Aging Transport Systems
Rulemaking Advisory Committee

ATSRAC Task 11:

EAPAS Rulemaking Advisory Harmonization Working Group

Interim Report to ATSRAC

Prepared by the members of ASTRAC HWG 11
July 1, 2004

Foreword

This report contains the interim recommendations of the Aging Transport Systems Rulemaking Advisory Committee (ATSRAC) EAPAS Rulemaking Advisory (ERA) Harmonization Working Group (known as HWG 11). The ERA HWG was formed by ATSRAC to address Task 11 which deals with developing alternatives to rulemaking, providing data to support the economic impact of the proposed rulemaking, and addressing public comments to the proposed rule. This report is submitted to ATSRAC at its meeting, July 7, 2004.

Tasking:

The FAA tasked ATSRAC with identifying recommendations to support the voluntary performance of the enhanced zonal analysis procedure (EZAP) on those supplemental type certificates (STC) not included in the proposed rulemaking currently being developed by the FAA. Additionally the ATSRAC was tasked with identifying electrical wiring interconnection systems (EWIS) training requirements for different groups of people maintaining, inspecting, or interacting with EWIS on the airplane.

The exact tasks are provided below.

Task 11.1.1

Identify the minimum set of training requirements to changes recommended in the ATSRAC Task 8 Final Report in accordance with defined changes in Task 9 final report.

Task 11.1.2

Provide recommendations that will facilitate voluntary implementation of the remaining training recommendations in task 8 final report not implicitly mandated in task 11.1

Task 11.2

Development of adequate maintenance tasks for an air carrier may necessitate analysis of the wiring systems installed by the way of an STC. STC holders may not be required to provide the results of an EZAP analysis, or similar, on their STCs. Therefore, ATSRAC is requested to provide a recommendation that would facilitate development of appropriate maintenance tasks associated with STC installations and how an air carrier might implement them into its maintenance program. This task is to be completed by July 31, 2004.

To complete this task please consider the following items:

1. Identification of types or categories of STCs that would require additional or revised inspections or intervals as compared to those developed by the type design holder

2. Method to integrate STC related maintenance and inspection tasks with the TC holder developed tasks
3. Most appropriate means to include Passenger to Freighter Conversion STCs in accordance with the intent of the ATSRAC recommendations
4. Other items that ATSRAC determines necessary.

Recommendations:

For Tasks 11.1.1 and 11.1.2 the working group used the proposed advisory circulars produced by ATSRAC HWGs 8 and 9 on EWIS training and the EZAP analysis, respectively to produce a set of training requirements applicable to the various target groups. These target groups are the same as identified in AC 120-YY produced by HWG 8. Recommendations for Tasks 11.1.1 and 11.1.2 (recommendation numbers 1 and 2) are contained in Appendix A of this report.

For Task 11.2 the working group developed a simple flow diagram for operators and STC holders to follow when determining if an EZAP is necessary for an STC installed on an airplane that had a baseline EZAP performed by the airplane manufacturer. Because of previous compliance requirements for SFAR 88, operators already know what STCs are installed on their airplanes. Therefore the task is simplified because operators have data readily available that shows which STCs are installed on their airplanes. Recommendations for Task 11.2 (recommendation numbers 3 and 4) are contained in Appendix B of this report.

Acronyms:

AC – Advisory Circular
ATSRAC – Aging Transport System Rulemaking Advisory Committee
DET – Detailed Inspection
EAPAS – Enhanced Airworthiness Program for Airplane Systems
ERA – EAPAS Rulemaking Advisory
ESDS – Electrostatic Discharge Sensitive
EWIS – Electrical Wiring Interconnection System
EZAP – Enhanced Zonal Analysis Procedure
FOD – Foreign Object Debris
GVI – General Visual Inspection
HWG – Harmonization Working Group
ICA – Instructions for Continued Airworthiness
LRU – Line Replaceable Unit
MRO – Maintenance, Repair and Overhaul
SDI – Special Detailed Inspection
SFAR – Special Federal Aviation Regulation
STC – Supplemental Type Certificate

Appendix A

HWG 11 Recommendations to Address Tasks 11.1.1 and 11.1.2

Recommendation for Task 11.1.1

HWG 11 Recommendation 1

Appendix A to AC 120 - YY, Electrical Wiring Interconnect Systems Minimum Initial Training Program, produced by ATSRAC HWG 8, recommends a minimum set of training requirements as well as the individuals who should receive EWIS specific training. HWG 11 reviewed those suggested minimum training requirements and developed the following chart to identify the minimum set of training requirements for personnel performing maintenance and inspection (Target Groups 1 and 2) on EWIS.

