Federal Aviation Administration
Aviation Rulemaking Advisory Committee

Transport Airplane and Engine Issue Area
Systems Design and Analysis Harmonization Working Group

Task 1 – Control of Certification Maintenance Requirements

Task Assignment

Aviation Rulemaking Advisory Committee; Transport Airplane and Engine Subcommittee; Systems Design and Analysis Harmonization Working Group

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of establishment of Systems Design and Analysis Harmonization Working Group.

SUMMARY: Notice is given of the establishment of the Systems Design and Analysis Harmonization Working Group of the Transport Airplane and Engine Subcommittee. This notice informs the public of the activities of the Transport Airplane and Engine Subcommittee of the Aviation Rulemaking Advisory Committee.

FOR FURTHER INFORMATION CONTACT: Mr. William J. (Joe) Sullivan, Executive Director, Transport Airplane and Engine Subcommittee, Aircraft Certification Service (AIR–3), 800 Independence Avenue, SW., Washington, DC 20591, Telephone: (202) 267–9554; FAX: (202) 267–5364.

SUPPLEMENTARY INFORMATION: The Federal Aviation Administration (FAA) established an Aviation Rulemaking Advisory Committee (56 FR 2190, January 22, 1991) which held its first meeting on May 23, 1991 (56 FR 20492, May 3, 1991). The Transport Airplane and Engine Subcommittee was established at that meeting to provide advice and recommendations to the Director, Aircraft Certification Service, FAA, regarding the airworthiness standards for transport airplanes, engines and propellers in parts 25, 33 and 35 of the Federal Aviation Regulations (14 CFR parts 25, 33 and 35).

The FAA announced at the Joint Aviation Authorities (JAA)–Federal Aviation Administration (FAA) Harmonization Conference in Toronto, Ontario, Canada, (June 2–5, 1992) that it would consolidate within the Aviation Rulemaking Advisory Committee structure an ongoing objective to "harmonize" the Joint Aviation Requirements (JAR) and the Federal Aviation Regulations (FAR). Coincident with that announcement, the FAA assigned to the Transport Airplane and Engine Subcommittee those projects related to JAR/FAR 25, 33 and 35 harmonization which were then in the process of being coordinated between the JAA and the FAA. The harmonization process included the intention to present the results of JAA/FAA coordination to the public in the form of either a Notice of Proposed Rulemaking or an advisory circular—an objective comparable to and compatible with that assigned to the Aviation Rulemaking Advisory Committee. The Transport Airplane and Engine Subcommittee, consequently, established the Systems Design and Analysis Harmonization Working Group.

Specifically, the Working Group's task is the following: The Systems Design and Analysis Harmonization Working Group is charged with making recommendations to the Transport Airplane and Engine Subcommittee concerning the FAA disposition of the following subject recently coordinated between the JAA and the FAA:

Equipment, Systems and Installations: Develop guidance material concerning the evaluation and control of certification maintenance requirements created to satisfy the requirements of FAR 25.1309 for newly certificated transport category airplanes (AC 25.1309–1A; ref. FAR 25.1309).

Reports: A. Recommend time line(s) for completion of each task, including rationale, for Subcommittee consideration at the meeting of the subcommittee held following publication of this notice.

B. Give a detailed conceptual presentation on each task to the Subcommittee before proceeding with the work stated under items C, below.

C. Draft a change to Advisory Circular 25.1309–1A providing appropriate guidance material.

D. Give a status report on each task at each meeting of the Subcommittee.

The Systems Design and Analysis Harmonization Working Group will be comprised of experts from those organizations having an interest in the tasks assigned. A Working Group member need not necessarily be a representative of one of the organizations of the parent Transport Airplane and Engine Subcommittee or of the full Aviation Rulemaking Advisory Committee. An individual who has expertise in the subject matter and wishes to become a member of the Working Group should write the person listed under the caption **FOR FURTHER INFORMATION CONTACT** expressing that desire, describing his or her interest in the task, and the expertise he or she would bring to the Working Group. The request will be reviewed with the Subcommittee and Working Group Chairs and the individual will be advised whether or not the request can be accommodated.

The Secretary of Transportation has determined that the information and use of the Aviation Rulemaking Advisory Committee and its subcommittees are necessary in the public interest in connection with the performance of duties of the FAA by law. Meetings of the full Committee and any subcommittees will be open to the public except as authorized by section 10(d) of the Federal Advisory Committee Act. Meetings of the Systems Design and Analysis Harmonization Working Group will not be open to the public except to the extent that individuals with an interest and expertise are selected to participate. No public announcement of Working Group meetings will be made.

Issued in Washington, DC, on December 11, 1992.

William J. Sullivan,

Executive Director, Transport Airplane and Engine Subcommittee, Aviation Rulemaking Advisory Committee.

[FR Doc. 92–30884 Filed 12–18–92; 8:45 am]

BILLING CODE 4910–13–M

Recommendation Letter

Transport Aircraft and Engine Subcommittee
Aviation Rulemaking Advisory Committee

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13 November 1992
C1-DSW-87

Anthony J. Broderick
Associated Administrator for Regulation and Certification
Federal Aviation Administration
800 Independence Avenue S.W.
Washington, DC 20591

Subject: Transport and Engine Subcommittee Recommendations Concerning the Report of the Systems Review Task Force

Dear Tony:

The Transport and Engine Subcommittee of the Rulemaking Advisory Committee has reviewed the report of the Systems Review Task Force. The recommendations contained in the report fall broadly into three categories.

1. Rulemaking

We mean this to include not only the regulations, but also implementing materials such as advisory circulars. We have identified three areas, all from the report of the Engine Hazards Working Group, which we recommend to the FAA for action.

a. Engine System Non-Containment:

- Create a category of parts, the primary failure of which is considered to have non-containment potential (NCP parts).
- Requirements relating to the repair of NCP parts, with specific attention to fan blade repair.
- Requirements for the defacing of NCP parts.
- Requirements related to rotor blade containment.
- Assessment of inspection reliability.

b. Engine Related Safety Assessment:

- Review of FAR/JAR 25.1309.
- Review AC 20-128 and ACJ 25.903

c. Related Activity:

- Review other relevant FAR's.

TAES notes that these items are interdependent, and recommends that they should be worked together by working group. We also note other sections of the regulations and/or implementing materials may be relevant. Thus, our recommendation should not be considered to be limited only to those parts identified above.

