

SUBPART M – REPAIRS

JAR 21.433(a)(1) (continued)

[JAR 21.431 Applicability

(a) This Subpart prescribes procedural requirements for the approval of repairs made on products, parts and appliances. (See ACJ 21.431(a).)

(b) A 'repair' means elimination of damage and/or restoration to an airworthy condition following initial release into service by the manufacturer of any product, part or appliance. Elimination of damage by replacement of parts or appliances without the necessity for design activity does not require approval under this subpart.

(c) A repair to a JTSO article must be treated as a change to the JTSO design and must be approved in accordance with 21.611.

(d) This subpart is applicable on and after 1 May 2002.]

[Amdt. 4, 01.05.02]

[JAR 21.432 Eligibility

(a) The Authority will only accept an application for major repair design approval from a person holding or having applied for an appropriate Design Organisation Approval under Subpart JA except that in the case of a repair which is of simple design, the Authority may agree to accept an application from a person who does not hold and has not applied for an appropriate Design Organisation Approval. In the latter case, the Authority will apply such alternative procedures as are necessary to provide equivalent confidence in the findings of compliance with requirements.

(b) Any person may apply for approval of a minor repair design.]

[Amdt. 4, 01.05.02]

[JAR 21.433 Repair design

(a) The applicant for approval of a repair design must -

(1) Show compliance with the requirements incorporated by reference in the Type Certificate or Supplemental Type Certificate, as applicable, or those in effect on the date of application (for repair design approval), plus any amendments to those requirements or special conditions the Authority finds necessary to establish a level of safety

equal to that established by the requirements incorporated by reference in the TC or STC.

(2) Submit all necessary substantiation data, when requested by the Authority.

(3) Declare compliance with the requirements of (1) above. (See ACJ to JAR 21.433(a) and JAR 21.447)

(b) Where the applicant is not the Type Certificate or Supplemental Type Certificate holder, as applicable, compliance with (a) above may be done from the applicants own resources or through an arrangement with the Type Certificate or Supplemental Type Certificate holder as applicable.]

[Amdt. 4, 01.05.02]

[JAR 21.435 Classification of repairs

(a) A repair may be 'major' or 'minor'. The classification must be made in accordance with the criteria of JAR 21.91 for a change in the Type Design. (See ACJ 21.435(a))

(b) A repair must be classified "major" or "minor" either -

(1) By the Authority, or

(2) By an appropriately approved Design Organisation under a procedure agreed with the Authority.]

[Amdt. 4, 01.05.02]

[JAR 21.437 Issue of repair design approval (See ACJ 21.437)

When it has been declared and has been shown that the repair design meets the applicable requirements of JAR 21.433(a)(1), it shall be approved -

(a) by the Authority (See ACJ 21.437(a)), or

(b) by an appropriately approved organisation that is also the Type Certificate or the Supplemental Type Certificate holder, through the use of procedures agreed with the Authority (See ACJ 21.437(b)), or

(c) for minor repairs only, by an appropriately approved design organisation through the use of procedures agreed with the Authority.]

[Amdt. 4, 01.05.02]

[JAR 21.439 Production of repair parts

(See ACJ 21.439)

Parts and appliances to be used in the repair must be manufactured -

- (a) Under Subpart F, or
- (b) By an organisation appropriately approved in accordance with Subpart G, or
- (c) By an appropriately approved Maintenance Organisation, and
- (d) In accordance with production data based upon all the necessary design data as provided by the repair design approval holder.]

[Amdt. 4, 01.05.02]

[JAR 21.441 Repair embodiment

(See ACJ 21.441)

(a) The embodiment of a repair may only be made by an appropriately approved Maintenance Organisation, or - according to the provision under JAR 21.163(c) - by a Production Organisation appropriately approved in accordance with Subpart G.

(b) Installation Instructions. The design organisation must transmit to the maintenance organisation implementing the repair all the necessary installation instructions.]

[Amdt. 4, 01.05.02]

[JAR 21.443 Limitations

(See ACJ 21.443)

A repair design may be approved subject to limitations, in which case the repair design approval must include all necessary instructions and limitations. These instructions and limitations must be transmitted to the operator in accordance with a procedure agreed with the Authority.]