Federal Aviation Regulation § 121.375 requires that any person performing a maintenance action on an airplane be properly trained to perform those actions. Therefore, these training requirements should be identified as the minimum set of training requirements for personnel performing maintenance and inspection on aircraft EWIS (Target Groups 1 and 2) in any advisory material produce by the FAA to support the current EAPAS rulemaking effort..

Target group 1: Personnel performing EWIS maintenance
Target Group 2: Personnel performing maintenance inspections on EWIS

TARGET GROUP	**1**	**2**
A – INTRODUCTION **Demonstrate the safe handling of airplane electrical systems, Line Replaceable Units (LRU's), tooling, troubleshooting procedures, and electrical measurement.**		
1. Safety practices	**X**	**X**
2. Electrostatic Discharge Sensitive (ESDS) Device handling and protection	**X**	**X**
3. Tools, special tools and equipment	**X**	
4. Verify calibration/certification of instruments, tools, and equipment	**X**	
5. Required wiring checks using the Troubleshooting Procedures and Charts	**X**	
6. Measurement and troubleshooting using meters.	**X**	
7. LRU replacement general practices	**X**	**X**
B – WIRING PRACTICES DOCUMENTATION **Know the construction and navigation of the applicable airplane wiring system overhaul or wiring practices manual**	**1**	**2**
8. Standard Wiring Practice Manual structure/overview	**X**	**X**
9. Chapter cross-reference Index	**X**	**X**
10. Important Data and Tables	**X**	**X**
11. Wiring Diagram Manual	**X**	**X**

TARGET GROUP	1	2
12. Other Documentation as applicable	X	X
C – INSPECTION **Know the different types of inspections, human factors in inspections, zonal areas and typical damages**	1	2
13. General Visual Inspection (GVI), Detailed Inspection (DET), Special Detailed Inspection (SDI), and Zonal Inspection	X	X
14. Human factors in inspection		X
15. Zonal areas of inspection		X
16. Wiring system damage	X	X
D – HOUSEKEEPING: **Know the contamination sources, materials, cleaning and protection procedures**	1	2
17. Airplane external contamination sources	X	X
18. Airplane internal contamination sources	X	X
19. Other contamination sources	X	X
20. Contamination protection planning	X	
21. Protection during airplane maintenance and repair	X	
22. Cleaning processes	X	
E – WIRE: **Demonstrate the correct identification of different wire types, their inspection criteria, and damage tolerance, repair and preventative maintenance procedures**	1	2
23. Identification, type and construction	X	X
24. Insulation damage limits	X	X
25. Inspection criteria and standards of wire and wire bundles		X
26. Wire bundle installation practices	X	X
27. Typical damage and areas found (airplane specific)	X	X
28. Maintenance and repair procedures	X	X
29. Sleeving	X	X
30. Unused wires-termination and storage	X	X
31. Electrical bonding and grounds	X	X
F – CONNECTIVE DEVICES: **Know the procedures to identify, inspect and find the correct repair for typical types of connectors found on the technician's airplane.**	1	2
32. General types and identification	X	X
33. Cautions and protections	X	X
34. Visual inspection procedures	X	X
35. Typical damage found	X	X
36. Repair procedures	X	
G – CONNECTIVE DEVICE REPAIR: **Demonstrate the procedures to replacement of all parts for**	1	2

TARGET GROUP typical types of connectors found on the technician's airplane.	1	2
37. Circular Connectors	X	
38. Rectangular Connectors	X	
39. Terminal Blocks-Modular	X	
40. Terminal Blocks- Non-modular	X	
41. Grounding Modules	X	
42. Pressure Seals	X	

Recommendation for Task 11.1.2

HWG 11 Recommendation 2

HWG11 acknowledges the recommendations for minimum set of training for Targeted Groups 3 through 8. Since there are no existing regulatory requirements to train Target Groups 3 through 8, the members of HWG 11, recommends that training be made available to Targeted Groups 3 through 8 through voluntary measures. The members believe that training the individuals in these groups would greatly enhance the knowledge of the importance of EWIS safety in the overall safe operation of aircraft. Although not all targeted groups are directly involved in the maintenance of EWIS, they have the potential to have an adverse impact on EWIS. This can occur through inadvertent contact with EWIS during aircraft cleaning or by individuals performing unrelated maintenance that could impact the integrity of EWIS. Mechanics leaving drill shavings on wire bundles is one example of how this could occur.

Therefore, the following are considerations for operators to voluntarily provide the recommended minimum set of training outlined in the table that follows this discussion.

