Federal Aviation Administration – Regulations and Policies
Aviation Rulemaking Advisory Committee

Transport Airplane and Engine Issue Area
General Structures Harmonization Working Group

Task 1 – Bird Strike Damage

Task Assignment

Aviation Rulemaking Advisory Committee; General Structures Harmonization Working Group

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of establishment of General Structures Harmonization Working Group.

SUMMARY: Notice is given of the establishment of the General Structures Harmonization Working Group of the Aviation Rulemaking Advisory Committee (ARAC). This notice informs the public of the activities of the ARAC on transport airplane and engine issues.

FOR FURTHER INFORMATION CONTACT: Mr. William J. (Joe) Sullivan, Assistant Executive Director, Aviation Rulemaking Advisory Committee, 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) has established an Aviation Rulemaking Advisory Committee (ARAC) (56 FR 2190, January 22, 1991; and 58 FR 9230, February 19, 1993). One area the ARAC deals with is transport airplane and engine issues (56 FR 31995; July 12, 1991). These issues involve 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) which are the responsibility of the FAA Director of Aircraft Certification.

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 ARAC 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 General Structures Harmonization Working Group is being formed to address general structures issues in JAR/FAR parts 25 identified below. The General Structures Harmonization Working Group will forward recommendations to the ARAC which will determine whether to forward them to the FAA.

Specifically, the Working Group's tasks are the following: The General Structures Harmonization Working Group is charged with making recommendations to the ARAC concerning the FAA disposition of the following subjects recently coordinated between the JAA and the FAA:

Task 1—Bird Strike Damage: Develop new or revised requirements for the evaluation of transport category airplane structure for in-flight collision with a bird, including the size of the bird and the location of the impact on the airplane (FAR 25.571, 25.631, 25.775, and other conforming changes).

Task 2—Safe Life Scatter Factor: Develop recommendations for new or revised advisory and guidance material concerning the safe life scatter factors (FAR 25.571).

Reports

A. Recommend time line(s) for completion of each task, including rationale, for consideration at the meeting of the ARAC to consider transport airplane and engine issues held following publication of this notice.

B. Give a detailed conceptual presentation on each task to the ARAC before proceeding with the work stated under item C and D, below.

C. Draft for the ARAC a notice of proposed rulemaking for Task 1 proposing new or revised requirements, a supporting economic analysis and other required analysis, advisory and guidance material, and any other collateral documents the Working Group determines to be needed.

D. Draft for the ARAC appropriate advisory and guidance material for Task 2.

E. Give a status report on each task at each meeting of the ARAC held to consider transport airplane and engine issues.

The General Structures 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 member organizations of the ARAC. 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 Chairs of the ARAC Transport Airplane and Engine Issues and the General Structures Working Group, 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 ARAC are necessary in the public interest in connection with the performance of duties of the FAA by law. Meetings of the ARAC to consider transport airplane and engine issues will be open to the public except as authorized by section 10(d) of the Federal Advisory Committee Act. Meetings of the General Structures 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 March 8, 1993.

William J. Sullivan,

Assistant Executive Director for Transport Airplane and Engine Issues, Aviation Rulemaking Advisory Committee.

[FR Doc. 93-5814 Filed 3-12-93; 8:45 am]

BILLING CODE 4910-13-M

Recommendation Letter

Pratt & Whitney
400 Main Street
East Hartford, CT 06108

Pratt & Whitney
A United Technologies Company

October 22, 2003

Federal Aviation Administration
800 Independence Avenue, SW
Washington, D.C. 20591

Attention: Mr. Nicholas Sabatini, Associate Administrator for Regulation and Certification

Subject: ARAC Recommendations, General Structures – 25.603 Materials

Reference: ARAC Tasking, Federal Register, dated August 7, 2001

Dear Nick,

The Transport Airplane and Engine Issues Group is pleased to submit the following as a recommendation to the FAA in accordance with the reference tasking. This information has been prepared by the General Structures Harmonization Working Group.

- GSHWG Report – FAR/JAR 25.603 Materials

The Working Group did achieve consensus and the report was unanimously approved by TAEIG.

Sincerely yours,

Craig R. Bolt

C. R. Bolt
Assistant Chair, TAEIG

Copy: Dionne Krebs – FAA-NWR
Mike Kaszycki – FAA-NWR
Effie Upshaw – FAA-Washington, D.C.
Andrew Kasowski - Cessna

Recommendation

June 30, 2003

IN REPLY, REFER TO
L350-03-112

Mr. Craig R. Bolt
Assistant Chair, TAEIG
Pratt & Whitney
400 Main Street
East Hartford, Ct 06108

Dear Craig,

Subject: Submittal of Results of Harmonization Effort on FAR/JAR §25.603, Material

The General Structures Harmonization Working Group herewith submits the Working Group Report on the subject regulatory material to the TAEIG for acceptance and recommendation to the FAA. ARAC tasked the General Structures Harmonization Working Group to review the proposed guidance of Advisory Circular Joint (ACJ) 25.603 paragraph 9 and Advisory Material Joint (AMJ) 25.603 (adopted in Joint Aviation Requirements-25 Change 15, resulting from Notice of Proposed Amendment 25D-256), develop a report based on the review, and recommend the adoption of harmonized guidance material for paragraph 25.603 of the JAR and §25.603 of the FAR.

Consensus of the full Harmonization Working Group (HWG) was achieved for incorporating the guidance material from NPA 25D-256 on Change of Composite Materials, recently incorporated into Change 15 of the JAR, into the existing Advisory Circular 20-107A. There currently exists no specific FAA advisory material for certification of alternative materials for composite structures other than the requirements for initial composite structure certification contained in AC 20-107A. The proposed guidance material to be added to AC20-107A outlines additional methods of compliance when a manufacturer, to provide an alternative source of material to be used on aircraft in production, changes the material for an already certificated composite structure. This guidance material defines the extent of analysis and type and number of tests that should be repeated in order to achieve the necessary level of confidence in structural integrity without undue cost penalties. For the majority of cases, this effort will be less than that previously required for the original certification, thus benefiting the airplane manufacturers and minimizing the oversight efforts of the authorities. No specific cost estimates of the benefit of this change are available. However, minimizing the certification efforts for changes in composite materials will benefit all manufacturers who attempt to qualify alternate materials for previously certificated composite structures.

