ORDER

8300.13

REPAIR ASSESSMENT PROGRAM

July 23, 2003

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

Distribution: A-WXYZ-1; A-W (FS/IR)-3;
A-FFS-0 (MAX); A-FAC-0 (MAX)

Initiated by: AFS-300

FOREWORD

This order establishes the criteria for approval and surveillance of Repair Assessment Programs for certain aircraft operated under Title 14 of the Code of Federal Regulations (14 CFR) part 91, section 91.410; part 121, section 121.370; part 125, section 125.248; and part 129, section 129.32. It establishes and defines the working relationship between Aircraft Certification Office (ACO) engineers and the Flight Standards District Office (FSDO) airworthiness safety inspectors (ASI) responsible for oversight of operator maintenance. A clear understanding of the roles and responsibilities of the ACO engineers and ASIs is important for approval and surveillance of these programs.

This order currently applies to the 11 models of aircraft listed below:

DC-8
DC-9/MD-80
DC-10
Boeing 707/720
727
737
747
Airbus A300 (excluding the -600 Series)
BAC 1-11
Fokker F28 (excluding the -0100 Series)
Lockheed L1011

Any deficiencies found, clarifications needed, or suggested improvements regarding the content of this order should be forwarded to the originating office, Attention: Management Systems Branch, AFS-110, for consideration. Your assistance is welcomed and appreciated. FAA Form 1320-19, Directive Feedback Information, is included as the last page of this order.

If an interpretation is urgently needed, you may call the originating office for guidance, but you should also use the tear-out sheet as a follow-up to verbal conversation.

/s/ John M. Allen for
James J. Ballough
Director, Flight Standards Service, AFS-1

CONTENTS

CHAPTER 1. INTRODUCTION

1-1. PURPOSE. This order provides guidance for Federal Aviation Administration (FAA) personnel regarding the implementation and surveillance of the Repair Assessment Programs required by Title 14 of the Code of Federal Regulations (14 CFR) parts 91, 121, 125, and 129. It also sets forth and clarifies the responsibilities and procedures for all affected FAA offices.

1-2. DISTRIBUTION. This order is distributed to the Associate Administrator for Regulation and Certification; to the division level in the Flight Standards Service (AFS), the Aircraft Certification Service (ACO); to the regional administrators; to the regional Flight Standards Divisions, the Aircraft Certification Directorates; and to all Flight Standards and Aircraft Certification field offices.

1-3. SCOPE. This order delineates FAA approval and surveillance of the Repair Assessment Programs required by parts 91, 121, 125, and 129 (U.S.-registered airplanes).

1-4. DEFINITIONS. The following definitions are offered as general terms for reference in this order.

a. Principal Maintenance Inspector (PMI). PMI refers to the representative of the FAA AFS who is the primary point of contact for an operator. This individual is responsible for the approval and surveillance of the air operator's maintenance program for operations conducted under parts 121, 125, or 129. For part 91 operations the PMI refers to the assigned maintenance inspector.

b. Baseline Zonal Inspection (BZI). BZI is an industry term used to define "Normal Maintenance" for the Repair Assessment Program. It is used to define normal versus supplemental inspections for repair assessment.

c. Aircraft Certification Office (ACO). The ACO is the certification office responsible for the type certification (TC) for an airplane model manufactured in the United States. The term ACO also refers to the International Office Branch of the FAA Transport Airplane Directorate (ANM-116), which is responsible for the TC for foreign-manufactured airplanes.

d. Repair Classifications. (See Appendix 5.)

(1) Category A. A permanent repair for which the BZI is adequate to ensure continued airworthiness (inspectability) equal to the unrepaired surrounding structure. The operator should demonstrate to the FAA that its maintenance or inspection program is at least as rigorous as the BZI.

(2) Category B. A permanent repair that requires supplemental inspections to ensure continued airworthiness.

(3) Category C. A temporary repair that will need to be reworked or replaced before an established time limit. Supplemental inspections may be necessary to ensure continued airworthiness before this limit.

e. Repair Assessment Program. The operator's Repair Assessment Program refers to the specific program, as developed using the manufacturer's Repair Assessment Guidelines (RAG) or other FAA-approved RAGs.

f. Design Service Goal (DSG). DSG refers to the flight cycle, flight hours, and calendar time goals used in the design of the airplane. Other common terms used in the aircraft industry are Design Service Objective (DSO) and Design Life Goal (DLG).

g. Implementation Age (IA). IA refers to the time at which the Repair Assessment Program should be incorporated into the operator's maintenance or inspection program for a specific airplane model. The IAs are equal to 75% of the DSG for each airplane. The IA for each model airplane is specified in parts 91, 121, 125, and 129. (See Appendix 3 for examples.)

h. Repair Assessment Guidelines (RAG). RAGs are airplane manufacturer's model-specific guidelines on how to perform the repair assessment. (See Appendix 2.)

1-5. BACKGROUND.

a. In April 1988, a high-cycle transport airplane suffered major structural damage to its pressurized fuselage during flight. This accident was attributed in part to the age of the airplane involved. The economic benefit of operating certain older technology airplanes has resulted in the operation of many such airplanes beyond their previously projected retirement age. Because of the problems revealed by the accident and the continued operation of older airplanes, both the FAA and industry generally agreed that increased attention needed to be focused on the aging fleet and on maintaining its continued operational safety.

b. In June 1988, the FAA sponsored a conference on aging airplanes. As a result of that conference, an aging aircraft task force was established in August 1988 as a sub-group of the FAA's Research, Engineering, and Development Advisory Committee. It represented the interests of the aircraft operators, aircraft manufacturers, regulatory authorities, and other aviation representatives. The task force, then known as the Airworthiness Assurance Task Force (AATF), set forth five major elements of a program for each airplane model in the aging transport fleet that would serve to keep the aging fleet safe. The elements are as follows:

(1) Review and select service bulletins (SB) describing modifications and inspections necessary to maintain structural integrity;

(2) Develop corrosion prevention and control programs (CPCP);

(3) Develop generic structural maintenance program guidelines for aging airplanes;

(4) Review and update the Supplemental Structural Inspection Documents (SSID) which describe inspection programs to detect fatigue cracking; and

(5) Assess damage-tolerance of structural repairs.

c. This order addresses the implementation of the fifth element. In general, existing repairs have performed quite well. Although the cause of an airplane accident has never been attributed to properly applied repairs using data acceptable to the Administrator, these repairs may be of concern as the age of the repairs increase (an expanded background dialogue is provided in Appendix 1).

1-6. DIRECTIVE FEEDBACK. Any deficiencies found, clarifications needed, or suggested improvements regarding the content of this order should be forwarded to the originating office, Attention: Directives Management Officer, for consideration. Your assistance is welcome. FAA Form 1320-19, Directive Feedback Information, is located on the last page of this order for your convenience. If an interpretation is urgently needed, you may call the originating office for guidance, but you should also use the tear-out sheet as a follow-up to verbal conversation.

1-7. COMMENTS INVITED. Internet users may reach the Federal Register web page at http://www.acess.gpo.gov/nara for access to the final rule. Comments may not require a direct acknowledgment to the commenter; however, they will be considered in the development of upcoming revisions to orders or other related technical material.

1-8. thru 1-13. RESERVED.

CHAPTER 2. GENERAL

2-1. GENERAL DISCUSSION OF THE REPAIR RULES.

a. Part 91, § 91.410; part 121, § 121.370; part 125, § 125.248; and part 129, § 129.32 require the incorporation of FAA-approved RAGs for the external fuselage pressure boundary into the maintenance or inspection program of each operator of the 11 large transport category airplane models. The RAGs establish a damage-tolerance-based supplemental inspection program (SIP) to detect damage, which may develop in a repaired area, before that damage degrades the load-carrying capability of the structure. The rule requires that operators assess repairs to baseline structure (as built by the original manufacturer) and repairs to modified structure (i.e., supplemental type certificates (STCs) and field approvals (FAA Form 337, Major Repair and Alteration)).

b. The repair assessment is currently limited to the external fuselage pressure boundary (fuselage skins, door skins, and bulkhead webs); future rulemaking will address the remaining primary structure. This is based on two considerations:

(1) The fuselage is more sensitive to structural fatigue than other airplane structure because its normal operating stresses are closer to its limit design; and

(2) The fuselage is more prone to damage from ground service equipment and corrosion than other structures and requires repair more often.