TAES is aware that the activities we are recommending may be of interest to the Air Carrier/General Aviation Maintenance Subcommittee and the Rotorcraft Subcommittee. Therefore, we believe that these subcommittees should be apprised of this recommendation and consideration should be given to formation of a joint working group with membership open to candidates from all three subcommittees.

2. Type-Specific Recommendations

   These include recommended actions through service bulletins and airworthiness directives, and are included in the individual manufacturers' reports. We recommend that these not be addressed by the TAES, since our understanding is that the ARAC is not intended to be the vehicle for these kinds of actions and that activity between the manufacturers and the cognizant FAA offices is already well underway on these items.

3. Generic Non-Rulemaking Recommendations

   These include areas such as research into more effective NDI/NDT procedures and technologies. In general, we support an aggressive FAA/private sector R&D program in this field. However we believe that this is outside the scope of the ARAC mandate, and therefore should not be the subject of an ARAC working group. We recommend that those items should be referred to the FAA RE&D Advisory Committee for integration into the research activities already underway in this field. A mechanism should be established by which the TAES is kept apprised of these developments. As research recommended by the SRTF matures to a state conducive to rulemaking, the TAES should consider each item on its merit for inclusion in this or another working group as appropriate.

   A proposed Task Description covering the work that should be done in TAES is included as Attachment 1.

Sincerely,

Dale S. Warren, Chairman

Acknowledgement Letter

U.S. Department
of Transportation
**Federal Aviation
Administration**

800 Independence Ave., S.W.
Washington, D.C. 20591

JAN 14 1993

Mr. Dale S. Warren, Chairman
Transport Airplane and Engine Subcommittee
Douglas Aircraft Corporation
3855 Lakewood Boulevard
Long Beach, CA 90846

Dear Mr. Warren:

This letter acknowledges receipt of your October 30, 1992, letter in which you transmitted several recommendations based on the Report of the Systems Review Task Force. The range of recommendations include rulemaking, airworthiness directives, service bulletins and other guidance material, and continuing effort in the area of research and development.

Your recommendations and the report have been forwarded to the Aircraft Certification and Flight Standards Services for review and a decision on the next appropriate action on each of your recommendations. You will be advised of any future tasks that may be assigned to the Transport Airplane and Engine Subcommittee related to the subject report before February 15.

Please pass on to the subcommittee our thanks for its prompt action and efforts in completing the task assigned by the Federal Aviation Administration.

Sincerely,

Anthony J. Broderick
Associate Administrator
for Regulation and Certification

TO: Chairman, Transport Aircraft & Engine Subcommittee

FROM: Anthony J. Broderick, Associated Administrator for Regulation and Certification

SUBJECT: Work Task Statement Concerning Report of Systems Review Task Force

Based on the report of the systems Review Task Force and the Engine Hazards Working Group, and considering the recommendations contained in your memorandum dated 13 November 1992 the following work tasks have been assigned to the Transport Aircraft and Engine Subcommittee as follow-on action.

A. Engine System Non-Containment

(1) Non-Containment Potential Parts

Draft FAR Part 33 proposed rules which create a category of engine parts having the potential of becoming uncontained (Engine Non-Containment Potential Parts) and require the engine manufacturer to identify the engine parts that come under the NCP category. Consideration should be given to harmonization with the appropriate JAR and related advisory material.

(2) Repair of NCP Parts

Draft FAR Part 43 proposed rules which establish requirements and criteria pertaining to the repair of NCP Parts and the approval standards required for repair stations undertaking such repairs.

(3) Defacing of NCP Parts

Draft FAR Part 21 proposed rules which establish requirements and standards for permanent defacing of nonconforming and scrapped NCP parts.

(4) Rotor Blade Containment

Draft FAR Part 33 advisory material related to continued airworthiness which describes a means for corrective action to both root cause and containment for future non-containment occurrences that represent a potential threat to flight safety.

(5) Fan Blade Repair

Develop FAR Part 33 advisory material related to continued airworthiness of fan blades addressing normal service induced damage and reasonable maintenance (inspection and repair) requirements consistent with their non-containment potential.

(6) Inspection Reliability

Design a program for developing reliability statistics for current inspection techniques (for cracks/defects) currently employed by industry.

B. Engine Related Safety Assessment

(1) FAR/JAR 25.1309 Applicability to Power Plant

Review issues related to:

(a) application of the general FAR/JAR 25.1309 rule to power plants,
(b) the relationship between this general rule and the specific rules under Subpart E of FAR/JAR 25 and,
(c) develop recommendations for a single FAA and JAA standard for transport category aircraft consistent with the technological capability of the industry to comply.

(2) AC 20-128 and ACJ 25.903

Review the historical basis of these advisory documents, update factual material based on recent experience and develop a single FAA and JAA methodology defining an acceptable approach to minimizing the hazard from engine system non-containments. Included within the new proposed guidance material should be clear instructions concerning the responsibilities of the engine and airframe manufacturers and the relationships between the provisions of Part 25 and Part 33.

C. Related Activity

Review all other applicable sections of 14 CFR and develop, as required, appropriate draft proposed rulemaking that is relevant to the areas above. Review FAA RE&D Advisory Committee material applicable to the question of: "Are engine containment structure designs in present use today the best that can be implemented or are improvements practicable for present and future designs?".

D. Project Management

Establish milestones and provide periodic reports on progress with respect to each issue.

Recommendation

ARAC RECOMMENDATION RESUME

Resume No. ANE-93-750-A

PROJECT TITLE: FLIGHT CONTROL SYSTEMS - REVIEW OF SERVICE BULLETINS

PROJECT CATEGORY:

OFFICE OF PRIMARY INTEREST: New England Region, ANE-100

CONTACT NAME: TELEPHONE NO.

OBJECTIVE: Recommendation.- Thirty service bulletins should be further reviewed with consideration given to making them mandatory. The recommendation suggests that if certain service bulletins are not made mandatory, under certain combinations of failures and events, a condition may result that would endanger the safety of the airplane, crew or passengers. The conditions created would require exceptional piloting skills to maintain control or would require immediate inflight corrective action, emergency procedure or landing at the nearest airport.

STATUS: Recommendation being reviewed and considered.