Sincerely,

Andrew H. Kasowski
General Structures HWG Chairperson
316-517-6008
315-517-1820 FAX
akasowski@cessna.textron.com

Attachment A

General Structures Harmonization Working Group Report

Material FAR/JAR §25.603

General Structures Harmonization Working Group Report

Material FAR/JAR §25.603

Transport Airplane Directorate
WG Report Format
Harmonization and New Projects

1 - BACKGROUND:

- *This section "tells the story."*
- *It should include all the information necessary to provide context for the planned action. Only include information that is helpful in understanding the proposal -- no extraneous information (e.g., no "day-by-day" description of Working Group's activities).*
- *It should provide an answer for all of the following questions:*

a. SAFETY ISSUE ADDRESSED/STATEMENT OF THE PROBLEM

(1) What prompted this rulemaking activity (e.g., accident, accident investigation, NTSB recommendation, new technology, service history, etc.)? What focused our attention on the issue?

Notice of Proposed Amendment (NPA) 25D-256 outlined additional methods of compliance when a manufacturer, to provide an alternative source of material to be used on aircraft in production, changes the material for an already certificated composite structure. Previous to the NPA, no regulatory guidance material existed to cover this situation that was becoming increasingly common as manufacturers sought alternative sources of material to be used on aircraft in production. The text of NPA 25D-256 was incorporated into Change 15 of the JAR. ARAC tasked the General Structures Harmonization Working Group to review the proposed guidance of Advisory Circular Joint (ACJ) 25.603 paragraph 9 and Advisory Material Joint (AMJ) 25.603 (adopted in Joint Aviation Requirements-25 Change 15, resulting from Notice of Proposed Amendment 25D-256), develop a report based on the review, and recommend the adoption of harmonized guidance material for paragraph 25.603 of the JAR and §25.603 of the FAR.

(2) What is the underlying safety issue to be addressed in this proposal?

Most aircraft composite structures are certificated initially with material supplied from only one source. This can lead to manufacturing challenges in continuity of production if the selected source of material becomes unreliable. To overcome this problem manufacturers are certifying structures with alternative materials to allow for dual sources of material supply. Substantiating a composite structure requires a large amount of test data ranging from coupon level to specimens representative of the most complex features

of the structural design. Such testing is time consuming and expensive. In seeking certification for an alternative material manufacturers attempt to minimize the amount of new testing by relying as much as possible on the testing done to certificate the structure originally. This guidance material defines the extent of analysis and type and number of tests that should be repeated in order to achieve the necessary level of confidence in structural integrity without undue cost penalties.

(3) What is the underlying safety rationale for the requirement?

See Items 1 and 2 above.

(4) Why should the requirement exist?

See Items 1 and 2 above.

b. CURRENT STANDARDS OR MEANS TO ADDRESS

(1) If regulations currently exist:

(a) What are the current regulations relative to this subject? (Include both the FAR's and JAR's.)

Current CFR 14 Part 25 text:

FAR 25.603 Materials.

The suitability and durability of materials used for parts, the failure of which could adversely affect safety, must--
(a) Be established on the basis of experience or tests;
(b) Conform to approved specifications (such as industry or military specifications, or Technical Standard Orders) that ensure their having the strength and other properties assumed in the design data; and
(c) Take into account the effects of environmental conditions, such as temperature and humidity, expected in service.

Amdt. 25-46, Eff. 10/30/78

Current JAR text:

JAR 25.603 Materials (For Composite Materials see ACJ 25.603.)

The suitability and durability of materials used for parts, the failure of which could adversely affect safety, must--
(a) Be established on the basis of experience or tests;

Material FAR/JAR §25.603

(b) Conform to approved specifications (such as industry or military specifications, or Technical Standard Orders) that ensure their having the strength and other properties assumed in the design data; and

(c) Take into account the effects of environmental conditions, such as temperature and humidity, expected in service.

(b) How have the regulations been applied? (What are the current means of compliance?) If there are differences between the FAR and JAR, what are they and how has each been applied? (Include a discussion of any advisory material that currently exists.)

The basic material qualification requirements specified in §25.603 of the FAR and JAR are worded the same. Advisory material for FAR 25 is contained in AC20-107A, Composite Aircraft Structure, which also applies to FAR 23, 27, and 29. Identical advisory material (apart from minor editing) for JAR 25 through Change 14 is contained in ACJ 25.603, Composite Aircraft Structure. At Change 15 of JAR 25, requirements for changing composite materials were introduced through the addition of paragraph 9 of ACJ 25.603, *Change of Composite Mate*rials, and the adoption of AMJ 25.603, *Change of Composite Material*.

(c) What has occurred since those regulations were adopted that has caused us to conclude that additional or revised regulations are necessary? Why are those regulations now inadequate?

Most aircraft composite structures are certificated initially with material supplied from only one source. This can lead to manufacturing challenges in continuity of production if the selected source of material becomes unreliable. To overcome this problem manufacturers are certifying structures with alternative materials to allow for dual sources of material supply. Substantiating a composite structure requires a large amount of test data ranging from coupon level to specimens representative of the most complex features of the structural design. Such testing is time consuming and expensive. In seeking certification for an alternative material manufacturers attempt to minimize the amount of new testing by relying as much as possible on the testing done to certificate the structure originally.

Previous to NPA 25D-256, no regulatory guidance material existed to cover this situation that was becoming increasingly common as manufacturers sought alternative sources of material to be used on aircraft in production. Notice of Proposed Amendment 25D-256 outlined additional methods of compliance when a manufacturer, to provide an alternative source of material to be used on aircraft in production, changes the material for an already certificated composite structure. The text of NPA 25D-256 was incorporated into Change 15 of the JAR. This guidance material defines the extent of analysis and type and number of tests that should be repeated in order to achieve the necessary level of confidence in structural integrity without undue cost penalties. Identical requirements for a change of composite material are being proposed for incorporation into the guidance material of AC20-107A.

2. If no regulations currently exist:

(a) What means, if any, have been used in the past to ensure that this safety issue is addressed? Has the FAA relied on issue papers? Special Conditions? Policy statements? Certification action items? Has the JAA relied on Certification Review Items? Interim Policy? If so, reproduce the applicable text from these items that is relative to this issue.

Previously, guidance material contained in AC20-107A and ACJ 25.603 (prior to Change 15) was used to evaluate the use of alternate materials for previously certificated composite structures.

(b) Why are those means inadequate? Why is rulemaking considered necessary (i.e., do we need a general standard instead of addressing the issue on a case-by-case basis?)?

Notice of Proposed Amendment 25D-256 outlined additional methods of compliance when a manufacturer, to provide an alternative source of material to be used on aircraft in production, changes the material for an already certificated composite structure. This guidance material clarifies the extent of analysis and type and number of tests that should be repeated in order to achieve the necessary level of confidence in structural integrity without undue cost penalties. Identical requirements for a change of composite material are being proposed for incorporation into the guidance material of AC20-107A.