2-2. GENERAL DISCUSSION OF THE BASELINE ZONAL INSPECTION (BZI).

a. One of the objectives of this program is to show that a repair that satisfies the static strength and durability of the original structure is damage-tolerant if the existing inspections are adequate. Every repair requires some level of inspection to maintain its airworthiness. That level of inspection is dependent upon the original design of the structure, the design of the repair, and the maintenance schedule of the operator. These inspections include an inspection method or type and a repetitive inspection interval. The type of inspection can vary from an external visual inspection to a low-frequency eddy current inspection. The repetitive interval can vary depending on the type, design, and location of the repair. The BZI enables operators to use their maintenance or inspection program to determine which repairs are damage-tolerant for their fleet.

b. The BZI is an industry term which is defined as typical maintenance inspection intervals assumed to be performed by most operators. The BZI is part of the overall inspection program developed by the Maintenance Review Board (MRB) during the TC process for each new model airplane. The BZI consists of both internal and external visual inspections. A Category “A” repair is a permanent repair for which the BZI is adequate to ensure continued airworthiness (inspectability) equal to the unrepaired surrounding structure. The operator must demonstrate to the FAA that its maintenance or inspection program is at least as rigorous as the BZI.

c. All operators are required to have a maintenance and/or inspection program. The maintenance or inspection program visually inspects the external and/or internal surfaces at regular intervals. These inspections typically check for general condition and structural distress such as corrosion, cracking, dents, and scratches. All repairs in the inspection area receive the same attention as the other structural components receive. The operator may have the airplane broken down into zones to accomplish these inspections. These zones will have different inspection intervals, and the inspections may be staggered.

d. The BZI concept takes advantage of the operator's maintenance or inspection program to satisfy a repair's inspection requirements. These inspections must meet certain requirements in order to satisfy the inspection requirements of a repair. The requirements are as follows:

(1) External Inspections:

(a) The repair and/or base structure must be inspected within arm's length;

(b) The lighting must be sufficient to find distress in the repair and in the base structure; and

(c) Fairings must be displaced or removed.

NOTE: Paint and corrosion inhibiting compound removal is not required.

(2) Internal Inspections:

(a) The repair and/or base structure must be inspected within arm's length;

(b) The lighting must be sufficient to find distress in the repair and in the base structure; and

(c) Interior furnishings must be displaced or removed (interior panels, insulation, liners, etc.).

NOTE: Paint and corrosion inhibiting compound removal is not required.

e. A comparison to the BZI is used to determine which repairs are screened out in Stage 1 as a Category A repair. The operator determines which zones on the fuselage shell are inspected visually during their maintenance or inspection program at an interval more frequently or at least equal to the appropriate visual repetitive inspection intervals of the BZI.

2-3. RESPONSIBLE OFFICES.

a. Two FAA organizations are involved in administering the repair program. The first is AFS, represented by the Flight Standards District Office (FSDO)/Certificate Management Office (CMO) or International Field Office (IFO) responsible for the oversight of an operator's maintenance program. In this order, the FAA AFS representative responsible for oversight will be referred to as

the PMI. The PMI has knowledge of an operator's capabilities, can determine the Repair Assessment Program's effect on the overall maintenance or inspection program, and can ensure that the FAA has the ability to monitor and enforce the program.

b. The second organization involved is the ACO. For a U.S.-manufactured airplane, the ACO responsible for the manufacturer represents this organization. For a non U.S.-manufactured airplane, this organization is represented by ANM-116. In this order, the responsible office of the Aircraft Certification Service is referred to simply as the ACO. The ACO provides a resource to the airworthiness safety inspector (ASI) by evaluating and approving the RAG developed by the manufacturer. ACOs are aware of the service experience of the entire model fleet and have access to the manufacturer's data; therefore, the ACO has the ability to enforce a uniform level of safety throughout the model fleet. This may include the issuance of an Airworthiness Directive (AD) if an unsafe condition is found to exist in the fleet.

c. When an operator submits a proposed revision of their maintenance or inspection program, the PMI should ensure that all appropriate provisions of the FAA-approved RAGs provided by the manufacturer are incorporated into an operator's maintenance or inspection program. Usually, the operators will incorporate the FAA-approved RAGs provided by the manufacturer into their maintenance or inspection program. These RAGs usually do not take into account repairs to STCs or field approvals. Therefore, the operator will need to provide a method by which they plan to assess repairs to STCs or field approvals.

> **NOTE: If the operator submits documentation (engineering report, engineering document, incorporation plan, etc.) to the PMI that incorporates the FAA-approved RAGs provided by the manufacturer and has a rational way to address repairs to STCs or field approvals, then the PMI can approve the operator's program for incorporation into their maintenance or inspection program. In this case, the PMI would not need any additional help or concurrence from the ACO. However, if the operator has developed their own Repair Assessment Program, is significantly deviating from FAA-approved RAGs provided by the manufacturer, or does not have a program to address repairs to STCs or field approvals, then the PMI should coordinate this situation with the ACO. Field approval procedures are in Order 8300.10, Airworthiness Inspector's Handbook, volume 2, chapter 1.**

d. The guidance contained in this order is directed primarily at the relationship between the ASI and the ACO. The responsibilities of the PMI and ACO are as follows:

(1) PMI Responsibilities:

(a) To make approvals on behalf of the FAA of the revised maintenance or inspection program (to include the RAGs), incorporation of Threshold and Repeat Inspection Intervals of Category B Repairs, and Threshold for removal of Category C Repairs;

(b) To coordinate such approvals, as necessary, with the ACO in accordance with (IAW) this order;

(c) To perform surveillance of an operator's Repair Program to ensure all repairs are being inspected IAW the established threshold and repetitive intervals;

NOTE: The PMI's surveillance activities should include spot checks of the repairs on individual airplanes. If a repair has been assessed and shows evidence of cracking, or the parent structure near the repair is cracking or showing other signs of degradation such as loose fasteners, then the repair design may be inadequate. In this case, the PMI should consult with the operator and the cognizant ACO, and if necessary provide technical information about the repair. Each assessed repair must be dealt with on a case-by-case basis. The PMI should also observe the operator's performance of selected inspections.

(d) To act as the focal point between the FAA and other civil airworthiness authorities concerning the intent of the operating rules; and

(e) To provide information to the ACO, as requested, about an operator and its fleet(s) so that the ACO may fulfill its responsibilities for administration of the rule.

(2) ACO Responsibilities:

(a) To evaluate and execute FAA approvals of RAGs provided by the manufacturer;

(b) To coordinate such approvals with the PMI as discussed in the rule or this order;

(c) To monitor the effectiveness of the manufacturer's RAGs for which the ACO is responsible and to require changes in the program;

(d) To provide engineering assistance and advice to the PMIs so that they may evaluate and approve requests for operator program adjustments; and

(e) To deal with each repair on a case-by-case basis. If a repair or structure near the repair is cracking on an aircraft, then the ACO must determine if it is an airplane-specific problem or if it affects the entire fleet. If it is determined that the repair was installed per an SB and the cracked repair or structure is in an unsafe condition, the ACO may mandate an inspection by AD to determine cracking in the fleet. The ACO must also determine if terminating modifications are required, which would be contained in a revised SB.

2-4. thru 2-9. RESERVED.

CHAPTER 3. REPAIR ASSESSMENT PROCESS

3-1. REPAIR ASSESSMENT GUIDELINES.

a. The rules do not prohibit an operator from developing their own RAGs. However, these guidelines must be approved by the ACO responsible for the TC of the affected airplane.

b. Manufacturers have developed RAGs that can be used to evaluate the continued airworthiness of existing repairs on the external fuselage pressure boundary. In the past, evaluation of repairs for damage-tolerance would require direct assistance from the manufacturer. The size of an assessment task conducted in this way would be unmanageable considering that:

(1) Each repair design is different;

(2) Each airplane model is different;

(3) Each area of the airplane is subjected to a different loading environment; and

(4) The number of engineers qualified to perform a damage-tolerance assessment is small.

c. Therefore, a new approach was developed. The repair assessment results will depend on the model-specific structure and loading environment, which will necessitate surveying the structure of each airplane.

