter (LH-shown/RH-opposite)	1/1	P/P
2	MS21059L08	Platenut	4	SP
3	CCR274CS-3-02	Rivet	8	SP
4	NAS1870-08-3	Platenut	34	SP
5	NAS1097U3-3-5	Rivet	68	SP
6-9	124035-801/-802	Kit – Seal, Filter, LH/RH (LH-shown/RH-opposite)	1/1	P/P
6	124360-201/-202	Seal – Filter, Upr, LH/RH (LH-shown/RH-opposite)	1/1	NP/NP
7	124361-201/-202	Seal – Filter, Fwd, LH/RH (LH-shown/RH-opposite)	1/1	NP/NP
8	124363-201/-202	Seal – Filter, Lwr, LH/RH (LH-shown/RH-opposite)	1/1	NP/NP
9	124362-201/-202	Seal – Filter, Aft, LH/RH (LH-shown/RH-opposite)	1/1	NP/NP
10	AN525-832R10	Bolt	38	SP
11	NAS1149DN816J	Washer	38	SP
		AVAIL CODE DEFINITION P Procurable NP Non Procurable SP Normal stock/procurable See introduction on availability codes for additional information.		

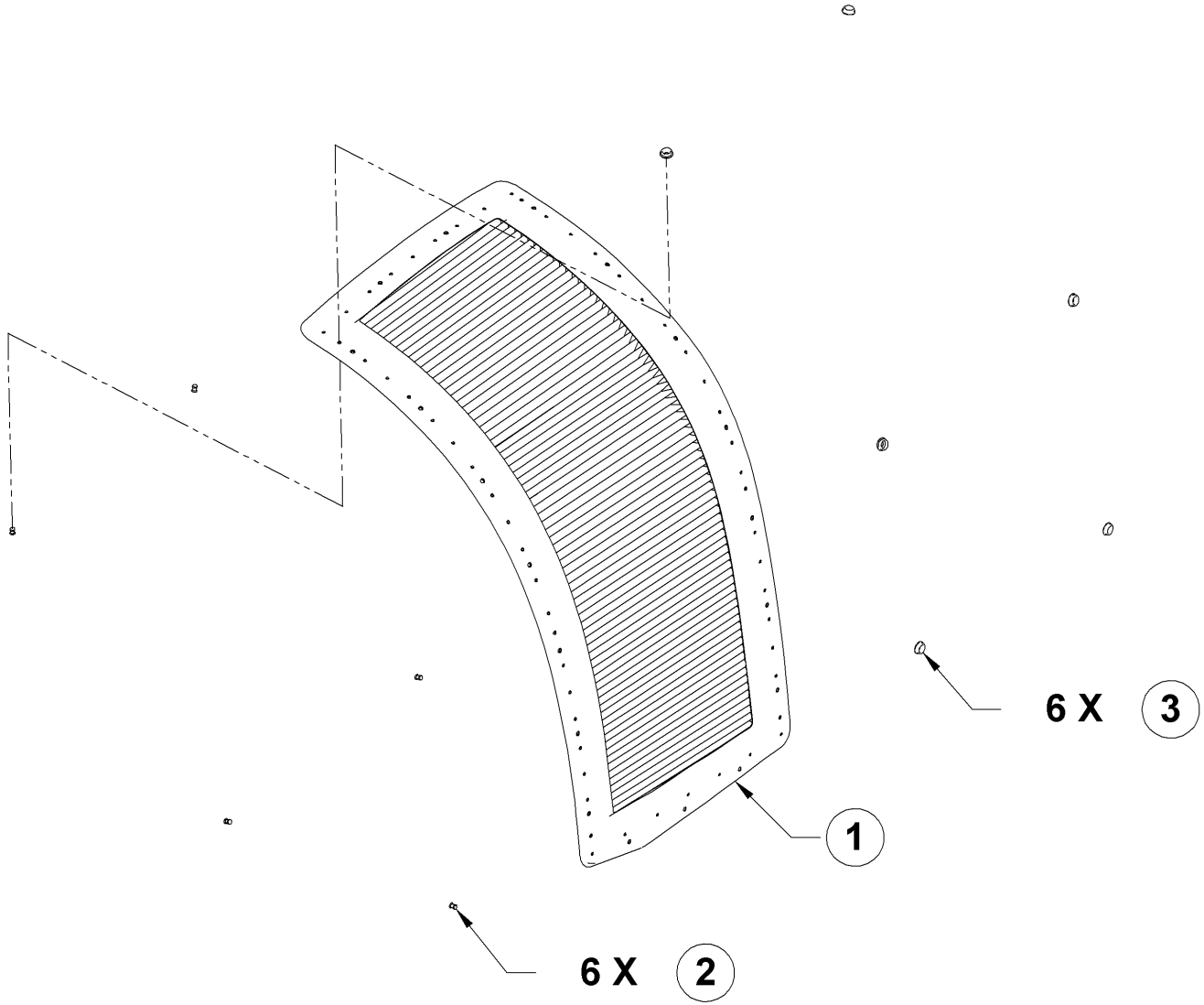


Figure A-5: Filter Assembly (Exploded View)
(LH Shown/RH Opposite)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figure A-5: Filter Assembly		
	124300-101/-102	Assy – Filter (LH/RH)		P/P
1	N/A	Assy – Filter , Base (LH-shown/RH-opposite)	1/1	NP/NP
2	NAS1097AD5-5-5	Rivet	6	SP
3	93-BS-10379-1C	Stud	6	SP

AVAIL CODE DEFINITION

P Procurable
NP Non Procurable
SP Normal stock/procurable

See introduction on availability codes for additional information.

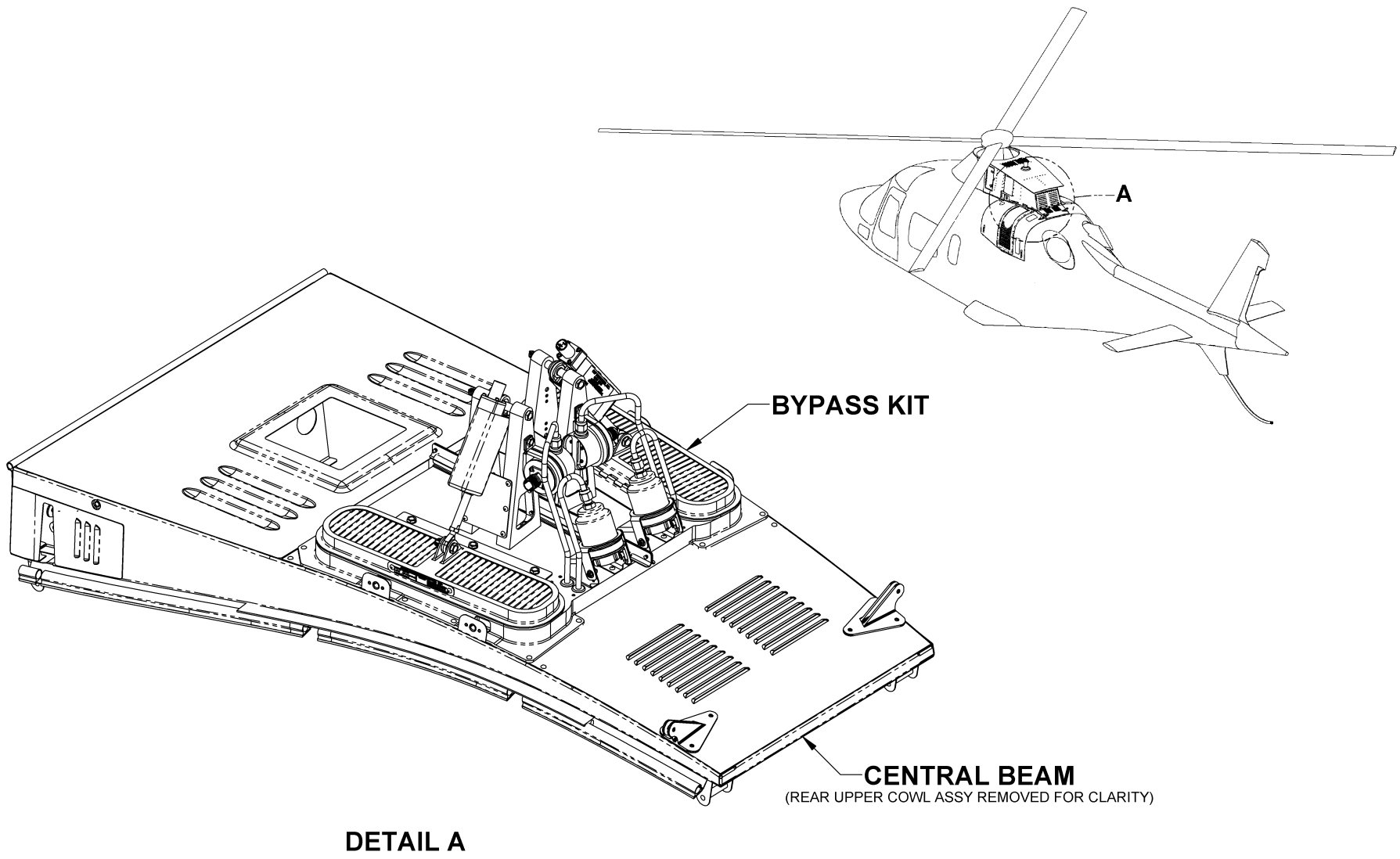


Figure A-6: Bypass Kit (A/C Location)

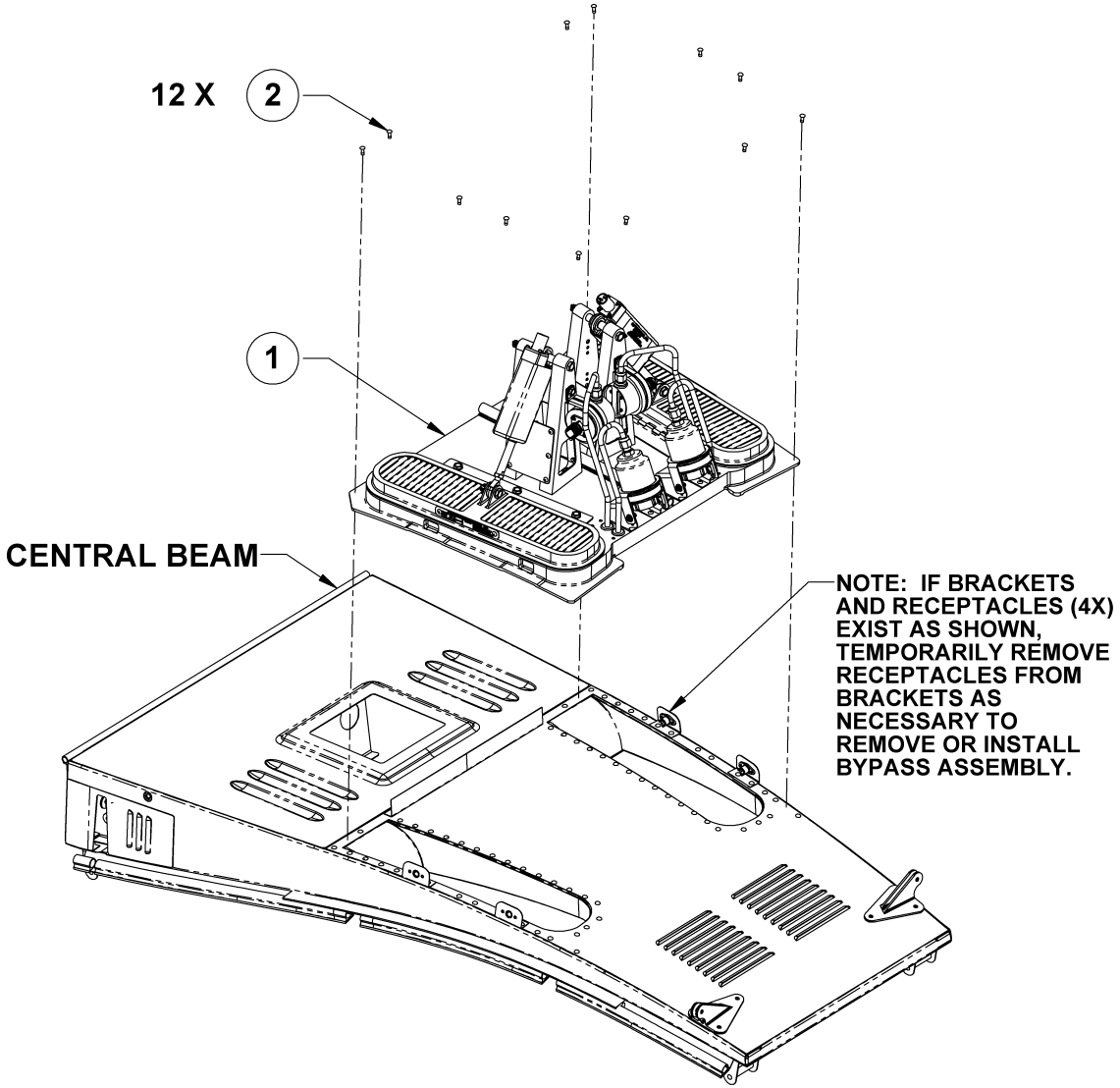


Figure A-7: Bypass Kit (Exploded View)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figures A-6 thru A-7: Bypass Kit		
	N/A	Kit – Bypass		NP
1	124100-101	Assy – Bypass	1	P
2	CR3253-4-04	Rivet	12	SP

AVAIL CODE DEFINITION

P Procurable
NP Non Procurable
SP Normal stock/procurable

See introduction on availability codes for additional information.

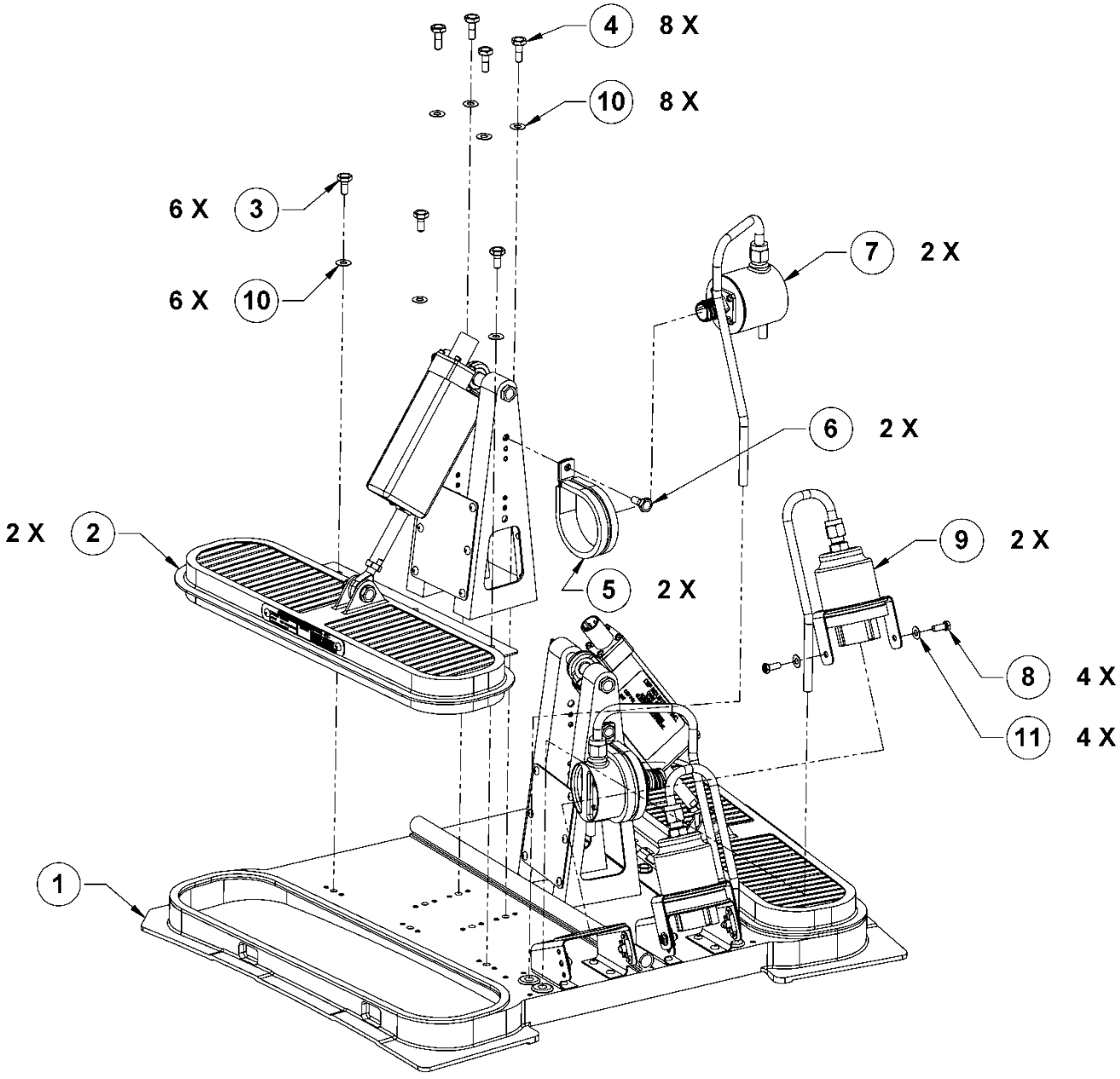


Figure A-8: Bypass Assembly (Exploded View)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figure A-8: Bypass Assembly		
	124100-101	Assy – Bypass		P
1	124110-101	Assy – Base	1	P
2	N/A	Assy – Actuator-Hanger & Door (LH-exploded/RH-installed)	1/1	NP/NP
3	NAS6203-2	Bolt	6	SP
4	NAS6203-4	Bolt	8	SP
5	MS21919WDG28	Clamp	2	SP
6	NAS6203-3	Bolt	2	SP
7	N/A	Assy – Switch, Pressure, Differential (LH-exploded/RH-installed)	1/1	NP/NP
8	NAS1801-08-6	Bolt	4	SP
9	N/A	Assy – Aid, Maintenance, Filter (LH-exploded/RH-installed)	1/1	NP/NP
10	NAS1149D0316J	Washer	14	SP
11	NAS1149DN816J	Washer	4	SP
		AVAIL CODE DEFINITION P Procurable NP Non Procurable SP Normal stock/procurable See introduction on availability codes for additional information.		

