

KEMENTERIAN PERHUBUNGAN
DIREKTORAT JENDERAL PERHUBUNGAN UDARA

PERATURAN DIREKTUR JENDERAL PERHUBUNGAN UDARA

NOMOR : KP 065 TAHUN 2018

TENTANG

PETUNJUK TEKNIS PERATURAN KESELAMATAN PENERBANGAN SIPIL
8900-4.3 (*STAFF INSTRUCTION 8900-4.3*) TENTANG PERSETUJUAN
PERBAIKAN DAN PERUBAHAN UTAMA (*STAFF INSTRUCTION APPROVAL OF
MAJOR REPAIRS AND ALTERATIONS*)

DENGAN RAHMAT TUHAN YANG MAHA ESA

DIREKTUR JENDERAL PERHUBUNGAN UDARA,

- Menimbang :
- a. bahwa dalam rangka membakukan seluruh petunjuk teknis yang ada di lingkungan Direktorat Jenderal Perhubungan Udara untuk memberikan petunjuk teknis yang terstruktur, sistematis, dan terorganisir maka perlu disusun suatu petunjuk teknis;
 - b. bahwa berdasarkan pertimbangan sebagaimana dimaksud dalam huruf a, perlu menetapkan Peraturan Direktur Jenderal Perhubungan Udara Tentang Petunjuk Teknis Peraturan Keselamatan Penerbangan Sipil 8900-4.3 (*Staff Instruction 8900-4.3*) tentang Persetujuan Perbaikan dan Perubahan Utama (*Staff Instruction Approval Of Major Repairs and Alterations*);
- Mengingat :
1. Undang-Undang Republik Indonesia Nomor 1 Tahun 2009 tentang Penerbangan (Lembaran Negara Republik Indonesia Tahun 2009 Nomor 1, Tambahan Lembaran Negara Republik Indonesia Nomor 4956);

2. Peraturan Presiden Nomor 7 Tahun 2015 tentang Organisasi Kementerian Negara (Lembaran Negara Republik Indonesia Tahun 2015 Nomor 8);
3. Peraturan Presiden Nomor 40 Tahun 2015 tentang Kementerian Perhubungan (Lembaran Negara Republik Indonesia Tahun 2015 Nomor 75);
4. Peraturan Menteri Perhubungan Nomor 59 Tahun 2015 tentang Kriteria, Tugas, dan Wewenang Inspektur Penerbangan sebagaimana telah diubah terakhir dengan Peraturan Menteri Perhubungan Nomor 142 Tahun 2016;
5. Peraturan Menteri Perhubungan Nomor PM 189 Tahun 2015 tentang Organisasi dan Tata Kerja Kementerian Perhubungan sebagaimana telah diubah terakhir dengan Peraturan Menteri Perhubungan Nomor 86 Tahun 2016;

MEMUTUSKAN :

Menetapkan: PERATURAN DIREKTUR JENDERAL PERHUBUNGAN UDARA TENTANG PETUNJUK TEKNIS PERATURAN KESELAMATAN PENERBANGAN SIPIL 8900-4.3 (*STAFF INSTRUCTION 8900-4.3*) TENTANG PERSETUJUAN PERBAIKAN DAN PERUBAHAN UTAMA (*STAFF INSTRUCTION APPROVAL OF MAJOR REPAIRS AND ALTERATIONS*).

Pasal 1

Memberlakukan Petunjuk Teknis Peraturan Keselamatan Penerbangan Sipil 8900-4.3 (*Staff Instruction 8900-4.3*) tentang Persetujuan Perbaikan dan Perubahan Utama (*Staff Instruction Approval Of Major Repairs and Alterations*) sebagaimana tercantum dalam Lampiran yang merupakan bagian tak terpisahkan dari Peraturan ini.

Pasal 2

Pada saat Peraturan ini mulai berlaku, ketentuan dalam Volume 2 Bab 1 Peraturan Direktur Jenderal Perhubungan Udara Nomor SKEP/44/III/2010 tentang *Staff Instruction 8300 Airworthiness Inspector's Handbook*, dicabut dan dinyatakan tidak berlaku.

Pasal 3

Direktur Kelaikudaraan dan Pengoperasian Pesawat Udara mengawasi pelaksanaan Peraturan ini.

Pasal 4

Peraturan Direktur Jenderal ini mulai berlaku sejak tanggal ditetapkan.

Ditetapkan di : JAKARTA

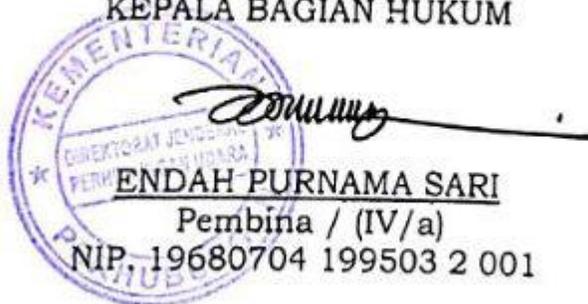
Pada tanggal : 8 MARET 2018

DIREKTUR JENDERAL PERHUBUNGAN UDARA

ttd

Dr. Ir. AGUS SANTOSO, M. Sc

Salinan sesuai dengan aslinya
KEPALA BAGIAN HUKUM



Staff Instruction

SI 8900 – 4.3

APPROVAL OF MAJOR REPAIRS AND
ALTERATIONS

Amendment : 0

Date :

REPUBLIC OF INDONESIA – MINISTRY OF TRANSPORTATION
DIRECTORATE GENERAL OF CIVIL AVIATION
JAKARTA – INDONESIA

AMENDMENT RECORD LIST

| Amendment No. | Issue Date | Reference |
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FOREWORD

1. PURPOSE : This Staff Instruction is prepared for use and guidance of DGCA inspector, AOC Holder, AMO Holder and applicant dealing with DGCA for approval major repair and major alteration.
2. REFERENCES : This Staff Instruction should be used in accordance with the applicable regulations.
3. CANCELLATION : Staff Instruction SI 8300 Volume 2 Chapter 1 is cancelled.
4. AMENDMENT : The amendment of this Staff Instruction shall be approved by the Director General of Civil Aviation.

