

SUMMARY SHEET
Airworthiness Directive Implementation Aviation Rulemaking Committee
Service Information Working Group

Primary Report and Recommendation	Corrective Action Decision Guidelines (Task 2), Recommendation 1: (T2, R1, B6)
Secondary Report and Recommendation	None
Assigned Members	Chip Amidon (Boeing) Elizabeth Bumann (AIR) Craig Fabian (ARSA) Rose Opland (ANM)
Links to Other Working Groups	None

WORKING GROUP REVIEW OF ISSUE/PROBLEM

Service bulletins that are the subject of an airworthiness directive (AD) provide both the instructions for correcting the unsafe condition and in some cases the compliance time for completing the action(s). Occasionally, service bulletins (SBs) are necessarily complex. A complex SB necessarily specifies multiple airplane configurations multiple corrective actions and alternative corrective actions, and complex compliance times. This complexity can result in confusion concerning what work needs to be accomplished and what work has already been accomplished to be in compliance with an AD. This complexity can also make it difficult for the FAA to enforce the actions defined in the service bulletins.

Prior to the publication of the AD Compliance Review Team reports some Design Approval Holders (DAHs) did include logic-based diagrams to assist air carriers in choosing the best corrective action path for complex service bulletins. However, prior to 2008 there was very little documentation, guidance, and standards for creating logic-based diagrams. This resulted in wide variation in format, content and location of the diagrams.

In 2008 one DAH worked with the FAA Transport Airplane Directorate to identify issues, develop standards, and document guidance for logic-based diagrams in future service bulletins. Issues identified and the resolution to those issues is shown in Appendix A. The solutions developed included: Standardizing the location of the logic-based diagrams and standardizing the content of the information in those diagrams. Documented standards are shown in Appendix B.

The Service Information Working Group (SIWG) reviewed the work previously accomplished by one DAH. After that review consensus was reached and the Working Group recommended that all DAHs participating on the ARC include logic-based diagrams in their complex SBs, considering the format, standards, and guidance previously created. Each DAH will be responsible for incorporating these standards into their internal processes for creating service bulletins.

REGULATIONS AND GUIDANCE IDENTIFIED FOR REVIEW

Air Transport Association (ATA) Spec2200 – *Information Standards for Aviation Maintenance*
S1000D – International Specification for Technical Publications

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FAA Order 8900.1 (FAA Inspector's Handbook)

WORKING GROUP PROPOSAL TO ADDRESS THE RECOMMENDATION(S)/FINDING(S)

The proposal is that all DAHs use logic-based diagrams to clarify required and alternative actions in a SB. The proposal also provides a recommended standard for content, format, and location of logic-based diagrams in service bulletins.

Details of the recommended standard include (see Appendix C):

- Providing the DAH's recommended compliance tasks and time in the Compliance paragraph of the service bulletin.
- Specifying the step by step instructions in the Accomplishment Instructions of the service bulletin.
- Providing a logic-based diagram as an appendix for complex service bulletins.
- Identifying tasks and times in logic-based diagrams.
- Identifying in a general note that the information in the Compliance paragraph and Accomplishment Instructions serve as the primary source of information, and the logic-based diagram is only provided to supplement that information.
- Placing the general note that identifies the logic-based diagram as a supplement at the beginning of the Accomplishment Instructions and in the appendix that includes the logic-based diagram.

Note: The DAHs will need to develop appropriate criteria for when logic-based diagrams will be used in their SBs (based on the complexity of the SB and inclusion of alternative corrective actions).

ALTERNATIVES CONSIDERED

The team considered taking the information from the compliance section of service bulletins and the Accomplishment Instructions of service bulletins to create one "picture" to convey all information to assist an air carrier to choose the necessary corrective action. Existing examples of service bulletins that included compliance tasks and times in a logic-based diagram format were evaluated. However, it was determined by Working Group members that those service bulletins were difficult to understand and follow. The Working Group concluded that logic-based diagrams: Could not be written using enough enforceable terminology to be effective and accurate; could be interpreted incorrectly due to the limited vocabulary that can be used in the amount of space given; could introduce too much variability; and could easily miss providing necessary information.