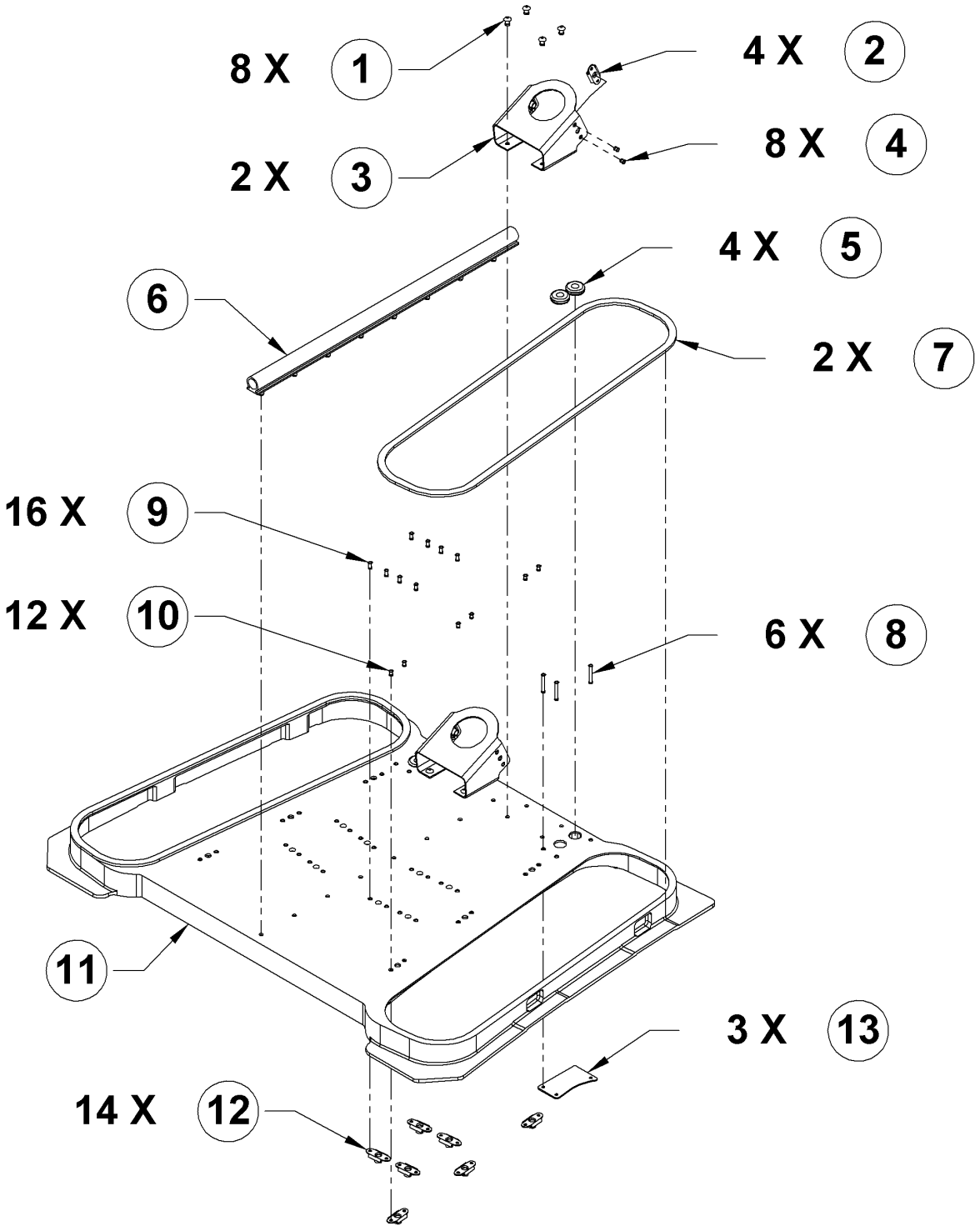


Figure A-9: Base Assembly (Exploded View)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figure A-9: Base Assembly		
	124110-101	Assy – Base (LH-exploded/RH-installed)		P
1	MS20470AD4-4-5	Rivet	8	SP
	N/A	Assy – Bracket	2	NP
2	MS21059L08	Platenut	4	SP
3	124113-201	Bracket	2	P
4	NAS1097AD3-3	Rivet	8	SP
5	MS35489-6	Grommet	4	SP
6	124115-201	Seal – Web	1	P
7	124111-201	Seal – Door	2	P
8	NAS1097AD3-12	Rivet	6	SP
9	NAS1097AD3-4-5	Rivet	16	SP
10	NAS1097AD3-3-5	Rivet	12	SP
11	124112-201	Base – Bypass	1	NP
12	MS21059L3	Platenut	14	SP
13	124114-201	Plate – Seal	2	P
		AVAIL CODE DEFINITION P Procurable NP Non Procurable SP Normal stock/procurable See introduction on availability codes for additional information.		

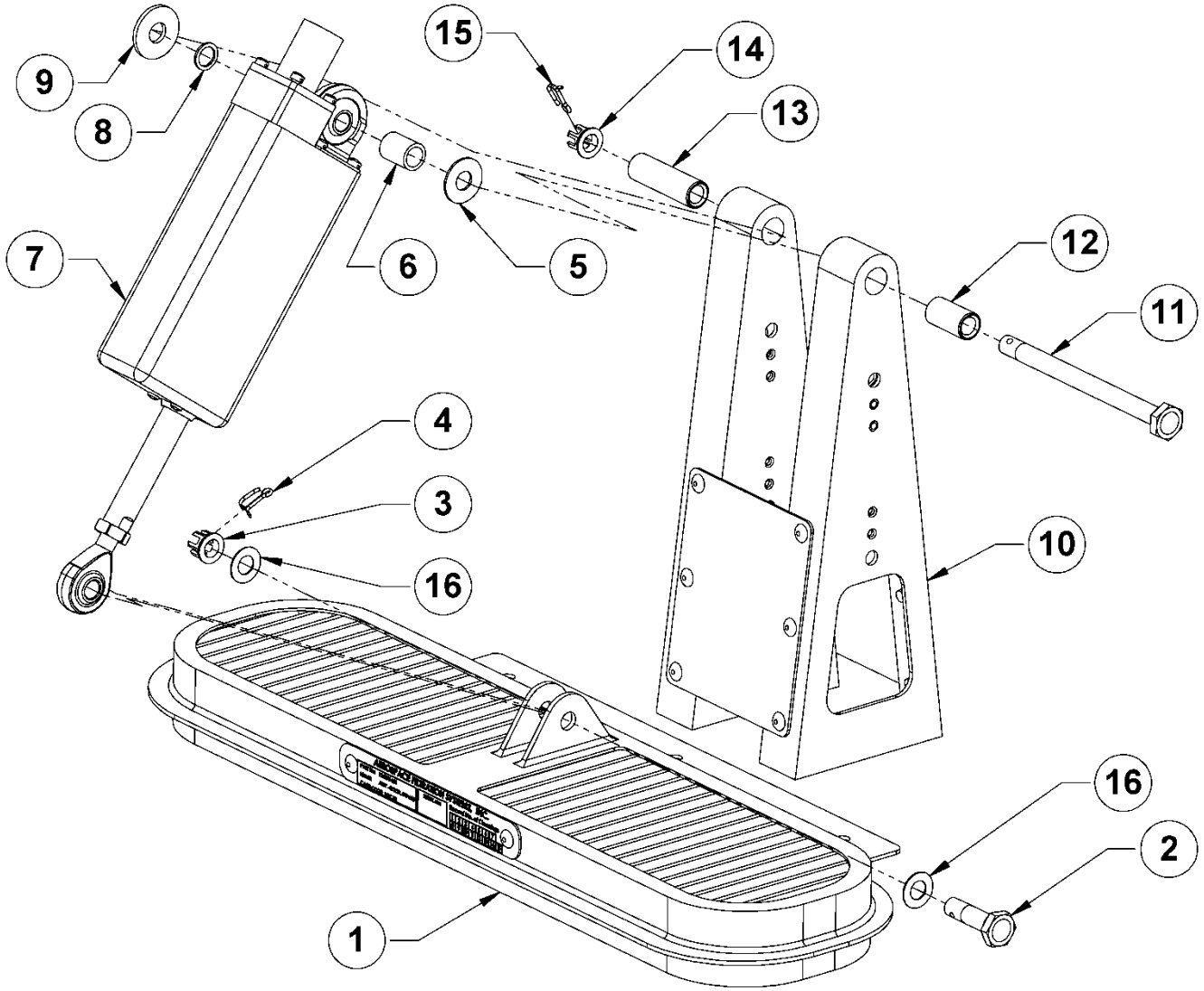


Figure A-10: Actuator-Hanger & Door Assembly (Exploded View)
(LH-shown/RH-opposite)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figure A-10: Actuator-Hanger & Door Assembly		
	N/A	Assy – Actuator-Hanger & Door (LH-shown/RH-opposite)		NP/NP
1	124375-101	Assy – Door	1	P
2	NAS6204-9D	Bolt	1	SP
3	MS14144L4	Nut	1	SP
4	MS24665-132	Cotter Pin	1	SP
5	MS15795-852	Washer	1	SP
6	NAS43DD4-32FC	Spacer	1	P
7	AFS-LA11500AC1	Actuator	1	P
8	NAS43DD4-2FC	Spacer	1	P
9	MS27183-52	Washer	1	SP
10	124130-101	Assy – Hanger	1	P
11	NAS6204-47D	Bolt	1	P
12	NAS76A4-023P	Bushing	1	P
13	NAS76A4-108P	Bushing	1	P
14	MS14144L4	Nut	1	SP
15	MS24665-132	Cotter Pin	1	SP
16	NAS1149D0416J	Washer	2	SP
		AVAIL CODE DEFINITION P Procurable NP Non Procurable SP Normal stock/procurable See introduction on availability codes for additional information.		

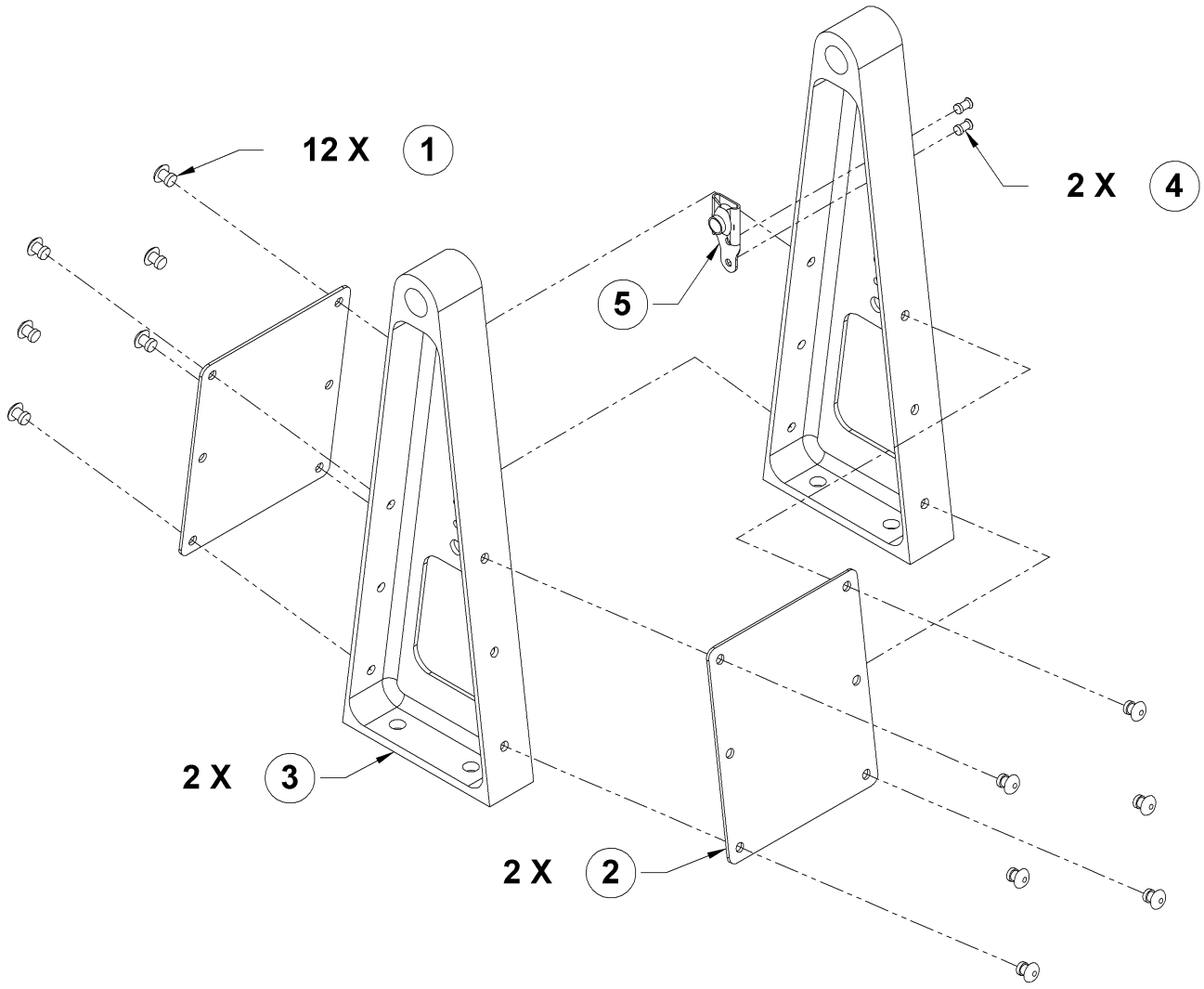


Figure A-11: Hanger Assembly (Exploded View)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figure A-11: Hanger Assembly		
	124130-101	Assy – Hanger		SP
1	MS20470AD4-4	Rivet	12	NP
2	124132-201	Plate – Hanger	2	NP
3	124131-201	Hanger – Bypass	2	NP
4	NAS1097AD3-4	Rivet	2	NP
5	MS2106L3	Platenut	1	NP
		AVAIL CODE DEFINITION P Procurable NP Non Procurable SP Normal stock/procurable See introduction on availability codes for additional information.		