2. DISCUSSION of PROPOSAL

- *This section explains:*

→ *what the proposal would require,*

→ *what effect we intend the requirement to have, and*

→ *how the proposal addresses the problems identified in Background.*

- *Discuss each requirement separately. Where two or more requirements are very closely related, discuss them together.*
- *This section also should discuss alternatives considered and why each was rejected.*

a. SECTION-BY-SECTION DESCRIPTION OF PROPOSED ACTION

(1) What is the proposed action? Is the proposed action to introduce a new regulation, revise the existing regulation, or to take some other action?

The proposed action is to incorporate the guidance material from NPA 25D-256 on Change of Composite Materials, recently incorporated into Change 15 of the JAR, into existing Advisory Circular 20-107A.

(2) If regulatory action is proposed, what is the text of the proposed regulation?

Not applicable, no rule changes are proposed, only changes to the advisory material.

(3) If this text changes current regulations, what change does it make? For each change:

- What is the reason for the change?
- What is the effect of the change?

Not applicable, no rule changes are proposed, only changes to the advisory material.

(4) If not answered already, how will the proposed action address (i.e., correct, eliminate) the underlying safety issue (identified previously)?

The proposed guidance material outlines additional methods of compliance when a manufacturer, to provide an alternative source of material to be used on aircraft in production, changes the material for an already certificated composite structure. This guidance material defines the extent of analysis and type and number of tests that should be repeated in order to achieve the necessary level of confidence in structural integrity without undue cost penalties.

(5) Why is the proposed action superior to the current regulations?

Encompassing the existing JAR guidance material into the FAR guidance material will result in a common set of guidance material for changes of composite materials facilitating concurrent certifications, minimizing the effort involved in validation programs, and minimizing cost penalties for such changes.

b. ALTERNATIVES CONSIDERED

(1) What actions did the working group consider other than the action proposed? Explain alternative ideas and dissenting opinions.

The proposed guidance material on change of composite materials (as defined in NPA 25D-256) is the result of the efforts of a working group sponsored by the JAA Structures Study Group and reflects the views of composites specialists from the authorities and industry. Therefore, the material was adopted by the GSHWG with minimal discussion and debate.

(2) Why was each action rejected (e.g., cost/benefit? unacceptable decrease in the level of safety? lack of consensus? etc.)? Include the pros and cons associated with each alternative.

Not applicable.

c. HARMONIZATION STATUS

(1) Is the proposed action the same for the FAA and the JAA?

The proposed guidance material has already been incorporated into the JAR at Change 15.

(2) If the proposed action differs for the JAA, explain the proposed JAA action.

Not Applicable

(3) If the proposed action differs for the JAA, explain why there is a difference between FAA and JAA proposed action (e.g., administrative differences in applicability between authorities).

Not Applicable

3. COSTS AND OTHER ISSUES THAT MUST BE CONSIDERED

The Working Group should answer these questions to the greatest extent possible. What information is supplied can be used in the economic evaluation that the FAA must accomplish for each regulation. The more quality information that is supplied, the quicker the evaluation can be completed.

a. COSTS ASSOCIATED WITH THE PROPOSAL

(1) Who would be affected by the proposed change? How? (Identify the parties that would be materially affected by the rule change – airplane manufacturers, airplane operators, etc.)

The proposed guidance material defines the extent of analysis and type and number of tests that should be repeated in order to achieve the necessary level of confidence in structural integrity without undue cost penalties for alternative composite materials used on a previously certificated composite structure. For the majority of cases, this effort will be less than that previously required for the original certification, thus benefiting the airplane manufacturers and minimizing the oversight efforts of the authorities.

(2) What is the cost impact of complying with the proposed regulation? Provide any information that will assist in estimating the costs (either positive or negative) of the proposed rule.

No specific cost estimates of the benefit of this change are available. However, minimizing the certification efforts for changes in composite materials will benefit all

manufacturers who attempt to qualify alternate materials for previously certificated composite structures.

b. OTHER ISSUES

(1) Will small businesses be affected? *(In general terms, "small businesses" are those employing 1,500 people or less. This question relates to the Regulatory Flexibility Act of 1980 and the Small Business Regulatory Enforcement Fairness Act of 1996.]*

Small businesses will not be affected.

(2) Will the proposed rule require affected parties to do any new or additional record keeping? If so, explain. *[This question relates to the Paperwork Reduction Act of 1995.]*

No.

(3) Will the proposed rule create any unnecessary obstacles to the foreign commerce of the United States -- i.e., create barriers to international trade? *[This question relates to the Trade Agreement Act of 1979.]*

No.

(4) Will the proposed rule result in spending by State, local, or tribal governments, or by the private sector, that will be $100 million or more in one year? *[This question relates to the Unfunded Mandates Reform Act of 1995.]*

No.

4. ADVISORY MATERIAL

a. Is existing FAA or JAA advisory material adequate? Is the existing FAA and JAA advisory material harmonized?

There is no specific FAA advisory material for certification of alternative materials for composite structures other than the requirements for initial composite structure certification contained in AC 20-107A. However, JAA advisory material was developed in NPA 25D-256 and was incorporated into ACJ 25.603 and AMJ 25.603 guidance material at Change 15 of the JAR.

b. If not, what advisory material should be adopted? Should the existing material be revised, or should new material be provided?

Material FAR/JAR §25.603

Based on OEM and regulator experience the guidance material of NPA 25D-256 should be incorporated into the existing AC20-107A.

c. Insert the text of the proposed advisory material here (or attach), or summarize the information it will contain, and indicate what form it will be in (e.g., Advisory Circular, Advisory Circular – Joint, policy statement, FAA Order, etc.)

The guidance material in JAR Change 15 ACJ 25.603 Section 9.0 is proposed to be adopted as a new Section 10.0 in AC20-107A and the guidance material in JAR Change 15 AMJ 25.603 is proposed to be adopted as a new Appendix 3 to AC20-107A. These proposed changes are shown in a revised version of AC20-107A below and are applicable for FAR 25 compliance findings.

U.S. Department of Transportation

Federal Aviation Administration

ADVISORY CIRCULAR

Subject: COMPOSITE AIRCRAFT STRUCTURE **Date:** 4/25/84 **AC No:** 20-107A
Initiated by: AWS-103 **Change:**

1. PURPOSE. This advisory circular sets forth an acceptable, but not the only, means of showing compliance with the provisions of Federal Aviation Regulations (FAR), Parts 23, 25, 27, and 29 regarding airworthiness type certification requirements for composite aircraft structures, involving fiber reinforced materials, e.g., carbon (graphite), boron, aramid (Kevlar), and glass reinforced plastics. Guidance information is also presented on associated quality control and repair aspects.