3-2. OPTIONAL SURVEY. The manufacturers have developed an optional survey form, which may be used to record key repair design features needed to accomplish a repair assessment. Operator personnel not trained as damage-tolerance specialists can use the form to document the configuration of each observed repair. An operator may develop their own method of obtaining the key repair data, but that method must supply sufficient input data to determine the damage-tolerance characteristics of the surveyed repairs.

3-3. CLASSIFICATION OF REPAIRS. Using the information from the survey form as input data, the manufacturers have developed simplified methods to determine the damage-tolerance characteristics of the surveyed repairs. Although the repair assessments should be performed by well trained personnel familiar with the model-specific repair assessment guidance material, these methods enable an engineer or technician not trained as a damage-tolerance specialist to perform the repair assessment without the assistance of the manufacturer. Whether the operator uses the manufacturer's or their own RAGs, the repairs should be classified into one of three categories: A, B, or C.

3-4. STRUCTURAL REPAIR MANUAL (SRM) REPAIRS. The manufacturers' SRMs include damage-tolerance repair considerations for the fuselage pressure boundary. The SRM contains brief descriptions of damage-tolerance considerations, categories of repairs, a description of BZI, and the repair assessment logic diagram. It also identifies repair categories

and related information. The SRM includes location-specific repairs labeled with appropriate repair category identification (A, B, or C), with specific inspection requirements for Category B and C repairs. SRM generic repairs also contain repair category considerations regarding size, zone, and proximity. Detailed information for determinations of inspection requirements are also provided in separate guidance material for each model. Repairs that were installed IAW a once current SRM, but that have now been superseded by a new damage-tolerant design, will require review. Such superseded repairs may be reclassified to Category B or C, requiring additional inspections and/or rework.

3-5. ORIGINAL EQUIPMENT MANUFACTURER (OEM) REPAIR ASSESSMENT PROCESS. There are two principal techniques that can be used to accomplish the repair assessment when using the manufacturer's RAGs. The first technique involves a three-stage procedure. This technique could be well-suited for operators of small fleets. The second technique involves the incorporation of the RAGs as part of an operator's routine maintenance program. This approach is well-suited for operators of large fleets and would evaluate repairs at predetermined, planned maintenance visits as part of the maintenance program. Manufacturers and operators may develop other techniques which would be acceptable, as long as they fulfill the objectives of these rules and are FAA-approved. The first technique generally involves the execution of the following three stages:

a. Stage 1, Data Collection.

(1) This stage specifies what structures should be assessed for repairs and collects data for further analysis. If a repair is on a structure in an area of concern, then the analysis continues; otherwise, the repair does not require classification per this program.

(2) Guidance material documents for each model will provide a list of structures for which repair assessments are required. Some manufacturers have reduced this list by determining the inspection requirements for critical details. If the requirements are equal to normal maintenance checks (e.g., BZI checks), those details were excluded from this list.

(3) Repair details are collected for further analysis in Stage 2. Repairs that do not meet the static strength requirements or are in an unacceptable condition are immediately identified, and corrective actions must be taken before further flight.

b. Stage 2, Repair Categorization. The repair categorization is accomplished by using the data gathered in Stage 1 to answer simple questions regarding structural characteristics. Well designed repairs in good condition meeting size and proximity requirements are classified as Category A, if the operator can demonstrate to the FAA that their maintenance program is at least as rigorous as the BZI identified in the manufacturer's SRM or applicable RAG. Simple condition and design criteria questions are provided in Stage 2 to define the lower bounds of Category B and Category C repairs.

c. Stage 3, Determination of Structural Maintenance Requirements.

(1) The supplemental inspection and/or replacement requirements for Category B and C repairs are determined in this stage. Inspection requirements for the repair are determined by calculation, by predetermined values provided by the manufacturer, or by other values obtained using an FAA-approved method.

(2) If the inspection method and intervals for a given repair are not compatible with the operator's maintenance schedule, the repair could be replaced with a more damage-tolerant repair.

(3) In evaluating the first supplemental inspection, Stage 3 will define the inspection threshold in flight cycles measured from the time of repair installation. If the time of installation of the repair is unknown and the airplane has exceeded the assessment implementation times or has exceeded the time for first inspection, the first inspection should occur IAW the approved RAG's limit (repair should be assumed to have been applied during original manufacture).

(4) An operator may choose to accomplish all three stages at once, or just Stage 1. In the latter case, the operator would be required to adhere to the schedule for completion of Stages 2 and 3. These schedules will be specified in the FAA-approved model-specific guidance documents.

(5) Incorporating the maintenance requirements for Category B and C repairs into an operator's individual airplane maintenance or inspection program completes the repair assessment process for the first technique.

(6) The second technique would involve setting up a repair maintenance program to evaluate all fuselage pressure boundary repairs at each predetermined maintenance visit to confirm that they are permanent. This technique would require the operator to choose an inspection method and interval IAW the FAA-approved RAGs. The repairs whose inspection requirements are fulfilled by the chosen inspection method and interval would be inspected IAW the regular FAA-approved maintenance program. Any repair that is not permanent, or whose inspection requirements are not fulfilled by the chosen inspection method and interval, would either be (1) upgraded to allow utilization of the chosen inspection method and interval, or (2) individually tracked to account for the repair's unique inspection method and interval requirements. This process is then repeated at the chosen inspection interval.

(7) Repairs added between the predetermined maintenance visits, including interim repairs installed at remote locations, would be required to either have a threshold greater than the length of the predetermined maintenance visit or be tracked individually to account for the repair's unique inspection method and interval requirements. This would ensure the airworthiness of the structure until the next predetermined maintenance visit, at which time the repair would be evaluated as part of the repair maintenance program.

(8) Whichever technique is used, there may be some repairs that cannot easily be upgraded to Category A, for cost, downtime, or technical reasons. Such repairs will require supplemental inspections, and each operator should make provisions for this when incorporating the RAGs into their maintenance program.

(9) The FAA-approved model-specific RAGs used to assess existing repairs can also be used to evaluate the damage-tolerance characteristics of new repairs applied to the airplane. They may also use the guidance in AC 25.1529-1, Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes. In either case, operators should have procedures that will adequately address new repairs.

3-6. REPAIR ASSESSMENT IMPLEMENTATION THRESHOLD. The implementation threshold is defined as 75% of DSG in terms of flight cycles for each airplane model. For airplanes already past the DSG implementation threshold, the implementation will be within one year of the effective date of the rule. The effective date of the rule was May 25, 2000.

a. For operations being conducted under part 121, no air carrier may operate any of the affected model aircraft beyond the applicable flight cycle implementation time or one year after the effective date of the amendment, whichever occurs later, unless its operation specifications (OpSpecs) have been revised to reference the RAGs applicable to the external fuselage pressure boundary, and those guidelines have been incorporated into its maintenance program.

b. For operations being conducted under part 129, no foreign air carriers or foreign persons operating a U.S.-registered airplane may operate any of the affected model aircraft beyond the applicable flight cycle implementation time or one year after the effective date of the amendment, whichever occurs later, unless its maintenance program has been revised to include the FAA-approved RAGs.

c. For operations being conducted under part 125, no certificate holder may operate any of the affected model aircraft beyond the applicable flight cycle implementation time or one year after the effective date of the amendment, whichever occurs later, unless its OpSpecs have been revised to reference the RAGs applicable to the external fuselage pressure boundary, and those guidelines have been incorporated into its FAA-approved inspection program.

d. For operations being conducted under part 91, no person may operate any of the affected model aircraft beyond the applicable flight cycle implementation time or one year after the effective date of the amendment, whichever occurs later, unless its inspection program has been revised to include the RAGs applicable to the external fuselage pressure boundary of the airplane.

> **NOTE: After the guidelines are incorporated into the maintenance or inspection program, operators must begin the assessment process for existing fuselage repairs within the cycle limit specified in their Repair Assessment Program. There are three implementation thresholds for the repair assessment process, depending on the number of cycles on the airplane on the effective date of the rule.**

e. For airplanes where the cycle age equals or is less than the implementation threshold on the rule effective date, the operator would be required to incorporate the guidelines in its maintenance or inspection program by the flight cycle implementation time or one year after the effective date of the rule, whichever occurs later. The assessment process would begin (e.g., accomplishment of Stage 1) on or before the cycle limit specified in the RAG (generally equivalent to a "D" check) after incorporation of the guidelines.

f. For airplanes where the cycle age is greater than the implementation time but less than the DSG on the rule effective date, the operator would be required to incorporate the guidelines in its maintenance or inspection program within one year after the effective date of the rule. The assessment process would begin (e.g., accomplishment of Stage 1) on or before the cycle limit specified in the RAG (generally equivalent to a "D" check), not to exceed the cycle limit computed by adding the DSG to the cycle limit equivalent of a "C" check (also specified in the RAG) after incorporation of the guidelines.

g. For airplanes where the cycle age is greater than the DSG on the rule effective date, the operator would be required to incorporate the guidelines in its maintenance or inspection program within one year of the rule effective date. The assessment process would begin (e.g., accomplishment of Stage 1) on or before the cycle limit specified in the RAG (generally equivalent to a "C" check) after incorporation of the guidelines.