ISSUES:

MILESTONE SCHEDULE	COMPLETION DATES: SCHEDULED	ACTUAL
Recommendation to the FAA		11/92
FAA Response Due		

COMMENTS: This recommenation resulted from the task assigned to the Systems Review Task Force, Transport Airplane and Engine Subcommittee, Aviation Rulemaking Advisory Committee.

The list of service bulletins to be considered is attached.

Airbus Service Bulletins

Category 1: Service Bulletins Recommended as "Mandatory"

A310-27-2042 .....Flight Controls - Slat/Flap wing tip brake solenoid - Inspection.

Category 2: Service Bulletins for further Regulatory Consideration

A300-27-105.....Flight Controls - Hydraulic Systems flexible hoses - Prevention of inadvertent cross connection.

A300-27-144.....Flight Controls - Modify Flap and slat tension regulator and speed brake pulley in the avionic compartment.

A300-27-2036 .....Flight Controls - Prevent possible hangup of
A300-27-6011 flight control cables to meet FAA requirements.

A300-27-2046 .....Flight Controls - Improvement of wing tip brake solenoid valves.

TFU27-22-21-01 .....A310 and A300-600 Rudder trim control switch knob replacement.

A300-29-056.....Hydraulic Power - Improve protection of hydraulic system in hydraulic compartment.

A300-29-059.....Hydraulic power - Relocate yellow system isolation valve.

Category 3: Service Bulletins Related to Engine Installation and Control

MDC A71-151.....Power plant - check/repair wing engine nose
(A300-71-055) cowl

CF6-80C/71-088.....Power plant - Addition of throttle cable cooling.
(A300-71-088) (BE CF6-80 C2 Engines only)

A300-76-013.....Engine controls - Flexible throttle control improve drainage. (PW JT9D-59A engines only)

PW7R4-76-3 .....Engine controls - Flexible throttle control -
(A310-76-2007) Change endfitting material on engine side.
(A300-76-6004) (PWJT9D-7R4 engines only)

Boeing Service Bulletins

747-27-2066.....Automatic Speedbrake Control Circuit Modification.

747-29-2051*.....Strut No. 2 and No. 3 Hydraulic Case Drain Line Reroute

747-29A2063*.....Hydraulic Power - Main Hydraulic Supply System No. 4 System.

757-29A30*.....Center System Rudder and Elevator Fuse and Check Valve Installation.

767-29-0021.....Hydraulic Power - Auxiliary - RAT System Wiring Modification

767-29A0038.....Hydraulic Power - Main - Main (Left) Hydraulic System Modification.

Douglas Service Bulletins

27-71 .....Flight Controls - Horizontal Stabilizers - Install Hydraulic Surge Damper Assemblies.

27-120 .....Flight Controls-Horizontal Stabilizers-Modify Horizontal Stabilizer Trim Hydraulic Motor Assembly.

27-152 .....Flight Controls-Horizontal Stabilizers-Replace Torsional Nut Locking Clip (Nut Retainer).

27-181 .....Flight Controls-Horizontal Stabilizers-Replace Horizontal Stabilizer Chain Drive Unit Assembly.

27-201 .....Flight Controls-Flaps-Replace Flap Lock Pipe Assemblies.

27-208 .....Flight Controls-Horizontal Stabilizers-Replace Trim Control Valve End Caps.

27-209 .....Flight Controls-Horizontal Stabilizers-Inspect/Readjust Chain Drive Unit.

29-109 .....Hydraulic Power - Auxiliary - Install Reversible Motor Pump Indication System.

29-125 .....Hydraulic Power - Main - Replace Hydraulic Case Drain High-Pressure Switches With Plugs.

32-134 .....Landing Gear-Wheels and Brakes-Add Protective Shield for Aft Antiskid Manifold Installation.

32-143 .....Landing Gear-Wheels and Brakes-Install Protective Shield for Brake Piping System Piping on Left and Right Main Landing Gear (MLG).

32-157 .....Landing Gear-Main and Gear Doors-Install Deflector Assembly and Replace Shock Strut Pressure Gage Manifold on Centerline Landing Gear (CLG).

ARAC RECOMMENDATION RESUME

Resume No. ANE-93-751-A

PROJECT TITLE: Establishment of Engine Non-Containment Potential Parts Category (Part 33)

PROJECT CATEGORY:

OFFICE OF PRIMARY INTEREST: New England Region, ANE-100

CONTACT NAME: TELEPHONE NO.

OBJECTIVE: Recommendation.- Develop a proposal to amend Part 33 of the Federal Aviation Regulations to create a category of engine parts that have the potential of becoming uncontained. The proposal would require an engine manufacturer to identify non-containment potential engine parts to be included in this category. Consideration should be given to harmonizing proposed regulations with any related Joint Airworthiness Regulations and advisory material.

STATUS: Recommendation being reviewed and considered.

ISSUES:

MILESTONE SCHEDULE	COMPLETION DATES: SCHEDULED	ACTUAL
Recommendation to the FAA		11/92
FAA Response Due		

COMMENTS: This recommendation resulted from the task assigned to the Systems Review Task Force, Transport Airplane and Engine Subcommittee, Aviation Rulemaking Advisory Committee.

ARAC RECOMMENDATION RESUME

Resume No. AFS-93-752-A

PROJECT TITLE: Maintenance and Inspection of Engine Non-Containment Potential Parts (Part 43)

PROJECT CATEGORY:

OFFICE OF PRIMARY INTEREST: Flight Standards Service, AFS-300

CONTACT NAME: TELEPHONE NO.

OBJECTIVE: Recommendation.- Develop a proposal to amend Part 43 of the Federal Aviation Regulations to establish requirements and criteria for repair of non-containment parts. The proposed rule would include requirements for repair station approval for return to service of repaired NCP parts.

STATUS: Recommendation being reviewed and considered.

ISSUES:

MILESTONE SCHEDULE	COMPLETION DATES: SCHEDULED	ACTUAL
Recommendation to the FAA		11/92
FAA Response Due		

COMMENTS: This recommendation resulted from the task assigned to the Systems Review Task Force, Transport Airplane and Engine Subcommittee, Aviation Rulemaking Advisory Committee.

ARAC RECOMMENDATION RESUME

Resume No. AIR-93-753-A

PROJECT TITLE: Requirements for Permanent Defacing of Nonconforming and Scrapped Non-Containment Parts (Part 21)

PROJECT CATEGORY:

OFFICE OF PRIMARY INTEREST: Aircraft Certification, AIR-100

CONTACT NAME: TELEPHONE NO.