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The team preferred to follow the industry standard defined in ATA Spec 2200 that a DAH's recommendation for accomplishing the actions specified in the service bulletin be contained in the compliance paragraph of a service bulletin, and the step by step instructions be contained in the in the Accomplishment Instructions of the SB.

The team also determined that there was insufficient time to try and introduce and implement a new format in which a service bulletin included all compliance tasks and times in one section of the service bulletin in a logic-based diagram format as the primary source for all compliance information. Another factor in determining the final proposal is the point that some air carriers do not want logic-based diagrams as the primary source of compliance information.

IMPLEMENTATION PLAN

Implementation includes documenting the standards for logic-based diagram format, content, and location. Proposed documentation has been drafted and will be submitted to the FAA Organization and Procedures Working Group (WG). That WG will review the draft documentation, create the appropriate FAA guidance material, and make the guidance material available to all affected stakeholders in the appropriate document by June 2011.

The SIWG will also work, in parallel, with the Air Transport Association and representatives on the S1000D Steering Committee to request the standards for logic-based diagrams be incorporated into industry specification documents (i.e., ATA Spec 2200 and S1000D). Each DAH will review their internal documentation for creating service bulletins and incorporate the standards into their documentation before June of 2011. DAHs, operators and authorities will need to provide training to all personnel that author, review, approve, implement, and enforce service bulletins (see Appendix D for potential training material).

ASSUMPTIONS/CONSTRAINTS

This solution assumes that DAHs issue service bulletins that have sufficient complexity that warrants a logic-based diagram to assist air carriers in choosing the best solution. This solution also assumes air carriers want logic-based diagrams in SBs to assist them in choosing the best corrective action. Some DAHs have stated they have never had a request from air carriers to include logic-based diagrams in the SBs to assist them

ISSUES FOR WORKING GROUP CONSIDERATION

It will be at the DAHs discretion to determine when a logic-based diagram is included in a service bulletin. This decision should take into consideration comments and requests from air carriers and personnel from Civil Aviation Authorities (CAA's) personnel. The recommended standard is that logic-based diagrams will be included in complex service bulletins as a secondary, rather than primary, source of compliance information in determining the tasks that must be accomplished and the times in which those tasks must be accomplished.

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ISSUES FOR ARC CONSIDERATION

The solution proposed by the SIWG is to use logic-based diagrams to clarify required and alternative actions in a SB. The SIWG also provides a recommended standard to meet the intent of including logic-based diagrams in SBs. All five DAHs on the SIWG have committed to include logic-based diagrams in complex SBs. However while four DAHs will use logic-based diagrams as a secondary means of information, one DAH (who currently uses logic-based diagrams in its SBs) will continue to use them as the primary means of information. Additionally, that DAH plans to deviate from the standard proposed by the SIWG and will refer to the compliance paragraph of the SB for compliance times. While that DAH will meet the intent of the AD CRT recommendation and the SIWG proposal, their practices will result in variation between their SBs and SBs prepared by other DAHs on the SIWG.

FINDING NO. 1 FROM TASK 2 REPORT

The Team found that in some cases, service instructions were not sufficiently user-friendly and complete. These incomplete instructions resulted in widespread air carrier confusion because of the differences in the referenced service instructions and AD instructions. These deficiencies in service instructions have led to an increased demand for AMOCs and AD time extensions and/or exemptions. This has strained limited national aviation authority resources. The Team found that there is an opportunity for expanded use of the FTEI process within the OEM industry. Use of this will ensure air carrier's review proposed mitigating actions and make user-friendly inputs to draft OEM service instructions.

RECOMMENDATION NO. 1. FROM TASK 2 REPORT

Corrective action decision guidelines. In some situations, alternative corrective actions are provided to the air carrier for compliance with the AD. Incorporating logic-based decision diagrams in service instructions would assist air carriers in choosing the best corrective action path, such as continued repeat inspection or termination repair, based upon the discovered condition and compliance time period.