DIRECTOR GENERAL OF CIVIL AVIATION

ttd

Dr. Ir. AGUS SANTOSO, M.Sc.

Salinan sesuai dengan aslinya
KEPALA BAGIAN HUKUM

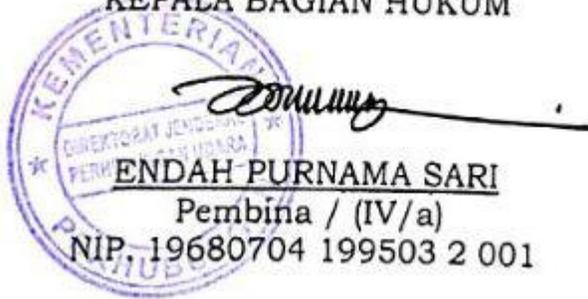


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CHAPTER 1 – INTRODUCTION

1. OBJECTIVES

This Staff Instruction contains DGCA specific guidance concerning authority and authorization to perform approval of major repairs and alterations and to approve certain Aircraft Flight Manual Supplement (AFMS)/Rotorcraft Flight Manual Supplement (RFMS)/Supplemental Aircraft Flight Manual (SAFM) associated with alterations.

This Staff Instruction also provides guidance in determining the category of a repair or alteration and ensuring that the aircraft can be returned to service in accordance with approved technical data.

2. GENERAL

A. Definitions

- (1) Aircraft: For the purposes of this chapter, means aircraft, aircraft engine, propeller, appliances and any component thereof.
- (2) Alter: To change or modify.
- (3) Acceptable Data. Data that you can reasonably expect the DGCA to find acceptable for the purpose it was created.
- (4) Approval: An approval which is given by DAAO Engineer (DGCA) for the engineering data, to substantiate compliance of the design change with the certification basis which is applicable to the product.
- (5) Approval for Return to Service. The approval given by an appropriately rated person that enables an aircraft to be returned to service.
- (6) Approved data: is information contained in Authoritative documents, such as TC and STC, including equivalent foreign documents, which have been validated by DGCA where the data can be used to substantiate major repairs/major alterations, derived from the following:
 - Type Certificate Data Sheets
 - Supplemental Type Certificate (STC) data, provided that it specifically applies to the item being repaired/altered
 - Airworthiness Directives (AD)
 - Airframe, engine, and propeller manufacturer's maintenance manuals or instructions.

- Appliance manufacturer's manuals or instruction, unless specifically not accepted by the DGCA
- DGCA Form 21-09, Major Repair or Alteration, when the specified data has been previously approved and will be used as a basis for an approval
- Approved Structural Repair Manuals (SRM), only as a source of approved data for a major repair.
- Parts Manufacturer Authorization (PMA), is considered approved data for the part only, an STC or Engineering Approval may be required for the actual installation
- Technical Standard Order Authorization (TSOA)
- Designated Engineering Representative (DER) approved data, only within authorized limitations
- Foreign bulletins, when approved by the Foreign Civil Aviation Authority (FCAA)
- Data describing an article or appliance used in an alteration which is under a TSO or equivalent. As such, the conditions and tests required for TSO, or equivalent, approval of an article are minimum performance standards. The article may be stalled only if further evaluation by the operator (applicant) documents an acceptable installation which may be approved by the DGCA
- Data describing a part or appliance used in an alteration which is DGCA-approved under a Parts Manufacturer Approval (PMA). (An STC or Engineering Approval may be required to obtain a PMA as a means of assessing airworthiness and/or performance of the part.)

Note: Installation eligibility for subsequent installation or reinstallation of such part in a type-certificated aircraft, other than the aircraft within which airworthiness or appliance was originally demonstrated is acceptable, provided the part or appliance meets its performance requirements and is environmentally and operationally compatible for installation. The operator (applicant) must provide evidence of previously approved installation by TC, STC, or a Engineering Approval (DAC Form 21-09) on DAC

Form 43-337 which will serve as a basis for "follow-on" approval.

- Service bulletins and letters or similar documents which are specifically approved by the DGCA (under a TSO, PMA, or other type-certificated basis)
 - Foreign bulletins as applied to use on an Indonesian.-certificated product made by a Foreign Manufacturer who is located within a country with whom a Bilateral Agreement is in place and by letter of specific authorization issued by the Foreign Civil Air Authority
 - Other data approved by the DGCA.
- (7) Approved Technical Data. The data that describes and substantiates a major repair or alteration and that has been approved by the DGCA or an authorized representative for a specific application.
- (8) Data: Information that supports and/or describes the alteration or repair, including the following:
- Technical description,
 - Compliance check list,
 - Drawings, sketches, and/or photographs including material/parts,
 - Analysis (structural, electrical, safety, etc.)
 - Engineering Orders,
 - Operating limitations,
 - Instructions for continued airworthiness if any,
 - Weight & balance data,
- (9) Major alteration: An alteration not listed in the aircraft, aircraft engine, or propeller specifications that also fits one or more of the following:
- Might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualifies affecting airworthiness
 - Is not done according to accepted practices or cannot be done by elementary operations
- (10) Major repair: A repair that fits one or more of the following:
- If improperly done, might appreciably affect weight, balance, structural strength, performance, powerplant operation,

flight characteristics, or other qualities affecting airworthiness

- Is not done according to accepted practices or cannot be done by elementary operations

(11) Minor alteration: Any alteration that is not classified as a major alteration.