[Amdt. 4, 01.05.02]

[JAR 21.445 Unrepaired Damage

(See ACJ 21.445)

(a) When a damaged product, part or appliance, is left unrepaired, the evaluation of the damage for its airworthiness consequences may only be made by the Authority or an appropriately approved design organisation, through the use of procedures agreed with the Authority. Any necessary limitations must be processed in accordance with the procedures of JAR 21.443.

JAR 21.445 (continued)

(b) Where the organisation evaluating the damage is not the Authority, TC holder or STC holder, this organisation must justify that the information on which the evaluation is based is adequate either from his organisation's own resources or through an arrangement with the TC holder or STC holder as applicable.]

[Amdt. 4, 01.05.02]

[JAR 21.447 Record Keeping

(See ACJ to JAR 21.433 (a) and JAR 21.447)

For each repair, all relevant design information, drawings, test reports, instructions and limitations possibly issued in accordance with JAR 21.443, justification for classification and evidence of the design approval, shall be held by the design approval holder at the disposal of the Authority and shall be retained by the repair design approval holder in order to provide the information necessary to ensure the continued airworthiness of the repaired products, parts or appliances.]

[Amdt. 4, 01.05.02]

[JAR 21.449 Instructions for Continued Airworthiness

(a) The holder of the repair design approval shall furnish at least one complete set of those changes to the Instructions for Continued Airworthiness which result from the design of the repair, comprising descriptive data and accomplishment instructions prepared in accordance with the applicable Joint Aviation Requirements, to each operator of aircraft incorporating the repair. The repaired product, part or appliance may be released into service before the changes to those Instructions have been completed, but this shall be for a limited service period, and in agreement with the Authority. Those changes to the Instructions shall be made available on request to any other person required by another JAR to comply with any of the terms of those changes to the Instructions.

(b) If updates to those changes to the Instructions for Continued Airworthiness are issued by the holder of the repair design approval after the repair has been first approved, these updates shall be furnished to each operator and shall be made available on request to any other person required by another JAR to comply with any terms of those changes to the Instructions.]

[Amdt. 4, 01.05.02]

[JAR 21.451 Responsibilities

Each holder of a major repair approval shall undertake the responsibilities

- (a) specified in JAR 21.3;
- (b) specified in JAR 21.439, 21.441, 21.443, 21.447 and 21.449;
- (c) implicit in the collaboration with the Type Certificate or the Supplemental Type Certificate holder under JAR 21.433 (b), as appropriate.]

[Amdt.4, 01.05.02]

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[ACJ 21.431(a)**Applicability (Interpretative Material)**

Manuals and other instructions for continued airworthiness (such as the Manufacturers Structural Repair Manual, Maintenance Manuals and Engine Manuals provided by the holder of the Type Certificate, Supplemental Type Certificate or JTSA authorisation as applicable) for operators, contain approved repair data, enabling operators to cope with anticipated in-service problems arising from normal usage.

Approved data is data which is approved either by the relevant National Authority, or by an appropriately approved Design Organisation, and is applicable for the purpose for which it has been developed

NB: Flow Chart 1 addresses the procedures that should be followed for a product that was first Type Certificated by the JAA under JAR 21, either as new or "caught-up."
Flow Chart 2 addresses procedures that should be followed for a product that was first Type Certificated outside the JAA, and subsequently validated by the JAA under JAR 21 Subpart N, either as new or "caught-up."]

[Amdt. 4, 01.05.02]

[ACJ to JAR 21.433 (a) and JAR 21.447**Repair Design and Record Keeping (Acceptable Means of Compliance)**

1. Relevant substantiation data associated with a new major repair design and record keeping should include:

- a. damage identification and reporting source,
- b. major repair design approval sheet identifying applicable requirements and references of justifications,
- c. repair drawing and/or instructions and scheme identifier,
- d. correspondence with the TC or STC holder, if its advice on the design has been sought,
- e. structural justification (static strength, fatigue, damage tolerance, flutter etc) or references to this data,
- f. effect on the aircraft, engines and/or systems, (performance, flight handling, etc as appropriate)
- g. effect on maintenance programme,
- h. effect on Airworthiness limitations, the Flight Manual and the Operating Manual,
- i. weight and moment change,
- j. special test requirements.