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APPENDIXES

Appendix A. Prototype SB with Logic Diagrams (showing Compliance paragraph, Accomplishment Instructions, and Logic Diagram)

SERVICE BULLETIN				
E. COMPLIANCE				
Table 1. Yoke Assembly and PCU Inspection				
Condition	Action	Compliance Time (Whichever Occurs Last)		Repeat Interval (Not to Exceed)
All airplanes	Do a detailed inspection of the yoke assembly and PCU lug for damage in accordance with Accomplishment Instruction 3.B.4	Before 5000 total flight cycles	Within six months after the date on the service bulletin	-
No damage found	Repeat the detailed inspection of the yoke assembly and PCU lug for damage in accordance with Accomplishment Instruction 3.B.4	-	-	500 flight cycles
	OR			
	Replace the yoke assembly in accordance with Accomplishment Instruction 3.B.4 and repeat the inspection of the yoke assembly and PCU lug for damage in accordance with Accomplishment Instruction 3.B.4	-	-	3000 flight cycles
No damage to PCU lug but yoke assembly has bearing damage rotation or migration, signs of wear, or fretting	Replace the yoke assembly in accordance with Accomplishment Instruction 3.B.6.	Before further flight	-	-
	AND			
	Repeat the detailed inspection of the yoke assembly and PCU lug for damage in accordance with Accomplishment Instruction 3.B.4	-	-	3000 flight cycles
Nicks and/or gauges found on PCU lug but no fretting damage to PCU lug	Replace the yoke assembly in accordance with Accomplishment Instruction 3.B.7.	Within 3000 flight cycles	-	-
Fretting damage to PCU lug	Replace the PCU in accordance with Accomplishment Instruction 3.B.8	Before further flight	-	-

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SERVICE BULLETIN

3. ACCOMPLISHMENT INSTRUCTIONS

A. GENERAL INFORMATION

CAUTION: KEEP THE WORK AREA, WIRES AND ELECTRICAL BUNDLES CLEAN OF METAL PARTICLES OR CONTAMINATION WHEN YOU USE TOOLS. UNWANTED MATERIAL, METAL PARTICLES OR CONTAMINATION CAUGHT IN WIRE BUNDLES CAN CAUSE DAMAGE TO THE BUNDLES. DAMAGED WIRE BUNDLES CAN CAUSE SPARKS OR OTHER ELECTRICAL DAMAGE

NOTES:

1. See Appendix A for a Logic diagram. Logic diagrams are provided as an aid. Information contained in paragraph 1.E., Compliance is the primary source for compliance times. Information in paragraph 3.B., Work Instructions is the primary source for steps required for compliance.
2. These work instructions refer to procedures included in other Boeing documents. When the words "refer to" are used and the operator has an accepted alternative procedure, the accepted alternative procedure can be used. When the words "in accordance with" are included in the instruction, the procedure in the Boeing document must be used.

B. WORK INSTRUCTIONS

1. Depressurize the left hydraulic system and reservoir. Refer to 777 AMM 29-11-00 as an accepted procedure.
2. Open the following circuit breakers and attach DO NOT CLOSE tags on the P5 panel:

110K26 FLPRN PCU LIB
110K28 ACE – L2 PWR
3. Remove access panel 657AT. Refer to 777 AMM 06-44-00 for location of the panel.
4. Do a detailed inspection of the yoke assembly and the Power Control Unit (PCU) lug on the left inboard Flaperon Power Control Unit in accordance with Figure 1.
5. If there is no damage, do one of the following
 - a. Repeat the detailed inspection at the times specified in paragraph, 1.E., Compliance
 - b. Replace the yoke assembly in accordance with Figure 2.
6. If there is no damage to the PCU, but the yoke assembly has bearing rotation or migration, or signs of wear, or fretting, do the following:
 - a. Replace the yoke assembly in accordance with Figure 2.
 - b. Repeat the detailed inspection at the times specified in paragraph, 1.E., Compliance
7. If nicks and/or gauges are found on the PCU lug but no fretting damage to PCU lug, replace the PCU assembly in accordance with Figure 2.