(12) Minor repair: Any repair that is not classified as a major repair.

(13) Return to service: The action of making an aircraft operational, after approval has been granted by appropriately rated personnel.

B. Data Requirements and Coordination

(1) The source of data presented by an operator is strictly the operator's responsibility. DGCA Engineers/Inspectors should not obtain nor provide data for the operator's use. Source, cost, and other matters concerning an operator's acquisition of data, presented as part of an alteration approval action, should not be questioned.

(2) Acceptable data that may be used on an individual basis to obtain approval are:

- Manufacturer's technical information (e.g., manuals, bulletins, kits, etc.)
- DGCA Engineering Approvals

C. Designated Engineering Representatives (DER). If an appropriately rated DER is employed by the operator, the operator should consult with the DER and DER will coordinate with DGCA Engineers.

(1) The Designated Engineering Representative may be limited to technical areas that do not fully cover the entire project. Any area not covered by this approval must be reevaluated by the DGCA Engineering.

(2) The Designated Engineering Representative should not be permitted to make any determination as to which inspections are necessary for the pertinent alteration or repair since this activity is outside the scope of the DER's authorization.

(3) Designated Engineering Representatives do not have authority, by virtue of their delegation, to:

- Grant field approvals or otherwise "sign off" an DGCA Form 43-337 in any way
- Issue Supplemental Type Certificates

- Grant data approvals by signing log books or other similar documents

Note: Only one manufacturer's DER's may submit data to the appropriate DGCA for approval on DGCA Form 21- 09.

3. AUTHORIZATION

DGCA Inspector authorization to perform approvals and approve AFMSs is managed by Sub Directorate of Engineering, DAAO-DGCA after verification that the inspector has satisfied all prerequisites. The prerequisites are:

- Knowledge of the regulatory requirements of CASR parts 21, 23, 25, 27, 29, 43, and 65, as applicable.
- Successful completion of the course with subject engineering side refer to the SI 8900-1.3 Inspector Training System.
- Successful completion of the DGCA training course FCN 6203, Aircraft Major repair and Alterations.

4. REQUIRED ENGINEERING APPROVAL

A. Many alterations are actually major design changes and will require a STC. Previously unapproved major changes to structural strength, reliability, and operational characteristics affect the airworthiness of the product and therefore require engineering approval. Typical major alterations in this category include the following:

- (1) Increase in gross weight and/or changes in center of gravity range
- (2) Installation, changes, or relocation of equipment and systems that may adversely affect structural integrity, flight, or ground handling characteristics of the aircraft
- (3) Any change (alteration) of movable control surfaces that may adversely disturb the dynamic and static balance, alter the contour, or make any difference (plus or minus) in the weight distribution
- (4) Change in control surface travel outside approved limits, control system mechanical advantage, location of control system component parts, or direction of motion of controls
- (5) Changes in basic dimensions or external configuration of the aircraft, such as wing and tail platform or incidence angles,

canopy, cowlings, contour or radii, or location of wing and tail fairings

- (6) Changes to landing gear, such as internal parts of shock struts, length, geometry of members, or brakes and brake systems
- (7) Any change to main-folding, engine cowling, and/or baffling that may adversely affect the flow of cooling air
- (8) Changes to primary structure that may adversely affect strength or flutter and vibration characteristics
- (9) Changes to systems that may adversely affect aircraft airworthiness, such as:
 - Relocation of exterior fuel vents
 - Use of new type or different hydraulic components
 - Tube material and fittings not previously approved
- (10) Changes to oil and fuel lines or systems that may adversely affect their operation, such as:
 - New types of hose and/or hose fittings
 - Changes in fuel dump valves
 - New fuel cell sealants
 - New fuel or oil line materials
 - New fuel or oil system components
- (11) Any change to the basic engine or propeller design controls, operating limitations, and/or unapproved changes to engine adjustments and settings having an affect on power output
- (12) Changes in a fixed fire extinguisher or detector system that may adversely affect the system effectiveness or reliability, such as:
 - Relocation of discharge nozzle or detector units
 - Use of new or different detector components in new circuit arrangements
 - Decreasing amount or different type of extinguishing agent
- (13) Changes that do not conform to the minimum standards established in a Technical Standard Order under which a particular aircraft component or appliance is manufactured

Note:

Meet the minimum standards established in a Technical Standard Order" means that the equipment does not have to have TSO approval, but only needs to meet the requirements set by the TSO.

- (14) Modifications to approved type (TSO or equivalent approval) radio communications and navigational equipment that may adversely affect reliability or airworthiness, such as:
- Changes that deviate from the vacuum tube or semiconductor manufacturer's operating limitations
 - Any changes to IF frequency
 - Extension of receiver frequency range above or below the manufacturer's extreme design limits
 - Major changes to the basic design of low approach aids
 - Changes that deviate from the design environmental performance
- (15) Changes to aircraft structure or cabin interior of aircraft that may adversely affect evacuation of occupants in any manner
- B. Engineering assistance and advice must be requested when working in areas that include:
- Use of synthetic covering material
 - Substitution of parts
 - Processes on which insufficient information is available
 - New chrome plating applications
 - New titanium applications
 - Ceramic coatings
 - New magnesium applications
 - Use synthetic resin glues
 - New stripping or plating coating
 - New welding of certain types of propeller or engine parts
 - Application of Technical Standard Orders to specific installations
 - Alternative means or extensions for complying with Airworthiness Directives
 - Any change to a required aircraft instrument system
 - Any other complex special process that if not properly performed could have a adverse effect on the integrity of the product
- C. The operator should make a request for engineering evaluation/assistance and/or approval of non-approved engineering data for approvals
- D. When the alteration or repair date file is forwarded to engineering for review, a memorandum of transmittal must accompany the file. When necessary, the transmittal will provide pertinent and detailed

information not contained in the submitted data, such as the airworthiness inspector's recommendations, viewpoints, and specific request for advice.