"Information = Knowledge = Power"
Power – what is needed to achieve progress and benefit all
Improves: Safety, Reliability, Availability and Cost

- Regulatory economics
  - Saves face
  - Public perception and political pressure
  - May prevent future mandatory action
- Raises awareness – to readily detect and report obvious/potential EWIS maintenance issues
- Avoids unintended damage to EWIS by these groups as they go about their business
- Engineers and. Planners could use newly obtained EWIS knowledge to improve documentation for the house keeping and cautionary notes
- Industry recognition programs (FAA's AMT, and other industry related awards programs) for outstanding EWIS maintenance or training practices
- An EWIS awareness video – Posters [e.g., FOD, Scribe (campaigns)]

- Executive management pressure at all levels – Regulatory, Operator, MRO

Below are the target groups associated with the following table:

Target group 3: Personnel performing electrical/avionic engineering on in service aircraft
Target group 4: Personnel performing general maintenance/inspections not involving electrical wiring interconnection systems maintenance.(LRU change is not considered wire maintenance)
Target group 5: Personnel performing other engineering or planning work on in service aircraft
Target group 6: Other service staff with duties in proximity to electrical wiring interconnection systems.
Target group 7: Flight Deck Crew
Target group 8: Cabin Crew

Target Groups	3	4	5	6	7	8
A – INTRODUCTION **Demonstrate the safe handling of airplane electrical systems, Line Replaceable Units (LRU's), tooling, troubleshooting procedures, and electrical measurement.**						
1. Safety practices		X		X	X	X
2. Electrostatic Discharge Sensitive (ESDS) Device handling and protection		X				
7. LRU replacement general practices		X				
B – WIRING PRACTICES DOCUMENTATION **Know the construction and navigation of the applicable airplane wiring system overhaul or wiring practices manual**	3	4	5	6	7	8
8. Standard Wiring Practice Manual structure/overview	X					
9. Chapter cross-reference Index	X					
10. Important Data and Tables	X					
11. Wiring Diagram Manual	X					
12. Other Documentation as applicable	X					
C – INSPECTION **Know the different types of inspections, human factors in inspections, zonal areas and typical damages**	3	4	5	6	7	8
13. General Visual Inspection (GVI), Detailed Inspection (DET), Special Detailed Inspection (SDI), and Zonal Inspection		X	X			
14. Human factors in inspection			X			
15. Zonal areas of inspection			X			
16. Wiring system damage		X	X	low level	low level	low level
D – HOUSEKEEPING: **Know the contamination sources, materials, cleaning and protection procedures**	3	4	5	6	7	8
17. Airplane external contamination sources		X		X	X	X
18. Airplane internal contamination sources		X		X	X	X
19. Other contamination sources		X		X	X	X
20. Contamination protection planning	X	X	X			
21. Protection during airplane maintenance and repair	X	X	X			
22. Cleaning processes	X	X	X	X		
E – WIRE:	3	4	5	6	7	8

Target Groups **Demonstrate the correct identification of different wire types, their inspection criteria, and damage tolerance, repair and preventative maintenance procedures**	**3**	**4**	**5**	**6**	**7**	**8**
23. Identification, type and construction	X					
24. Insulation damage limits	X					
25. Inspection criteria and standards of wire and wire bundles	X					
26. Wire bundle installation practices	X					
27. Typical damage and areas found (airplane specific)	X	X	X	Low level	Low level	Low level
28. Maintenance and repair procedures	X					
29. Sleeving	X					
30. Unused wires-termination and storage	X					
31. Electrical bonding and grounds	X	X Bond	X			
F – CONNECTIVE DEVICES: **Know the procedures to identify, inspect and find the correct repair for typical types of connectors found on the technician's airplane.**	**3**	**4**	**5**	**6**	**7**	**8**
32. General types and identification	X					
33. Cautions and protections	X					
34. Visual inspection procedures	X					
35. Typical damage found	X					
36. Repair procedures	X					

Appendix B

HWG 11 Recommendations to Address Task 11.2

Summary

The FAA is expected to issue new regulatory requirements that will require holders of type certificates to develop Electrical Wiring Interconnection System (EWIS) related instructions for continued airworthiness (ICA) based on the application of an enhanced zonal analysis procedure (EZAP). However, the FAA has indicated that there will not be a parallel requirement for performing an EZAP on existing supplemental type certificates (STC) to those type designs. Supplemental type certificates that affect or modify wiring could impact the EWIS ICA developed by the type certificate holder.