2. CANCELLATION. AC 20-107A, Composite Aircraft Structure dated July 10, 1978, is canceled.

3. REGULATIONS AFFECTED. The material contained herein applies to normal, utility, acrobatic, and transport category aircraft type certificated under Civil Aviation Regulations (CARs) 3, 4b, 6, 7; and FARs 23, 25, 27, 29; and produced in compliance with FAR Part 21, sections 21.125, or 21.143 as may be appropriate. The individual FARs applicable to each paragraph are listed in Appendix 1 of this advisory circular.

4. GENERAL

a. The procedures outlined in this advisory circular provide guidance material for composite structures and are considered acceptable to the FAA for showing compliance with certification requirements of civil composite aircraft. This circular is published to aid in the evaluation of certification programs for composite applications and reflects the current status of composite technology. It is expected that this circular will be modified periodically to reflect technology advances. The information contained herein is for guidance purposes and is not mandatory nor regulatory in nature.

b. The extent of testing and/or analysis and the degree of environmental accountability required will differ for each structure depending upon the expected service usage, the material selected, the design margins, the failure criteria, the data base and experience with similar structures, and on other factors affecting a particular structure. It is expected that these factors will be considered when interpreting this advisory circular for use on a specific application.

c. Pertinent definitions are given in Appendix 2.

5. MATERIAL AND FABRICATION DEVELOPMENT. To provide an adequate design database, environmental effects on the design properties of the material system should be established.

a. Environmental design criteria should be developed that identify the most critical environmental exposures, including humidity and temperature, to which the material in the application under evaluation may be exposed. This is not required where existing data demonstrate that no significant environmental effects, including the effects of temperature and moisture, exist for the material system and construction details, within the bounds of environmental exposure being considered. Experimental evidence should be provided to demonstrate that the material design values or allowables are attained with a high degree of confidence in the appropriate critical environmental exposures to be expected in service. The effect of the service environment on static strength, fatigue and stiffness properties should be determined for the material system through tests; e.g., accelerated environmental tests, or from applicable service data. The effects of environmental cycling (i.e., moisture and temperature) should be evaluated. Existing test data may be used where it can be shown directly applicable to the material system.

b. The material system design values or allowables should be established on the laminate level by either test of the laminate or by test of the lamina in conjunction with a test validated analytical method.

c. For a specific structural configuration of an individual component (point design), design values may be established which include the effects of appropriate design features (holes, joints, etc.).

d. Impact damage is generally accommodated by limiting the design strain level.

6. PROOF OF STRUCTURE - STATIC. The static strength of the composite design should be demonstrated through a program of component ultimate load tests in the appropriate environment, unless experience with similar designs, material systems and loadings is available to demonstrate the adequacy of the analysis supported by subcomponent tests, or limit load component tests.

a. The effects of repeated loading and environmental exposure which may result in material property degradation should be addressed in the static strength evaluation. This can be shown by analysis supported by test evidence, by tests at the coupon, element or subcomponent level, or alternatively by relevant existing data.

b. Static strength structural substantiation tests should be conducted on new structure unless the critical load conditions are associated with structure that has been subjected to a repeated loading and environmental exposure. In this case either (1) the static test should be conducted on structure with prior repeated loading and environmental exposure, or (2) coupon/element/subcomponent test data should be provided to assess the possible degradation of static strength after application of repeated loading and environmental exposure, and this degradation accounted for in the static test or in the analysis of the results of the static test of the new structure.

c. The component static test may be performed in an ambient atmosphere if the effects of the environment are reliably predicted by subcomponent and/or coupon tests and are accounted for in the static test or in the analysis of the results of the static test.

d. The static test articles should be fabricated and assembled in accordance with production specifications and processes so that the test articles are representative of production structure.

e. When the material and processing variability of the composite structure is greater than the variability of current metallic structures, the difference should be considered in the static strength substantiation (1) by deriving proper allowables or design values for use in the analysis, and the analysis of the results of supporting tests, or (2) by accounting for it in the static test when static proof of structure is accomplished by component test.

f. Composite structures that have high static margins of safety (e.g., some rotor blades) may be substantiated by analysis supported by subcomponent, element, and/or coupon testing.

g. It should be shown that impact damage that can be realistically expected from manufacturing and service, but not more than the established threshold of detectability for the selected inspection procedure, will not reduce the structural strength below ultimate load capability. This can be shown by analysis supported by test evidence, or by tests at the coupon, element or subcomponent level.

7. PROOF OF STRUCTURE - FATIGUE/DAMAGE TOLERANCE. The evaluation of composite structure should be based on the applicable requirements of FAR 23.571, 23.572, 25.571, 27.571, and 29.571. The nature and extent of analysis or tests on complete structures and/or portions of the primary structure will depend upon applicable previous fatigue/damage tolerant designs, construction, tests, and service experience on similar structures. In the absence of experience with similar designs, FAA-approved structural development tests of components, subcomponents, and elements should be performed. The following considerations are unique to the use of composite material systems and should be observed for the method of substantiation selected by the applicant. When selecting the damage tolerance or safe life approach, attention should be given to geometry, inspectability, good design practice, and the type of damage/degradation of the structure under consideration.

a. Damage Tolerance (Fail-Safe) Evaluation.

(1) Structural details, elements, and subcomponents of critical structural areas should be tested under repeated loads to define the sensitivity of the structure to damage growth. This testing can form the basis for validating a no-growth approach to the damage tolerance requirements. The testing should assess the effect of the environment on the flaw growth characteristics and the no-growth validation. The environment used should be appropriate to the expected service usage. The repeated loading should be representative of anticipated service usage. The repeated load testing should include damage levels (including impact damage) typical of those that may occur during fabrication, assembly, and in-service, consistent with the inspection techniques employed. The damage tolerance test articles should be fabricated and

assembled in accordance with production specifications and processes so that the test articles are representative of production structure.

(2) The extent of initially detectable damage should be established and be consistent with the inspection techniques employed during manufacture and in service. Flaw/damage growth data should be obtained by repeated load cycling of intrinsic flaws or mechanically introduced damage. The number of cycles applied to validate a no-growth concept should be statistically significant, and may be determined by load and/or life considerations. The growth or no growth evaluation should be performed by analysis supported by test evidence or by tests at the coupon, element, or subcomponent level.

(3) The extent of damage for residual strength assessments should be established. Residual strength evaluation by component or subcomponent testing or by analysis supported by test evidence should be performed considering that damage. The evaluation should demonstrate that the residual strength of the structure is equal to or greater than the strength required for the specified design loads (considered as ultimate). It should be shown that stiffness properties have not changed beyond acceptable levels. For the no-growth concept residual strength testing should be performed after repeated load cycling.