2. Relevant minor repair documentation includes 1(a) and 1(c). Other sections of paragraph 1 may be included where necessary. If the repair is outside the approved data, justification for classification is required.

3. Special consideration should be given to repairs that impose subsequent limitations on the part, product or appliance, (e.g. engine turbine segments that may only be repaired a finite number of times, number of repaired turbine blades per set, oversizing of fastener holes etc.).

4. Special consideration should also be given to Life Limited parts and Critical Parts, notably with the involvement of the Type Certificate Holder, when deemed necessary under JAR 21.433 (b).

5. Repairs to engine critical parts would normally only be accepted with the involvement of the TC holder.]

[Amdt. 4, 01.05.02]

[ACJ 21.435(a)**Classification of repairs (Interpretative Material)**

1. Clarification of the terms Major/Minor

In line with the definitions given in JAR 21.91, a new repair is classified as 'major' if the result on the approved type design has an appreciable effect on structural performance, weight, balance, systems, operational characteristics or other characteristics affecting the airworthiness of the product, part or appliance. In particular, a repair is classified as major if it needs extensive static, fatigue and damage tolerance strength justification and/or testing in its own right, or if it needs methods, techniques or practices that are unusual (i.e. unusual material selection, heat treatment, material processes, jiggling diagrams, etc.....)

Repairs that require a re-assessment and re-evaluation of the original certification substantiation data to ensure that the aircraft still complies with all the relevant requirements, are to be considered as major repairs.

Repairs whose effects are considered minor and require minimal or no assessment of the original certification substantiation data to ensure that the aircraft still complies with all the relevant requirements, are to be considered minor

It is understood that not all the certification substantiation data will be available to those persons/organisations classifying repairs. A qualitative judgement of the effects of the repair will therefore be acceptable for the initial classification. The subsequent review of the design of the repair may lead to it being re-classified, owing to early judgements being no longer valid.

2. Airworthiness concerns for Major/Minor classification

The following should be considered for the significance of their effect when classifying repairs. Should the effect be considered to be significant then the repair should be classified 'Major'. The repair can be classified 'Minor' where the effect is known to be without appreciable consequence.

i) Structural performance

Structural performance *of the product* includes static strength, fatigue, damage tolerance, flutter and stiffness characteristics. Repairs to any element of the structure should be assessed for their effect upon the structural performance.

ii) Weight and balance

The weight of the repair may have a greater effect upon smaller aircraft as opposed to larger aircraft. The effects to be considered are related to overall aircraft centre of gravity and aircraft load distribution. Control surfaces are particularly sensitive to the changes due to the effect upon the stiffness, mass distribution and surface profile which may have an affect upon flutter characteristics and controllability.

iii) Systems

Repairs to any elements of a system should be assessed for the effect intended on the operation of the complete system and for the effect on system redundancy. The consequence of a structural repair on an adjacent or remote system should also be considered as above, (for example: airframe repair in area of a static port).

iv) Operational characteristics

Changes may include:

- stall characteristics
- handling
- performance and drag
- vibration

v) Other characteristics

- changes to load path and load sharing
- change to noise and emissions
- fire protection / resistance]

ACJ 21

[Note: Considerations for classifying repairs 'Major/Minor' should not be limited to those listed above.

3. Examples of 'Major' repairs

- i) A repair that requires a permanent additional inspection to the approved maintenance programme, necessary to ensure the continued airworthiness of the product. Temporary repairs for which specific inspections are required prior to installation of a permanent repair do not necessarily need to be classified as 'Major'. Also, inspections and changes to inspection frequencies not required as part of the approval to ensure continued airworthiness do not cause classification as 'Major' of the associated repair.
- ii) A repair to life limited or critical parts.
- iii) A repair that introduces a change to the Aircraft Flight Manual.]

[Amdt. 4, 01.05.02]

[ACJ 21.437

Issue of repair design approval (Interpretative Material)

1) Approval by DOA Holder

Approval of repairs through the use of procedures agreed with the Authority, means an approval issued by the DOA Holder without requiring Authority involvement. The Authority will monitor application of this procedure within the surveillance plan for the relevant organisation. When the organisation exercises this privilege, the repair release documentation should clearly show that the approval is under their DOA privilege.