NOTE: For examples of a Boeing 727 Assessment Threshold, see Appendix 4.

3-7. SALE AND TRANSFER OF AIRPLANES. Before an airplane is added to an air carrier's OpSpecs or an operator's fleet, a program for accomplishment of the repair assessment should be established IAW the following:

a. Airplanes That Were Previously Operated under an FAA-Approved Maintenance Program. For airplanes that have been operated under an FAA-approved maintenance program, the new operator should begin the process IAW either the previous operator's schedule or the new operator's schedule, whichever would result in an earlier accomplishment date for the assessment.

b. Airplanes That Were Not Previously Operated under an FAA-Approved Maintenance Program. For airplanes that previously have not been operated under an FAA-approved maintenance program, the operator should begin the repair assessment IAW paragraph 3-6(e) above. If the airplane's DSG and compliance times have been exceeded, the repair assessment should be accomplished before the airplane is added to the air carrier's OpSpecs, or IAW a schedule approved by the PMI.

c. Operations of Leased, Foreign-Owned Airplanes. Acquisition of a leased, foreign-owned airplane for use in operations under parts 91, 121, 125, or 129 will require that the certificate holder determine the status of the airplane relative to the model-specific implementation times. If the airplane has exceeded or is within one year of exceeding the

implementation time, the operator should implement the Repair Assessment Program into the airplane's maintenance or inspection program. Implementation of the Repair Assessment Programs would then occur per the model-specific RAGs.

3-8. OPERATOR-DEVELOPED PROGRAM. The operator may submit their own Repair Assessment Program for FAA approval. The operator-developed program should fulfill all of the objectives of the rule to gain FAA approval. If the proposed maintenance or inspection program revises any of the FAA-approved RAGs, the proposal should be reviewed by the PMI in conjunction with the ACO having cognizance over the TC for the affected airplane to determine if the program is adequate.

3-9. thru 3-13. RESERVED.

CHAPTER 4. INCORPORATION INTO MAINTENANCE OR INSPECTION PROGRAM

4-1. INTRODUCTION.

a. The rules are intended to ensure that comprehensive repair assessment for damage-tolerance will be completed for the external fuselage pressure boundary repairs and that the resulting inspections, modifications, and corrective actions, if any, will be accomplished at the given model-specific implementation times. To comply with this, the operator would need to develop their own Repair Assessment Program using the manufacturer's FAA-approved RAG or other equivalent FAA-approved RAGs. When this repair assessment program is incorporated into a maintenance or inspection program, paragraph b(1)-(5) below should be considered.

b. The means by which the FAA-approved RAGs are incorporated into a certificate holder's FAA-approved maintenance or inspection program is subject to approval by the certificate holder's PMI, with the exception of the issues listed below. Any desired alteration of the conditions following must be submitted to the cognizant FAA ACO for approval.

(1) Implementation times;

(2) Threshold and Repeat Inspection Interval times;

(3) Threshold and Repeat Inspection methodology that differs from FAA-approved documents or any other FAA-approved method;

(4) Escalation of an inspection interval beyond the BZI; and

(5) New methods of inspection.

4-2. RECORDKEEPING REQUIREMENTS. There are no new reporting requirements; however, normal reporting required under applicable 14 CFR parts would still apply. As with all maintenance, the current operating regulations (e.g., part 121, § 121.380) already impose recordkeeping requirements that would apply to the actions required by this rule. When incorporating the repair assessment into its approved maintenance program, each operator should address the means by which he or she will comply with these recordkeeping requirements. Therefore, along with the remainder of the program, the reporting would also be subject to approval by the cognizant PMI.

4-3. SCOPE OF ASSESSMENT. The scope of the assessment is limited to repairs on the fuselage pressure boundary (fuselage skins, door skins, and pressure webs).

a. A list of SBs that are the subject of ADs will be contained in the model-specific program document published by the airplane manufacturer with post modification/repair inspection programs, as required.

b. A list of other structural SBs will be provided in the model-specific program document published by the airplane manufacturer with associated inspection threshold and repeat intervals.

4-4. SUPPLEMENTAL TYPE CERTIFICATE (STC) OR FIELD APPROVALS.

a. The RAGs provided by the manufacturer do not generally apply to structure modified by an STC or field approval. However, under this rule, the operator would still be responsible to provide a repair assessment applicable to the entire fuselage external pressure boundary that meets the program objectives specified in AC 120-73, Damage Tolerance Assessment of Repairs to Pressurized Fuselages. Therefore, the operator should develop, submit, and gain FAA approval of guidelines to evaluate repairs to such structure.

b. It is recognized that operators do not usually have the resources to determine a DSG or to develop RAGs, even for a very simple piece of structure. The FAA expects the STC holder to assist the operators in preparing the required documents; however, the operator remains responsible for the continued safe operation of the airplane. If the STC holder is out of business, or is otherwise unable to provide assistance, the operator must acquire the FAA-approved guidelines independently. To keep the airplanes in service, it is always possible for operators, individually or as a group, to hire the necessary expertise to develop and gain approval of RAGs and the associated DSG.

c. The cost and difficulty of developing guidelines for modified structure may be less than that for the basic airplane structure for three reasons:

(1) The only modifications made by persons other than the manufacturer that are of concern in complying with this rule are those that affect the external fuselage pressure boundary. Of those that do affect this structure, many are small enough to qualify as Category A repairs under the RAGs, based solely on their size.

(2) If the modified structure is identical, or very similar, to the manufacturer's original structure, then only a cursory investigation may be necessary. In such cases, the manufacturer's guidelines may be shown to be applicable with few, if any, changes. If the operator determines that a repair to modified structure can be evaluated using the manufacturer's model-specific guidance documents, that determination should be documented and submitted to the operator's PMI for approval. For all other repairs, a separate program must be developed.

(3) The modification may have been made so recently that no guidelines would be needed for many years. Compliance with this rule could be shown by establishing the DSG for the new modified structure, calculating an implementation time that is equal to three quarters of that DSG, and then adding a statement to the OpSpecs that RAG will be incorporated into the maintenance program by that time. If the modified structure is very similar to the original, then the DSG for the modified structure may also be very similar. No guidelines would be needed until 75% of that goal is reached. For example, in the case of a large cargo door, such installations are often made after the airplane has reached the end of its useful life as a passenger-carrying airplane. For a new structure, the clock would start on repair assessment at the time of installation. Further, since the DSG is measured in cycles, and cargo operation usually entails fewer operational cycles than passenger operations, the due date for incorporation of the RAG for that structure could be many years away.

d. There should be very few instances where the STC holder is unavailable, and the operators must bear the cost of developing a complete RAG document. Guidance on how to comply is also discussed in AC 120-73.

4-5. NEW REPAIRS.

a. Damage-Tolerance Assessments. An operator's Repair Assessment Program must include damage-tolerance assessments for new repairs. Repairs made IAW the revised version of the SRM would already have a damage-tolerance assessment performed; otherwise, the manufacturer's RAGs could be used for this purpose. Operators may also develop other methods as long as they achieve the same objectives.

b. Approval. Once the PMI having oversight responsibilities is satisfied that the operator's continued airworthiness maintenance or inspection program contains all of the elements of the FAA-approved RAGs, the PMI would approve an OpSpecs or inspection program revision. This would have the effect of requiring use of the approved RAGs.