OBJECTIVE: Recommendation.- Develop a proposal to amend Part 21 of the Federal Aviation Regulations to establish requirements and standards for permanent defacing of nonconforming and scrapped noncontainment parts.

STATUS:

ISSUES:

MILESTONE SCHEDULE	COMPLETION DATES: SCHEDULED	ACTUAL
Recommendation to the FAA		11/92
FAA Response Due		

COMMENTS: This recommendation resulted from the task assigned to the Systems Review Task Force, Transport Airplane and Engine Subcommittee, Aviation Rulemaking Advisory Committee.

ARAC RECOMMENDATION RESUME

Resume No. AFS-93-754-A

PROJECT TITLE: Inspection Reliability Program

PROJECT CATEGORY:

OFFICE OF PRIMARY INTEREST: Flight Standards Service, AFS-300

CONTACT NAME: TELEPHONE NO.

OBJECTIVE: Recommendation.- Review current engine inspection techniques for cracks and defects. Initiate a program to obtain statistics for determining Probability of Detection (POD) levels for current inspection techniques.

STATUS: Recommendation is being reviewed and considered.

ISSUES:

MILESTONE SCHEDULE	COMPLETION DATES: SCHEDULED	ACTUAL
Recommendation to the FAA		11/92
FAA Response Due		

COMMENTS: This recommendation resulted from the task assigned to the Systems Review Task Force, Transport Airplane and Engine Subcommittee, Aviation Rulemaking Advisory Committee.

ARAC RECOMMENDATION RESUME

Resume No. AFS-93-755-A

PROJECT TITLE: Inspection and Repair of Fan Blades Advisory Circular

PROJECT CATEGORY:

OFFICE OF PRIMARY INTEREST: Flight Standards Service, AFS-300

CONTACT NAME: TELEPHONE NO.

OBJECTIVE: Recommendation.- Develop an advisory circular establishing standards and guidance for inspections and repair of fan blades.

STATUS: Recommendation is being reviewed and considered.

ISSUES:

MILESTONE SCHEDULE	COMPLETION DATES: SCHEDULED	ACTUAL
Recommendation to the FAA		11/92
FAA Response Due		

COMMENTS: This recommendation resulted from the task assigned to the Systems Review Task Force, Transport Airplane and Engine Subcommittee, Aviation Rulemaking Advisory Committee.

ARAC RECOMMENDATION RESUME

Resume No. ANE-93-756-A

PROJECT TITLE: Engine Rotor Burst containment Study

PROJECT CATEGORY:

OFFICE OF PRIMARY INTEREST: New England Region, ANE-100

CONTACT NAME: TELEPHONE NO.

OBJECTIVE: Recommendation.- The Federal Aviation Administration, the Department of Defense, and/or the National Air and Space Administration should continue to sponsor research and development of disk containment technology and shielding technology as a means of improving the protection against engine non-containments in future designs.

STATUS: Recommendation is being reviewed and considered.

ISSUES:

MILESTONE SCHEDULE	COMPLETION DATES: SCHEDULED	ACTUAL
Recommendation to the FAA		11/92
FAA Response Due		

COMMENTS: This recommendation resulted from the task assigned to the Systems Review Task Force, Transport Airplane and Engine Subcommittee, Aviation Rulemaking Advisory Committee.

ARAC RECOMMENDATION RESUME

Resume No. ANM-93-757-A

PROJECT TITLE: Engine Related Safety Assessment (§ 25.1309)

PROJECT CATEGORY:

OFFICE OF PRIMARY INTEREST: Northwest Mountain Region, ANM-100

CONTACT NAME: TELEPHONE NO.

OBJECTIVE: Recommendation.- Assess level of safety in qualitative and quantitative terms and review required safety analysis in light of complex aircraft systems described in § 25.1309 of the Federal Aviation Regulations.

STATUS: Recommendation is being reviewed and considered.

ISSUES:

MILESTONE SCHEDULE	COMPLETION DATES: SCHEDULED	ACTUAL
Recommendation to the FAA		11/92
FAA Response Due		

COMMENTS: This recommendation resulted from the task assigned to the Systems Review task Force, Transport Airplane and Engine Subcommittee, Aviation Rulemaking Advisory Committee.

ARAC RECOMMENDATION RESUME

Resume No. ANM-93-758-A

PROJECT TITLE: Engine Related Safety Assessment Advisory Circulars

PROJECT CATEGORY:

OFFICE OF PRIMARY INTEREST: Northwest Mountain Region, ANM-100

CONTACT NAME: TELEPHONE NO.

OBJECTIVE: Recommendation.- Review advisory material contained in Advisory Circulars 20-128 and Advisory Circular Joint (ACJ) 25.903 to ensure safety analysis procedures and standards are appropriate for complex aircraft systems described in § 25.1309 of the Federal Aviation Regulations.

STATUS: Recommendation is being reviewed and considered.

ISSUES:

MILESTONE SCHEDULE	COMPLETION DATES: SCHEDULED	ACTUAL
Recommendation to the FAA		11/92
FAA Response Due		

COMMENTS: This recommendation resulted from the task assigned to the Systems Review task Force, Transport Airplane and Engine Subcommittee, Aviation Rulemaking Advisory Committee.

Recommendation Letter

Jean

Boeing Commercial Airplane Group
P.O. Box 3707
Seattle, WA 98124-2207

July 14, 1994
B-T01B-GRM-94-049

Mr. Anthony J. Broderick
Associate Administrator for Regulations and Certification, (AVR-1)
Department of Transportation
Federal Aviation Administration
800 Independence Avenue, S.W.
Washington DC 20591
Tele: (202) 267-3131
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BOEING

Dear Mr. Broderick:

On behalf of the Aviation Rulemaking Advisory Committee, I am pleased to submit the enclosed recommendation for publication on the following subject:

AC 25.XX Certification Maintenance Requirements

The enclosed package is in the form of a final draft AC. The package was developed by the Systems Design & Analysis Harmonization Working Group chaired by Ed Schroeder of Boeing and J. C. Rouquet of Aerospatiale. The membership of the group is a good balance of interested parties in the U.S. and Europe. This group can be made available if needed for docket review.