HWG 11 Recommendation 3

Airplane operators and STC holders should review the installed STCs to determine if the type certificate holder's EZAP derived EWIS ICA are still applicable and provide effective guidance for the area of the airplane that has been modified. If the determination is made that these ICA are no longer applicable and effective then the operators and STC holders should work together to perform an EZAP on their STC modifications. ICA developed by the STC EZAP should then be incorporated in the operator's scheduled maintenance program.

This appendix presents a process that would allow operators and STC holders to make a determination if an EZAP should be performed on the STC modification.

To address the task, the HWG developed a simple process that could be applied to existing STCs to determine if they had any impact on the baseline EZAP performed by the airplane manufacturer. The data gathered by the operators and STC holders under compliance with SFAR 88 could be used to identify which existing STCs impacted airplane wiring and then a three step process would be applied to make a determination as to the impact of the STC on the existing EZAP.

The following paragraphs explain the process:

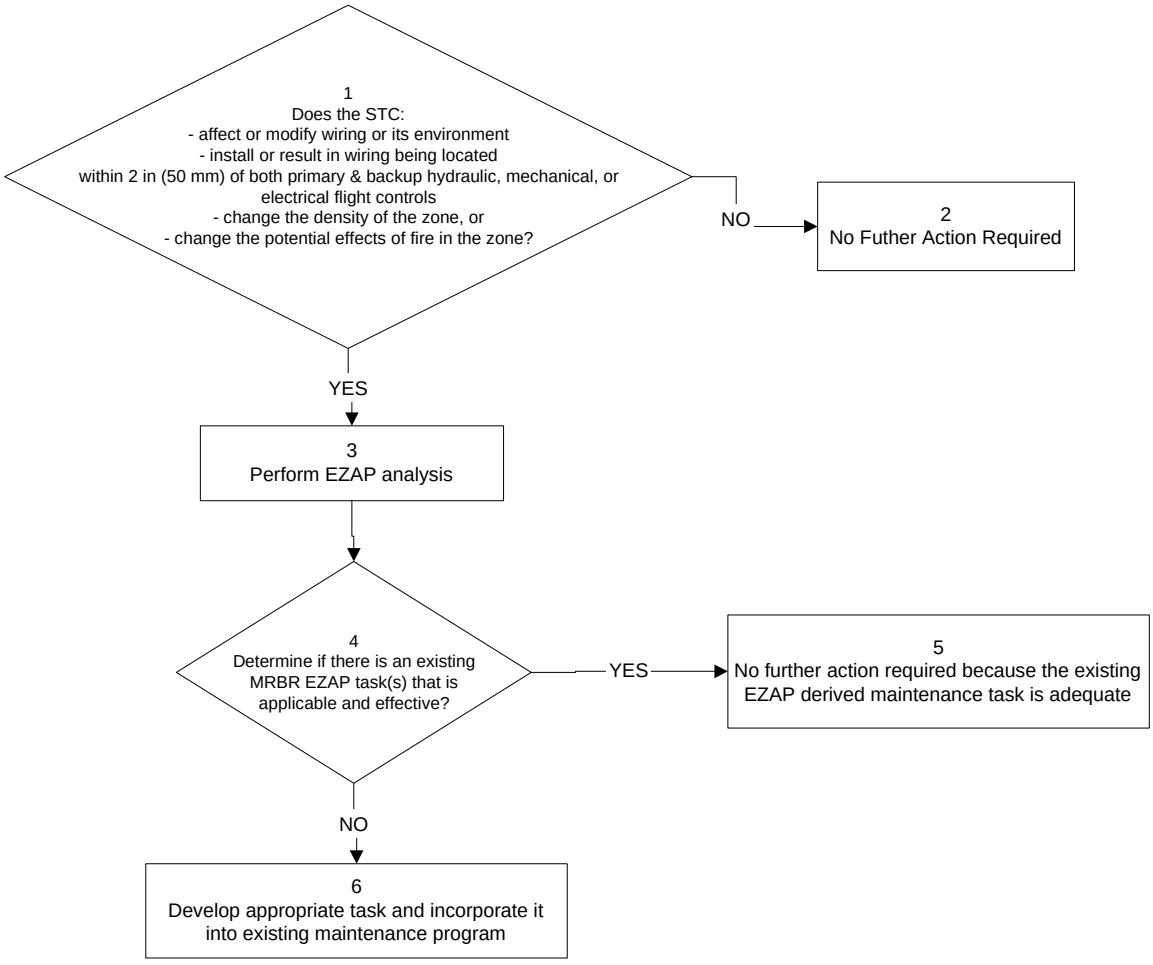
This following flowchart presents a method to determine whether:

1. An existing STC needs an EZAP analysis in accordance with Advisory Circular (AC) 120-XX to be accomplished, or to determine if,

2. The Original Equipment Manufacturer (OEM) analysis derived EWIS maintenance tasks are adequate.

Based on information collected from the Special Federal Aviation Regulation (SFAR) 88 STC review, this logic chart is designed to target only those STCs which affect or modify wiring or its environment.