(4) An inspection program should be developed consisting of frequency, extent, and methods of inspection for inclusion in the maintenance plan. Inspection intervals should be established such that the damage will be detected between the time it initially becomes detectable and the time at which the extent of damage reaches the limits for required residual strength capability. For the case of no-growth design concept, inspection intervals should be established as part of the maintenance program. In selecting such intervals the residual strength level associated with the assumed damages should be considered.

(5) The structure should be able to withstand static loads (considered as ultimate loads) which are reasonably expected during a completion of the flight on which damage resulting from obvious discrete sources occur (i.e., uncontained engine failures, etc.). The extent of damage should be based on a rational assessment of service mission and potential damage relating to each discrete source.

(6) The effects of temperature, humidity, and other environmental factors which may result in material property degradation should be addressed in the damage tolerance evaluation.

b. Fatigue (Safe-Life) Evaluation. Fatigue substantiation should be accomplished by component fatigue tests or by analysis supported by test evidence, accounting for the effects of the appropriate environment. The test articles should be fabricated and assembled in accordance with production specifications and processes so that the test articles are representative of production structure. Sufficient component, subcomponent, element or coupon tests should be performed to establish the fatigue scatter and the environmental effects. Component, subcomponent, and/or element tests may be used to evaluate the fatigue response of structure with impact damage levels typical of those that may occur during fabrication, assembly, and in service, consistent with the inspection procedures employed. The component fatigue test may be

performed with an as-manufactured test article if the effects of impact damage are reliably predicted by subcomponent and/or element tests and are accounted for in the fatigue test or in analysis of the results of the fatigue test. It should be demonstrated during the fatigue tests that the stiffness properties have not changed beyond acceptable levels. Replacement lives should be established based on the test results. An appropriate inspection program should be provided.

8. PROOF OF STRUCTURE - FLUTTER. The effects of repeated loading and environmental exposure on stiffness, mass and damping properties should be considered in the verification of integrity against flutter and other aeroelastic mechanisms. These effects may be determined by analysis supported by test evidence, or by tests at the coupon, element or subcomponent level.

9. ADDITIONAL CONSIDERATIONS.

a. Impact Dynamics. The present approach in airframe design is to assure that occupants have every reasonable chance of escaping serious injury under realistic and survivable impact conditions. Evaluation may be by test or by analysis supported by test evidence. Test evidence includes but is not limited to element or subcomponent tests and service experience. Analytical comparison to conventional structure may be used where shown to be applicable.

b. Flammability.

(1) The existing requirements for flammability and fire protection of aircraft structure attempt to minimize the hazard to the occupants in the event ignition of flammable fluids or vapors occur. In addition, components exposed to heat, flames or sparks should withstand these effects. The use of composite structure should not decrease this existing level of safety. Compliance may be shown by analysis supported by test evidence that aircraft interior material subjected to these hazards can withstand fire and heat as required in FAR 25.

(2) Certain aircraft structure is required to be fire resistant. The following test is considered acceptable for demonstrating compliance for aircraft exterior structure and engine compartment materials that are to be fire resistant. A comparison test should be made between the specimen and an aluminum alloy sheet of the thickness normally used for the intended installation. The structure and materials should be tested by subjecting a specimen sheet 24 inches by 24 inches positioned perpendicular to a 2000°F plus or minus 150°F flame produced by a modified oil burner consuming two gallons of kerosene per hour. The burner should be positioned so that the time required for the flame to penetrate the aluminum alloy sample would be approximately five minutes. The test specimen should be positioned at the same distance from the burner flame as the aluminum alloy sheet. The specimen will be considered satisfactory if it resists flame penetration for a time period equal to or greater than the aluminum alloy sheet.

c. Lightning Protection.

(1) Some composites are susceptible to lightning damage, and do not dissipate P-static electrical charges or provide electromagnetic shielding. Therefore it should be demonstrated by analysis support by test evidence that the structure can dissipate P-static electrical charges, provides electromagnetic protection where required and provides an

acceptable means of diverting the resulting electrical current (as a result of a lightning strike) so as not to endanger the aircraft.

(2) Consideration should be given possible deterioration and undetected damage to the lightning protection system.

d. Protection of Structure. Weathering, abrasion, erosion, ultraviolet radiation, and chemical environment (glycol, hydraulic fluid, fuel, cleaning agents, etc.) may cause deterioration in a composite structure. Suitable protection against and/or consideration of degradation in material properties should be provided for and demonstrated by test.

e. Quality Control. The overall plan required by the certifying agency should involve all relevant disciplines, i.e., engineering, manufacturing and quality control. This quality control plan should be responsive to special engineering requirements that arise in individual parts or areas as a result of potential failure modes, damage tolerance and flaw growth requirements, loadings, inspectability, and local sensitivities to manufacture and assembly.

f. Production Specifications. Specifications covering material, material processing, and fabrication procedures should be developed to ensure a basis for fabricating reproducible and reliable structure. The discrepancies permitted by the specifications should be substantiated by analysis supported by test evidence, or tests at the coupon, element or subcomponent level.

g. Inspection and Maintenance. Maintenance manuals developed by manufacturers should include appropriate inspection, maintenance and repair procedures for composite structures.

h. Substantiation of Repair. When repair procedures are provided in FAA approved documents or the maintenance manual, it should be demonstrated by analysis and/or test that methods and techniques of repair will restore the structure to an airworthy condition.

10. CHANGE OF COMPOSITE MATERIAL – Part 25 (See also Appendix 3).

a. For composite structures a change of material is defined as any of the following situations (even though the structural design remains unchanged).

(1) Any change in the basic constituents.
(2) The same basic constituents but any change of the impregnation method.
(3) The same material, but modification of the processing route.

b. For any material change the showing of compliance with FAR 25.603 should cover paragraphs b(1) to b(5) in detail.

(1) The nature and extent of the material change should be clearly defined.

(2) Substantiation should be based on a comparability study between the structural performances of the material accepted for type certification and the replacement

material. An acceptable approach would be to select from the original substantiating testing those tests that are to be repeated and to justify the omission of others. The extent of testing required will depend on the airworthiness significance of the part and the nature of the material change.

(3) Pass /fail targets should be established as part of the agreement to the test program. Any properties that show a significant change in the replacement material should be given special consideration.

(4) The test substantiation selected should interrogate the critical failure modes of the component.

(5) Design allowables should be established to the same level of statistical confidence for the replacement material.