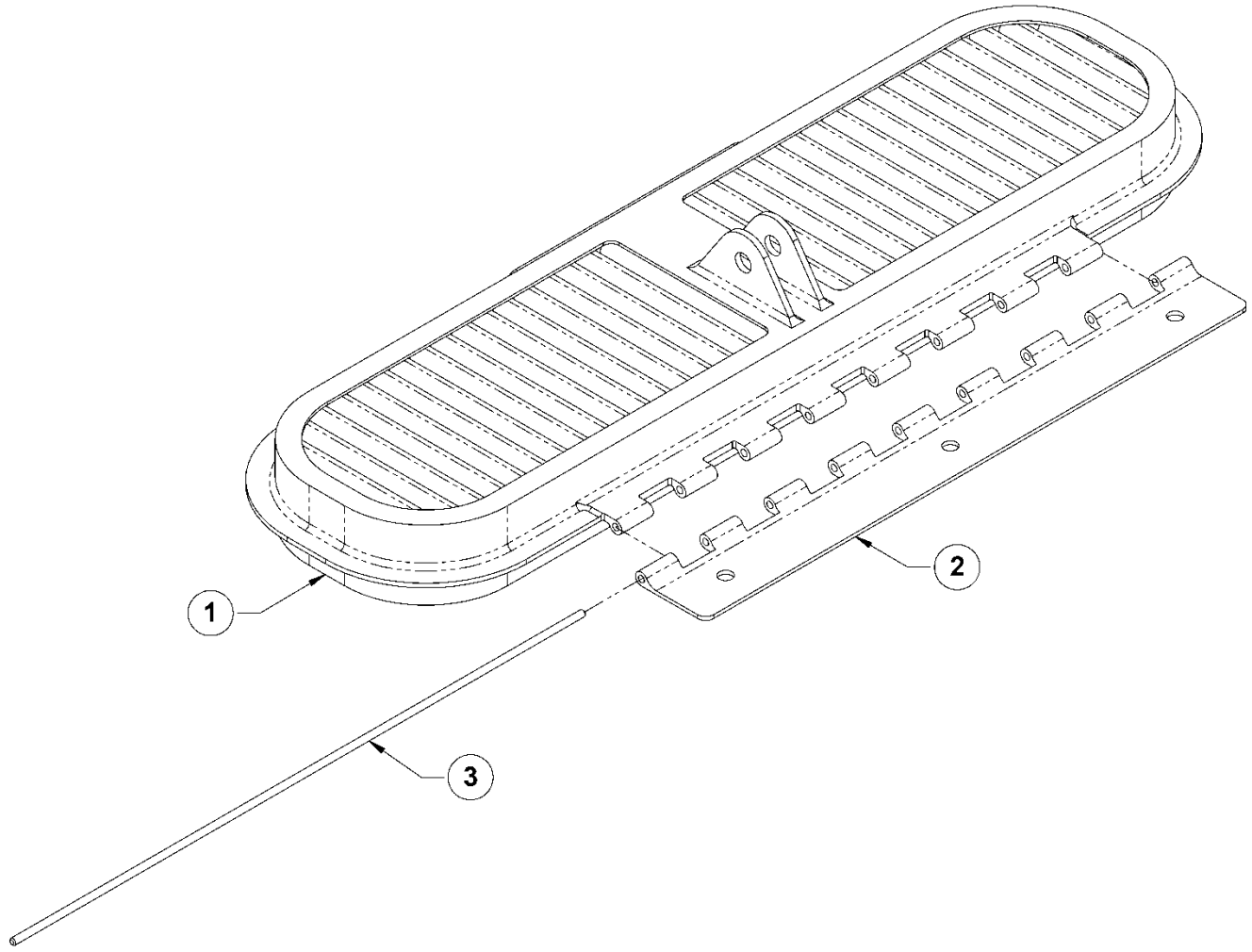


Figure A-12: Door Assembly (Exploded View)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figure A-12: Door Assembly		
	124375-101	Assy – Door		SP
1	N/A	Door – Filter	2	NP
2	124124-201	Hinge – Base	1	NP
3	MS20253P2-890	Pin	1	SP
		AVAIL CODE DEFINITION P Procurable NP Non Procurable SP Normal stock/procurable See introduction on availability codes for additional information.		

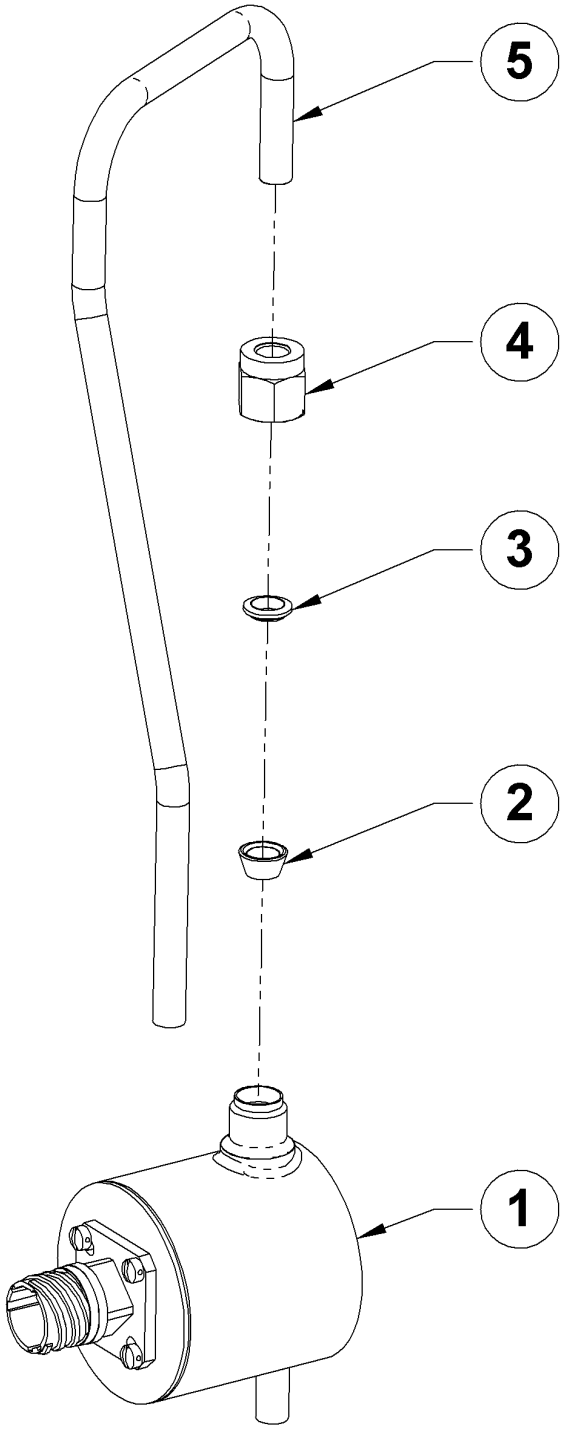


Figure A-13: Delta-P Switch Assembly (Exploded View)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figure A-13: Delta-P Switch Assembly		
	N/A	Assy – Switch, Delta-P (LH-shown/ RH-opposite)		NP
1	100409-101	Assy – Switch, Pressure, Differential	1	P
	N/A	Assy – Tube (not shown)	1	NP
2	A-403-1	Front Ferrule	1	SP
3	A-404-1	Back Ferrule	1	SP
4	A-402-1	Nut	1	SP
5	124145-201/-202	Tube – Delta-P (LH-shown/RH-opposite)	1/1	P/P
		AVAIL CODE DEFINITION P Procurable NP Non Procurable SP Normal stock/procurable See introduction on availability codes for additional information.		

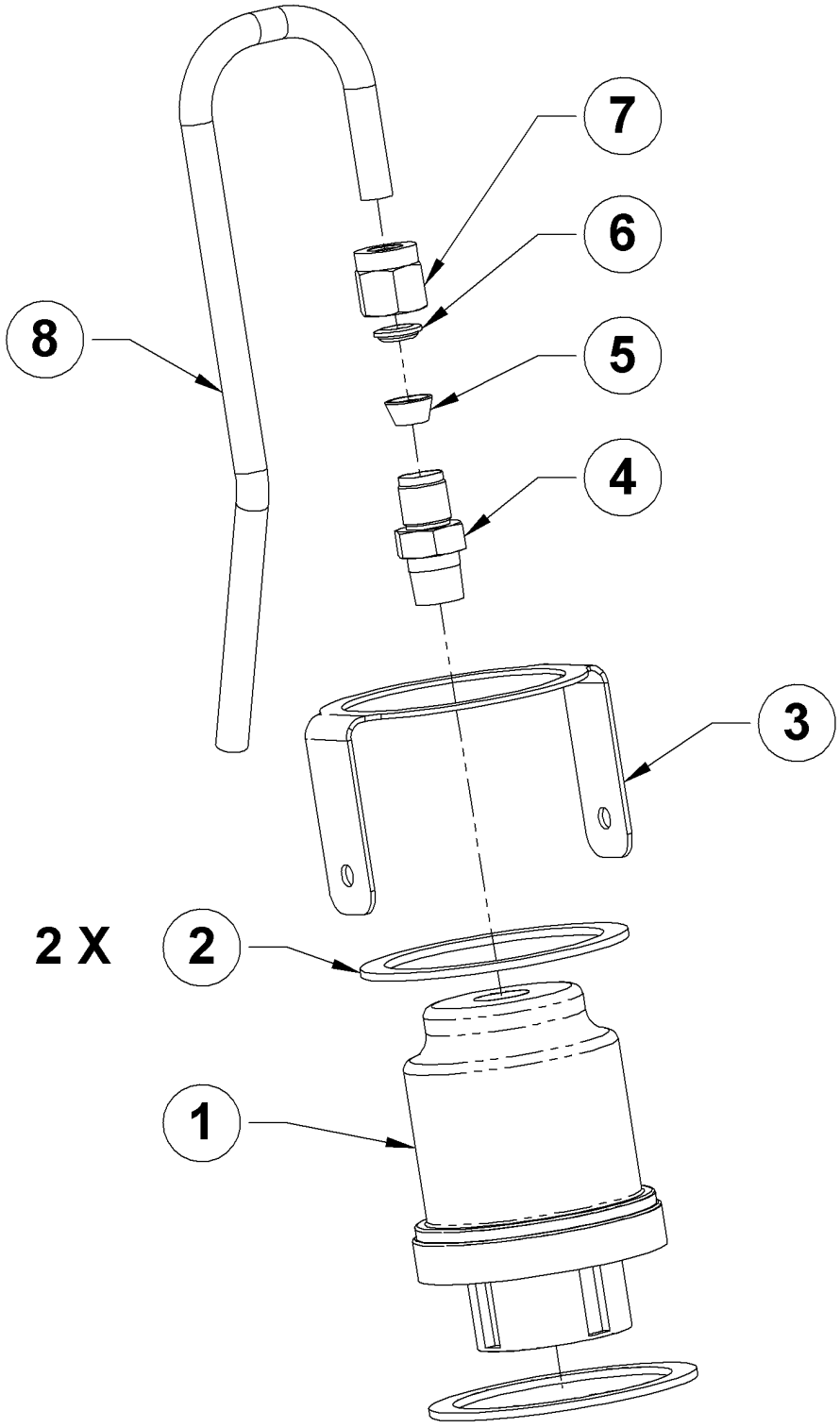


Figure A-14: Filter Maintenance Aid Assembly (Exploded View)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figure A-14: Filter Maintenance Aid Assembly		
	N/A	Assy – Aid, Maintenance, Filter (LH-shown/ RH-opposite)		NP
1	104441-201	Indicator - Maintenance	1	P
2	122134-201	Cushion	2	P
3	124135-201	Retainer - Indicator	1	P
4-7	A-400-1-2	Connector (¼ Fractional Tube to 1/8 NPT)	1	SP
4	A-401-1	Adapter	1	NP
5	A-403-1	Front Ferrule	1	SP
6	A-404-1	Back Ferrule	1	SP
7	A-402-1	Nut	1	SP
8	124140-201/-202	Tube – Indicator (LH-shown/RH-opposite)	1/1	P/P
		AVAIL CODE DEFINITION P Procurable NP Non Procurable SP Normal stock/procurable See introduction on availability codes for additional information.		

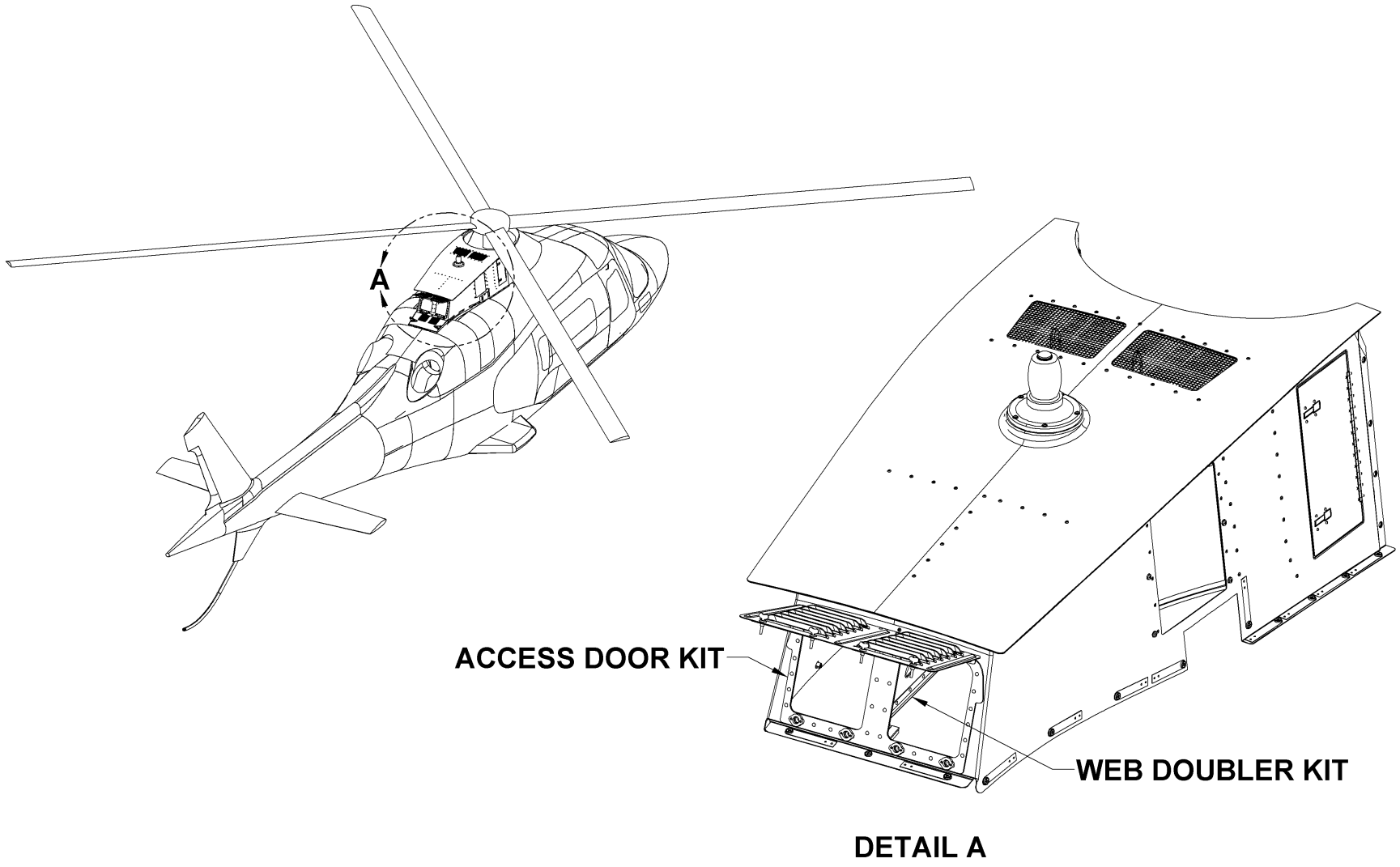


Figure A-15: Access Door Kit & Web Doubler Kit (A/C Location)

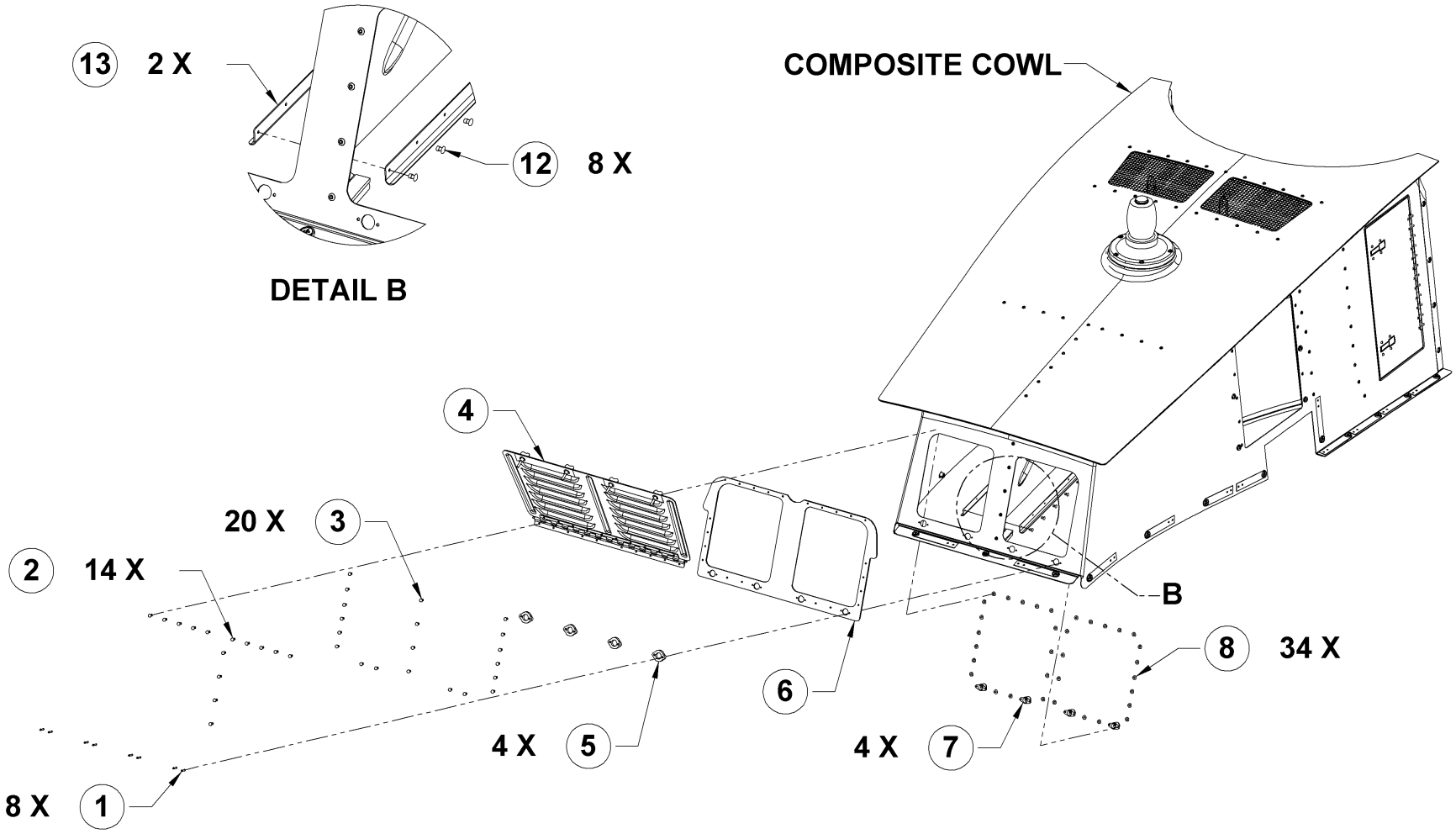


Figure A-16: Access Door Kit & Web Doubler Kit (Composite Cowl - Exploded View)
(NOTE: This figure pertains to installations on composite rear upper cowls only.)