- E. When engineering assistance is requested for approval purposes, the inspector who will complete the approval will normally be expected to coordinate and implement the assistance requested by engineering.
- F. The inspector should be aware that the data approved by DGCA engineering may not cover all the steps and procedures needed to accomplish the alteration or repair. An Approval by the inspector may be required for the completion of the task.

5. INCOMPLETE AND/OR PIECEMEAL INSTALLATIONS

- A. Incomplete or piecemeal installation approvals are intended to approve partial major modifications on aircraft that will be operated for an unspecified period of time. Aircraft having an incomplete equipment installation may be released for service only if the following has been accomplished:
 - The alteration data has been DGCA-approved
 - The incomplete/piecemeal alteration has been determined to not affect the safe operation of the aircraft
 - The equipment installed remains deactivated and has placards affixed to prevent use
 - The weight and balance reflects the incomplete installation
 - The maintenance records have been completed and signed for the work that was actually accomplished
- B. In order to maintain the validity of the Certificate of Airworthiness, the approval for return to service must be conducted by an authorized person as defined in CASR 43.7.
- C. The operator should be advised that alterations accomplished on a piecemeal basis may be subject to a complete conformity inspection when the entire project is presented for approval.

Note: The formal approval of each step of the alteration could eliminate this possibility and may provide for the utilization of equipment which, in itself, could be used safely.

6. FLIGHT TEST AND OPERATION CHECK REQUIREMENTS

- A. An alteration or repair requiring a change to a flight manual or operation limitation must be coordinated with the appropriate engineering personnel.
- B. Alterations requiring a flight manual supplement or operations limitations changes must be coordinated with the Sub Directorate of Engineering.
- C. Any alteration or repair that may have appreciably changed the aircraft flight characteristics or substantially affected its operation in flight will be operationally checked in accordance with CASR 91.167 and the results recorded on the aircraft records.
- D. If an operational check is unsatisfactory as a result of using approved data, additional data must be developed by the operator.

7. FLIGHT MANUAL SUPPLEMENT APPROVALS

- A. Signing Authority.
 - 1) DGCA Engineer to review and approve certain AFMSs.
 - 2) DGCA policy authorizes approval of AFMSs associated with specific types of alterations that are based on data from a prior type certificate (TC) or Supplemental Type Certificate (STC) approval and where the AFMS is based on the one that was approved as part of the TC or STC. A list of those alterations is maintained as part of the Major Repair and Alteration Data Approval Job Aid.
- B. Procedures.
 - 1) A flight manual supplement may be submitted for approval with or without a request to approve other data associated with the alteration. If the proposed AFMS is based on an original AFMS that was approved as part of the TC or STC, the applicant must submit the original and any other supporting data necessary to evaluate the proposed AFMS. Approval of the AFMS will be indicated on the cover page of the manual. Block 3 of the associated DGCA Form no. 43-337, Return To Service After Embodiment Of Alteration Or Major Repair will be stamped only if additional data is being approved.
 - 2) At the conclusion of the review and approval of the AFMS, the applicant is responsible for ensuring that the AFMS is recorded in block 8, "Description of Work Accomplished," of DGCA Form no. 43-337 by reference to the approval date, document name, and number.

Such entry must indicate that the AFMS is inserted into or affixed to the AFM or pilot's operating handbook (POH).

C. Task Outcomes.

- 1) Approval of Proposed AFMS. Sign and date the cover page and return copies to the applicant.
- 2) Denial of Proposed AFMS. Terminate the process by notification in writing to the applicant. This notification should include the reason for denial. The applicant should be given the opportunity to make corrections and resubmit as necessary.

8. DGCA FORM 21-09, MAJOR REPAIR AND MODIFICATION

A. Data Approval

- (1) Data approval issued for one type aircraft is applicable to only the aircraft described in DGCA Form 21-09. This data cannot automatically be used as approved data for other aircraft. The data may be used only with the approval of the DGCA as the basis for obtaining approval on other aircraft.
- (2) Data approval issued for duplication of identical aircraft may be used as approved data only when the identical alteration is performed on an aircraft of identical make, model, and series by the original modifier.
- (3) When the alteration has been performed by persons other than the original modifier, this data may be used as the basis for obtaining approval on other aircraft.

B. Alteration Approval. Alteration approval, issued for one aircraft, is applicable only to the aircraft described in DGCA Form 21-09. This alteration cannot automatically be applied to other aircraft. The alteration may be used only with the approval of the Sub Directorate of Engineering as the basis for performing alterations on another aircraft.

C. Data Deviation. Alterations that use data which is different from previously approved data require new or additional approval.

D. Alterations to Fuel Tanks and/or Systems. Within 24 hours of receipt of an DGCA Form 21-09 that describes a modification to an aircraft fuel system or shows additional fuel tanks installed in the passenger or baggage compartment, accomplish the following:

- (1) Review the form to ensure that all airworthiness requirements are met

- (2) Ensure that all applicable sections, signatures, and dates are affixed to the form
- (3) Ensure that the office identifier and the inspector's initials are entered in the place provided for in the upper right-hand corner of the form
- (4) Submit the form to DGCA.

9. PROCEDURES

A. Review Operator Submitted Data. Engineers must determine that the data supplied is complete enough to proceed with evaluation of proposed alteration or repair.