The members of ARAC appreciate the opportunity to participate in the FAA rulemaking process and fully endorse this recommendation.

Sincerely,

Gerald R. Mack

Gerald R. Mack
Assistant Chairman
Transport Airplane & Engine Issues Group
Aviation Rulemaking Advisory Committee
Tele: (206) 234-9570, Fax: 237-0192, Mailstop: 67-UM

Enclosure

cc:

M. Borfitz	(617) 238-7199
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Acknowledgement Letter

AUG 16 1994

#1

Mr. Gerald R. Mack
Aviation Rulemaking Advisory Committee
Boeing Commercial Airplane Group
P.O. Box 3707
Seattle, WA 98124-2207

Dear Mr. Mack:

Thank you for your July 14 letter forwarding the Aviation Rulemaking Advisory Committee's (ARAC) recommendation in the form of an advisory circular addressing Certification Maintenance Requirements.

I would like to thank the aviation community for its commitment to ARAC and its expenditure of resources to develop the recommendation. We in the Federal Aviation Administration (FAA) pledge to process the document expeditiously as a high-priority action.

Again, let me thank the ARAC and, in particular, the Systems Design and Analysis Harmonization Working Group for its dedicated efforts in completing the task assigned by the FAA.

Sincerely,

Anthony J. Broderick

Anthony J. Broderick
Associate Administrator for
Regulation and Certification

Recommendation

Certification Maintenance Requirements	03/03/94 ANM-100	25-xx

1. PURPOSE. This Advisory Circular (AC) provides guidance on the selection, documentation and control of Certification Maintenance Requirements (CMR's). This document also provides a rational basis for coordinating the Maintenance Review Board (MRB) and CMR selection processes in order to minimize the impact of CMR's on airplane operators. This AC describes an acceptable means, but not the only means, for selecting, documenting and managing CMR's.

2. APPLICABLE FEDERAL AVIATION REGULATIONS. Sections 25.1309 and 25.1529 of the Federal Aviation Regulations (FAR).

3. RELATED DOCUMENTS.

a. Advisory Circular (AC) 25.1309-1A, System Design and Analysis.

b. Advisory Material Joint AMJ 25.1309, System Design and Analysis

c. AC 121-22A, Maintenance Review Board (MRB) Procedures

d. ATA Maintenance Steering Group (MSG-3), Airline / Manufacturer Maintenance Program Development Document, available from the Air Transport Association of America, 1301 Pennsylvania Avenue - Suite 1100, Washington, DC 20004-1707.

e. AC 120-17A, Maintenance Program Management through Reliability Methods.

4. BACKGROUND. CMR's have been in use since the early 1970's, when the industry began using quantitative approaches to certify systems to the requirements of FAR 25.1309 and other regulations requiring safety analyses. CMR's have been established on several airplanes certified in the U. S. and in other countries, and are being planned for use on airplanes currently under development.

5. CMR DEFINITION. A CMR is a required periodic task, established during the design certification of the aircraft as an operating limitation of the type certificate. CMR's are a subset of the tasks identified by the type certification process. CMR's usually result from a formal, numerical analysis conducted to show compliance with Catastrophic and Hazardous failure

conditions as defined in paragraph 6.b., below. There are two types of CMR's, as defined in paragraph 12 of this AC.

a. A CMR is intended to detect safety-significant latent failures which would, in combination with one or more other specific failures or events, result in a Hazardous or Catastrophic Failure Condition.

b. It is important to note that CMR's are derived from a fundamentally different analysis process than the maintenance tasks and intervals which result from MSG-3 (Maintenance Steering Group) analysis associated with MRB (Maintenance Review Board) activities. MSG-3 analysis activity produces maintenance tasks which are performed for safety, operational, or economic reasons, involving both preventative maintenance tasks which are performed before failure occurs (and are intended to prevent failures), as well as failure finding tasks. CMR's, on the other hand, are failure finding tasks only, and exist solely to limit the exposure to otherwise hidden failures. Although CMR tasks are failure finding tasks, use of potential failure finding tasks such as functional checks and inspections may also be appropriate.

c. CMR's are designed to verify that a certain failure has or has not occurred, and do not provide any preventative maintenance function. CMR's "restart the failure clock to zero" for latent failures by verifying that the item has not failed, or cause repair if it has failed. Because the exposure time to a latent failure is a key element in the calculations used in a safety analysis performed to show compliance with FAR 25.1309, limiting the exposure time will have a significant effect on the resultant overall failure probability of the system. The CMR task interval should be designated in terms of flight hours, cycles, or calendar time, as appropriate.

d. The type certification process assumes that the aircraft will be maintained in a condition of airworthiness at least equal to its certified or properly altered condition. The process described in this AC is not intended to establish normal maintenance tasks that should be defined through the MSG-3 analysis process. Also, this process is not intended to establish CMR's for the purpose of providing supplemental margins of safety for concerns arising late in the type design approval process. Such concerns should be resolved by appropriate means which are unlikely to include CMR's not established via normal safety analyses.

e. CMR's should not be confused with required structural inspection programs which are developed by the type certificate applicant to meet the inspection requirements for damage tolerance, as required by FAR 25.571 or 25.1529, Appendix H25.4 (Airworthiness Limitations section). CMR's are to be developed and administered separately from any structural inspection programs.

6. OTHER DEFINITIONS. The following terms apply to the system design and analysis requirements of § 25.1309(b), (c), and (d) and to the guidance material provided in this AC. For a complete definition of these terms, refer to the applicable regulations and guidance material, i.e., AC 25.1309-1A and/or the Joint Aviation Authorities Advisory Material Joint AMJ 25.1309. AC 25.1309-1A and AMJ 25.1309 are being revised by an FAA/JAA Harmonization Working Group.

As amended, these will be the controlling documents for definition of these terms. The terms listed below are derived from this guidance material and are included to assist in the use of this document.

a. Failure: A loss of function, or a malfunction, of a system or a part thereof.

b. Failure Condition: The effect on the airplane and its occupants, both direct and consequential, caused or contributed to by one or more failures, considering relevant adverse operational or environmental conditions. Failure Conditions may be classified according to their severities as follows:

(1) Minor Failure Conditions: Failure Conditions which would not significantly reduce airplane safety, and which involve crew actions that are well within their capabilities. Minor Failure Conditions may include, for example, a slight reduction in safety margins or functional capabilities, a slight increase in crew workload, such as routine flight plan changes, or some inconvenience to occupants.