M.C. Beard
Director of Airworthiness

APPENDIX 1. APPLICABLE FARs AND RELATED ADVISORY CIRCULARS

Text Paragraphs	FAR 23	FAR 25	FAR 27	FAR 29
1. PURPOSE		Not Applicable		
2. CANCELLATION		Not Applicable		
3. REGULATIONS AFFECTED		Not Applicable		
4. GENERAL		Not Applicable		
5. MATERIAL AND FABRICATION DEVELOPMENT				
	.603 .613 .615	.603 .613 .615	.603 .613	.603 .613
6. PROOF OF STRUCTURE - STATIC	.305 .307(a)	.305 .307(a)	.305 .307(a)	.305 .307(a)
7. PROOF OF STRUCTURE - FATIGUE/DAMAGE TOLERANCE				
	.571 .572	.571	.571 AC 20-95	.571 AC 20-95
8. PROOF OF STRUCTURE - FLUTTER	.629	.629	.629	.629
9. ADDITIONAL CONSIDERATIONS				
a. Impact Dynamics	.561 .601 .785 .787(e) .807(b)(4) .967(e)	.561 .601 .721 .783(c)(g) .785 .787(a)(b) .789 .801 .809 .963(d)	.561 .601 .785 .787(c) .801 .807(b)(4) .965	.561 .601 .783(d) .785 .787(c) .801 .803(c)(1)

APPENDIX 1. APPLICABLE FARs AND RELATED ADVISORY CIRCULARS

Text Paragraphs	FAR 23	FAR 25	FAR 27	FAR 29
ADDITIONAL CONSIDERATIONS				
a. Impact Dynamics (cont'd)				
		*	.1413	.809 .963(b) .967(f)
b. Flammability	.609(a)	.609(a)	.609(a)	.609(a)
	.787(d)	.853	.853	.853
	.853	.855	.855	.855
	.859	.859	.859	.859
	.865	.863	.861	.861
	.1121(c)	.865	.1183	.863
	.1182	.867	.1185	.903(c)
	.1183	.903(c)	.1191	.967(e)
	.1189(b)(2)	.967(e)	.1193(d)(e)	
	.1191	.1121(c)	.1194	.1013(e)
	.1193(c)(d)(e)	.1181		.1121(c)
		.1182		.1183
		.1183		.1185
		.1185		.1189(a)(2)
		.1189(a)(2)		.1191
		.1191		.1193(c)(d)(e)
		.1193(c)(d)(e)		.1194

* Special Conditions have been issued in the past on wide body airplanes concerning emergency wheels up landing.

APPENDIX 1. APPLICABLE FARs AND RELATED ADVISORY CIRCULARS

Text Paragraphs	FAR 23	FAR 25	FAR 27	FAR 29
ADDITIONAL CONSIDERATIONS				
c. Lightning Protection	.609 .867	.581 .609	.609	.609
d. Protection of Structure	.609	.609	.609	.609
e. Quality Control	**	**	**	**
f. Production Specifications	.603	.603	.603	.603
	.605	.605	.605	.605
10. CHANGE OF COMPOSITE MATERIAL		.603		

** A new Advisory Circular on Quality Control for Composites is under development.

APPENDIX 2. DEFINITIONS

Design values - material, structural element, and structural detail properties that have been determined from test data and chosen to assure a high degree of confidence in the integrity of the completed structure [reference FAR 25.613(b)].

Allowables - material values that are determined from test data at the laminate or lamina level on a probability basis, e.g., A or B base values [reference FAR 25.615(a)].

Laminate level design values or allowables - established from multi-ply laminate test data and/or from test data at the lamina level and then established at the laminate level by test validated analytical methods.

Lamina level material properties - established from test data for a single ply or multi-ply single direction oriented lamina layup.

Point design - an element or detail of a specific design which is not considered generically applicable to other structure for the purpose of substantiation, e.g., lugs and major joints. Such a design element or detail can be qualified by test or by a combination of test and analysis.

Environment - external, non-accidental conditions (excluding mechanical leading), separately or in combination, that can be expected in service and which may affect the structure (e.g., temperature, moisture, UV radiation, and fuel).

Degradation - the alteration of material properties (e.g., strength, modulus, coefficient of expansion) which may result from deviations in manufacturing or from repeated loading and/or environmental exposure.

Discrepancy - a manufacturing anomaly allowed and detected by the planned inspection procedure. They can be created by processing, fabrication or assembly procedures.

Flaw - a manufacturing anomaly created by processing, fabrication or assembly procedures.

Damage - a structural anomaly caused by manufacturing (processing, fabrication, assembly or handling) or service usage. Usually caused by trimming, fastener installation or foreign object contact.

Impact damage - a structural anomaly created by foreign object impact.

Coupon - a small test specimen (e.g., usually a flat laminate) for evaluation of basic lamina or laminate properties or properties of generic structural features (e.g., bonded or mechanically fastened joints).

APPENDIX 2. DEFINITIONS

Element - a generic element of a more complex structural member (e.g., skin, stringers, shear panels, sandwich panels, joints, or splices).

Detail - a non-generic structural element of a more complex structural member (e.g. specific design configurated joints, splices, stringers, stringer runouts, or major access holes).

Subcomponent - a major three-dimensional structure which can provide complete structural representation of a section of the full structure (e.g. stub-box, section of a spar, wing panel, wing rib, body panel, or frames).

Component - a major section of the airframe structure (e.g., wing, body, fin, horizontal stabilizer) which can be tested as a complete unit to qualify the structure.

APPENDIX 3 CHANGE OF COMPOSITE MATERIALS

Purpose

This Appendix provides guidance for the re-certification of composite structures that, in production, use a different material from that proposed and substantiated at the time of certification of the original structure. It is issued to provide guidance and to outline an acceptable method of showing compliance with FAR 25 certification requirements.

Scope

This Appendix only addresses already certificated composite structures where there is no change to the design and use other than the material change. Components that have a change in geometry or design loading may need to be addressed in a different way.

1. *Background*

The showing of compliance of a new material with FAR 25 requirements, as an alternative to the previously selected material, should normally involve the following steps:

- identify the key material parameters governing performances,
- define the appropriate tests able to measure these parameters,
- define pass/fail criteria for these tests.

The problem with composites is much more complex than with metallic materials, because their performance is much more process dependent. So, until we are capable of accurately identifying the key material parameters governing processability, there will be a need for tests directly interrogating material performance through specimens representative of the actual design details of the composite structure.

Today, showing the suitability of a composite material for its anticipated use, requires a large amount of test data ranging from the coupon level to specimens representative of the most complex features of the structure design. The time needed to perform all these tests and the associated costs are the reasons why, in most cases, only one material can be proposed for type certification.

Such diversity of testing is required with composites because these materials develop their mechanical properties only when the component is processed (or at least, the resin cured) i.e. that the design of the structure and the associated production processes govern these properties.