- (1) Review and evaluate the following, prior to the operator starting the actual work:
 - (a) A formal application submitted on one of the following:
 - DGCA Form 21-09 completed in duplicate
 - Other administrative forms used by a manufacturer or operator that are acceptable to the DGCA
 - (b) Data that may include, but is not limited to, the following:
 - Detailed description of the proposed alteration or repair
 - Detailed design standards such as methods, sketches, drawings, stress analyses, photographs, electrical load analyses, etc.
 - Testing procedures or methods to meet certification and/or operating rules, such as flammability, carbon monoxide, and noise requirements
 - (c) The description of proposed alteration or repair to ensure that it correctly and accurately describes the alteration or repair
 - (d) Detailed design standards, to ensure that the operator has considered all applicable design standards and has analyses to substantiate the findings in this regard. The standards must consider at least the following:
 - The certification basis (fail safe, damage tolerance, etc.)
 - Compliance check list
 - Any hazards that may affect the aircraft or its occupants
 - Weight and balance computations
 - Operating limitations
 - Any other factors affecting safety or airworthiness

- (e) Test procedures, to ensure that they include all tests necessary to substantiate that the alteration or repair meets applicable certification requirements and are appropriate to the alteration or repair.
 - (f) Instructions for continued airworthiness, if applicable
 - (g) Supplement to flight manual if applicable
- (2) If data is not complete, the operator must supply any additional information needed.
- B. Evaluate the Proposal to Determine Compatibility with the Current Aircraft Configuration. Make a preliminary evaluation of the proposed alteration or repair and an inspection of the aircraft, as required. Accomplish at least the following, as applicable:
- (1) Review aircraft records for previous alterations and repairs that may have an affect on the proposed alteration or repair
 - (2) Review maintenance and inspection procedures to determine that the alteration or repair is referenced
 - (3) Inspect aircraft for the following:
 - Previous alterations or repairs that may not have been recorded
 - Compatibility of previous alterations or repairs with intended alterations or repairs
 - (4) If a determination is made that the proposed alteration is beyond the scope of an approval, advise the operator that DGCA engineering evaluation is necessary. Assistance to the operator will include:
 - Furnishing an Application for Type Certificate, Production Certificate, or Supplemental Type Certificate, as applicable
 - Furnishing DGCA Form 21-09.
 - Advising that supporting data must be attached
 - (5) If the inspector determines that assistance from engineering is needed for approving a major repair, the inspector will contact DGCA engineering. Coordination with the operator will include:
 - Requesting that the operator provide all supporting data
 - Cautioning against proceeding with the repairs prior to receiving engineering approval
- C. Evaluate Alteration or Repair After Data Approval or Acceptance, When Appropriate. Schedule a conformity inspection with the operator to verify workmanship and compliance to accepted or approved data.

- (1) The inspection must account for activities during and after the alteration or repair process. This includes but is not limited to the following:
 - Proof of loading structure
 - Operational tests and checks
 - Any other techniques or methods as deemed necessary
 - (2) If, during the conformity inspection, it is determined that the operator cannot comply with the data submitted, the operator must revise the data accordingly.
 - (3) When an operator's data is "data approved only", check the operator's workmanship, conformity, and compliance with the alteration or repair data as part of normal surveillance.
- D. Review the Approval for Return to Service. The aircraft must be approved for return to service by a person authorized by CASR 43.7 by completing block 7 of DGCA Form 43-337 and making a maintenance record entry.

10. TASK OUTCOMES

- A. File
- B. Completion of this task can result in the approval of data, alteration, or repair. DGCA processing of the forms will depend upon whether or not the operator used previously approved data.
 - (1) Approved data. If the data used in performing the major repair or major alteration was previously approved, the operator will complete Block 7, "Approval for Return to Service." The original will be kept by the aircraft owner and the duplicate will be given to the DGCA for processing.

Note: For parts, like a wing, that will not be used immediately, attach the DAC Form 43-337 to the part until needed (ref. AC 43-9 instruction for completion of DGCA Form 43-337)
 - (2) Unapproved data. When the data used in the major repair or alteration was not previously approved, the operator will submit both copies of the form to the DGCA for evaluation. If the repair or alteration data complies with regulations and is in conformity with accepted industry practices, record data approval by entering the appropriate statement in DGCA Form 21-09.

CHAPTER 2 – DATA

1. INTRODUCTION

This chapter provides guidance related to the sources, use, and approval of data used to substantiate an aircraft major repair or major alteration.

2. TYPE OF TECHNICAL DATA

In the context of this Staff Instruction, technical data means the drawings, specifications, and other material that provide the description and substantiation of an aircraft repair or alteration. There are several ways in which data may be labeled and described.

A. **Descriptive Data.** Descriptive data describes the design of the repair or alteration. Descriptive data should include reference to installation methods, materials, fabrication processes, dimensions, and tolerances. It may also include intended function and how the alteration is appropriate to the aircraft.

B. **Substantiating Data.** Substantiating data shows that the design complies with the applicable regulations and that all appropriate technical considerations have been addressed.

C. **Acceptable Data.**

1) Acceptable data means data acceptable to the DGCA. The terms “acceptable to the DGCA” appear numerous times in the maintenance regulations. They refer to any item addressed in the regulation (e.g., data; methods, techniques, and practices; manual contents; tools; materials; equipment; etc.) that must meet regulatory standards. If the regulation requires only that an item must be “acceptable to,” it does not necessarily follow that the DGCA requires the item to have specific DGCA review and acceptance before it may be used. A person making a determination of whether an item is “acceptable to” the applicant must ensure the item addresses specific applicable section(s) of the regulations.