4-6. RECORDKEEPING AND RETENTION. The PMI should check the operator's records and recordkeeping system to ensure that the current compliance status of the airplane can be identified from these records and that this data is available when an airplane is transferred. The PMI should determine whether the operator has an alternative recordkeeping system and is maintaining records IAW the system.

a. Audit Trail. The proposed recordkeeping system should enable the ASI to determine the inspection intervals for each repair. The operator's Repair Assessment Program should allow the ASI to determine the method of compliance for each repair. For example, the operator may propose to use its airworthiness release record (job/task card or equivalent) to satisfy the status record requirements.

b. Record Retention. To ensure that current status records are available, the Repair Assessment Program should contain provisions which require each job/task card to be retained until one of the following situations:

(1) The repair has had a repeat inspection, or

(2) The job/task card is transferred with the airplane.

c. Record Transfer. In the event that an airplane is transferred, the losing operator should provide the gaining operator with all records that show status of the Repair Assessment Program.

4-7. thru 4-12. RESERVED.

CHAPTER 5. SURVEILLANCE

5-1. SURVEILLANCE OF AN OPERATOR'S REPAIR PROGRAM. Once the operator has begun their Repair Assessment Program, the PMI may use the following items to monitor compliance:

a. Does the operator have the manufacturer's RAG or an operator developed, FAA-approved RAG?

b. Do job/task cards contain instructions for threshold and repeat inspections for Category B repairs, and/or replacement times for Category C repairs?

c. Is the operator meeting the implementation and repeat inspection schedule requirements of the rule?

d. If the operator's repair program is being performed by a contract facility, is it being accomplished IAW the operator's program?

5-2. CLASSIFICATION OF REPAIRS. Repairs that exhibit structural distress should be replaced before further flight. From the information on the survey form, it is also possible to classify repairs into one of the three categories: A, B, or C.

5-3. ACTIONS REQUIRED FOR CATEGORY B AND C REPAIRS.

a. If the repair has been classified as a Category B repair, then the operator is required to apply the manufacturer's or operator's FAA-approved RAGs to determine inspection threshold and interval.

b. If the repair has been classified as a Category C repair, then the operator is required to apply the manufacturer's or operator's FAA-approved repair assessment guidelines to determine inspection threshold, interval, and removal time limit.

5-4. REPAIRS AND AIRWORTHINESS DIRECTIVES (AD).

a. It was also recognized by the Airworthiness Assurance Working Group that a repair assessment guidance document would add to, or in some cases appear to be in conflict with, existing repair approval data. All repairs assessed under this rule should have been previously approved by the FAA using an FAA-approved SRM, an FAA-approved SB, or a repair scheme approved by an FAA Designated Engineering Representative (DER) or a Special Federal Aviation Regulations (SFAR) 36 authorization holder. To avoid the appearance of conflicts between FAA-approved data sources, the manufacturers have agreed to update the affected SRMs, as well as repairs identified in SBs, to determine requirements for supplemental inspections, if not already addressed.

b. Structural modifications and repairs mandated by ADs do not always contain instructions for future supplemental inspection requirements. The manufacturers have agreed to evaluate the

need for post modification inspections for these mandated modifications and repairs. A list of SBs that are the subject of ADs will be contained in the model-specific program document with required post modification/repair inspection programs as required. A list of other structural SBs will be provided in the model-specific guidance material with associated inspection Thresholds and Repeat Intervals. The manufacturers have agreed to complete their review of SBs related to skin repairs in conjunction with the initial SRM updates.

c. These agreements notwithstanding, there is still a possibility that the requirements in the RAG document will not agree with that of an AD, especially if the AD was written to address a modification to the airplane made by someone other than the original manufacturer. The CFRs would require that compliance is shown with both the AD and this rule. Such dual compliance can be avoided in the longer term by working with the manufacturer, if that is the source of difficulty, or by securing an Alternative Method of Compliance (AMOC) to the AD. In the short term, compliance with the earlier threshold, a shorter repeat inspection interval, or a more stringent rework/replace schedule would always constitute compliance with the less stringent requirement. Thus, the operator would not be faced with an unresolvable conflict. There is no need for AMOCs when an AD related repair is assessed unless the repair is modified.

5-5. NEW REPAIRS. New repairs must have a damage-tolerance assessment. It is expected that most new repairs will be installed IAW an FAA-approved SRM that has been updated to include this damage-tolerance assessment. However, in the event that a new repair is installed for which no such assessment has been made or is available, the RAGs prepared to meet the requirements of this proposal should be used. All repairs to the fuselage external pressure boundary must be evaluated for damage-tolerance, and any resulting inspection schedule must be specified and the work accomplished, regardless of when, where, or by whom the repair was installed.

5-6. FAA ADVISORY MATERIAL. Advisory Circular 120-73 provides guidance on how the RAG could be incorporated into an operator's maintenance program. In brief, the AC provides information and guidance concerning the repair assessment process, new repairs, operator developed RAGs and procedures for submitting the program to the FAA for approval, a recommended schedule for accomplishing the repair assessment, and guidelines for structure certified by STC. Additional information on forms of approved data is found in AC 120-77, Maintenance and Alteration Data.

5-7. thru 5-11. RESERVED.

APPENDIX 1. SUPPLEMENTARY BACKGROUND INFORMATION

The basic structure of each of the large jet transports affected by this rule was required at the time of original certification to meet the applicable regulatory standards for fatigue and static strength. These same standards were also required for repairs and modifications.

These early fatigue or fail-safe requirements did not provide for timely inspection of critical structure. Damaged or failed structure could not be dependably detected and repaired or replaced before a hazardous condition developed. In 1978, a new certification requirement called damage-tolerance was introduced to assure the continued structural integrity of transport category airplanes certificated after that time. This concept was adopted as an amendment to Title 14 of the Code of Regulations (14 CFR) part 25, § 25.571 by Amendment 25-45 (43 FR 46242). In 1981, the Federal Aviation Administration (FAA) published Advisory Circular (AC) 91-56, Supplemental Structural Inspection Program for Large Transport Category Airplanes. This AC applied the concept of damage-tolerance to aircraft certified before Amendment 25-45.

Damage-tolerance is a structural design and inspection methodology used to maintain safety by considering the possibility of metal fatigue or other structural damage. The underlying principle for damage-tolerance is that the initiation and growth of structural fatigue damage can be anticipated with sufficient precision to allow inspection programs to detect damage before it reaches a critical size. A damage-tolerance evaluation predicts where fatigue cracks are most likely to start in the airplane structure, and their trajectories and rates of growth under repeated structural loading. The evaluation also predicts the size of the damage at which strength limits are exceeded and performs an analysis of the potential inspection opportunities for detecting the damage. This information is used to establish an inspection program for the structure that, if rigorously followed, will be able to detect cracking before it causes a major structural failure. A damage-tolerant structure is one in which damage would be detected by reliance on maintenance and inspection actions long before it becomes hazardous. The evidence to date is that when the damage-tolerant concept is applied to all critical structures and the supplemental inspections are performed, this concept provides the best assurance of continued structural integrity that is currently available.

In order to apply this concept to transport airplanes type-certificated before to Amendment 25-45, the FAA issued a series of Airworthiness Directives (AD) requiring compliance with the first Supplemental Structural Inspection Programs (SSIP) developed for these airplanes. These SSIPs were developed by the airplane manufacturers using AC 91-56, which embraces the damage-tolerance concept. SSIPs were then incorporated into a manufacturer's document which has become known as a Supplemental Structural Inspection Document (SSID). Regardless of what they are called, they all include damage-tolerance-based SSIPs.

All of the airplane models covered in this order are now covered by these ADs. Generally, the ADs require that operators incorporate SSIDs into their maintenance programs for the affected airplanes. These SSIDs were derived from damage-tolerance assessments of the originally type-certificated designs (before Amendment 25-45) for these airplanes and therefore did not address the damage tolerance of repairs made to these airplanes. An objective of the requirements in

14 CFR parts 91, 121, 125, and 129 is to provide that same level of assurance for certain repairs and for the adjacent structure of the airplane.

Repairs are a concern on older airplanes because of the possibility that they may develop, cause, or obscure metal fatigue, corrosion, or other damage during service. This damage might occur within the repair itself or in the adjacent structure and might ultimately lead to structural failure. The Repair Assessment Program would use damage-tolerance concepts to evaluate existing repairs and establish an appropriate supplemental inspection if necessary, or a repair replacement schedule if the inspection is too rigorous or not possible.

