Electrical Wiring Interconnection Systems (EWIS)

2-5. Zonal Analysis Procedure

Zonal inspections may be developed from application of the Zonal Analysis Procedure. This requires a summary review of each zone on the aircraft and normally occurs as the MSG-3 analyses of structures, systems, and powerplants are being concluded. These inspections may subsequently be included in the Zonal Inspections.

This Zonal Analysis Procedure permits appropriate attention to be given to electrical wiring installations. Thus, as well as determining zonal inspections, the logic provides a means to identify applicable and effective tasks to minimize contamination and to address significant wiring installation discrepancies that may not be reliably detected through zonal inspection. These dedicated tasks may subsequently be included in the Systems and Powerplant tasks.

In top down analyses conducted under MSG-3, many support items such as plumbing, ducting, Other Structure, wiring, etc., may be evaluated for possible contribution to functional failure. In cases where a general visual inspection is required to assess degradation, the zonal inspection is an appropriate method.

2-5-1. Procedure

The following procedures may be used

- a. Divide the aircraft externally and internally into zones as defined in [ATA iSpec 2200], (formerly ATA Spec 100).
- b. For each zone, prepare a work sheet that identifies data such as: zone location and access, approximate size (volume), type of systems and components installed, typical power levels in any wiring bundles, features specific to L/HIRF protection, etc. In addition, assess potential for the presence of combustible material, either through contamination (e.g., dust and lint) or occurring by design (e.g., fuel vapor).
- c. Develop rating tables to determine the repeat interval for a zonal inspection. Rating tables will permit the likelihood of accidental damage, environmental deterioration and the density of equipment in the zone to be taken into account.
- d. For all zones containing systems installations, perform a standard zonal analysis using the rating tables from paragraph (c.) to define the extent and interval of zonal inspection tasks. Multiple zonal inspections may be identified for each zone with those having less frequent intervals requiring increased acces EWIS ments.

e. Identify zones that both contain electrical wiring and have potential for combustible material being present. For those zones, perform an enhanced zonal analysis that permits the identification of stand-alone inspection tasks that allow appropriate attention to be given to deterioration of installed wiring and electrical wiring interconnection system (EWIS), in particular for wiring in close proximity (i.e., within 2 inches or 50 mm) to both primary and back-up hydraulic, mechanical, or electrical flight controls, and tasks that minimize contamination by combustible materials, if applicable and effective. Rating tables addressing the potential effects of fire caused by a wiring/EWIS failure on adjacent wiring and systems (e.g., the risk to aircraft controllability), the size of the zone and the density of installed equipment may be used to determine the inspection level. General Visual Inspections may be found effective for the complete zone.

EWIS

Detailed Inspections may be found applicable and effective for specific items in a zone. Interval determination may be accomplished using rating tables that consider accidental damage and environment.

- f. Detailed Inspections, stand-alone GVIs, and tasks to minimize contamination, arising from paragraph "e" should be included in the Systems and Powerplant tasks. Since these tasks are not specific to the routine ATA-defined systems and do not have a Failure Effect Category, introduction in a dedicated section is suggested, for example, under ATA 20.
- g. General Visual Inspections arising from the enhanced zonal analysis (paragraph e.) may be compared with the Zonal Inspections determined from the standard zonal analysis (paragraph d.). The former may be considered fully covered by the zonal inspection if the access requirement is the same and the proposed interval is at least as frequent. Otherwise, a stand-alone GVI should be included with the tasks identified in paragraph (f.).
- h. Except as noted in paragraph 2-3-7.3, General Visual Inspections arising from the systems, powerplants and structures may be compared with the Zonal Inspections determined from the standard zonal analysis (paragraph d.). Work sheets should record the interval proposed in the originating analysis. These GVIs may be considered fully covered by the zonal inspection if the access requirement is the same and the proposed interval is at least as frequent. Otherwise, a stand-alone GVI should be included within the MSI or SSI from which it was identified.
- i. General Visual Inspections arising from the analysis of L/HIRF may be compared with the Zonal Inspections determined from the standard zonal analysis (paragraph d.). These GVIs may be considered fully covered by the zonal inspection if the access requirement is the same and the proposed interval is at least as frequent. Otherwise, a stand-alone GVI should be included within the Systems and Powerplants tasks as described in [Subject 2-6-1].
- j. Visual Checks may be considered covered by the Zonal Inspections provided that the Systems Working Group that identified them consider that the failure would be noted and addressed during a zonal inspection. Otherwise, the task should remain in the Systems and Powerplants tasks where specific attention can be drawn to the item.
- k. All tasks developed through application of the standard zonal analysis (paragraph d.) should be included in the Zonal Inspections. For accountability purposes, any General Visual Inspection or Visual Check originating from application of systems, powerplant or structures analyses should be referenced in the MRB Report zonal task. To avoid giving unjustified attention to these items, this should not be indicated on task/work eards.

 [Enhanced Zonal Analysis Procedure]
- 1. All EZAP-derived stand-alone tasks (GVI or DET) should be uniquely identified in the data documentation for traceability during future changes. This is intended to prevent the inadvertent deletion or escalation of an EZAP-derived stand-alone task without proper consideration of the risk basis for the task and its interval.