2) Items required by regulation to be “acceptable to” the DGCA (unless otherwise required by regulation to be approved) do not necessarily require DGCA review and acceptance prior to a person using the item. A person using an item that must be acceptable to the DGCA should be able to demonstrate that the item meets all

applicable regulatory requirements. If, however, upon subsequent review of the item, the DGCA believes the item is not acceptable, the applicant has the burden of demonstrating its unacceptability in any related enforcement matter. In any event, if an DGCA Inspector finds an item unacceptable to the DGCA, the DGCA Inspector must immediately inform the maintenance provider/certificate holder, in writing, of the potential noncompliance and request compliance.

D. **Approved Data.** Approved data means data approved by the DGCA. The term “approved” means approved by the DGCA or any person to whom the DGCA has delegated its authority in the matter concerned, or approved under the provisions of a bilateral agreement between the Republic of Indonesia and a foreign country or jurisdiction.” For the DGCA Inspector, “approved” or “approved by” means the item (e.g., data; methods, techniques, and practices; manual contents; tools; materials; equipment; etc.) is required to be and has been reviewed and formally approved by the DGCA (or appropriate Civil Aviation Authority (CAA)). Approvals are granted only by letter, by a stamp of approval, by the issuance of operations specifications (OpSpecs), or by other official means. All data used to substantiate a major repair or alteration, regardless of the source, must be approved before being used.

E. **Previously Approved.** This term refers to data that was approved for a specific purpose, such as an STC or major alteration on an aircraft, powerplant, propeller, or appliance. All previously approved data has to be applicable to the requested major repair or alteration. All differences, deviations, inclusions, and exclusions between the original use of the data and the current one must be considered before the data can be approved for use. Table 2-1, Possible Resources for Approved Data Relevant to Major Repairs or Major Alterations, identifies possible sources of previously approved data that may be relevant to a major repair or major alteration. Table 2-1 is not all-inclusive.

1) Previously approved data on DGCA Form 43-337 for a single product identified in block 1 may be used to substantiate a similar repair or alteration on a different product or article, but it must be evaluated for each new application to determine if, and how much

of, the data can be directly approved. Reference to the previous DGCA Form 43-337 itself does not constitute substantiation; the actual data must be available if requested.

- 2) Previously approved data may also refer to data that has been approved for use on multiple products or articles. In this case, further review or approval of that data would not be necessary for the products or articles identified in the approval.

Table 2-1. Possible Resources for Approved Data Relevant to Major Repairs or Major Alterations

TCDS (Type Certificate Data Sheet)

Repair data approved by DGCA. Acceptable Methods, Techniques, and Practices—Aircraft Inspection and Repair, may also be used as approved data, all repair data are listed in block 8 of DGCA Form 43-337 when the user has determined that it is:

- Appropriate to the product that receives repairs;
- Directly applicable to the repair being made; and
- Not contrary to the airframe, engine, propeller, or appliance manufacturer's repair data or instructions.

Alteration data approved by DGCA, Acceptable Methods, Techniques, and Practices—Aircraft Alterations, approved alteration data for major alterations listed in block 8 of DGCA Form 43-337 when the user has determined that it is:

- Appropriate to the product being altered;
- Directly applicable to the alteration being made; and
- Not contrary to the airframe, engine, propeller, product, or appliance manufacturer's data.

ADs.

Appliance manufacturer's manuals or instructions, unless specifically not approved by the DGCA, may be used as approved data for major repairs.

Data describing an article used in an alteration which is DGCA-approved under a Parts Manufacturer Approval (PMA).

Data developed during the DGCA authorization of an article for production under a Technical Standard Order (TSO) when applicable to the repair or alteration intended.

DER-approved data, including repair specifications, within the limitations listed on the DER's authorization.

DOA-approved data, within the limitations of the DOA holder's procedures manual.

Structural Repair Manuals (SRM) form manufacturer.

Manufacture Service Bulletins (SB) and Service Letters (SL) or similar documents, Use of Manufacturers' Maintenance Manuals.

Original aircraft manufacturer's service and repair data in accordance with current regulations, for major repairs on non-pressurized elements of aircraft that are 12,500 pounds or less maximum certificated takeoff weight

TCDS (Type Certificate Data Sheet)

provided the person intending to perform such repair determines that:

- Data is appropriate for the specific make and model aircraft being repaired;
- Data is applicable to the specific make and model aircraft being repaired; and
- The repair does not deviate from the manufacturer's methods, techniques, and practices.

STC data, including that for approved model list (AML) STCs, may be used, if applicable, to substantiate a major alteration on a different aircraft.

DGCA Form 43-337, used by the original alterer for approval of multiple identical aircraft.

- 1) Previously approved data may not be directly applicable to repair or alteration of certain products or appliances. For example, such data may identify a location to which an appliance or component part cannot be located due to a mounting conflict or configuration differences. Relocation may be considered a deviation from the previously approved data. In these instances, the DGCA Inspector must consider the deviation and, if appropriate, may consult with the Sub Directorate of Engineering (DAAO) responsible for issuance of the TC or STC. Consideration for approval may occur provided that the applicant can show that the alteration meets the certificated characteristics with regard to aerodynamic function, structural strength, resistance to vibration, deterioration, and that other qualities affecting airworthiness are not adversely affected.
- 2) Data that was approved for alteration of a particular product type (e.g., CASR part 25 aircraft) may be used to provide substantiation for a similar alteration on a different product type (e.g., CASR part 23 aircraft). Typically, data that meets a more stringent airworthiness standard when applied to an alteration requiring a less stringent airworthiness standard is normally acceptable. The same is not true for the application of a less stringent airworthiness standard to an alteration requiring a more stringent airworthiness standard—while not specifically prohibited, it is not recommended. For example:
 - a) STC for a CASR part 23, Single Engine Land aircraft to another aircraft of the same make and model. In this situation, there is

a strong probability that the data developed for the first aircraft is directly applicable to the second.