To give a more technical interpretation of this specific character of composites, it is necessary to go back to the general principles for dimensioning a structure. Theoretically the strength of a structure could be calculated with analytical models capable, from the knowledge of relevant material properties, of anticipating the mechanical behavior of complex design details. Unfortunately with composites these analytical models are still insufficiently precise at the level

of failure prediction and require a step-by-step testing verification with more and more complex specimens (the "pyramid" approach).

Moreover, as the design and the associated manufacturing process can affect the eventual properties, the failure modes along with composite failure prediction models may vary from one material to another. Consequently, they both need to be examined for any material change.

"In house" composite material "qualification" procedures developed by every manufacturer involve specifications covering:

- physical plus, in some cases, chemical properties,
- mechanical properties measured at the coupon level,
- reproducibility (checked by testing several batches).

But interchangeability for a structural application is not guaranteed between two materials meeting the same manufacture specification (as it could be for materials that are much less process dependant, metallic materials for instance). Under these circumstances, a material that meets the "qualification" required by a specification does not necessarily produce satisfactory components.

2. *Definition of Material Change*

There is a material change in any of the following situations:

A- A change in one or both of the basic constituents
- resin
- fiber (including sizing or surface treatment alone).

B- Same basic constituents but any change of the impregnation method
- prepregging process (e.g. solvent bath to hot melt coating),
- tow size (3k, 6k, 12k) with the same fiber areal weight,
- prepregging machine at the same suppliers,
- supplier change for a same material (licensed supplier),
- etc.,

C- Same material but modification of the processing route (if the modification to the processing route governs eventual composite mechanical properties):
- curing cycle,
- tooling,
- lay-up method,
- environmental parameters of the laying room.

A classification is to be made between a new material which is intended to be a replica of the former one (cases 'B' or 'C') and a 'truly new material' (case 'A'). So, two classes are proposed:
- 'Identical materials' in case of a replica.

- 'Alternative materials' for truly new materials.

Within the 'identical materials' class, a sub-classification can be made between a change of the prepregging machine alone at the supplier and licensed production elsewhere. For the time being, a change to a new fiber produced under a licensed process and reputed to be a replica of the former one, will be dealt with as an 'alternate material'.

Some changes within this class may not interact with structural performances (e.g. prepreg release papers, some bagging materials, etc.) and should not be submitted to an agency approval. However the manufacturers (or the supplier) should develop a proper system for screening those changes, with adequate proficiency at all relevant decision levels.

Case 'A' (alternative material) should always be considered as an important change. It is not recommended to try a sub-classification according to the basic constituents being changed, as material behavior (e.g. sensitivity to stress concentrations) may be governed by interfacial properties which may be affected either by a fiber or a resin change.

3. *Substantiation Method*

Only the technical aspects of substantiation are addressed here.

a. *Compliance philosophy*

Substantiation should be based on a comparability study between the structural performances of the material accepted for type certification, and the second material.

Whatever the modification proposed for a certificated item, the revised margins of safety should remain adequate. Any reduction in the previously demonstrated margin should be investigated in detail.

Identical material (case "B" and "C"):

- allowables and design values, whatever the level of investigation; material or design, should remain valid,
- calculation models – including failure prediction should remain the same,
- the technical content of the procurement specification (case "B") should not be changed.

Alternative material (case "A"):

- new allowables and design values for all relevant properties should be determined,
- analytical models, including failure prediction models, should be reviewed and, if necessary, substantiated by tests,

- the procurement specification should be evaluated (or a new specification suited to the newly selected material should be defined) to adequately control quality variations.
- example changing from 1st to 2nd generation of carbon fibers may improve tensile strength properties by more than 20%: so keeping the same acceptability threshold in the process specification would not allow the detection of quality variations.

b. *Tests to be performed*

The pyramid of tests (building block approach) illustrated in Figure 1 is a consistent way to prepare and present structural substantiation for approval. Each stage of this pyramid refers to an investigation level in terms of specimen category (coupon, element, detail, sub-component and component) as they are defined in Appendix 2. Coupons and elements are generic specimens which form the database and can be common to several pyramids. The non-generic specimens (details, sub-component, component) are specific to each composite item.

Under these circumstances substantiation to be provided for a changed material cannot be independent from the structural item concerned and a universal list of tests cannot be established. The approach would then consist in selecting, within each pyramid, those tests that are to be duplicated with the second material for the component under examination and the justification of the omission of others.

As a first approach, the investigation level might be restricted to the generic specimens for an identical material, but for an alternative material non-generic ones should be included.

Typically, substantiation should always cover the inherent structural behavior of composites. The program should be established considering the material change proposed and the airworthiness significance of the part. An example list of tests is given in table 1.

This table applies also for a change in the process route Case C. In some instances (e.g. a cure cycle change) possible consequences can be assessed by tests on generic specimens only. For other changes like those involving tooling (e.g. from a full bag process to thermo-expansive cores) the assessment should include an evaluation of the component itself (sometimes called the 'tool proof test'). In this case, an expanded non-destructive procedure should be required for the first items to be produced. This should be supplemented – if deemed necessary – by 'cut up' specimens from a representative component, for physical or mechanical investigations.

c. Number of batches

The purpose for testing a number of batches is the demonstration of an acceptable reproducibility of material characteristics. The number of batches required should take into account:

- material classification (identical or alternative),
- the investigation level (non-generic or generic specimen),
- the source of supply,
- the property under investigation.

d. Pass/Fail Criteria

Target pass/fail criteria should be established as part of the test program. As regards strength considerations for instance, a statistical analysis of test data should demonstrate that new allowables derived for the second material provide an adequate margin of safety. Therefore, provision should be made for a sufficient number of test specimens to allow for such analysis. At the non-generic level, when only one test article is used to assess a structural feature, the pass criteria should be a result acceptable with respect to design ultimate loads. In the cases where test results show lower margins certification documentation will need to be revised.