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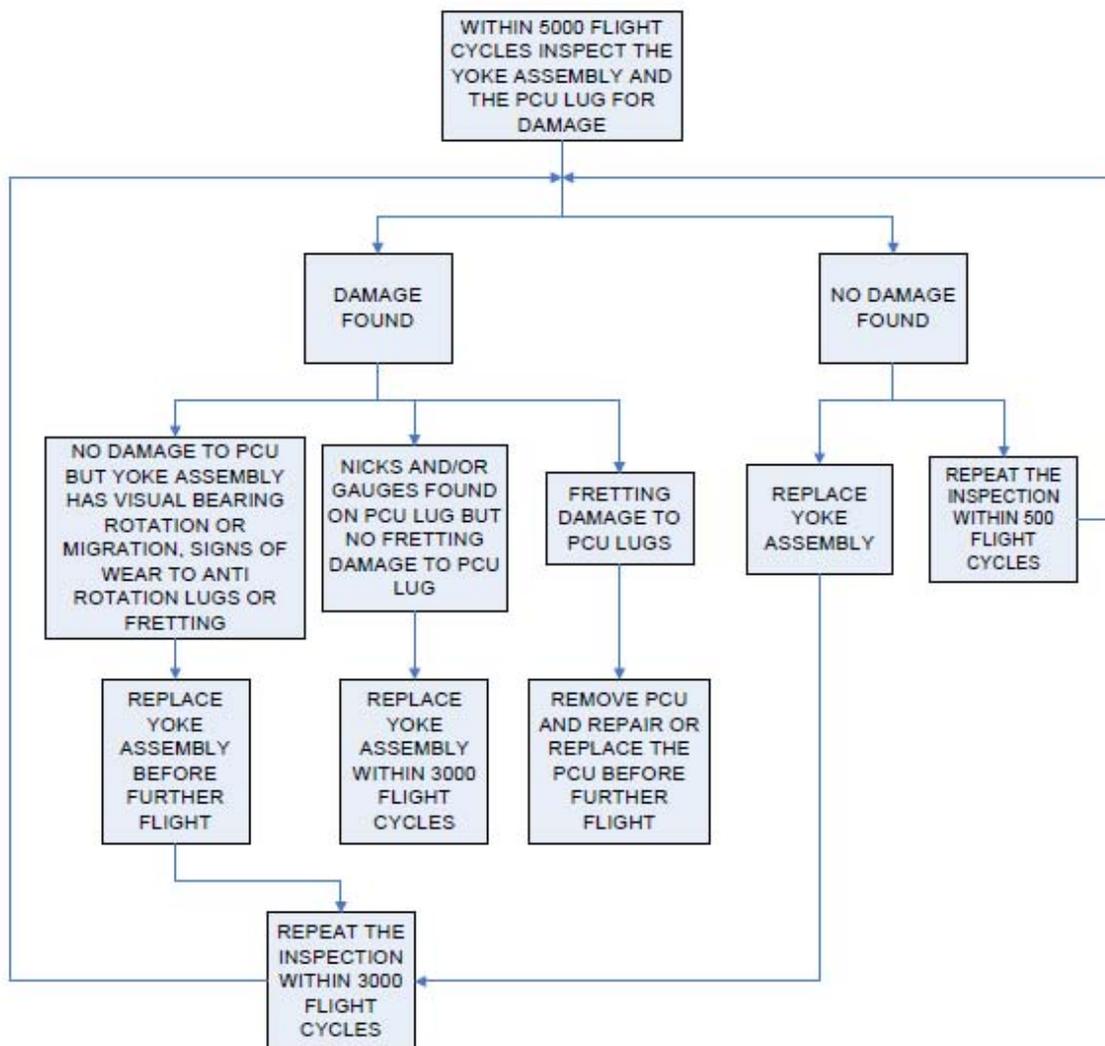
SERVICE BULLETIN