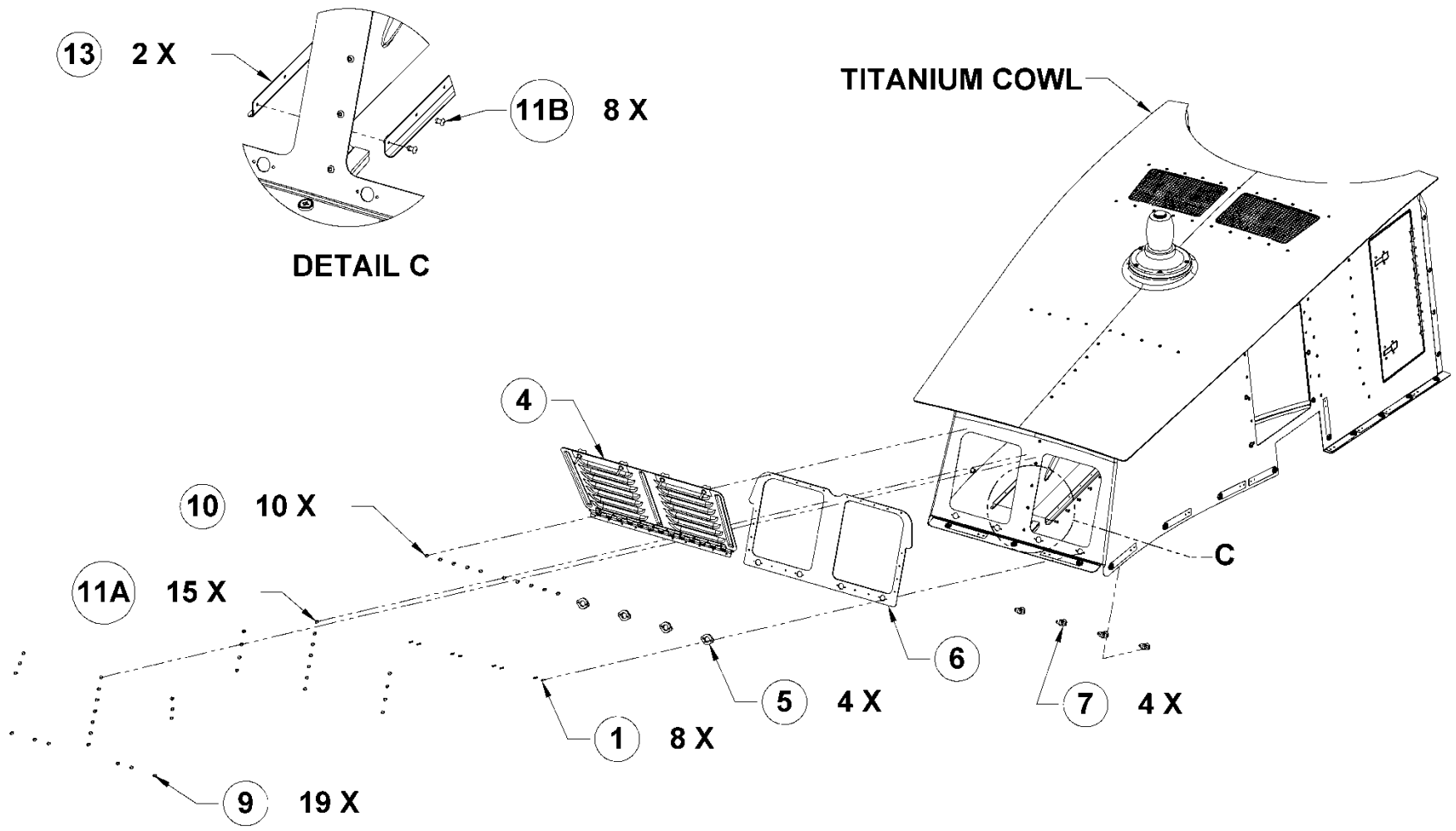


Figure A-17: Access Door Kit & Web Doubler Kit (Titanium Cowl - Exploded View)
(NOTE: This figure pertains to installations on titanium rear upper cowls only.)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figures A-15 thru A-17: Access Door Kit & Web Doubler Kit		
	N/A	Kit – Door, Access		NP
1	NAS1097U3-8	Rivet	8	SP
2	NAS9307M-4-04	Rivet	14	SP
3	NAS9307M-4-03	Rivet	20	SP
4	124410-101	Assy – Access	1	P
5	124401-201	Spacer	4	P
6	124403-201	Doubler – Access, Door	1	P
7	26R18-1-1AA	Receptacle	4	P
8	AN960C4L	Washer	34	SP
9	MS20470T4-5	Rivet	19	SP
10	MS20470T4-6	Rivet	10	SP
11A	MS20470T4-5	Rivet	15	SP
	N/A	Kit – Doubler, Web		NP
11B	MS20470T4-5	Rivet	8	SP
12	NAS9307M4-02	Rivet	8	SP
13	124400-201	Doubler – Web	2	P
		AVAIL CODE DEFINITION P Procurable NP Non Procurable SP Normal stock/procurable See introduction on availability codes for additional information.		

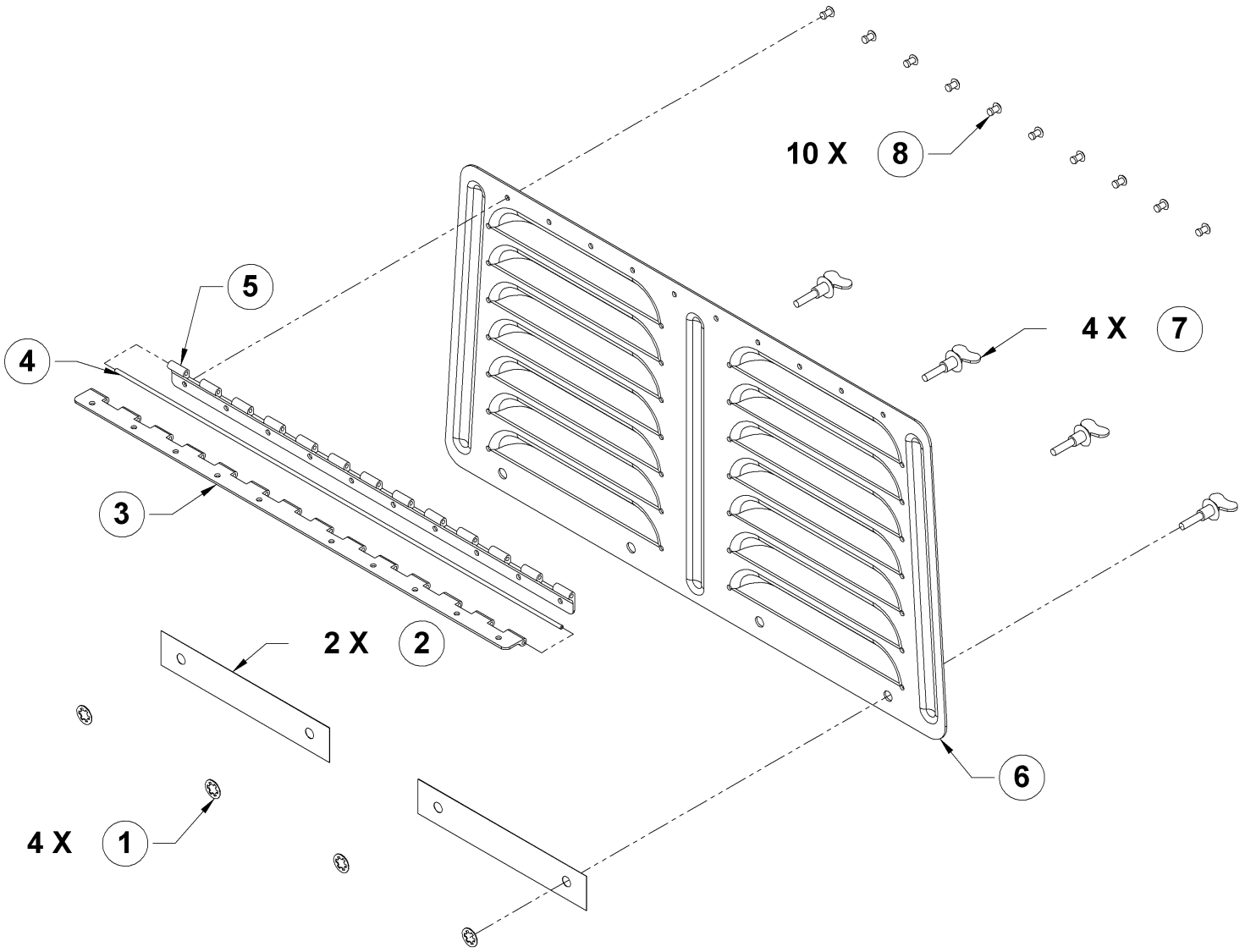


Figure A-18: Access Assembly (Exploded View)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figure A-18: Access Assembly		
	124410-101	Assy – Access		SP
1	2600-LW-7	Retaining Ring	4	NP
2	TAC18	Tape	2	NP
3	124413-201	Hinge – Doubler	1	NP
4	MS20253P2-1390	Pin	1	SP
5	124412-201	Hinge – Door	1	NP
6	124411-201	Door	1	NP
7	2600-14SW	Stud	4	NP
8	MS20470AD4-4-5	Rivet	10	NP
		AVAIL CODE DEFINITION P Procurable NP Non Procurable SP Normal stock/procurable See introduction on availability codes for additional information.		

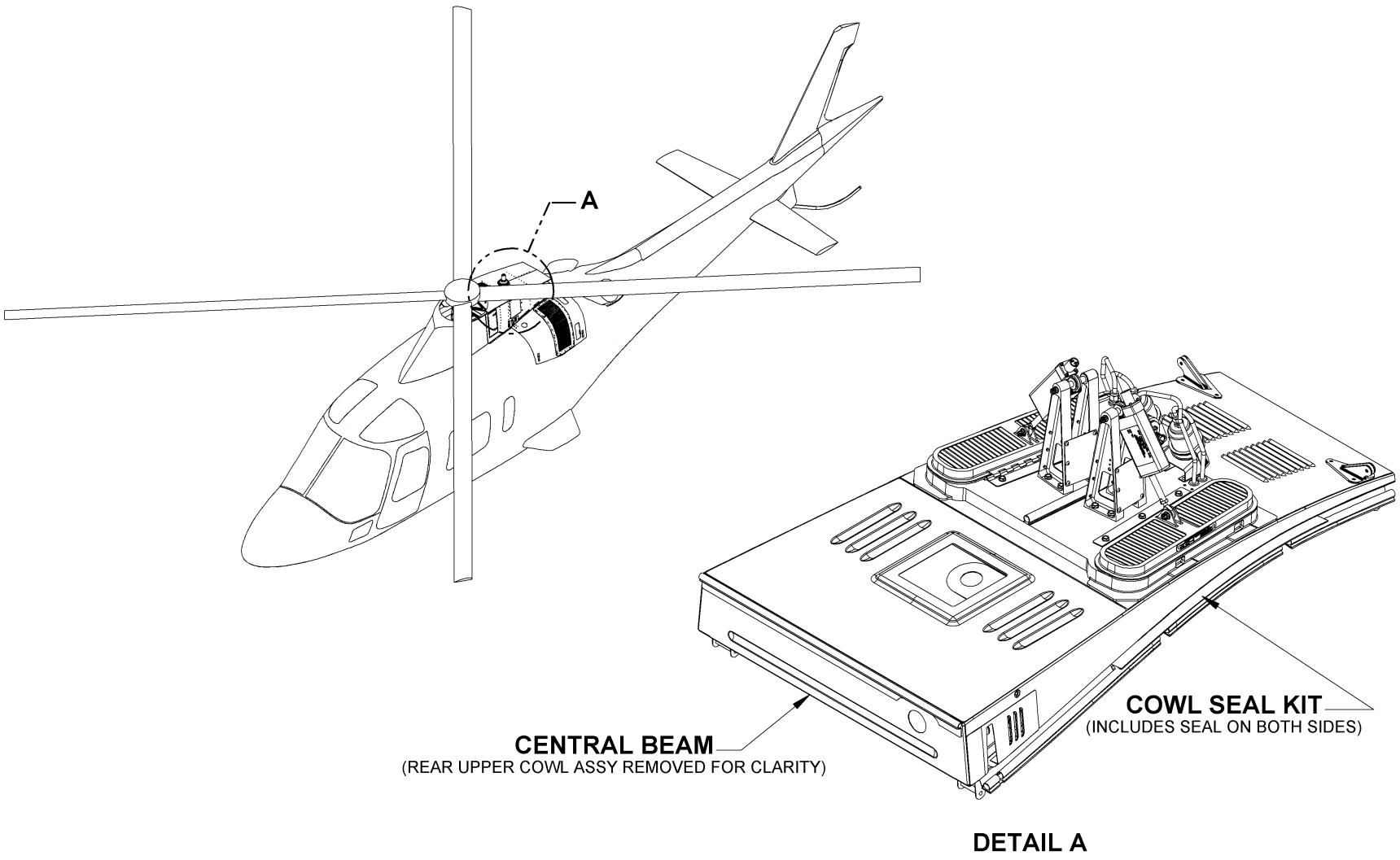


Figure A-19: Cowl Seal Kit (A/C Location)

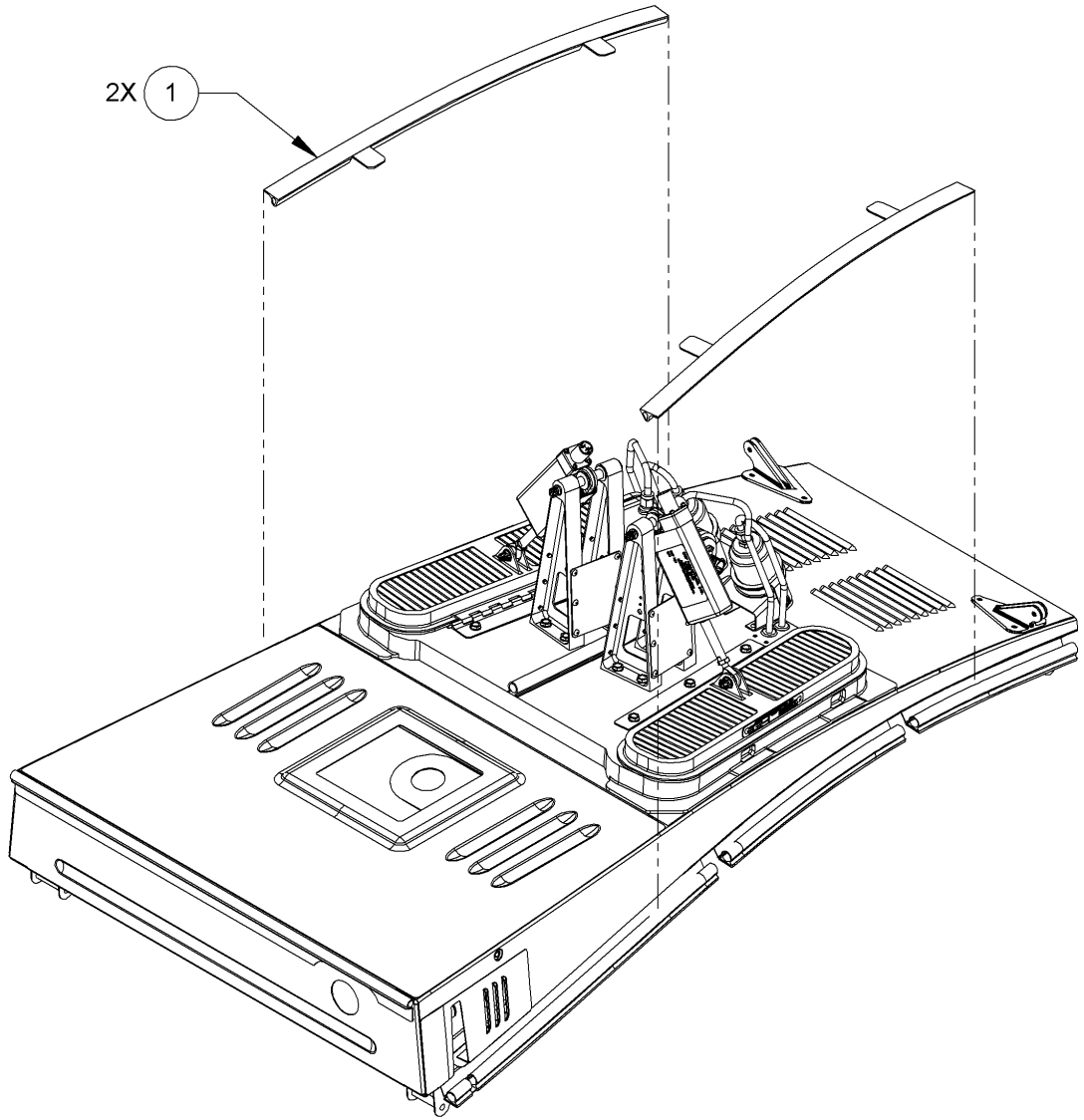


Figure A-20: Cowl Seal Kit (Exploded View)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figures A-19 thru A-20: Cowl Seal Kit		
	N/A	Kit – Seal, Cowl		NP
1	124500-201	Seal, Cowl	2	P
		AVAIL CODE DEFINITION P Procurable NP Non Procurable SP Normal stock/procurable See introduction on availability codes for additional information.		