2) Previously approved data for other applications

When it is intended to use previously approved data for other applications, it is expected that applicability and effectiveness would be checked with an appropriately approved design organisation. After damage identification, if a repair solution exists in the available approved data, and if the application of this solution to the identified damage remains justified by the previous approved repair design, (structural justifications still valid, possible airworthiness limitations unchanged), the solution can be considered approved and can be used again.

3) Temporary repairs.

These are repairs that are life limited, to be removed and replaced by a permanent repair after a limited service period. These repairs should be classified as per JAR 21.435 and the service period defined at the approval of the repair.

4) Fatigue and damage tolerance.

When the repaired product is released into service before the fatigue and damage tolerance evaluation has been completed, the release should be for a limited service period, defined at the issue of the repair.]

[Amdt. 4, 01.05.02]

[ACJ 21.437(a)

Issue of repair design approval (Interpretative Material)

1) Products first type certificated by a JAA Authority

i) Authority approval is required in cases of major repairs proposed by Design Organisation Approval holders, not being the TC or STC holder, and in cases of minor repairs proposed by persons not holding a Design Organisation Approval.

ii) Authority approval may be required in cases of major repairs proposed by Design Organisation Approval holders, being the TC or STC holder, if the major repair is:

- related to new interpretation of the airworthiness requirement as used for type certification.
- related to different means of compliance from that used for Type certification.
- related to the application of airworthiness requirements different from that used for type certification.]

ACJ 21

[NOTE: This should be established at the time of DOA approval.

2) Products first type certificated by a non-JAA Authority.

Authority approval is always required for major repairs on products first type certificated by a non-JAA country. Approval privileges extended to TC holders (noted in JAR 21.437(b)) are not extended to TC holders of products first type certificated by a non-JAA country. Type certificate holders of those types may need to be involved when an arrangement with the TC holder has been determined necessary under JAR 21.433(b).

For repairs designed outside the JAA, approval procedures are dealt with under JAR Subpart N-M. (See Flow Chart 2).]

[Amdt. 4, 01.05.02]

[ACJ 21.437(b)

Issue of repair design approval (Acceptable Means of Compliance)

In order for the approved design organisation that is also the type certificate holder to approve 'Major' repair design the following should be considered applicable:

- i) The type certificate holder being approved under JAR 21 Subpart JA.
- ii) Procedures having been established that comply with JAR 21 Subpart M as agreed with the authority.
- iii) The certification basis for the product, part or appliance to be repaired having been identified together with all other relevant requirements.
- iv) All records and substantiation data including documents showing compliance with all relevant airworthiness requirements being held for review (by the authority).
- v) A summary list of all major repair approvals being provided to the authority on a regular basis (as agreed with the authority).
- vi) Whether the repair design is affected by the presence of any Supplemental Type Certificate.]

[Amdt. 4, 01.05.02]

[ACJ 21.439

Repair parts production (Interpretative Material)

A maintenance body, (organisation or person), may manufacture parts for repair purposes when in accordance with Subpart F or when approved under Subpart G of this JAR or the relevant part of other JARs. A maintenance organisation may manufacture parts for its own repair purposes when expressly authorised by the National Aviation Authority']

[Amdt. 4, 01.05.02]

[ACJ 21.441

Repair Embodiment (Interpretative Material)

JAR-145 requires that repairs to aircraft operated in commercial air transport be accomplished by JAR-145 approved maintenance organisations. The holder of a Production Organisation Approval under JAR 21 Subpart G may accomplish repairs to new aircraft, within his Terms of Approval, under the privilege of JAR 21.163(c). In the absence of JAR maintenance rules for products parts or appliances that are not operated in commercial air transport, a repair thereto must be accomplished by an organisation or person in accordance with the national regulations of the JAA country (State of Registry).]

[Amdt. 4, 01.05.02]

[ACJ 21.443**Limitations (Interpretative Material)**

Instructions and limitations associated with repairs should be specified and controlled by those procedures required by the applicable operations rules e. g. JAR OPS-1/3.915(a)(3) Technical Log or equivalent, the Flight Manual, etc..]