In general, repairs present a more challenging problem to solve when applied to the original airplane structure. They become unique in that they are tailored in design to correct particular damage to the original structure. The behavior of a repair and its effect on the fatigue characteristics of the original structure are generally not known to the same extent as for the basic unrepaired structure.

The service histories of repairs indicate they have performed quite well. Although an airplane accident has never been attributed to properly-applied repairs, as time-in-service increases, they may pose a concern for the following reasons:

1. As airplanes age, both the number of repairs and the age of existing repairs increase. Along with this is the possibility of unforeseen repair interaction, autogenous failure, or other damage occurring in the repaired area. The continued airworthiness of these airplanes depends primarily on an adequate maintenance or inspection program that ensures inspections are conducted at the right time, in the right place, and using the most appropriate procedures and techniques. To develop this program, a damage-tolerance evaluation of repairs applied to certain flight-critical structures is essential. The longer an airplane is in service, the more important this evaluation and a subsequent inspection program becomes.

2. The practice of damage-tolerance methodology has evolved gradually over the last 20-plus years, and therefore some or all repairs described in the airplane manufacturers' Structural Repair Manuals (SRM) are not designed to current standards. Repairs accomplished in accordance with (IAW) the information contained in the early versions of the SRMs may require additional inspections if evaluated using the current methodology.

3. Because a regulatory requirement for damage tolerance was not applied to airplane designs type-certificated before 1978, the damage-tolerance characteristics of repairs may vary widely and are largely unknown.

APPENDIX 2. APPLYING REPAIR ASSESSMENT GUIDELINES

Applying the Repair Assessment Guidelines to an Airplane:

- Implement Program
  - Implementation threshold
  - Stage 1 - Determine repairs to assess
- Assess Repairs
  - Assessment threshold
  - Stage 2 - Examine repairs
  - Stage 2 - Classify repairs
  - Stage 3 - Determine inspection requirements
  - Inspection threshold
- Inspect Repairs

APPENDIX 3. EXAMPLE OF IMPLEMENTATION THRESHOLD

What is the Implementation Threshold?

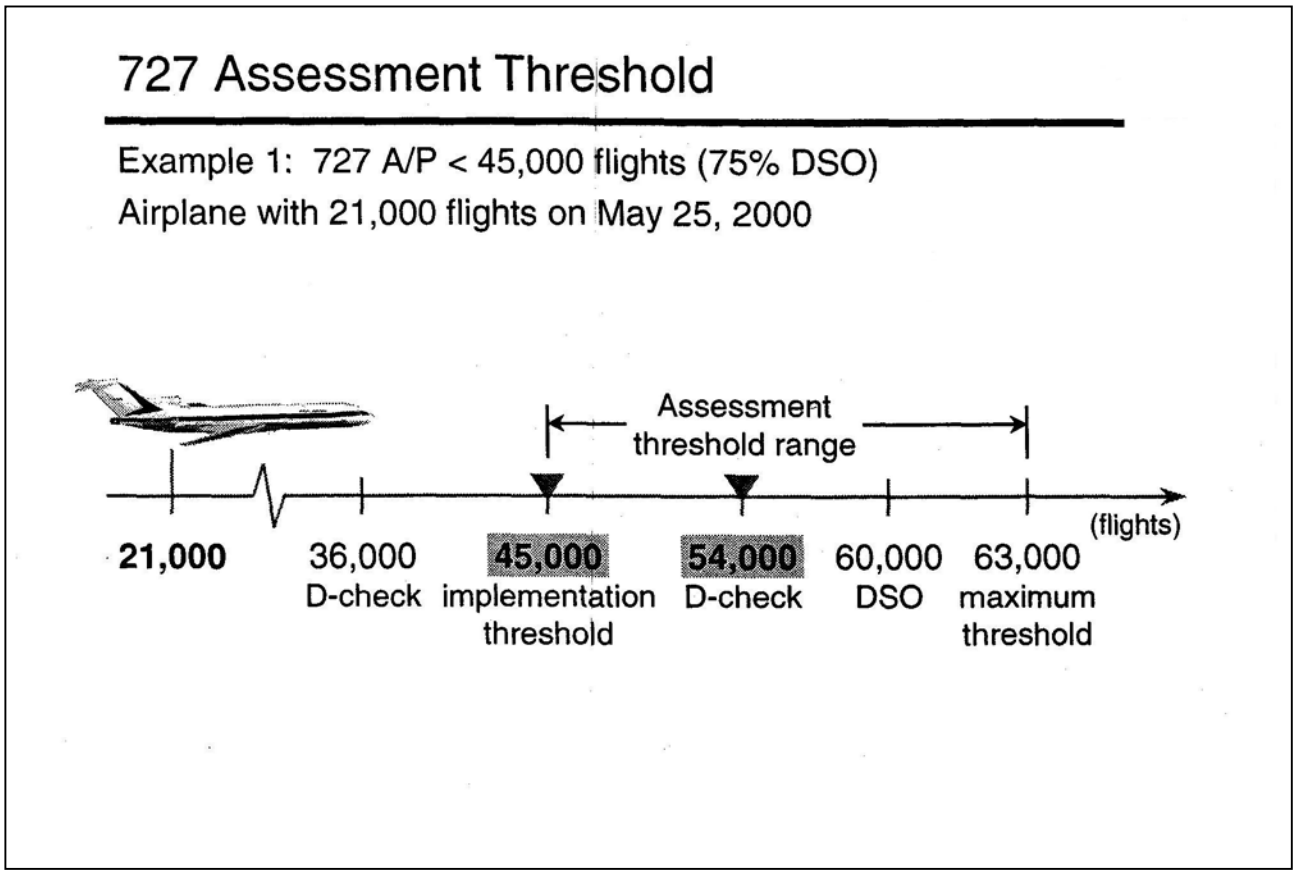
The program implementation threshold is the time, in flight cycles, when the Repair Assessment Program (RAP) should be in place for an airplane.

	707	720	727	737	747
DSG/DSO (flights)	20,000	30,000	60,000	75,000	20,000
RAP Implementation Threshold	15,000	23,000	45,000	60,000	15,000

The threshold that defines when the RAP must be in place is a specific number of flight cycles which is approximately equal to 75% of an airplane model's Design Service Goal (DSG/DSO).

NOTE: An airplane model's DSG is the minimum period of service during which primary structure is defined to be essentially free of detectable fatigue cracks.