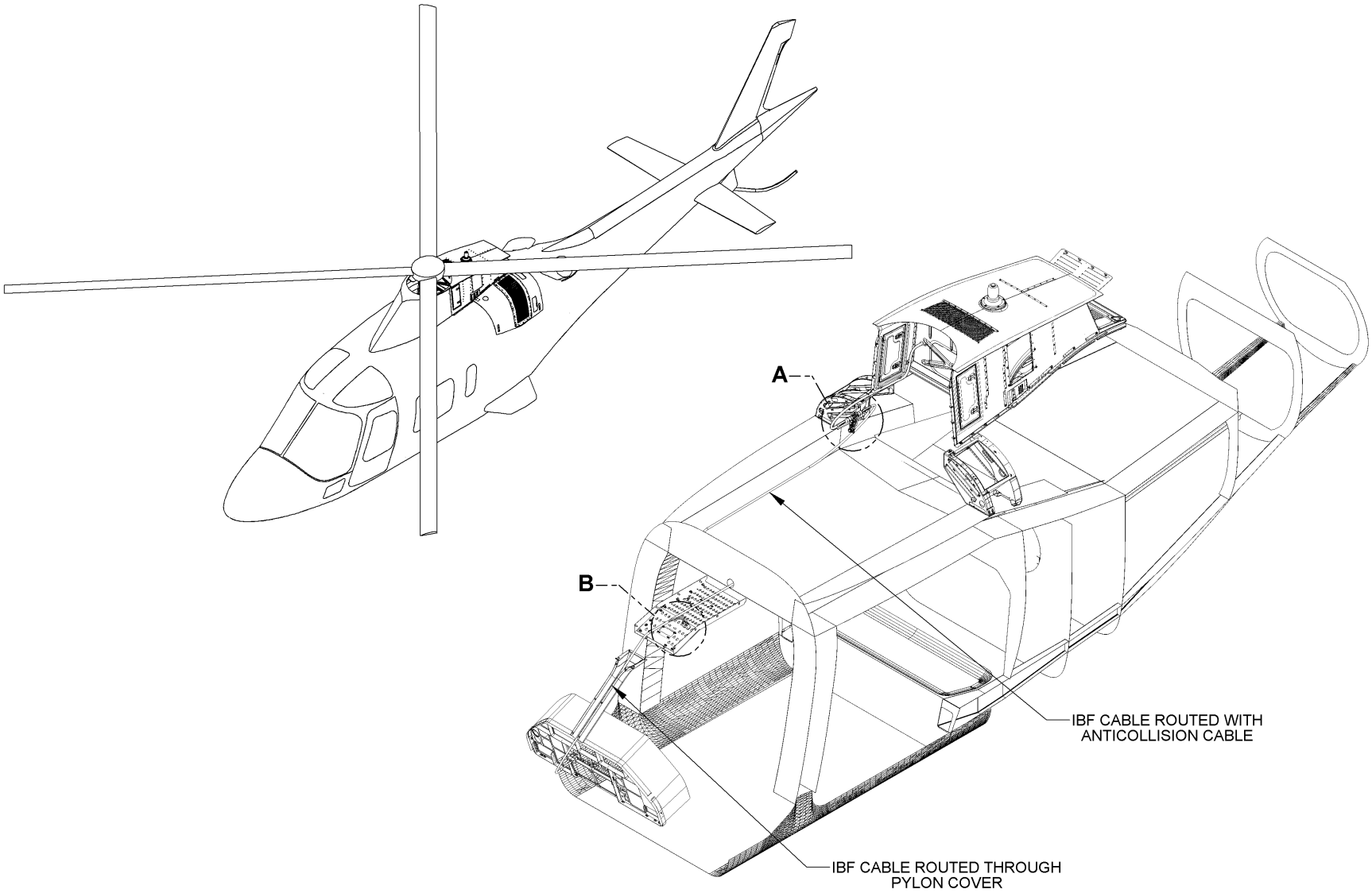


Figure A-21: Fwd Electrical Kit (A/C Routing, Bracket, & C/B Details Locations)

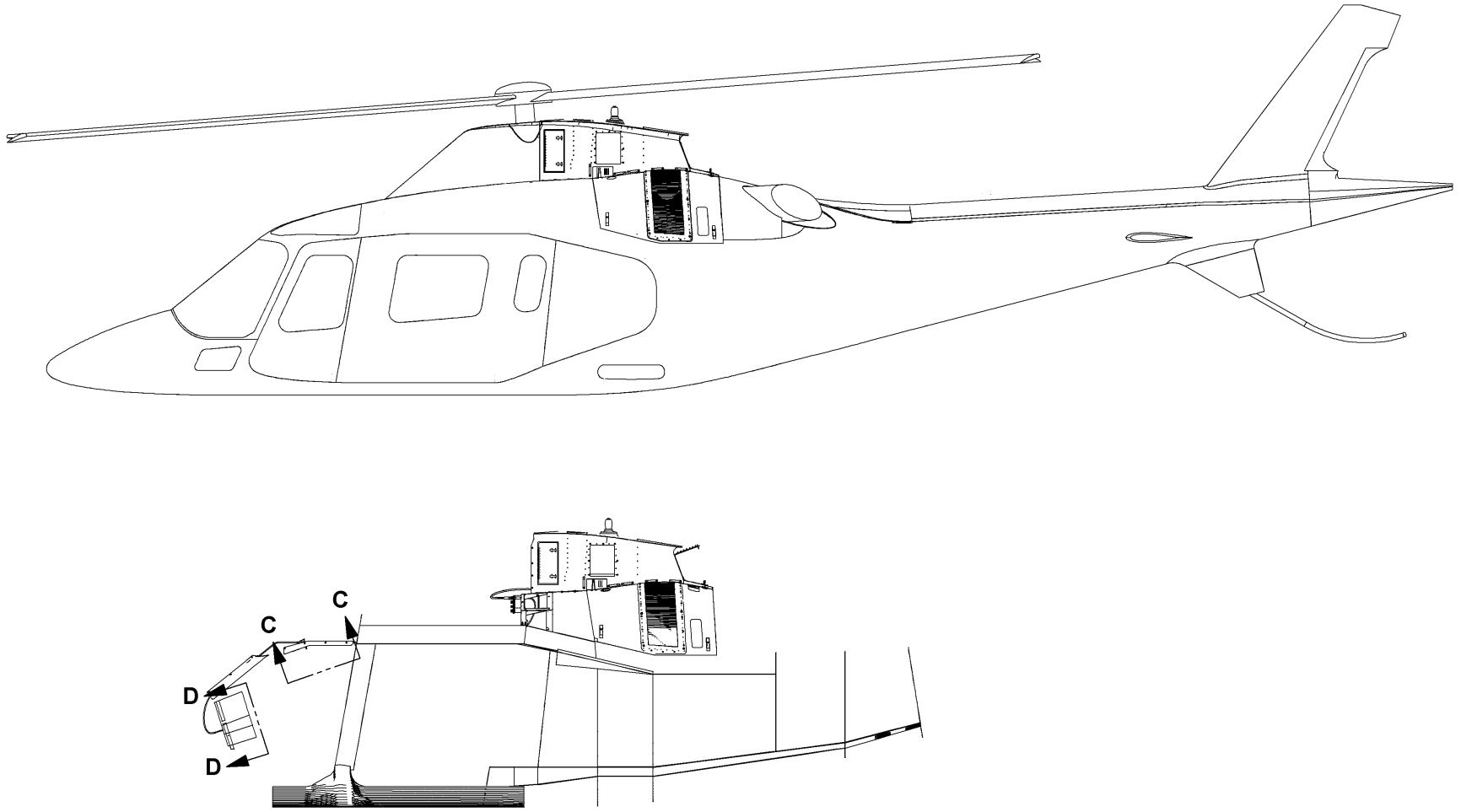


Figure A-22: Fwd Electrical Kit (C/B Panel & Console Detail Locations)

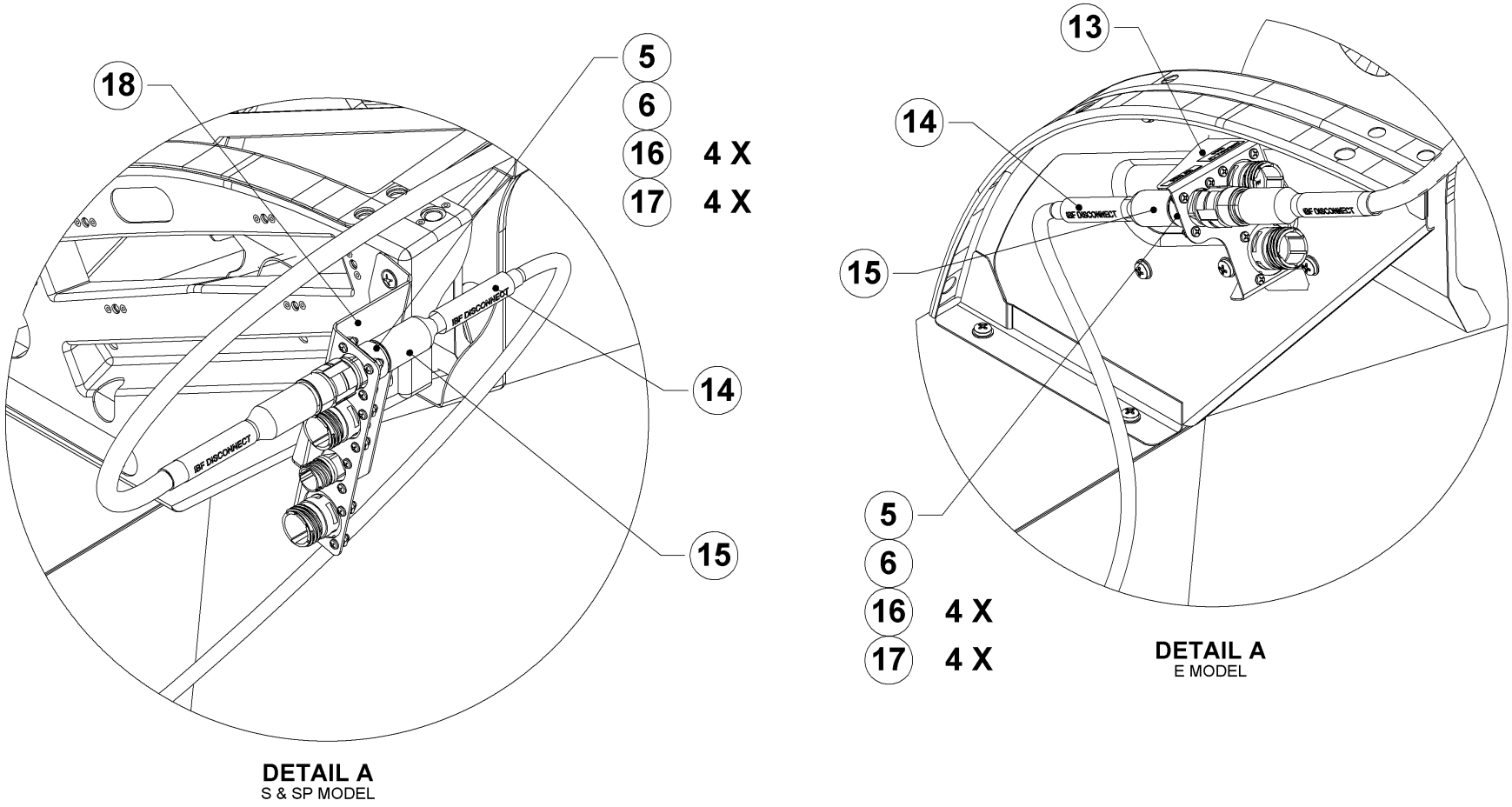
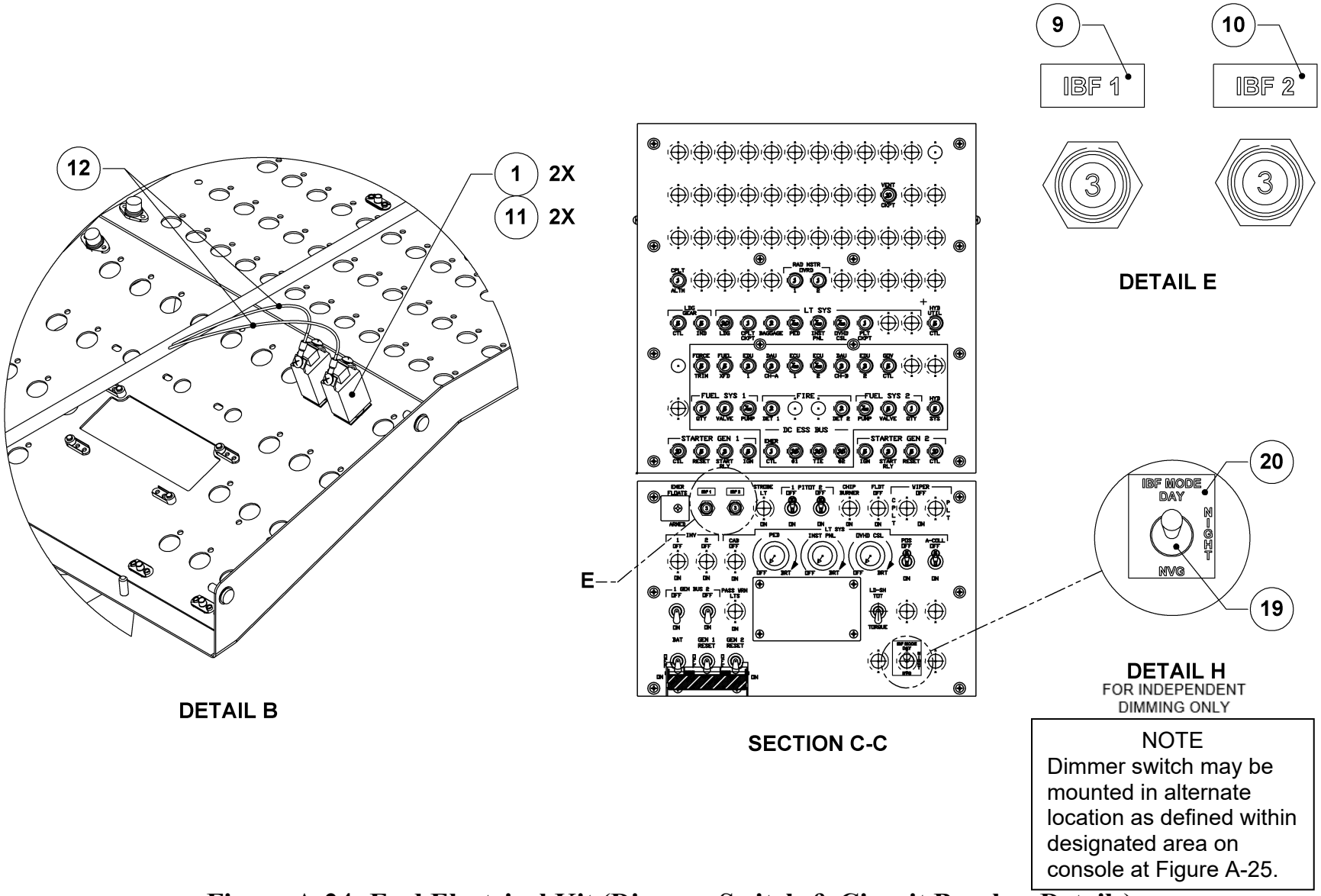


Figure A-23: Fwd Electrical Kit (Bracket & Connector Details)



NOTE
Dimmer switch may be mounted in alternate location as defined within designated area on console at Figure A-25.