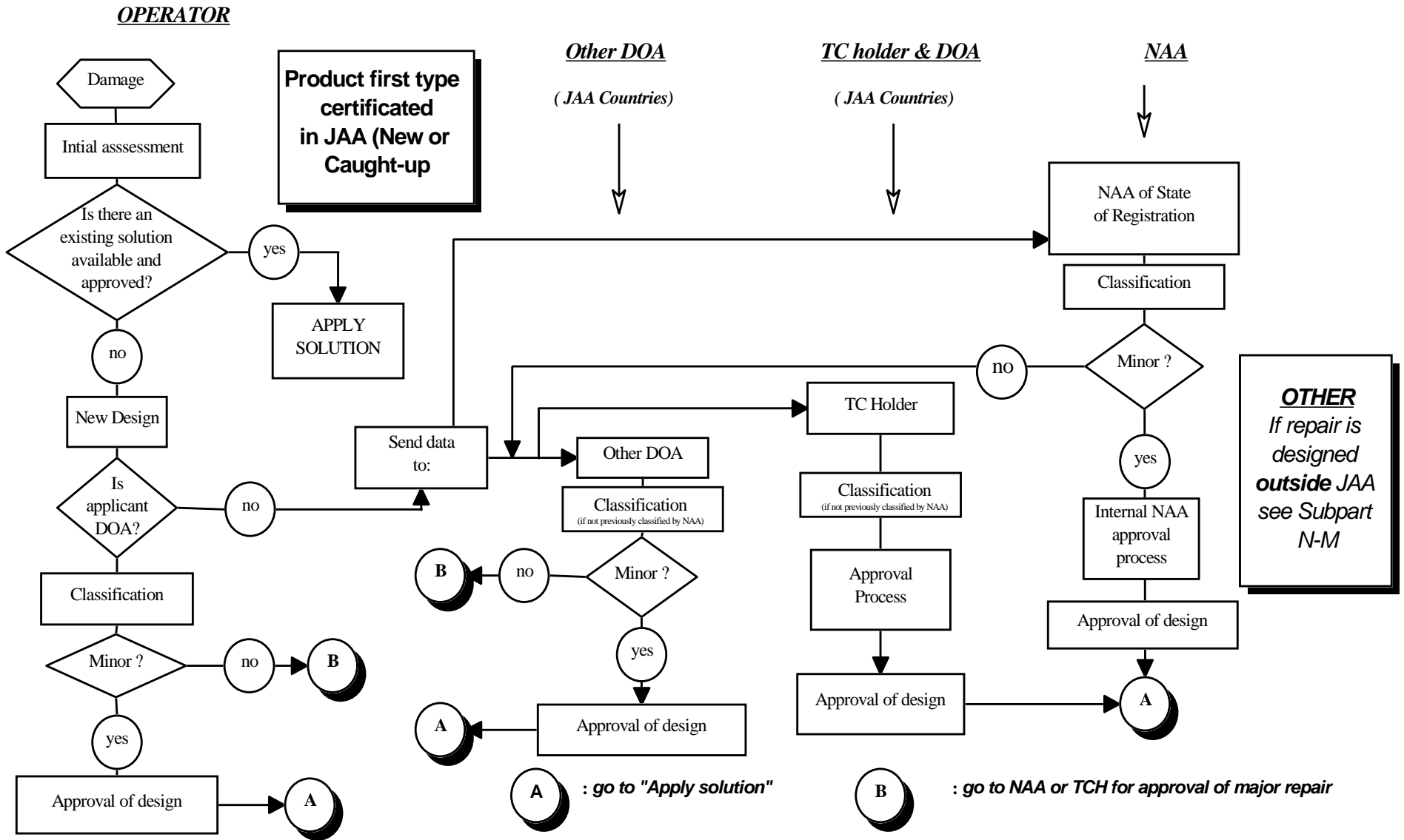
[Amdt. 4, 01.05.02]