The results of this review will identify those STCs that require the STC holder or operator to apply EZAP methodology. Active STC holders are encouraged to analyze their STCs by use of this logic. For orphaned STC (STCs whose holders have gone out of business and who no longer support them) the operator is encouraged to analyze the STC by use of this logic.



Step 1: **Does the STC**:

Affect or modify wiring or it's environment?

The question asks whether the STC affects or modifies wiring. Modifications to wiring or other EWIS components includes, but not limited to removal, addition, relocation, etc.

Note: This question may have been answered for SFAR88 compliance, thus further simplifying the task.

Does the STC install or results in wiring being located within 2 inches of primary and back-up hydraulic, mechanical or electric flight controls, change the density of the zone or change the potential effects of fire in the zone?

Does the STC affect zone density? If the STC includes the addition or deletion of numerous components in a small area, the density of the zone could be changed even if wire bundles are untouched. A significant change in the zone density should warrant re-analysis of the zone.

Potential effects of fire on adjacent wiring and systems requires the analyst to assess the potential effect of a localized fire on adjacent wiring and systems by considering the potential for loss of multiple functions to the extent that a hazard could be introduced. Consideration of potential effect must also include whether wiring is in close proximity (i.e. within 2 inches/50 mm) to both primary and back-up flight controls.

Additionally, this question requires an evaluation of whether the zone might contain combustible material that could cause a fire to be sustained in the event of an ignition source arising in adjacent wiring. Examples include the possible presence of fuel vapors, dust/lint accumulation, and contaminated insulation blankets.

With respect to commonly used liquids (e.g., oils, hydraulic fluids, and corrosion prevention compounds), the analyst should refer to the product specification in order to assess the potential for combustibility. The product may be readily combustible only in vapor/mist form and thus an assessment is required to determine if conditions might exist in the zone for the product to be in this state.

Although liquid contamination of wiring by most synthetic oil and hydraulic fluids (e.g., skydrol) may not be considered combustible, it is a cause for concern if it occurs in a zone where contamination causes significant adherence of dust and lint.

If the answer to this question is "No", then no further action is required (Step 2), because the density of the zone or the potential effects of fire in the zone has not changed.

Step 3: **Perform an EZAP analysis per AC 120-XX**

If the answer to question 1 is "yes," then the only way to determine if existing EWIS maintenance tasks are sufficient is to perform the EZAP for the STC and compare the results with the existing EWIS maintenance tasks (see Step 4).;

Step 4: **Is there an existing MRBR EZAP task(s) that is applicable and effective?**

Once the STC EZAP has been accomplished, a comparison of the derived maintenance tasks can be made with the existing EWIS maintenance tasks. If the existing task are adequate, then no further action regarding EWIS maintenance actions for the STC is necessary.

Step 5: **No further action required because the existing EZAP derived maintenance task is adequate**

Step 6: **Develop an appropriate task and incorporate it into the existing maintenance program.**

These tasks should be incorporated into the operator's existing maintenance program.

Thoughts on How to impact voluntary compliance

The following points should be considered as possible actions that could be taken to help achieve voluntary compliance in completing EZAP analysis on existing STCs.

- Use of "first cut' logic…simplified process to determine applicability. Use of data gathered from compliance with SFAR 88 will allow operators and STC holders to quickly identify those STCs that have a potential affect on wiring or those that modify or add wiring.
- FAA management (AVR-1 or above) should meet with top management of air carriers' to encourage them to review STCs for their potential impact on the TC holder developed EZAP maintenance tasks.
- Although economic considerations do not always support voluntary compliance of some initiatives, it is the right thing to do.
- Operators should realize reliability improvements by ensuring that all EZAP maintenance tasks are properly identified and incorporated into their maintenance program.
- Operators could encourage STC holders to work with them to complete this task because the STC holders' ability to market new STC to the operators could depend on their willingness to participate.
- STCs that have an EZAP completed could be a potential marketing tool for the STC holders, thus it could be a potential revenue source.

HWG 11 Recommendation 4

ATSRAC should ask for volunteers to use the process described in Recommendation 3 in order to validate the process.

END