A typical logic diagram is depicted in [Figure 2-5-1.1] and [Figure 2-5-1.2]. This is provided as a guide and may be customized to reflect individual company policies and procedures.

Appendix A. Glossary

Accidental Damage (AD)

Age Exploration

Airworthiness Limitations

Conditional Probability of Failure

Corrosion Level 1

Corrosion Prevention and Control Program (CPCP)

Damage Tolerant

Physical deterioration of an item caused by contact or impact with an object or influence which is not a part of the aircraft, or by human error during manufacturing, operation of the aircraft, or maintenance practices.

A systematic evaluation of an item based on analysis of collected information from inservice experience. It verifies the item's resistance to a deterioration process with respect to increasing age.

A section of the Instructions for Continued Airworthiness that contains each mandatory replacement time, structural inspection interval, and related structural inspection task. This section may also be used to define a threshold for the fatigue related inspections and the need to control corrosion to Level 1 or better. The information contained in the Airworthiness Limitations section may be changed to reflect service and/or test experience or new analysis methods.

The probability that a failure will occur in a specific period provided that the item concerned has survived to the beginning of that period.

Corrosion damage that does not require structural reinforcement or replacement.

Or

Corrosion occurring between successive inspections exceeds allowable limit but is local and can be attributed to an event not typical of operator usage of other aircraft in the same fleet (e.g. Mercury spill).

A program of maintenance tasks implemented at a threshold designed to control an aircraft structure to Corrosion Level 1 or better.

A qualification standard for aircraft structure. An item is judged to be damage tolerant if it can sustain damage and the remaining structure can withstand reasonable loads without structural failure or excessive structural deformation until the

Delamination/Disbond

Direct Adverse Effect on Operating Safety

Any wire, wiring device, or combination of these, including termination devices, installed in any area of the aircraft for the purpose of transmitting electrical energy between two or more intended termination points. Refer to governing regulations for a specific definition.

Operating

Discard

Economic Effects

Electrical Wiring Interconnection System (EWIS)

Environmental Deterioration (ED)

Enhanced Zonal Analysis Procedure (EZAP)

Failure

Failure Cause

Failure Condition

damage is detected.

Structural separation or cracking that occurs at or in the bond plane of a structural element, within a structural assembly, caused by in service accidental damage, environmental effects and/or cyclic loading.

To be direct, the functional failure or resulting secondary damage must achieve its effect by itself, not in combination with other functional failures (no redundancy exists and it is a primary dispatch item).

Safety shall be considered as adversely affected if the consequences of the failure condition would prevent the continued safe flight and landing of the aircraft and/or might cause serious or fatal injury to human occupants.

This is defined as the time interval during which passengers and crew are on board for the purpose of flight.

The removal from service of an item at a pecified life limit.

Failure effects which do not prevent aircraft operation, but are economically undesirable due to added labor and material cost for aircraft or shop repair.

An electrical connection between two or more points including the associated terminal devices (e.g., connectors, terminal blocks, splices) and the necessary means for

Physical deterioration of an to (1) minimize chemical interaction with environment.

The inability of an item to previously specified limits.

Why the functional failure of

its installation and identificat A logical procedure to identify tasks or resistance to failure a accumulation of combustible materials, (2) detect EWIS component defects, and (3) detect EWIS installation discrepancies that may not be reliably detected by standard zonal inspections.

The effect on the aircraft and its occupants, both direct and consequential, caused or contributed to by one or more failures, considering relevant adverse operational or **Inspection - Detailed (DET)**

Inspection - General Visual (GVI)

Inspection - General Visual (GVI) - Stand-Alone

Inspection - Special Detailed (SDI)

Inspection - Zonal

Interval (Initial - Repeat)

can be expected from a unit, system, or aircraft if it receives effective maintenance to achieve higher levels of reliability generally requires modification or redesign.

An intensive examination of a specific item, installation or assembly to detect damage, failure or irregularity. Available lighting is normally supplemented with a direct source of good lighting at an intensity deemed appropriate. Inspection aids such as mirrors, magnifying lenses, etc. may be necessary. Surface cleaning and elaborate access procedures may be required.

A visual examination of an interior or exterior area, installation or assembly to detect obvious damage, failure irregularity. This level of inspection is made from within touching distance unless otherwise specified. A mirror may be necessary to enhance visual access to all exposed surfaces in the inspection area. This level of inspection is made under normally available lighting conditions such as daylight, hangar lighting, flashlight or drop-light and may require removal or opening of access panels or doors. Stands, ladders or platforms may be required to gain proximity to the area being checked.

An intensive examination of a specific item, installation, or assembly to detect damage, failure or irregularity. The examination is likely to make extensive use of specialized Inspection Techniques and/or equipment. Intricate cleaning and substantial access or disassembly procedure may be required.

A collective term comprising selected general visual inspections and visual checks that is applied to each zone, defined by access and area, to check system and powerplant installations and structure for security and general condition.

<u>Initial Interval</u> - Interval between the start of service-life and the first task accomplishment.

Repeat Interval - The interval (after the initial interval) between successive accomplishments of a specific maintenance task.

A general visual inspection that is not performed as part of a zonal inspection. Even in cases where the interval coincides with the zonal inspection, the stand-alone GVI remains an independent step on the work card.