- b) STC for a part 23, Single Engine Land aircraft to a CASR part 23 aircraft of a different make and model. In this situation, the two aircraft would have to be compared for equivalency, and depending on that determination, the data may be directly or partially applicable.
 - c) STC for a CASR part 23, Single Engine Land aircraft to a CASR part 25 aircraft. In this situation, since there are two different airworthiness standards involved, an extensive evaluation must be performed in order to ensure that the data for the first aircraft meets the requirements for the second.
- 3) Use of STC data to substantiate a major repair or major alteration requires extra considerations. Exercise caution when approving STC data for alteration of an aircraft of a different type design. STCs are issued for major changes in type design of a specific product design. Incorporation of that alteration on a different design will likely introduce a major type design change to that product. This would require application for an STC or addition of that model to an approved model list STC. If an STC is being installed directly, further approval may not be required. If the STC data is being used to do something similar to “part” of the STC, then the existence of the STC may be adequate substantiation, but the applicant also needs descriptive data. If the applicant is not the STC holder, the applicant must have written permission from the STC holder to alter an aircraft based on the STC.
- 4) Care should be taken regarding the use of any previously approved data used in a different application. Even in situations where the reuse of data appears appropriate, there are many things to consider before approving the data for the new application, including:
- a) Differences in certification basis. The data may have been originally approved under a certification basis different than the one for the new application of the data. Different amendments of regulations (either newer or older) or new regulations may be applicable to the new application.

- b) ADs. The repair or alteration may affect systems or structures that are the subject of an AD. There may be ADs that are applicable to the new application that were not applicable to the original application. In these situations, an alternate method of compliance (AMOC) may be appropriate.
- c) Special conditions. The original approval may have included special conditions that affect the proposed alteration.
- d) Equivalent Level of Safety (ELOS) findings. The original approval may have been based on an ELOS finding.
Note: The DGCA Inspector must be especially attentive to the existence of any special conditions or Equivalent Level of Safety (ELOS) findings that apply to the aircraft and their impact on the proposed alteration.
- e) Exemptions. The original approval of the data may have been based on an exemption to regulations. If so, the applicable rule must be complied with or a request for an exemption must be submitted.
- f) Any adverse interaction with other changes to the product must be addressed.
- g) Any added function.
- h) Any differences in selected or programmed functions.

CHAPTER 3 MAINTENANCE INFORMATION AND INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

1. APPROVAL DATA PACKAGE

- A. **Continued Airworthiness.** The DGCA has determined that the major repair or major alteration data package must address how the major repair or alteration affects continued airworthiness. If the major repair or alteration does not affect continued airworthiness, then the applicant must state such. If the major repair or alteration affects the Instructions for Continued Airworthiness (ICA), then the applicant must develop maintenance information which addresses those changes in the maintenance program (MP). If the major repair or alteration affects the Airworthiness Limitation Section (ALS) of the Instructions for Continued Airworthiness (ICA), then that maintenance information that affects the Airworthiness Limitation Section (ALS) must be approved by the DGCA.
- B. **Maintenance Information.** The purpose of maintenance information is to provide adequate instructions to maintain the altered product in an Airworthy condition.
- C. **Maintenance Information Checklist.** The maintenance information checklist (see Table 3-1, Major Repair or Major Alteration Maintenance Information Checklist) is a guide for the applicant who develops maintenance information in accordance with methods, techniques, and practices acceptable to the DGCA.
- D. **Advantages of Maintenance Information Checklist.** The maintenance information provides the aircraft owner or operator with the following advantages when it is included in block 8 of DGCA Form 43-337:
- 1) The major alteration and reference to the maintenance information are contained in one document;
 - 2) The maintenance information becomes a permanent aircraft record, as required by CASR Part 91.417(a)(2)(vi); and
 - 3) The owner or operator can contact the DGCA for a replacement DGCA Form 43-337 if the maintenance information is lost or destroyed. The owner or operator may also forward a previously completed DGCA Form 43-337 and the associated maintenance information if it is not currently in the registry.
- E. **Future Inspections.** The additional reference to the presence of maintenance information as part of the major alteration in the aircraft's maintenance entry will ensure that maintenance personnel appropriately

address maintenance of the major repair or alteration during future inspections.

2. APPROVAL OF MAJOR ALTERATIONS UNDER THE CIVIL AVIATION SAFETY REGULATIONS (CASR).

For approved major alterations to aircraft, engines, and propellers certificated under the CASRs, the maintenance information must meet the original certification basis. In cases where the major alteration adds new items which the CASRs requirements did not address, the major alteration must meet the applicable CASR requirements. The checklist in Table 3-1 provides acceptable guidance for these types of installations that require additional maintenance, or inspections not covered by the Original Equipment Manufacturer’s (OEM) instructions.

Table 3-1. Major Repair or Major Alteration Maintenance Information Checklist

| | | | | |
|----------------|---|------------|--------------|------------|
| A/C Make_____ | | Model_____ | S/N_____ | Reg. _____ |
| Revision:_____ | | Date:_____ | System:_____ | |
| Item | Subject | | | |
| 1. | Introduction: This section briefly describes the aircraft, engine, propeller, or component that has been altered. Include any other information on the content, scope, purpose, arrangement, applicability, definitions, abbreviations, precautions, units of measurement, referenced publications, and distribution of the maintenance information, as applicable. | | | |
| 2. | Description: Describe the major alteration and its functions, including an explanation of its interface with other systems, if any. | | | |
| 3. | Control, operation information, or special procedures, if any. | | | |
| 4. | Servicing information: Such as types of fluids used, servicing points, and location of access panels, as appropriate. | | | |