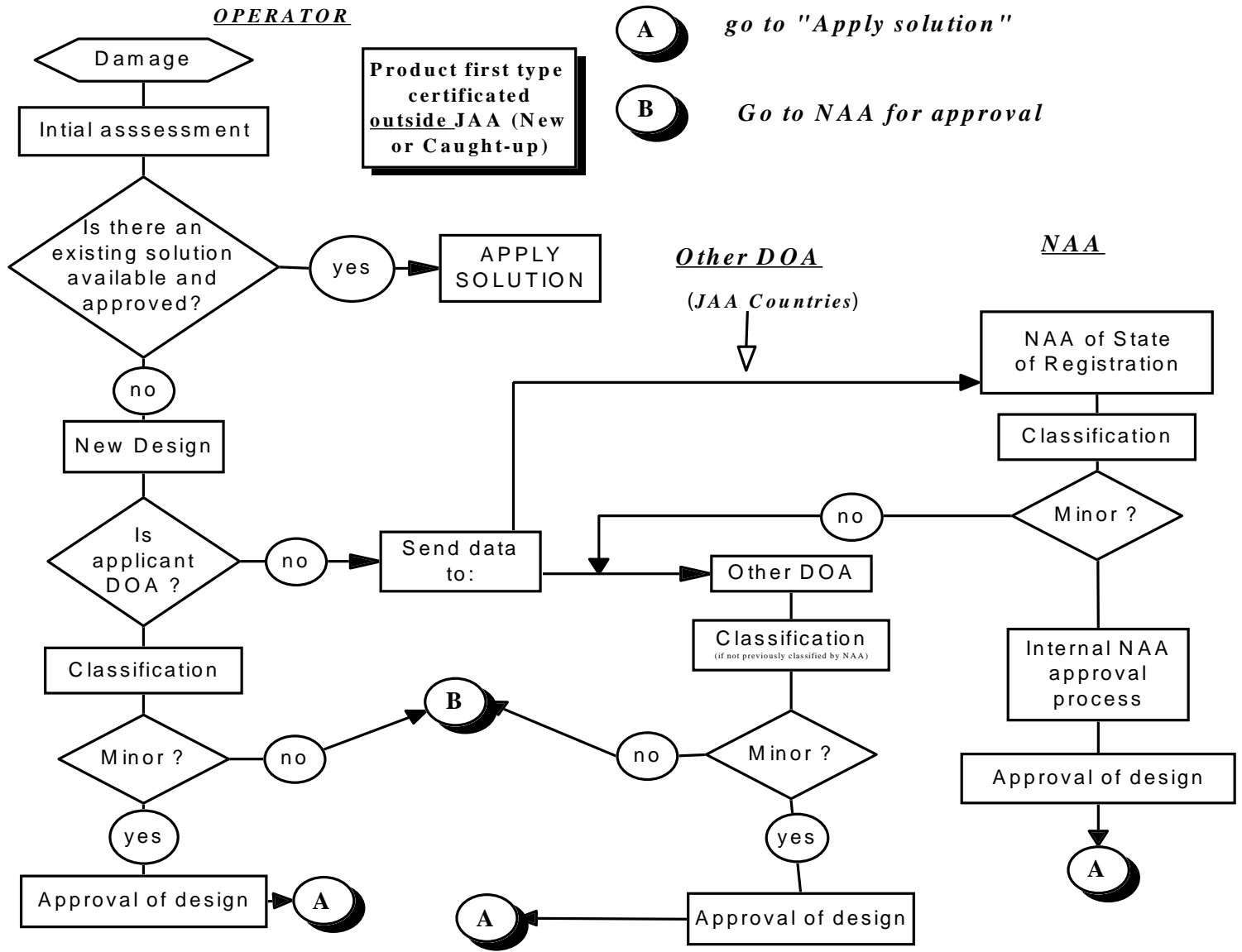
[ACJ 21.445**Unrepaired damage (Interpretative Material)**

This is not intended to supersede the normal maintenance practices defined by the type certificate holder, (e.g. blending out corrosion and re-protection, stop drilling cracks etc..), but addresses specific cases not covered in the manufacturer's documentation.]

[Amdt. 4, 01.05.02]

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If the repair design originates in a state outside of the JAA, see Subpart N-M