8. If fretting damage to the PCU lugs is found replace the PCU. Refer to 777 AMM 27-11-12 as an accepted procedure.
9. Install removed panel 657AT. Refer to 777 AMM 06-44-00 for location of panel.
10. Remove the DO NOT CLOSE tags and close the following circuit breakers on the P5 panel:
110K26 FLPRN PCU RIB
110K28 ACE – L2 PWR
11. Pressurize the left right hydraulic system and reservoir. Refer to 777 AMM 29-11-00 as an accepted procedure.
12. Put the airplane back to a serviceable condition.

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This logic diagram is provided as an aid. Information contained in paragraph 1.E., Compliance, is the primary source for compliance times. Information contained in paragraph 3.B., Work Instructions is the primary source for steps required for compliance.



APPENDIX A. LOGIC DIAGRAM FOR YOKE ASSEMBLY AND PCU LUG INSPECTION

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Appendix B. Issues and Resolutions to Issues Related to Logic-Based Diagrams

- **Issue:** Some air carriers prefer logic-based diagrams in service bulletins and some air carriers do not prefer them. **Solution:** Include the logic-based diagram as an appendix to the service bulletin. By including the diagram as an appendix it is an aid and it is not required that the air carrier use the diagram.
- **Issue:** There was variation in the location for the logic-based diagrams. Diagrams were placed in the Description paragraph, compliance paragraph, Accomplishment Instructions, Figures, or an appendix to the service bulletin. **Solution:** Standardize the location of the logic-based diagrams in service bulletins. Include the diagram in an appendix to the SB.
- **Issue:** Logic-based diagrams often included compliance actions and times. In doing so, conflicts between the Compliance paragraph, the Accomplishment Instructions, the Figures, and the logic-based diagrams were inadvertently introduced at times. **Solution:** Include necessary compliance times in the Compliance paragraph and compliance actions in the Accomplishment Instructions. The logic-based diagram should be located in an appendix and serve as a supplement to the Compliance paragraph and Accomplishment Instructions. Make it clear the logic-based diagrams are not the authoritative source of compliance information
- **Issue:** Logic-based diagrams are frequently unenforceable due to the inclusion of unenforceable terminology. **Solution:** Include the logic-based diagrams in an appendix to the service bulletin. Provide the logic-based diagrams as a supplement to the work instructions. Make it clear the logic-based diagrams are not the authoritative source of compliance information.
- **Issue:** Logic-based diagrams include a potential for mis-interpretation due to the limited amount of vocabulary that can be used in the space provided. **Solution:** Include the logic-based diagrams in an appendix to the service bulletin. Provide the logic-based diagrams as a supplement to the work instructions. Make it clear the logic-based diagrams are not the authoritative source of compliance information.
- **Issue:** There was too much variability in logic-based diagrams. **Solution:** The SIWG will work with the FAA Organization and Procedures WG to create industry level guidance material. SIWG will also work with ATA and S1000D organization to include guidance material in their specification documents. Each DAH will include detailed guidance in their internal process documentation.

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- **Issue:** Logic-based diagrams often had missing information. **Solution:** The SIWG will work with the FAA Organization and Procedures WG to create industry level guidance material. SIWG will also work with ATA and S1000D organization to include guidance material in their specification documents. Each DAH will include detailed guidance in their internal process documentation..

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Appendix C. Standards for Logic-Based Diagrams

The following standards should be used when including logic-based diagrams in service bulletins.