(2) Major Failure Conditions: Failure Conditions which would reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions to the extent that there would be, for example, a significant reduction in safety margins or functional capabilities, a significant increase in crew workload or in conditions impairing crew efficiency, or discomfort to occupants, possibly including injuries.

(3) Hazardous Failure Conditions: Failure Conditions which would reduce the capability of the airplane or the ability of the crew to cope with adverse operating conditions to the extent that there would be:

(i) A large reduction in safety margins or functional capabilities;

(ii) Physical distress or higher workload such that the flight crew cannot be relied upon to perform their tasks accurately or completely, or

(iii) Serious or fatal injury to a relatively small number of the occupants.

(4) Catastrophic Failure Conditions: Failure Conditions which would prevent the continued safe flight and landing of the airplane.

c. Probability Terms: When using qualitative or quantitative assessments to determine compliance with FAR 25.1309(b), the following descriptions of the probability terms used in the requirement and in the advisory materials listed above have become commonly accepted aids to engineering judgment:

(1) Probable Failure Conditions Probable Failure Conditions are those anticipated to occur one or more times during the entire operational life of each airplane. Probable Failure

Conditions are those having a probability on the order of 1×10^{-5} or greater. Minor Failure Conditions may be Probable.

(2) Improbable Failure Conditions: Improbable Failure Conditions are divided into two categories as follows:

(i) Remote: Unlikely to occur to each airplane during its total life but may occur several times when considering the total operational life of a number of airplanes of the same type. Improbable (Remote) Failure Conditions are those having a probability on the order of 1×10^{-5} or less, but greater than on the order of 1×10^{-7}. Major Failure Conditions must be no more frequent than Improbable (Remote).

(ii) Extremely Remote: Unlikely to occur when considering the total operational life of all airplanes of the same type, but nevertheless has to be considered as being possible. Improbable (Extremely Remote) Failure Conditions are those having a probability of on the order of 1×10^{-7} or less, but greater than on the order of 1×10^{-9}. Hazardous Failure Conditions must be no more frequent than Improbable (Extremely Remote).

(3) Extremely Improbable Failure Conditions: Extremely improbable failure conditions are those so unlikely that they are not anticipated to occur during the entire operational life of all airplanes of one type, and have a probability on the order of 1×10^{-9} or less. Catastrophic Failure Conditions must be shown to be extremely improbable.

d. Qualitative: Those analytical processes that assess system and airplane safety in a subjective, non-numerical manner, based on experienced engineering judgment.

e. Quantitative: Those analytical processes that apply mathematical methods to assess system and airplane safety.

7. SYSTEM SAFETY ASSESSMENTS (SSA): Section 25.1309(b) provides general requirements for a logical and acceptable inverse relationship between the probability and severity of each failure condition, and § 25.1309(d) requires that compliance be shown primarily by analysis. In recent years there has been an increase in the degree of system complexity and integration, and in the number of safety-critical functions performed by systems. This increase in complexity has led to the use of structured means for showing compliance with the requirements of § 25.1309.

a. Section 25.1309(b) and (d) specify required safety levels in qualitative terms, and require that a safety assessment be made. Various assessment techniques have been developed to assist applicants and the FAA in determining that a logical and acceptable inverse relationship exists between the probability and the severity of each failure condition. These techniques include the use of service experience data of similar, previously-approved systems, and thorough qualitative analyses.

b. In addition, difficulties had been experienced in assessing the acceptability of some designs, especially those of systems, or parts of systems, that are complex, that have a high degree of integration, that use new technology, or that perform safety-critical functions. These difficulties led to the selective use of rational analyses to estimate quantitative probabilities, and the development of related criteria based on historical data of accidents and hazardous incidents caused or contributed to by failures. These criteria, expressed as numerical probability ranges associated with the terms used in § 25.1309(b), became commonly accepted for evaluating the quantitative analyses that are often used in such cases to support experienced engineering and operational judgment and to supplement qualitative analyses and tests.

c. See Advisory Circular 25.1309-1A, System Design and Analysis, for a complete description of the inverse relationship between the probability and severity of failure conditions, and the various methods of showing compliance with § 25.1309.

8. DESIGN CONSIDERATIONS RELATED TO CANDIDATE CMR's. A decision to create a candidate CMR should follow the guidelines given in AC 25.1309-1A, i.e., the use of candidate CMR's in lieu of practical and reliable failure monitoring and warning systems to detect significant latent failures when they occur does not comply with FAR 25.1309(c) and (d)(4). A practical failure monitoring and warning system is one which is considered to be within the state of the art. A reliable failure monitoring and warning system is one which would not result in either excessive failures of a genuine warning, or excessive or untimely false warnings which can sometimes be more hazardous than lack of provision for, or failures of, genuine but infrequent warnings. Experienced judgment should be applied when determining whether or not a failure monitoring and warning system would be practical and reliable. Comparison with similar, previously-approved systems is sometimes helpful. Appendix 1 outlines some design considerations that should be observed in any decision to create a candidate CMR.

9. IDENTIFICATION OF CANDIDATE CMR's (CCMR's).

a. Figure 1 illustrates the relationship between the certification process and the MRB process in establishing scheduled maintenance tasks. Those tasks related to the certification process as well as those derived through MSG-3 analysis must be identified and documented as illustrated. The details of the process to be followed in defining, documenting, and handling CMR's are given in Paragraphs 9.b. through 12. below.

b. Candidate CMR's:

(1) Tasks that are candidates for selection as CMR's usually come from safety analyses, e.g., System Safety Assessments (SSA), which may establish the need for tasks to be carried out periodically to comply with FAR 25.1309 and other requirements requiring this type of analysis. Tasks may be selected from those intended to detect latent failures which would, in combination with one or more specific failures or events, lead to a Hazardous or Catastrophic Failure Condition.

(2) Other tasks, not derived from formal safety analyses but based on properly justified engineering judgment, may also be candidates for CMR's. The justification must include the logic leading to identification as a candidate CMR, and the data and experience base supporting the logic.