APPENDIX 4. EXAMPLE OF BOEING 727 ASSESSMENT THRESHOLD



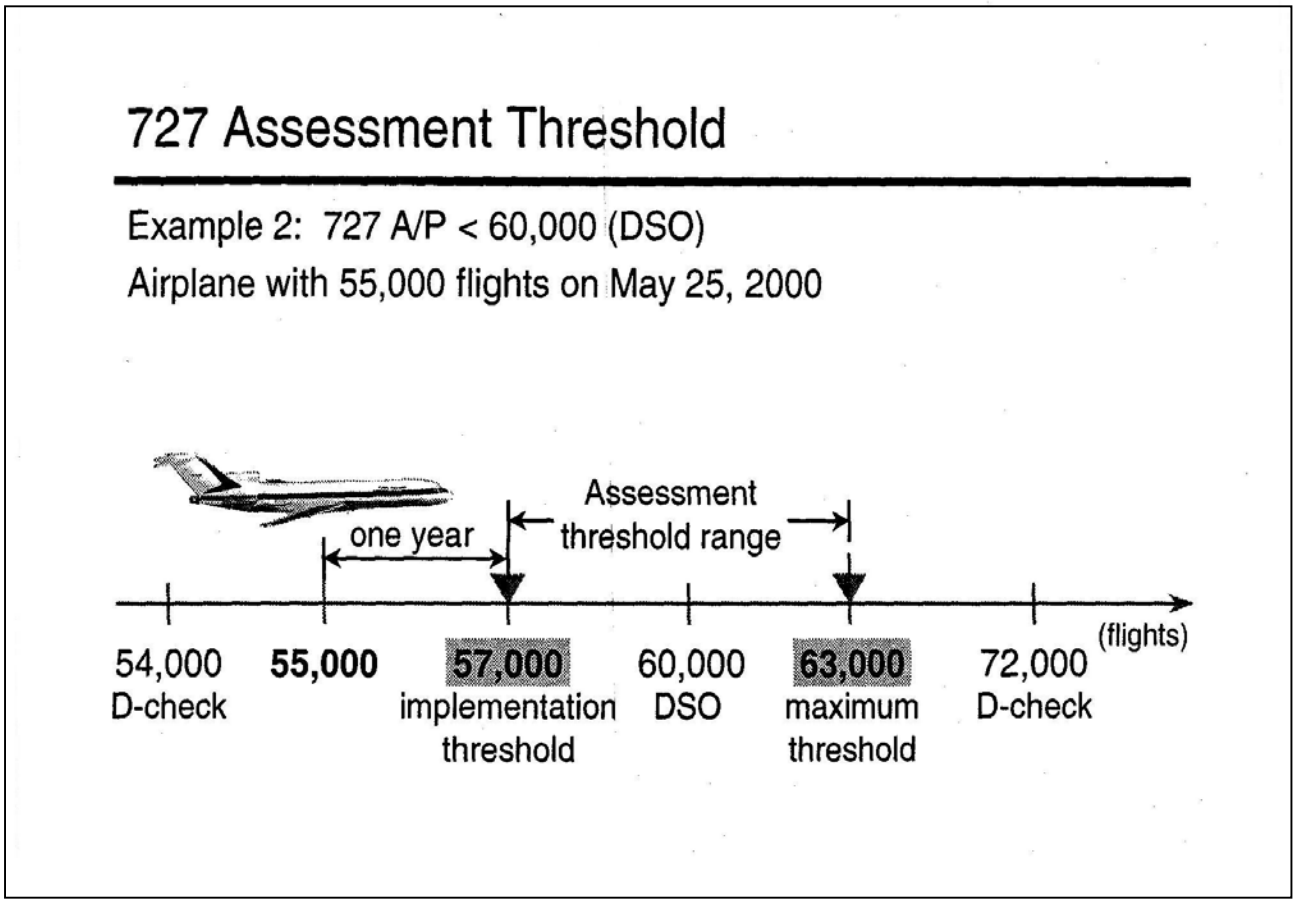
This example is of the implementation and assessment thresholds for a 727 airplane that had 21,000 flight cycles on May 25, 2000. This was less than 45,000 flights (75% DSG/DSO); thus:

- The implementation threshold for this airplane is 45,000 flight cycles since it will reach this after May 25, 2001.
- The airplane's first D-check after implementing the program is at 54,000 flights. Since the maximum threshold for the 727 is 63,000 flights (DSG/DSO plus 3,000), the repairs should be assessed at this D-check.
- The operator could choose to implement the program earlier and assess repairs at the 36,000-flight D-check, but it is not required.

In the above and following charts, the triangle markers (▼) show the flights on the airplane when each part of the program will be accomplished.

The arrows (|⟷|) show the flight cycle ranges for the thresholds within which each part must be accomplished.

APPENDIX 4. EXAMPLE BOEING 727 ASSESSMENT THRESHOLD (Continued)

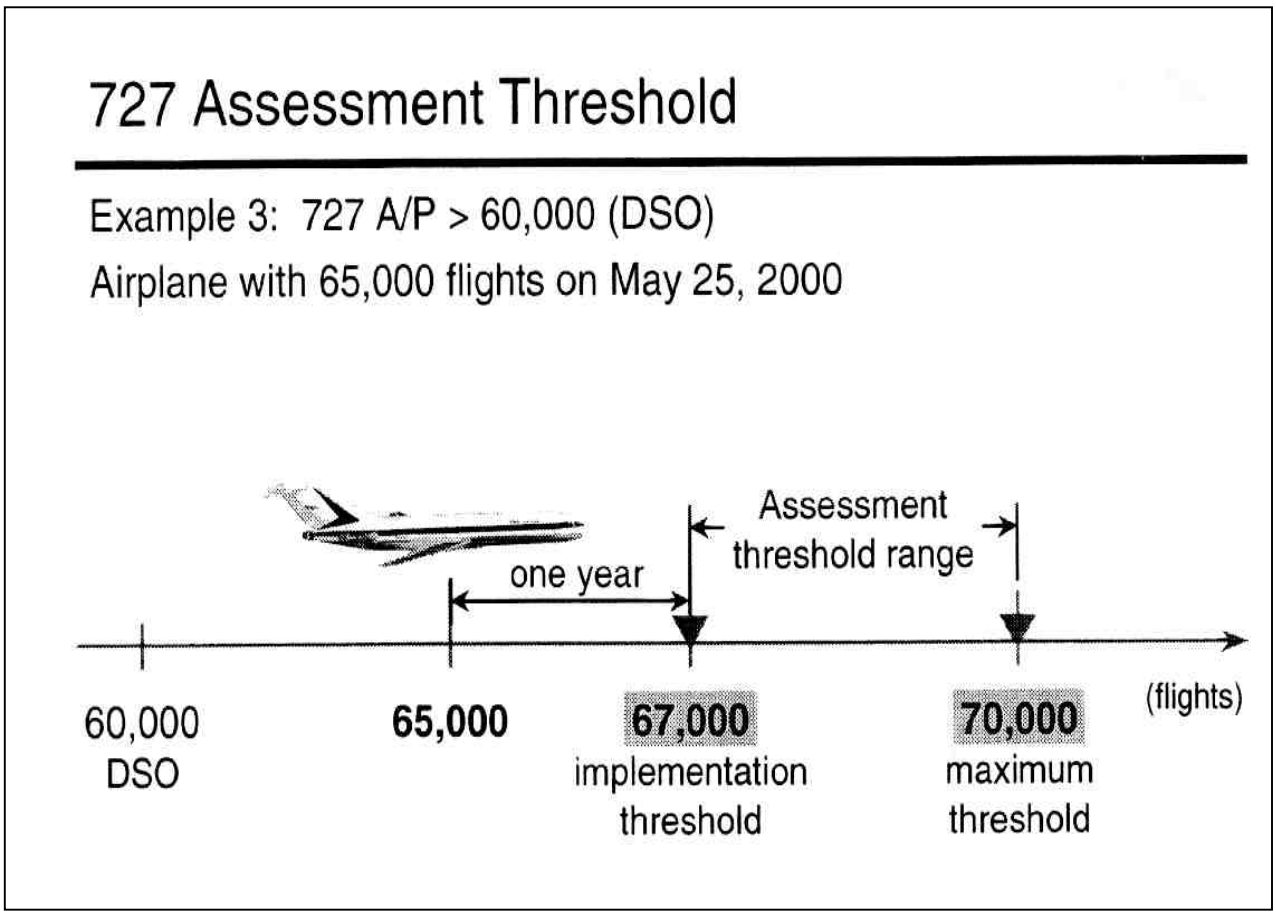


This example is for a 727 airplane with 55,000 flight cycles on May 25, 2000. This was over 45,000 flights (75% DSG/DSO), but less than 60,000 flights (DSG/DSO); thus:

- The implementation threshold for this airplane is May 25, 2001, since it is over 45,000 flights, at which time the airplane will have approximately 57,000 flight cycles.

- The airplane's first D-check after implementing the program is at 72,000 flights. Since the maximum threshold for the 727 is 63,000 flights (DSG/DSO plus 3,000), the repairs will have to be assessed on or before the airplane reaches 63,000 flights.