- The DAH will determine when to include a logic-based diagram in a service bulletin. The DAH will use judgment to determine when the SB is complex and a logic-based diagram should be included. The DAH should also consider a request from air carriers and FAA personnel on whether a logic-based diagram would be helpful.
- The logic-based diagram should not be a required portion of the SB. It should be provided as an aid to help air-carriers determine the necessary tasks in accomplishing the service bulletin.
- Logic-based diagrams should be located as an appendix to the service bulletin.
- Logic-based diagrams should include tasks. Logic-based diagrams should include times for when to do those tasks.
- The logic-based diagram should not be the primary source for compliance information. The diagram should be provided as a supplement to the information in the compliance and accomplishment instruction paragraphs.
- The service bulletin should make it clear that the logic-based diagram is not the authoritative source for tasks. It should be clear that the logic-based diagram is only a supplement to the tasks described in the Accomplishment Instructions and the times specified in the Compliance paragraph of the service bulletin. A general note in the accomplishment instructions paragraph and on the logic-based diagram should delineate this requirement.
- Use consistent terminology within the logic-based diagram.
- Use descriptive and concise terminology in the logic-based diagram.

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Appendix D. Training material available for use

Logic Based Diagrams in SBs

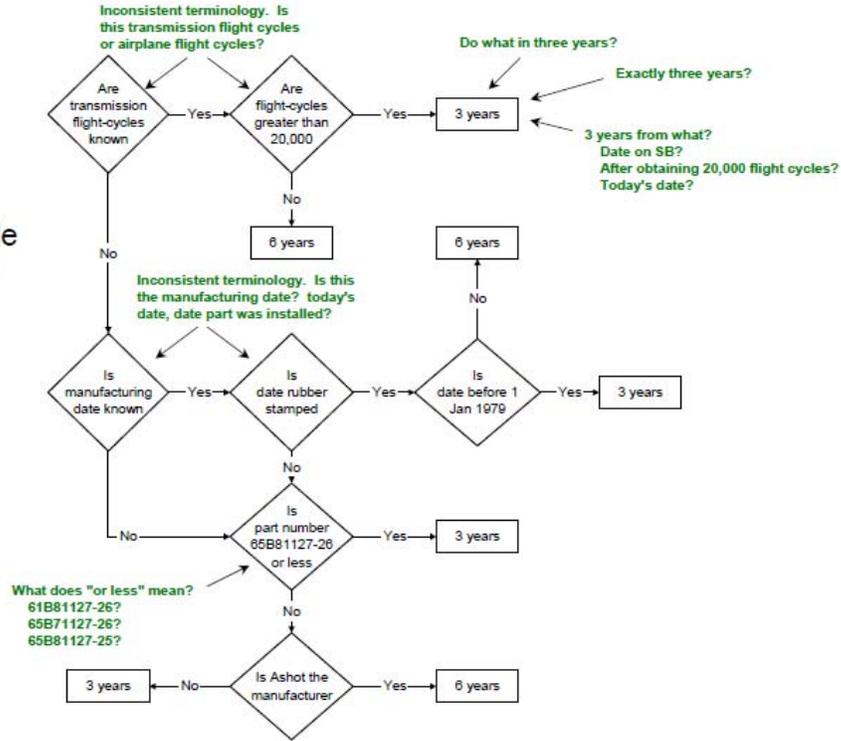
Information in logic based diagrams can not be approved as the primary source of compliance information

- Not legally enforceable due to terminology
- Concerned with interpretation due to limited vocabulary
- Too much variability
- Missing information

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Example of
 Non-enforceable
 Logic Diagram



APPENDIX A: INCORPORATION TIME DIAGRAM

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New Agreement

Logic diagrams can be added to a Service Bulletin

- Should be included as an Appendix
- Should not be the primary method to show compliance tasks and times
 - Should be a supplement to the Compliance paragraph and Accomplishment Instructions
 - Compliance paragraph in the service bulletin should be the primary source for compliance times
 - Accomplishment Instructions should be the primary source for tasks
- A general note should be included in the Accomplishment Instructions to:
 - Direct users to the Appendix for a visual representation of the tasks
 - To inform users the logic diagrams are not the primary source for necessary tasks
- A general note should be included in the Appendix:
 - To inform users the logic diagrams are not the primary source for compliance tasks and times.

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