Figure A-24: Fwd Electrical Kit (Dimmer Switch & Circuit Breaker Details)

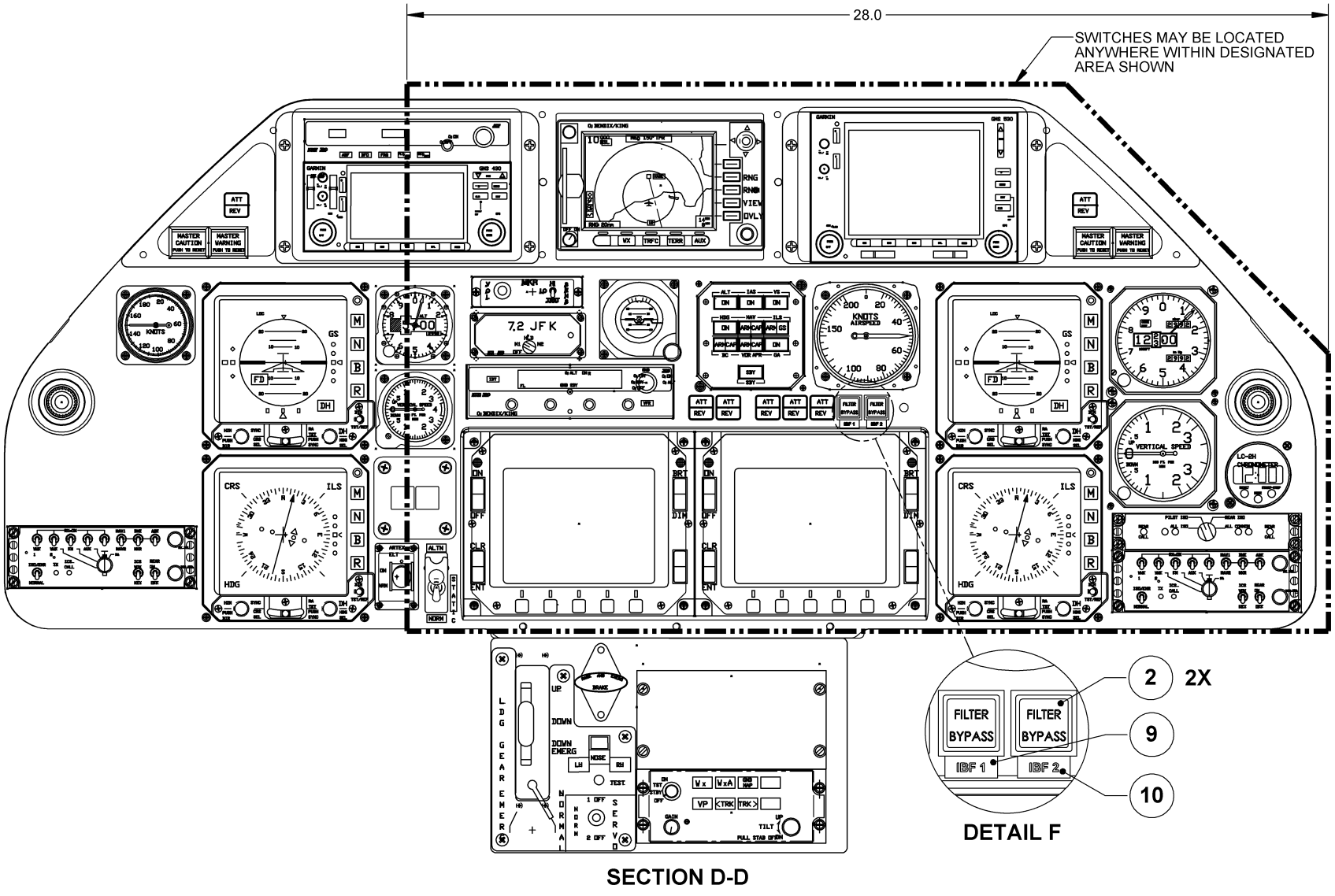


Figure A-25: Fwd Electrical Kit (Cockpit Indicator/Switch Details)

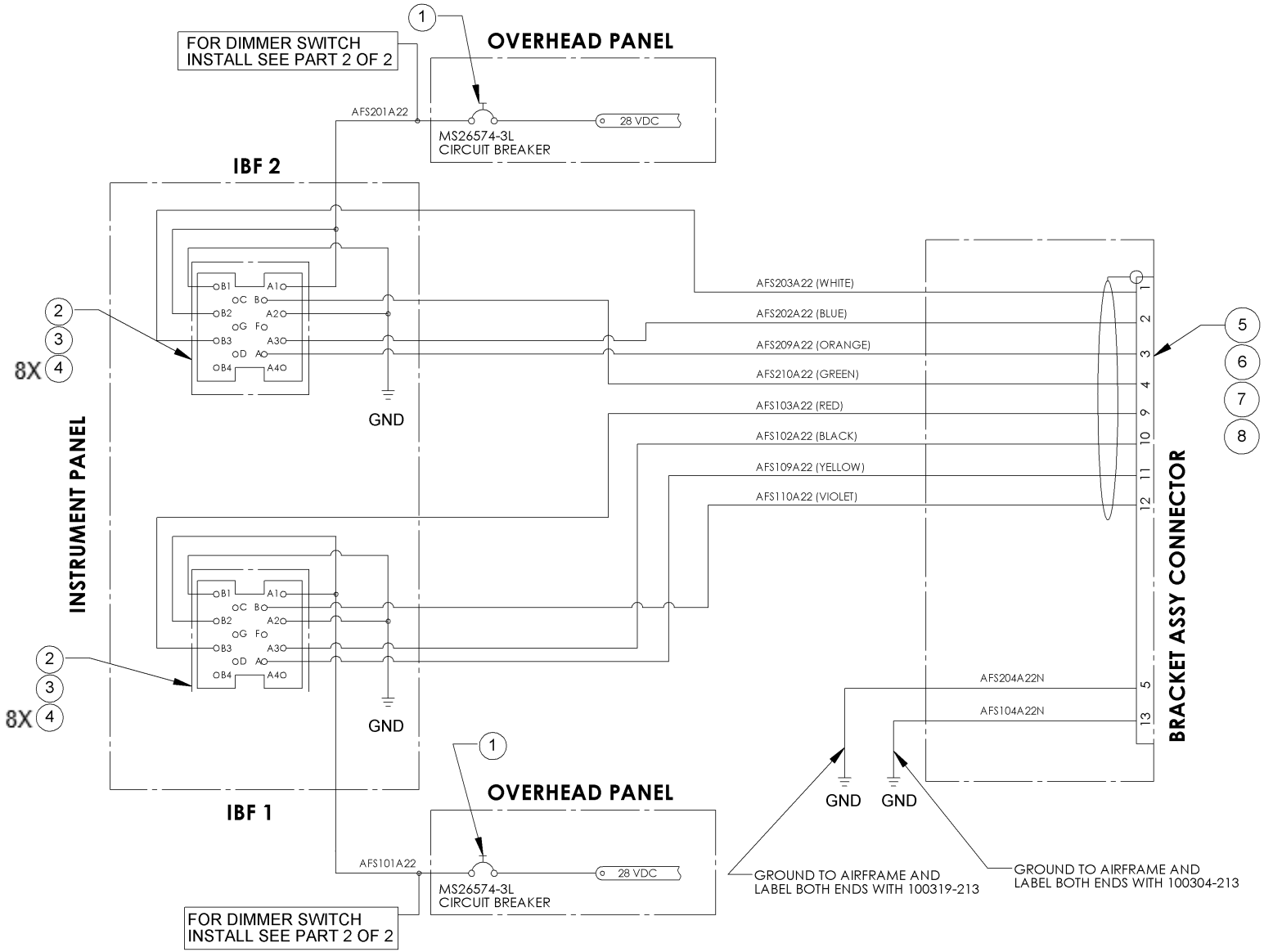
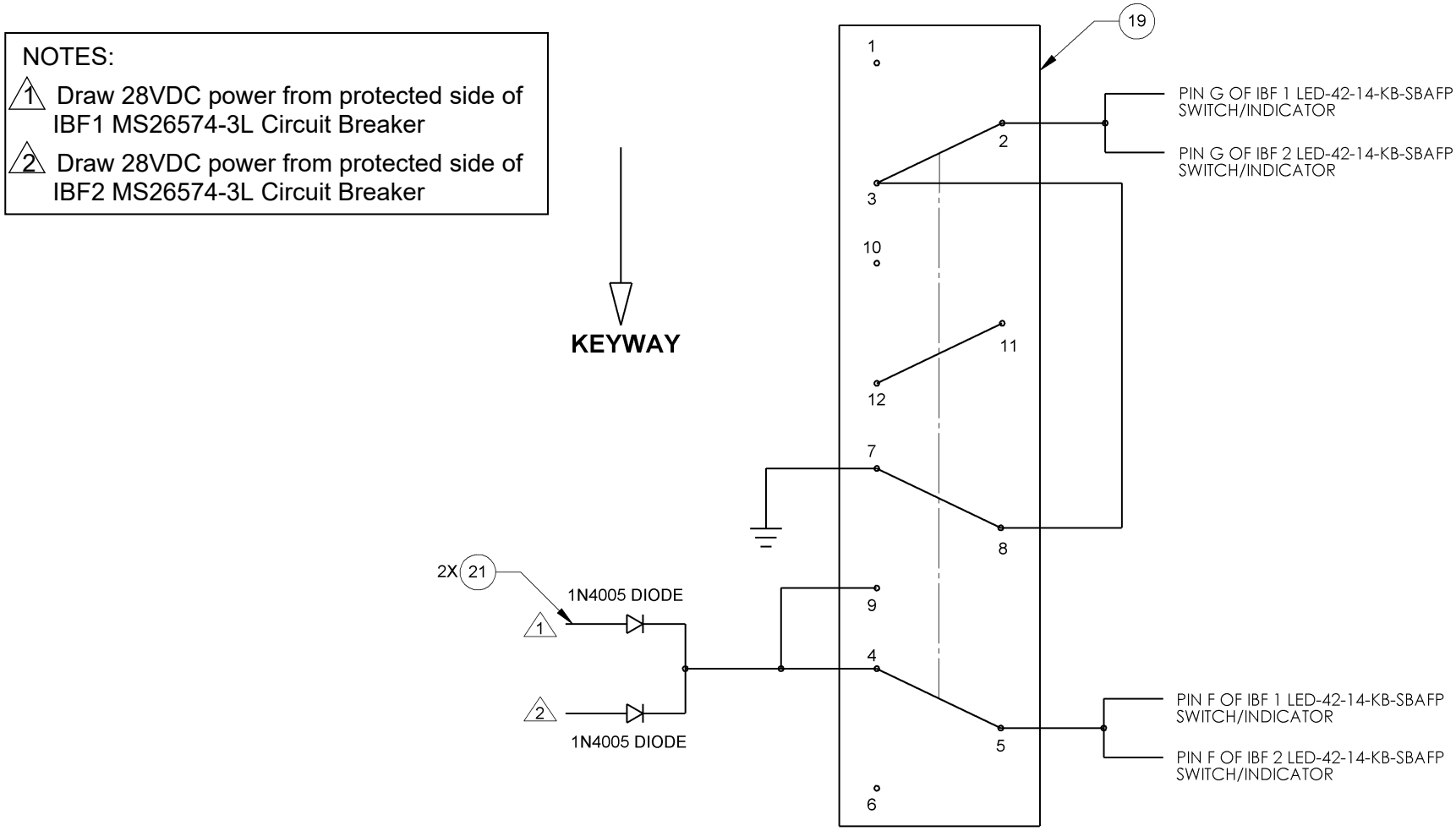


Figure A-26: Fwd Electrical Kit for Independent Dimming (Wiring Diagram – Part 1 of 2)



MS27406-1 SWITCH OPERATION		
OPPOSITE KEYING SIDE	**CENTER**	**KEYING SIDE**
2-3, 5-6, 8-9, 11-12	2-3, 4-5, 7-8, 11-12	1-2, 4-5, 7-8, 10-11

(NOTE: CENTER SWITCH POSITION SHOWN)

Figure A-27: Fwd Electrical Kit for Independent Dimming (Wiring Diagram – Part 2 of 2)

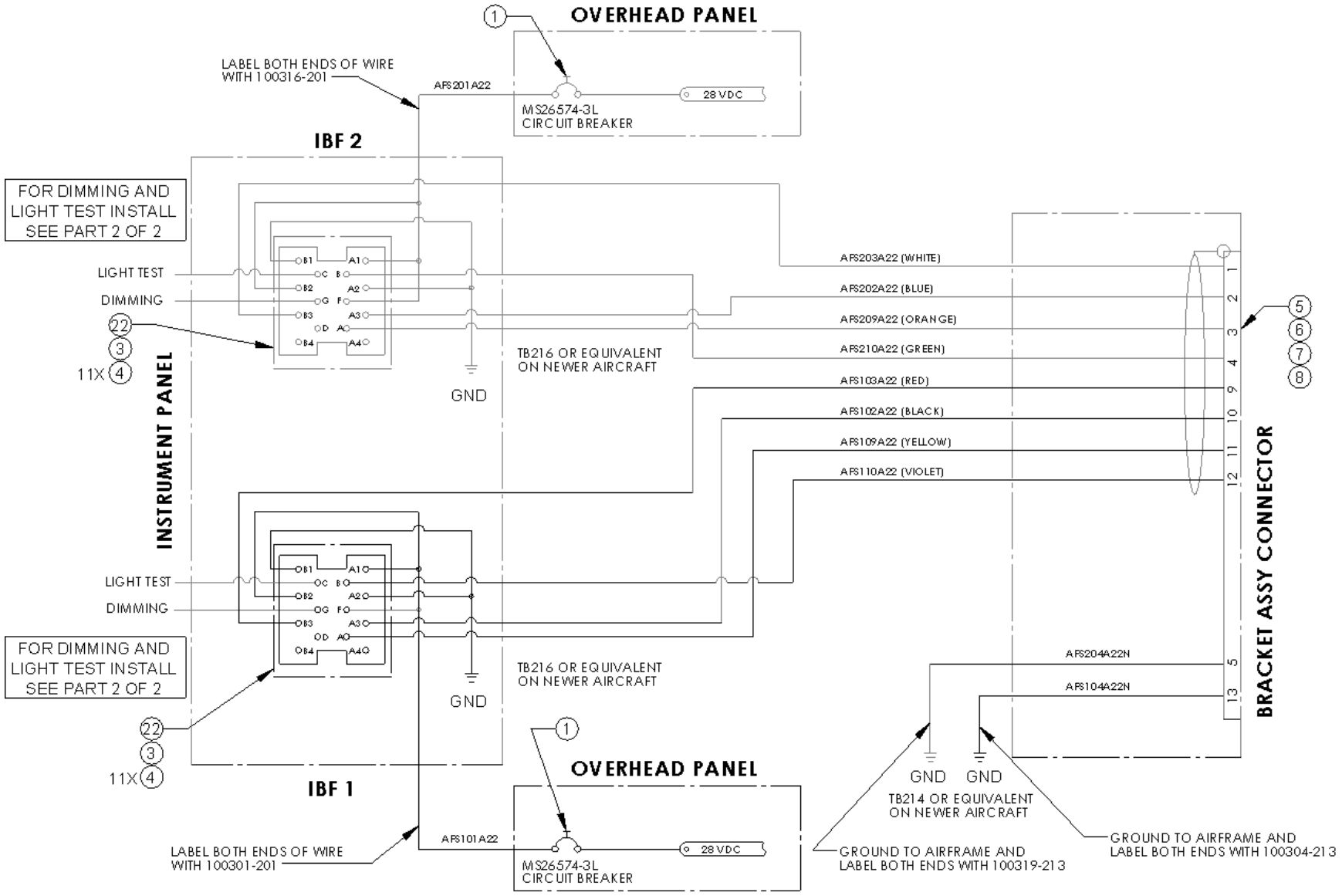


Figure A-28: Fwd Electrical Kit for Integrated Dimming (Wiring Diagram – Part 1 of 2)