10. CERTIFICATION MAINTENANCE COORDINATION COMMITTEE (CMCC).

a. In order to grant operators of the airplane an opportunity to participate in the selection of CMR's and to assess the candidate CMR's and the proposed MRB tasks and intervals in an integrated process, the type certificate (TC) applicant should convene a Certification Maintenance Coordination Committee (CMCC) (see Figure 1). This committee should be made up of manufacturers, operator representatives designated by the Industry Steering Committee (ISC) Chairperson, Aircraft Certification Office (ACO) Specialists, and the MRB Chairperson.

b. As early as possible in the design phase of the airplane program, and at intervals as necessary, the CMCC would meet to review candidate CMR's, their purpose, criticality, and other relevant factors. During the CMCC's discussions, participants' experience may suggest alternatives to a given CMR which would satisfy the intent of the CMR while allowing reduced operational impact. In addition, where multiple tasks result from a quantitative analysis, it may be possible to extend a given interval at the expense of one or more other intervals, in order to optimize the required maintenance activity. However, if a decision is made to create a CMR, then the CMR task interval shall be based solely on the results of the safety analysis.

c. The CMCC would function as an advisory committee for the TC applicant. The results of the CMCC (proposed CMR's to be included in the type design definition and proposed revisions to MRB tasks and/or intervals) would be forwarded by the TC applicant to the ISC for their consideration. Revisions to proposed MRB tasks and/or intervals accepted by the ISC will be reflected in the MRB Report proposal. Revisions to proposed MRB tasks and/or intervals rejected by the ISC will result in CMR tasks. Subsequent to the ISC's consideration, the TC applicant will submit the CMR document to the FAA ACO for final review and approval.

11. SELECTION OF CMR's

a. The candidate CMR's should be reviewed by the CMCC and a determination made as to whether or not CMR status is necessary and, if it is, whether One Star or Two Star, as defined in Paragraph 12 of this AC, is appropriate. To reach this decision the following should be considered by the CMCC:

(1) CMR status does not need to be applied if the CCMR is satisfied by:

(i) Maintenance actions considered to be routine maintenance activity (MRB tasks) based on engineering judgment and experience on similar airplane types, or

(ii) Tasks included in the approved Airplane Flight Manual.

(2) CCMR's remaining after application of paragraph 11a(1) should be categorized as either One Star or Two Star CMR's. The following should be considered in assigning One Star or Two Star status:

(i) The degree of conservatism taken in the classification of the Failure Condition consequences.

(ii) The degree of conservatism taken in the individual failure rates and event occurrence rates used.

(iii) The margin between safety analysis calculated maximum interval and the interval selected through the MRB process.

(iv) The sensitivity of the Failure Condition probability to interval escalation.

(v) The proximity of the calculated maximum interval to the airplane life.

b. For operators with approved escalation practices or an approved reliability program, data collection and analytical techniques are used to make adjustments to an operator's maintenance program. It has been demonstrated that the management of a maintenance program does not give rise to undue escalations. Therefore, escalation of Two-Star CMR task intervals within an operator's maintenance program ensures that Two-Star CMR's will be properly managed by the operator with adequate controls.

12. DOCUMENTATION AND HANDLING OF CMR's. CMR's should be listed in a separate CMR document which is referenced in the Type Certificate Data Sheet. The latest version of the CMR document should be controlled by an FAA-approved log of pages. In this way changes to CMR's following certification will not require an amendment to the Type Certificate Data Sheet. The CMR document should clearly identify the two types of CMR tasks, which are handled as follows:

a. One Star CMR's (*) - The tasks and intervals specified are mandatory and cannot be changed, escalated, or deleted without the concurrence of the responsible Aircraft Certification Office.

b. Two Star CMR (**) - Task intervals may be adjusted in accordance with an operator's approved escalation practices or an approved reliability program, but the task may not be changed or deleted without prior ACO approval.

c. All minimum initial scheduled maintenance tasks, and CMR's, should reside in an MRB Report to ensure that the operator's maintenance planning personnel are aware of all requirements. The CMR document should be included as Appendix 1 or A (the first appendix) to

the MRB Report. The MRB Report should include a note indicating that the CMR Document is the controlling document for all CMR tasks. When a CMR task corresponds to an MRB task, whatever the respective intervals, this fact should be highlighted, for example, by flagging the task in the CMR appendix of the MRB Report.

d. Since CMR's are based on statistical averages and reliability rates, an exceptional short-term extension for a single CMR interval may be made on one airplane for a specific period of time without jeopardizing safety. Any extensions to CMR intervals (both one-star and two star) must be defined and fully explained in the CMR Document. The local regulatory authority (e.g., a Principle Maintenance Inspector) must be notified as soon as practicable if any short-term extension allowed by the CMR Document has taken place.

(1) The term "exceptional short-term extension" is defined as an increase in a CMR interval which may be needed to cover an uncontrollable or unexpected situation. Any allowable increase must be defined either as a percent of the normal interval, or a stated number of flight hours, flight cycles, or calendar days. If no short term extension is to be allowed for a given CMR, this restriction should be stated in the CMR Document.

(2) Repeated use of extensions, either on the same airplane or on similar airplanes in an operator's fleet, should not be used as a substitute for good management practices. Short-term extensions must not be used for fleet CMR escalation.

(3) The CMR Document should state that the cognizant ACO must approve, prior to its use, any desired extension not explicitly listed in the CMR Document.

13. POST-CERTIFICATION CHANGES TO CMR's. Any post-certification changes to CMR's should be reviewed by the CMCC, and must be approved by the ACO which approved the type design.

a. Since the purpose of a CMR is to limit the exposure time to a given significant latent failure as part of an engineering analysis of overall system reliability, instances of a CMR task repeatedly finding that no failure has occurred may not be sufficient justification for deleting the task or increasing the time between repetitive performances of the CMR task. In general, One Star CMR's are not good candidates for escalation under an operator's reliability program. A One Star CMR task change or interval escalation could only be made if world fleet service experience indicates that certain assumptions regarding component failure rates made early during the engineering analysis were overly conservative, and a re-calculation of system reliability with revised failure rates of certain components reveals that the task or interval may be changed.

b. The introduction of a new CMR or any change to an existing CMR should be reviewed by the same process used during initial certification. It is important that operators be afforded the same opportunity to participate they received during the original certification of the airplane, in order to allow the operators to manage their own maintenance programs.