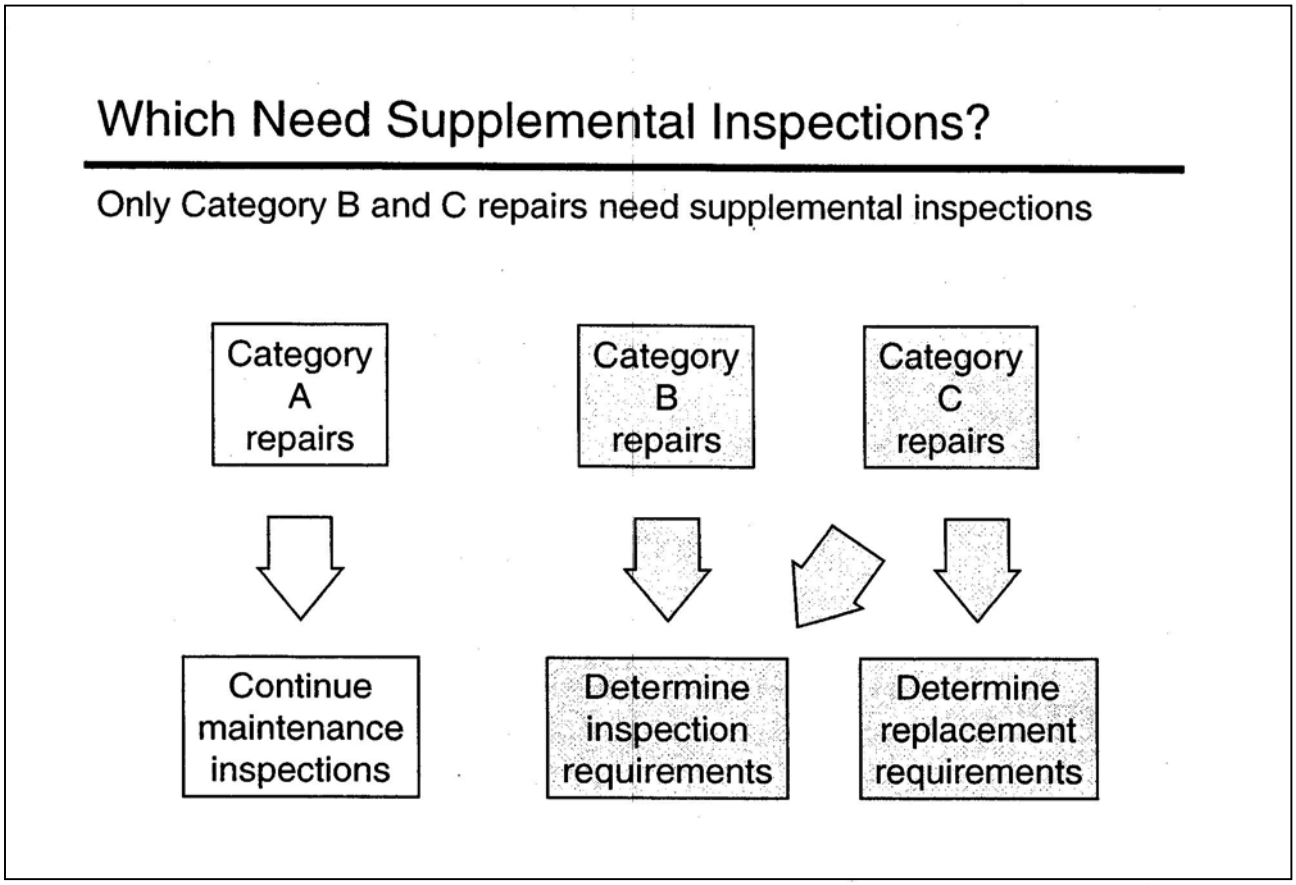
APPENDIX 4. EXAMPLE BOEING 727 ASSESSMENT THRESHOLD (Continued)



This is an example for a 727 airplane with 65,000 flight cycles on May 25, 2000. The aircraft was over 60,000 flights (DSG/DSO); thus:

- The implementation threshold for this airplane is May 25, 2001, at which time the airplane will have approximately 67,000 flight cycles.
- For 727 airplanes over 60,000 flights, the assessment threshold is within 3,000 flights. Thus, the repairs will need to be assessed on or before the airplane reaches 70,000 flights.

APPENDIX 5. REPAIR DESCRIPTIONS

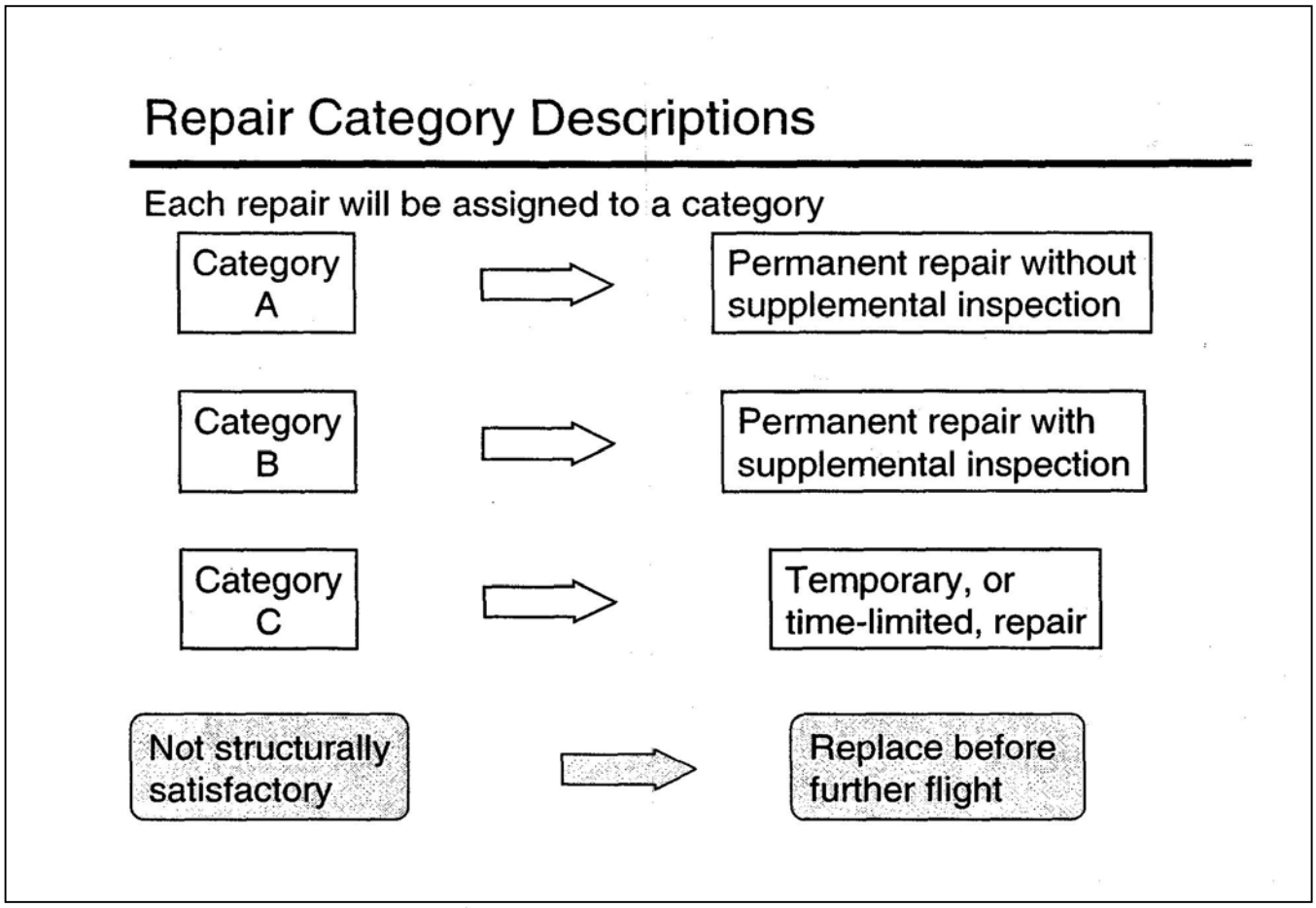


Once a repair has been determined to be Category A, no further work is needed. It can continue to be inspected by normal maintenance.

For Category B and C repairs, the assessment continues by determining the inspection requirements for the repair.

For Category C repairs, the replacement limit must also be determined.

APPENDIX 5. REPAIR DESCRIPTIONS (Continued)



After answering a series of questions based on the data gathered earlier, you will be able to assign each repair to a category.

The three categories are shown next to a brief description of each.

There is also the possibility of an unsatisfactory repair that must be replaced before further flight.

U.S. Department of
Transportation
Federal Aviation
Administration

Directive Feedback Information

Please submit any written comments or recommendations for improving this directive, or suggest new items or subjects to be added to it. Also, if you find an error, please tell us about it.

SUBJECT: Order 8300.13, Repair Assessment Program

To: Directive Management Officer, AFS-140

(Please check all appropriate line items)

☐ An error (procedural or typographical) has been noted in paragraph _____ on page _____.

☐ Recommend paragraph _____ on page _____ be changed as follows: *(attach separate sheet if necessary)*

☐ In a future change to this directive, please include coverage on the following subject *(briefly describe what you want added):*

☐ Other comments:

☐ I would like to discuss the above. Please contact me.

Submitted by: _____ Date: _____

FTS Telephone Number: _____ Routing Symbol: _____

FAA Form 1320-19 (8-89)