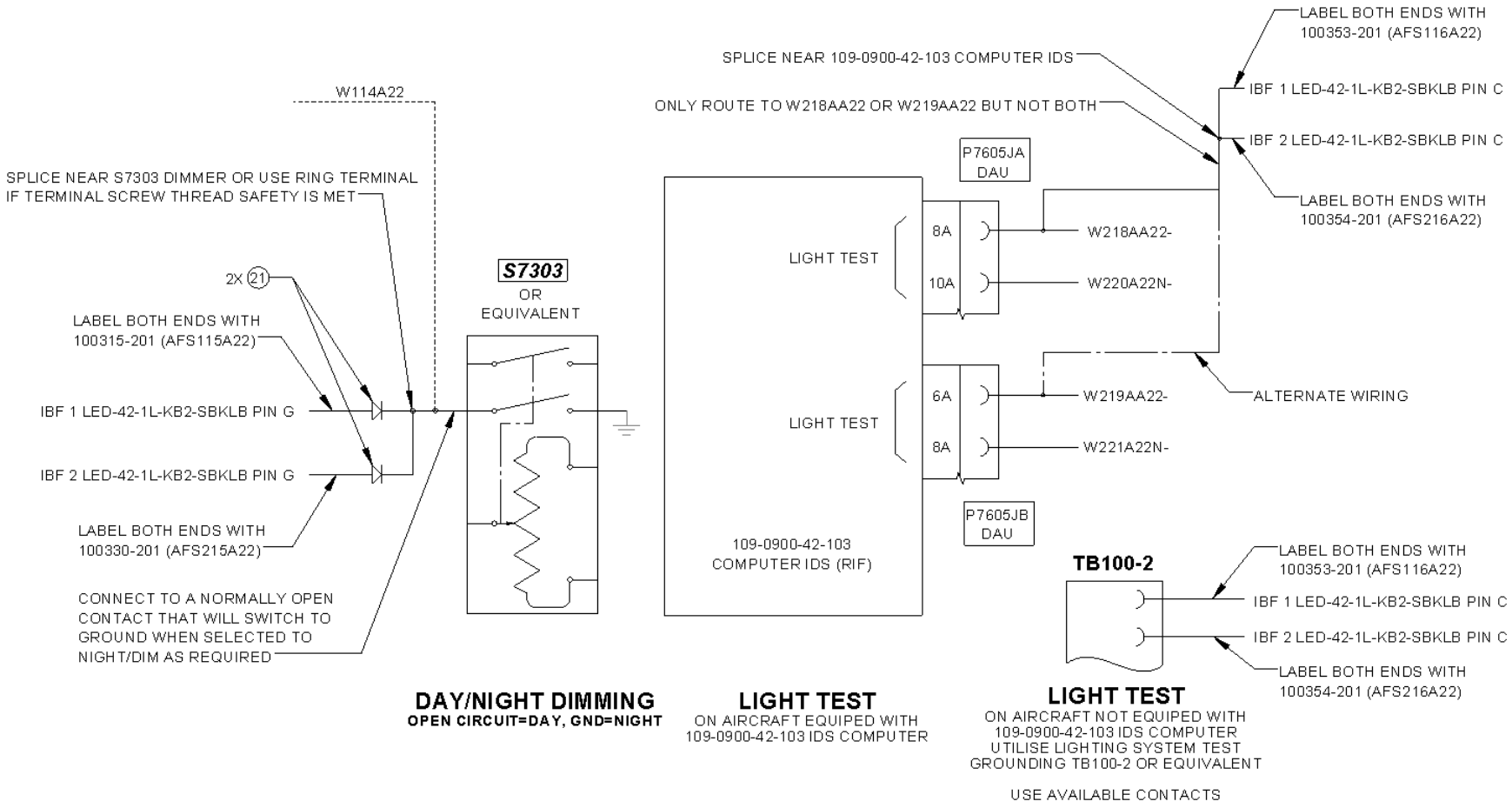


Figure A-29: Fwd Electrical Kit for Integrated Dimming (Wiring Diagram – Part 2 of 2)

INDEX NUMBER	PART NUMBER	ITEM NAME	FOR INDEPENDENT DIMMING UNIT PER ASSY	FOR INTEGRATED DIMMING UNIT PER ASSY	AVAIL
		Figures A-21 thru A-29: Fwd Electrical Kit			
	N/A	Kit – Electrical, Fwd			NP
1	MS26574-3L	Circuit Breaker	2	2	P
2	LED-42-14-KB-SBAFP	Cockpit Switch/Indicator	2	0	P
3	18-200	Connector	2	2	P
4	M39029/22-192	Socket	16	22	P
5	D38999/20WB35SN	Receptacle	1	1	P
6	ISOHS150NF1103-5S	Backshell	1	1	P
7	M27500-22RC8S09	Cable	N/A	N/A	SP
8	M23053/13-004-0	Tubing	N/A	N/A	SP
9	100375-201	Placard	2	2	SP
10	100375-203	Placard	2	2	SP
11	322364	Terminal Lug	2	2	SP
12	M16878/4BFE-9	Wire	N/A	N/A	SP
13	124201-101	Assy - Bracket	1	1	P
14	100349-201	ID Tag	1	1	SP
15	770-006S302	Boot	1	1	P
16	MS35206-215	Screw	4	4	SP
17	MS21045-04	Nut	4	4	SP
18	124210-101	Bracket	1	1	P
19	MS27406-1	Switch - Dimmer	1	0	P
20	124404-201	Placard - Dimmer	1	0	P
21	1N4005	Diode	2	2	SP
22	LED-42-1L-KB2-SBKLB	Cockpit Switch/Indicator	0	2	P
		AVAIL CODE DEFINITION P Procurable NP Non Procurable SP Normal stock/procurable See introduction on availability codes for additional information.			

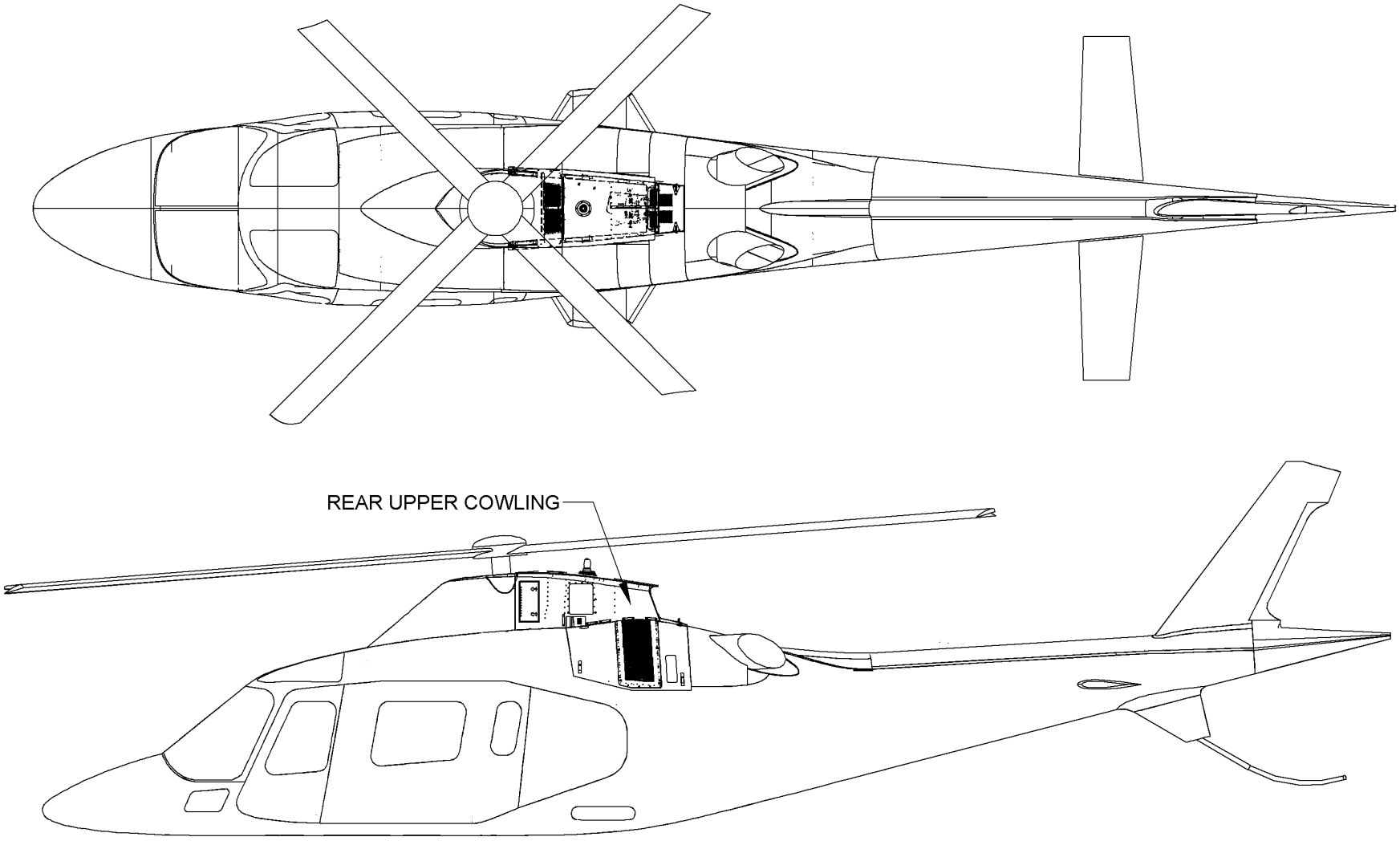


Figure A-30: Aft Electrical Kit (A/C Location)

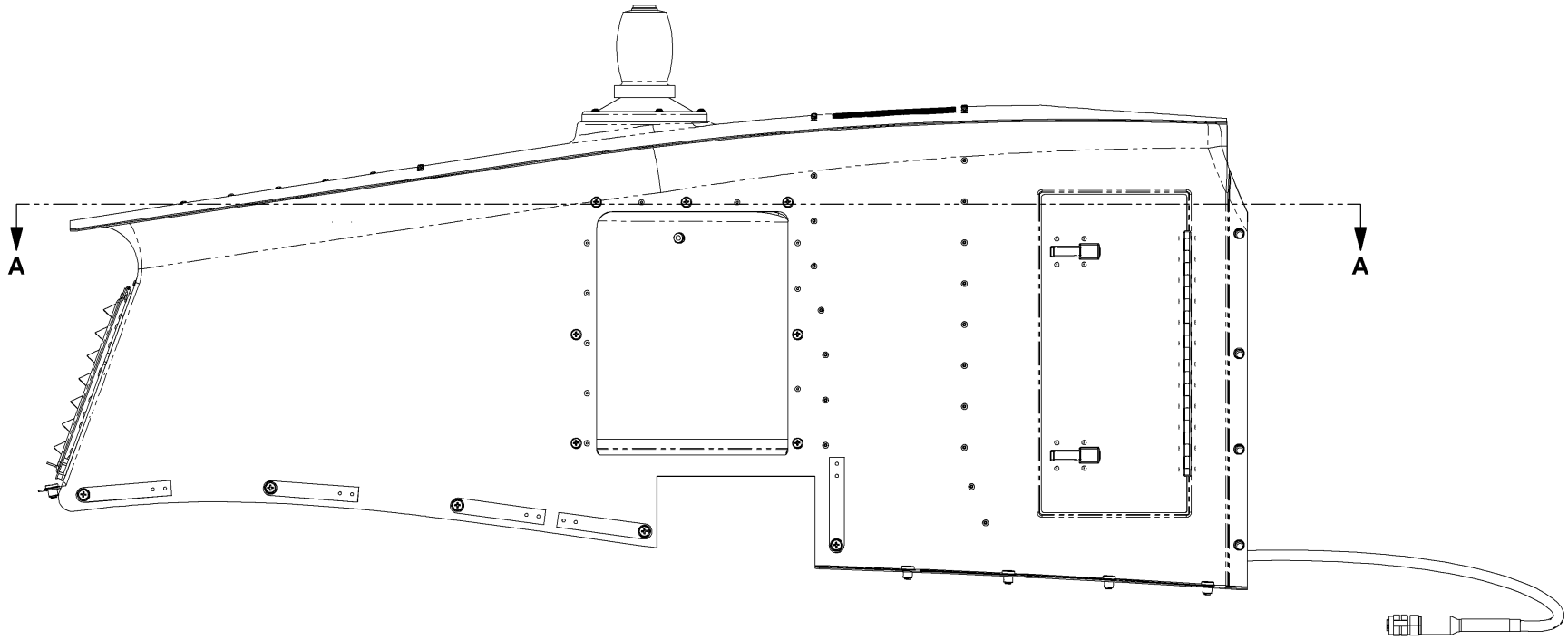


Figure A-31: Aft Electrical Kit (Rear Upper Cowling Removed)

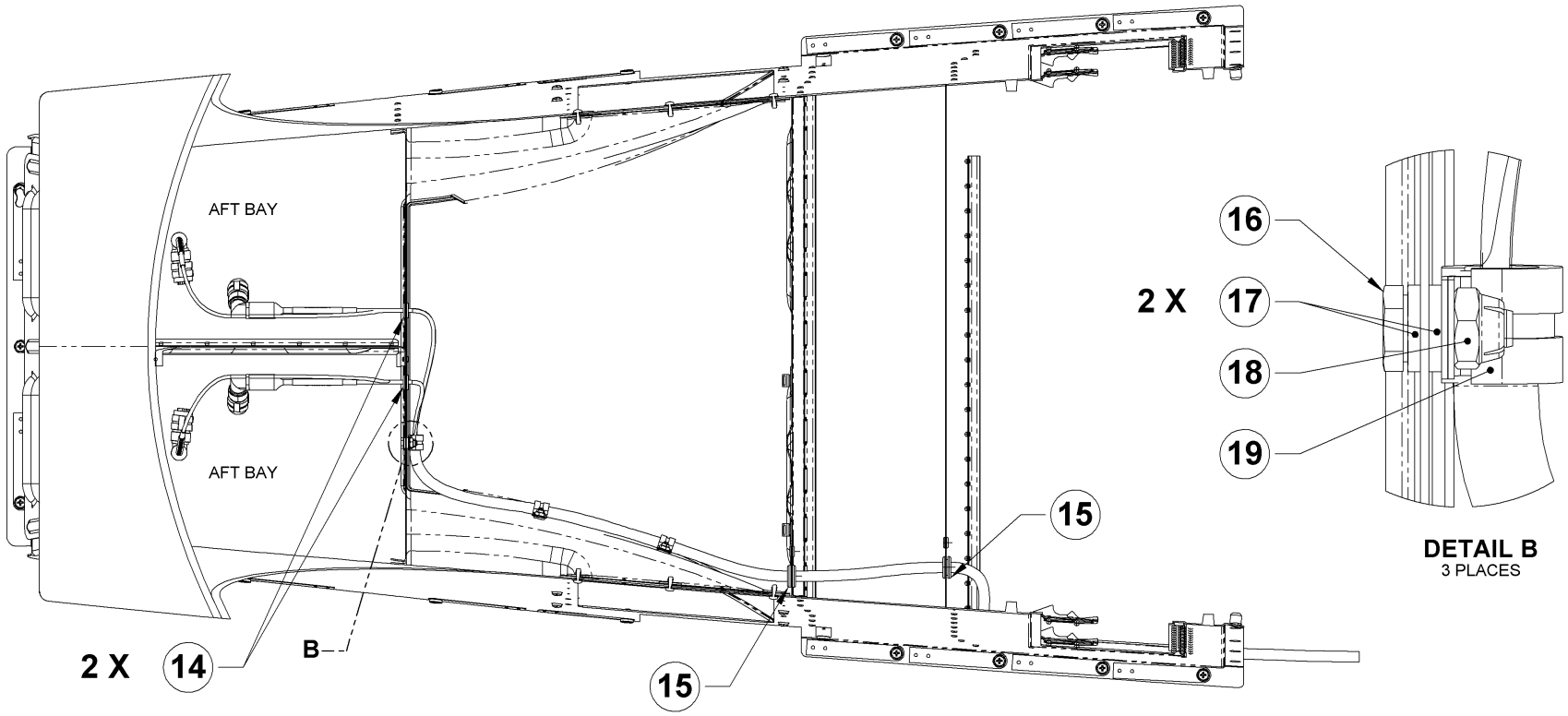


Figure A-32: Aft Electrical Kit (Routing through Rear Upper Cowling)