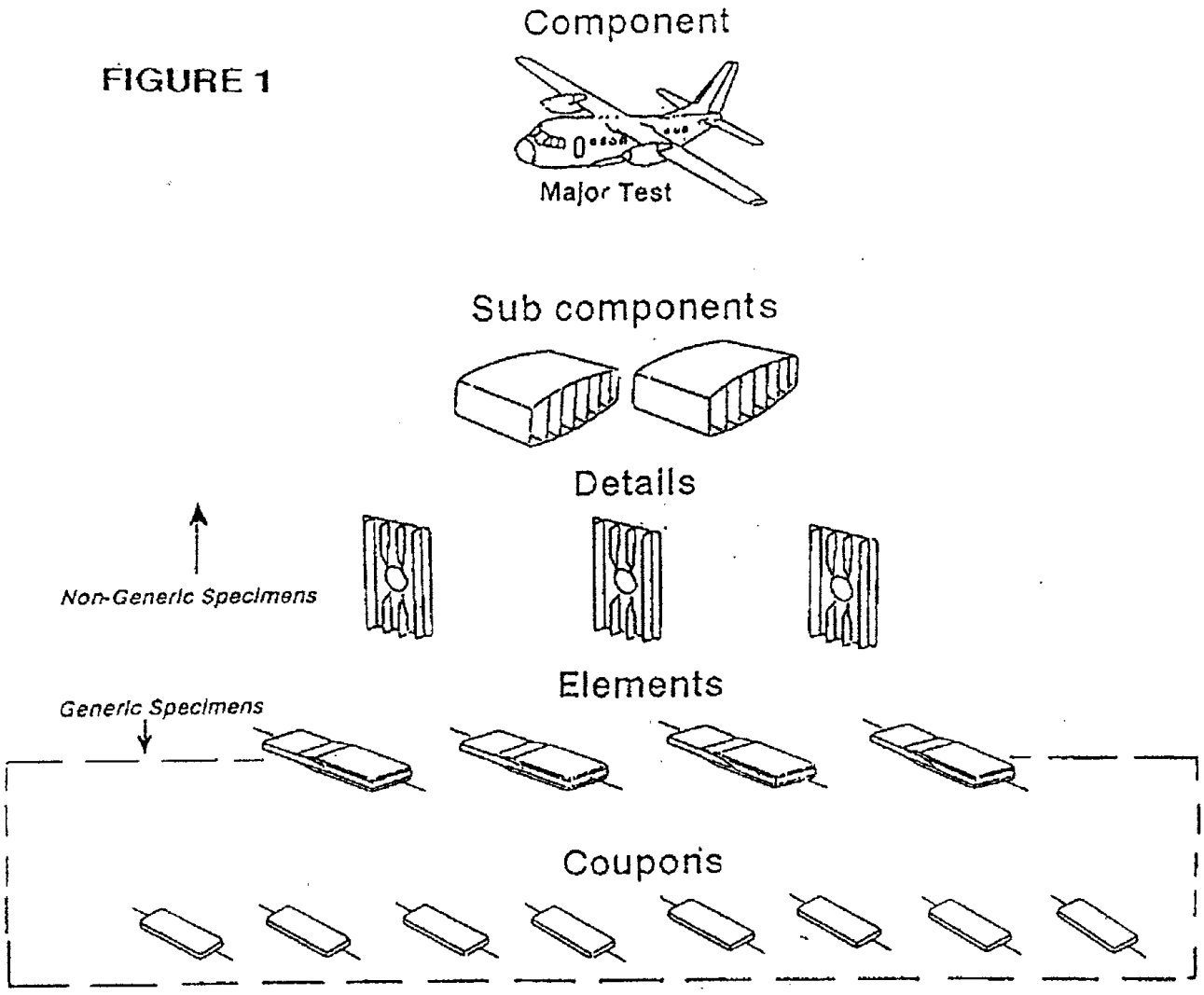
e. Other considerations

For characteristics other than strength (all those listed in paragraphs 8 and 9) the substantiation should also ensure an equivalent level of safety.

Table 1
EXAMPLES OF TESTS THAT MAY NEED TO BE CARRIED OUT

				Number of Batches		
				Alternative Material "A"	Identical B"	Material C"
Generic Tests	On the material	Material Identity	**- Physical tests (aerial weight, resin content, volatile content).** **- Thermomechanical tests** **- Physio-chemical characterization of the resin (IR, HPLC, DSC, etc.)** **- Fiber Characterization, etc.**	up to 3	1 min	0
	On the Laminate	Structural Properties	- Physical tests (cured ply thickness, fiber content, porosity, etc.) - Mechanical test: - on unidirectional lay-up, - on standardized stacking sequences, taking into account: - stress raiser effects in static - temperature/environmental sensitivity - bearing effects - tolerance to manufacturing defects, etc.	up to 5	up to 3	1
Non-generic tests			- Tests on stacking sequences representative of the actual ones on the design - Damage tolerance tests - Detailed tests (e.g.: stringer runouts, access holes, sandwich panels if relevant, etc.) To be selected, from engineering judgment, within the pyramid of tests provided for the first material.	1	0	0
		Processability	Tool proof tests	1	1	1
		Other Considerations	Impact dynamics, flammability, lightning protection, flutter, protection of structure, substantiation of repairs.	1	0	0

FIGURE 1


Component
Major Test
Sub components
Details
Non-Generic Specimens
Elements
Generic Specimens
Coupons

FAA Action

September 20, 2004

Mr. Craig R. Bolt
Assistant Chair, Aviation Rulemaking
Advisory Committee
Pratt & Whitney
400 Main Street, Mail Stop 162-14
East Hartford, CT 06108

Dear Mr. Bolt:

This letter acknowledges receipt of several letters that you sent for the Aviation Rulemaking Advisory Committee (ARAC) on Transport Airplane and Engine (TAE) Issues.

Date of Letter	Description of Recommendation	Working Group
01/06/2003	Proposed rule and draft advisory material on bird ingestion capability (§ 33.76)	Engine Harmonization Working Group (HWG)
10/22/2003	Final report and position statements on bird strike requirements (§ 25.631)	General Structures HWG
10/22/2003	Final report and draft advisory material on alternative composite structure material (§ 25.603)	General Structures HWG
05/14/2004	Final report, proposed rule language, and draft advisory material on warning, caution, and advisory alerts installed in the cockpit (§ 25.1322)	Avionics Systems HWG
06/17/2004	Final report and draft advisory material on fire protection of flight controls, engine mounts and other flight structures (§ 25.865)	Loads and Dynamics HWG
06/22/2004	Final report, proposed rule, and draft advisory material on installed systems and equipment for use by the flight crew (§ 25.1302)	Human Factor HWG

I wish to thank the ARAC and the working groups for the resources that industry gave to develop these recommendations. The recommendations from the Avionics Systems HWG, the Human Factor HWG, and the Loads and Dynamics HWG will remain open until these working groups complete a Phase 4 review. The remaining recommendations have been closed, as we consider submittal of the reports as completion of the tasks. All of these recommendations will be placed on the ARAC website at **http://www.faa.gov/avr/arm/arac/index.cfm**.

We will continue to keep you apprised of our efforts on the ARAC recommendations and the rulemaking prioritization at the regular ARAC TAE issues meetings.

Sincerely,

/s/ Margaret Gilligan

Nicholas A. Sabatini
Associate Administrator for Regulation
and Certification

FAA Action: Placed on the AVS “Do By Other Means” list, dated June 14, 2005.