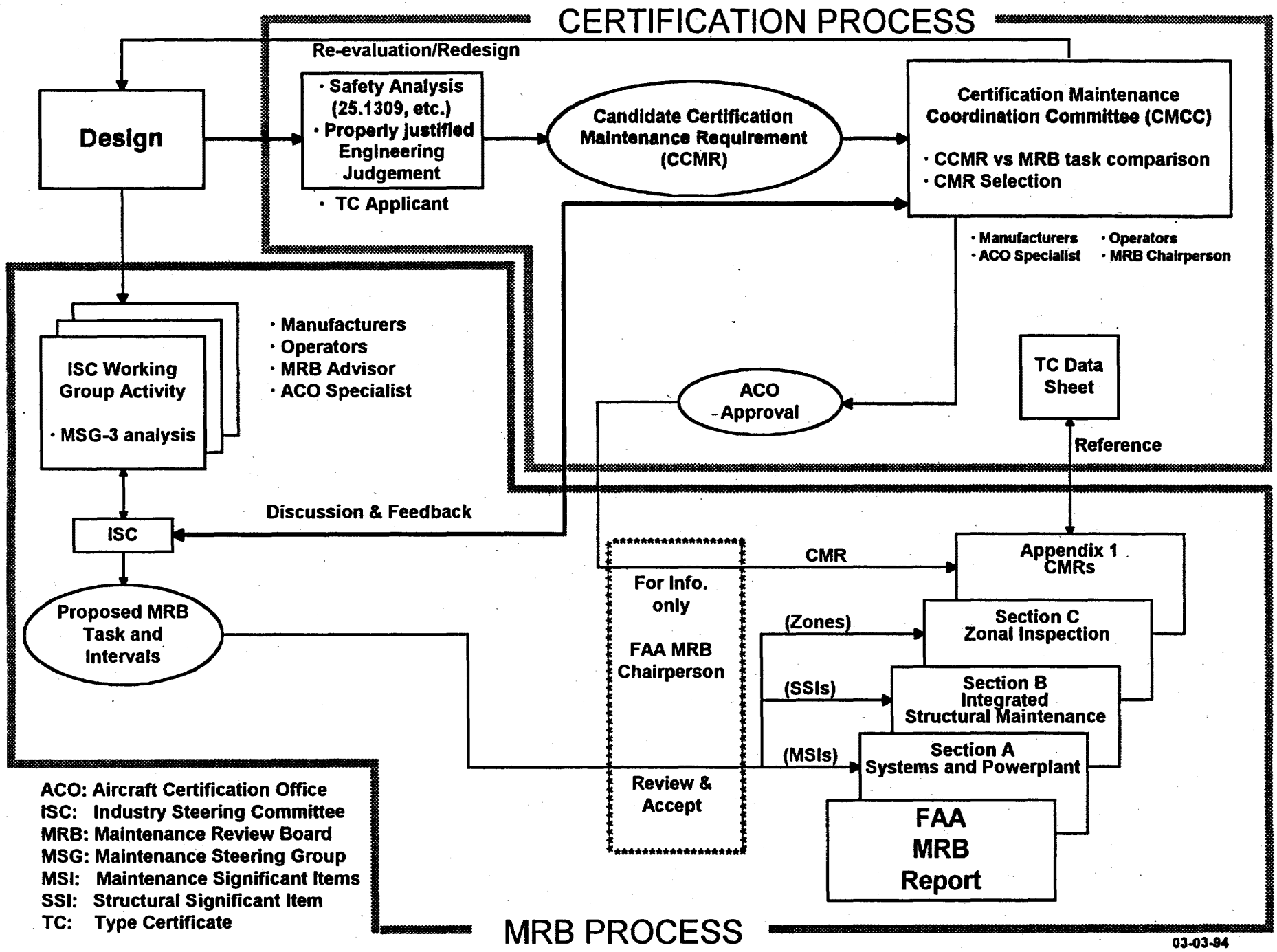
c. In the event that later data provide sufficient basis for a relaxation of a CMR (less restrictive actions to be required), the change may be documented by an FAA-approved change to the CMR Document.

d. If the requirements of an existing CMR must be increased (more restrictive actions to be performed), it will be mandated by an airworthiness directive (AD).

e. After initial aircraft certification, the only basis for adding a new CMR is in association with certification of design changes.

f. A new CMR created as part of a design change should be a part of the approved data for that change, and added to the CMR document.

Figure 1: SCHEDULED MAINTENANCE TASK DEVELOPMENT



APPENDIX 1

GUIDANCE FOR THE USE OF CMR's

The underlying goal of any system design should be an absolute minimum number of CMR's, with none as the goal. However the final determination of system design, and ultimately the number of CMR's -- after safety and reliability are assured -- should be the total cost of ownership of the system (or the airplane), with due regard to weight, reliability, initial, and recurring costs. If the cost of adding practical and reliable monitoring and/or warning to a system is large, and the added maintenance burden of a CMR is small, addition of a CMR may be the solution of choice for both the TC applicant and the operator.

A decision to create a CMR should include a rigorous trade-off of the cost, weight, or complexity of providing an alerting mechanism or device that will expose the latent failure, versus the requirement for the operator to conduct a maintenance or inspection task at fixed intervals. The following points should be considered in any decision to create a CMR:

a. What is the magnitude of the changes to the system and/or airplane needed to add a reliable monitoring or warning device that would expose the hidden failure? What is the cost in added system complexity?

b. Is it possible to introduce a self test on power-up?

c. Is the monitoring and warning system reliable? False warnings must be considered as well as a lack of warnings.

d. Does the monitoring or warning system itself need a CMR due to its latent failure potential?

e. Is the CMR task reasonable, considering all aspects of the failure condition that the task is intended to address?

f. How long (or short) is the CMR task interval?

g. Is the proposed CMR task labor intensive or time consuming? Can it be done without having to "gain access" and/or without workstands? Without test equipment? Can the CMR task be done without removing equipment from the airplane? Without having to re-adjust equipment? Without leak checks and/or engine runs?

h. Can a simple visual inspection be used instead of a complex one? Can a simple operational check suffice in lieu of a formal functional check against measured requirements?

i. Is there "added value" to the proposed task, i.e., will the proposed task do more harm than good if the airplane must be continually inspected?

j. Have all alternatives been evaluated? [end]

FAA Action: Advisory Circular (AC) 25-19, Certification Maintenance Requirements – Regulatory and Guidance Library