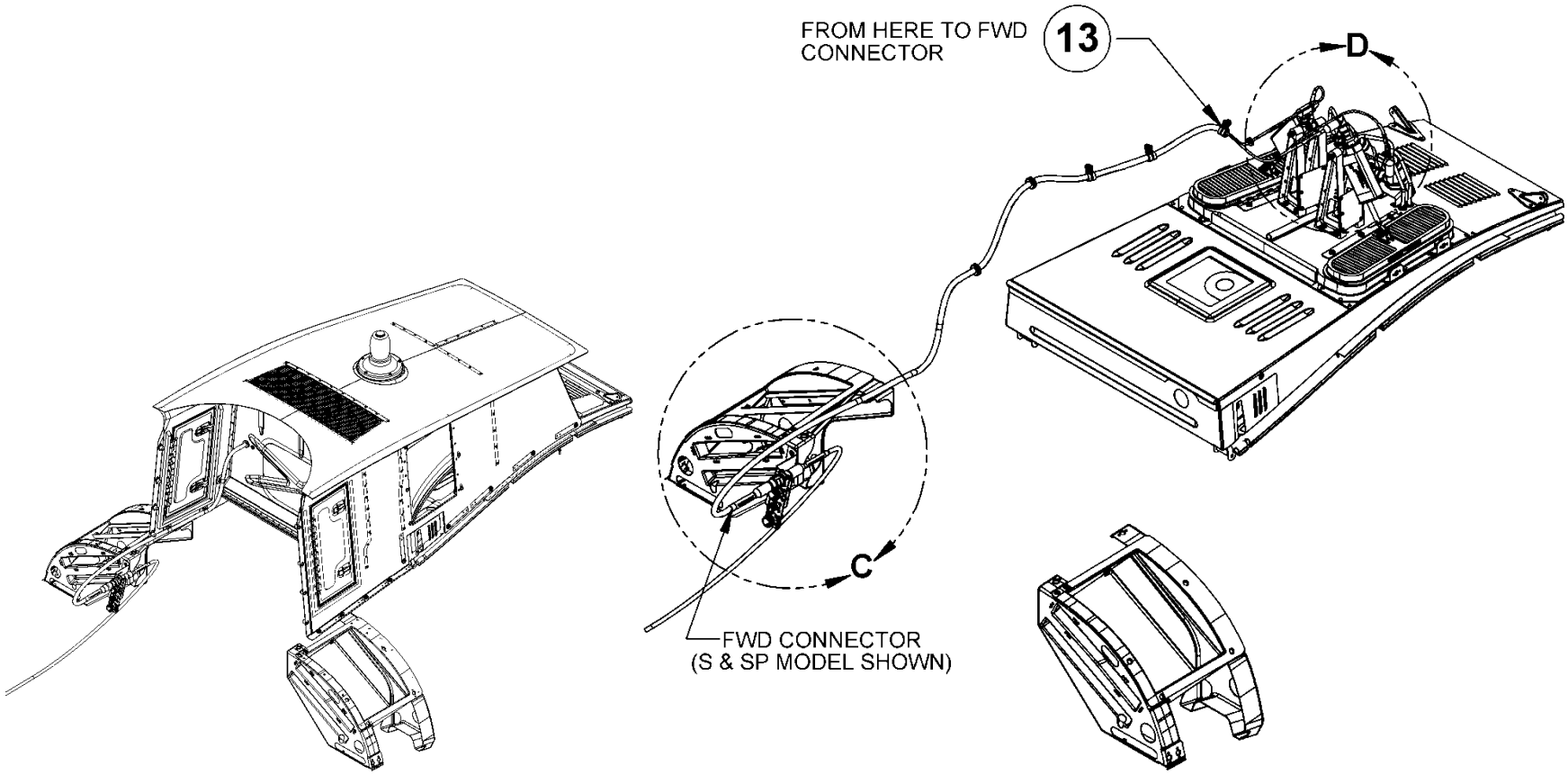


Figure A-33: Aft Electrical Kit (Routing to Fwd Bracket)

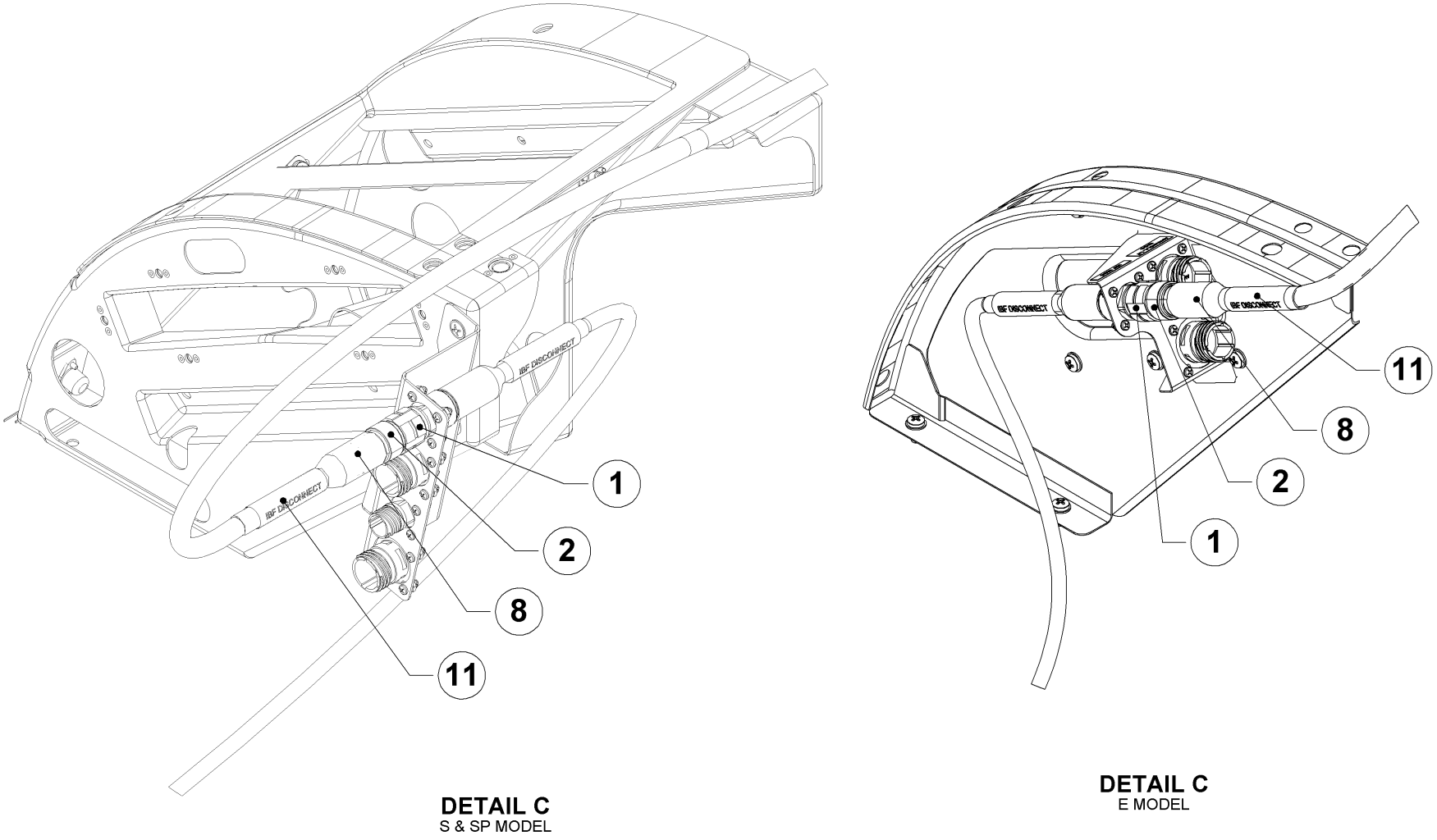


Figure A-34: Aft Electrical Kit (Fwd Bracket Connector)

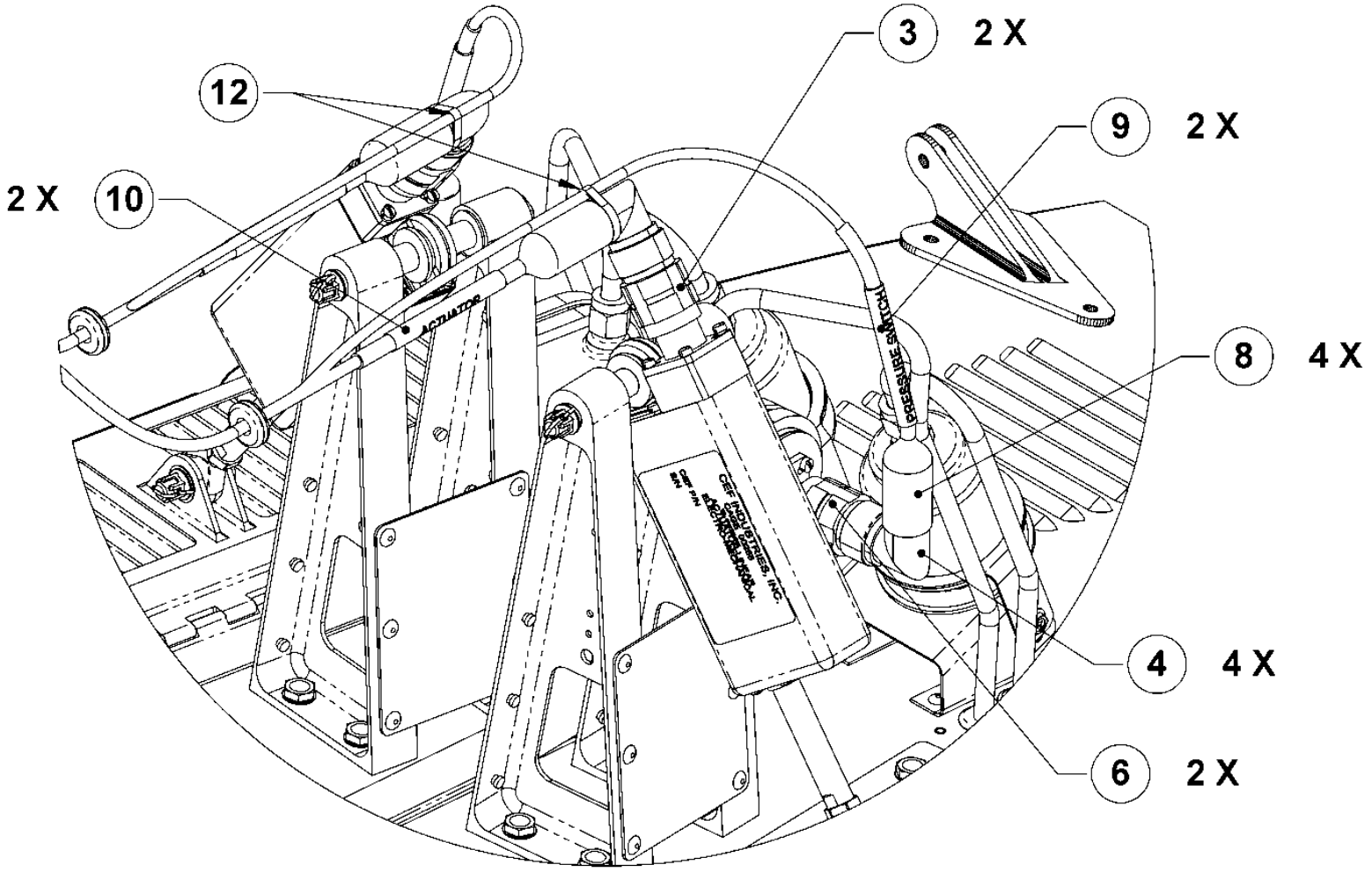


Figure A-35: Aft Electrical Kit (Component Connectors)

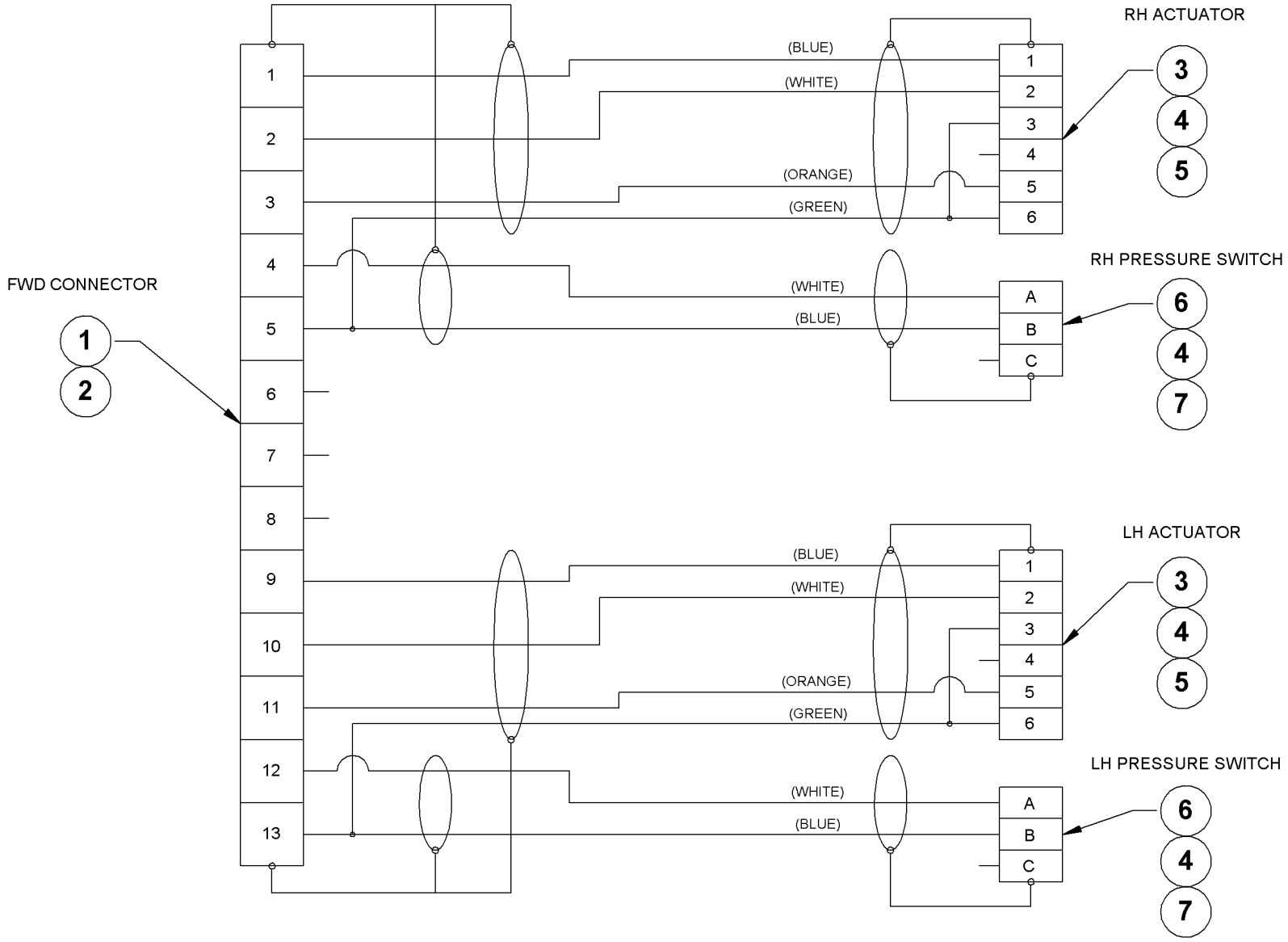


Figure A-36: Aft Electrical Kit (Wiring Diagram)

INDEX NUMBER	PART NUMBER	ITEM NAME	UNIT PER ASSY	AVAIL
		Figures A-30 thru A-36: Aft Electrical Kit		
	N/A	Kit – Electrical, Aft		NP
1	D38999/26WB35PN	Plug	1	P
2	ISOHS150NF1103-5S	Backshell	1	P
3	D38999/26WA35SN	Plug	2	P
4	ISOHJ150NF0902-S	Backshell	4	P
5	M27500-22RC4S09	Cable	N/A	P
6	D38999/26WA98SA	Plug	2	P
7	M27500-22RC2S09	Cable	N/A	SP
8	770-006S302	Boot	5	P
9	100347-201	ID Tag	2	SP
10	100348-201	ID Tag	2	SP
11	100349-201	ID Tag	1	SP
12	AA52081-B-3	Lacing Tape	N/A	SP
13	M23053/13-004-0	Tube	N/A	SP
14	MS35489-6	Grommet	2	SP
15	MS35489-11	Grommet	2	SP
16	NAS673V3	Bolt	3	SP
17	NAS549-10	Washer	6	SP
18	MS21045L3	Nut	3	SP
19	MS21919WDG6	Clamp AVAIL CODE DEFINITION P Procurable NP Non Procurable SP Normal stock/procurable See introduction on availability codes for additional information.	3	SP