| A/C Make _____ | Model _____ | S/N _____ | Reg. _____ |
|----------------|--|-----------|------------|
| 5. | Maintenance instructions: Such as recommended inspection/maintenance periods in which each of the major alteration components are inspected, cleaned, lubricated, adjusted, and tested, including applicable wear tolerances and work recommended at each scheduled maintenance period. This section can refer to the manufacturer's instructions for the equipment installed where appropriate (e.g., functional checks, repairs, and inspections). It should also include any special notes, cautions, or warnings, as applicable. | | |
| 6. | Troubleshooting information: Information describing probable malfunctions, how to recognize those malfunctions, and the remedial actions to be taken. | | |
| 7. | Removal and replacement information: This section describes the order and method of removing and replacing products, parts, and any necessary precautions. This section should also describe or refer to manufacturer's instructions to make required tests, trim checks, alignment, calibrations, center of gravity (CG) changes, lifting, or shoring, etc., if any. | | |
| 8. | Diagrams: Of access plates and information, if needed, to gain access for inspection. | | |
| 9. | Special inspection requirements: Such as x ray, ultrasonic testing, or magnetic particle inspection, if required. | | |

Table 3-1. Major Repair or Major Alteration Maintenance Information Checklist (continued)

| | |
|-----|---|
| 10. | Application of protective treatments: To the affected area after inspection and/or maintenance, if any. |
| 11. | Data: Relative to structural fasteners such as type, torque, and installation requirements, if any. |
| 12. | List of special tools: Special tools that are required, if any. |

| | |
|-----|--|
| 13. | <p>For commuter category aircraft: The following additional information must be furnished, as applicable:</p> <p>A. Electrical loads.</p> <p>B. Methods of balancing flight controls.</p> <p>C. Identification of primary and secondary structures.</p> <p>D. Special repair methods applicable to the aircraft.</p> |
| 14. | <p>Recommended overhaul periods: Are required to be noted on the maintenance information when an overhaul period has been set by the manufacturer of a component or equipment. If there is no overhaul period, the maintenance information for item 14 should state, “No additional overhaul time limitations.”</p> |
| 15. | <p>Airworthiness Limitations Section (ALS): Include any approved airworthiness limitations (AL) identified by the manufacturer or DGCA (e.g., an STC incorporated in a larger approved major alteration may have an airworthiness limitations (AL)). The DGCA inspector will not establish, alter, or cancel ALs without coordinating with the appropriate Sub Directorate Engineering of DAAO DGCA. If there are no changes to the airworthiness limitations (AL), the maintenance information for item 15 should state, “No additional airworthiness limitations” or “Not applicable.”</p> |
| 16. | <p>Maintenance information is required to be acceptable to the DGCA. As such, changes should be documented by submitting the revised maintenance information along with the original DGCA Form 43-337 to the Directorate of Airworthiness and Aircraft Operations (DAAO). An entry in the aircraft records should indicate the current revision.</p> |

3. MAINTENANCE INSTRUCTION REQUIREMENTS.

The maintenance instruction requirements for a major alteration are very similar to those for an STC except that an applicant for an STC must produce **Instructions for Continued Airworthiness (ICA)**. Changes that affect the Airworthiness Limitations Section (ALS) must be approved by the **DGCA** or a qualified **DOA**. Changes that affect the certificated life limit of a part are major changes to type design and must not be approved. The vast majority of approved major alterations are simplistic in design and execution. Therefore, the applicant's maintenance information may not need as much detail as it would for a complicated STC.

4. CHANGE TO MAINTENANCE INFORMATION AFTER APPROVAL

If owners or operators wish to formally incorporate maintenance information developed for existing major alterations, they may do so using the revision process in checklist item number 16 in Table 3-1.

5. MAINTENANCE INFORMATION PROCEDURES.

A. Description of Maintenance Information. Each major alteration that requires additional maintenance or inspections not covered by acceptable OEM's instructions must have maintenance information prepared in accordance with methods, techniques, and practices acceptable to the DGCA. The description of the maintenance information prepared will be documented on DGCA Form 43-337. The DGCA Inspector, DER, or DOA will advise the applicant that the entry for the major alteration in the aircraft's maintenance records required by CASR 43.9 must also include a reference to the maintenance information and be identified by the approval date of the DGCA Form 43-337 on which the instructions are documented. The form will be kept in the aircraft's permanent records, in accordance with CASR 91.417(a)(2)(vi).

B. Supporting Data. If the applicant employs a DER or DOA to provide approved technical data to support a major repair or major alteration, then the applicant is responsible for ensuring that the DER or DOA is authorized to approve such technical data, as applicable to the repair or alteration. If the data, as approved, addresses the entire repair or alteration, and all of the requirements of CASR parts 21 and CASR Part 43 are met, there is no requirement for any further approval by the DGCA Inspector. If the repair or alteration data is approved solely by the DER, or DOA, but necessitates

maintenance instructions, the maintenance instructions should be prepared by the applicant and recorded in block 8 of DGCA Form 43-337.

6. DEVELOP THE MAINTENANCE INFORMATION.

- A. **Approval Request.** The applicant is to develop the maintenance information and present it in conjunction with the approval request.
- B. **Guidance.** The applicant should use Table 3-1 as a guide that will help ensure that all the applicable requirements are met.
- C. **Continued Airworthiness.** The maintenance information must include specific instructions that describe how to maintain the affected area in order to ensure continued airworthiness. For example, the maintenance information might include a new requirement for a special inspection to be accomplished during each 100-hour or annual inspection. Such maintenance information must also include installed appliances that may impact maintainability of the product or require periodic maintenance to ensure their continued performance. When appropriate, the maintenance information should also include specific instructions for determining excessive wear or deterioration, troubleshooting information, installation and removal procedures, and functional checks. Servicing requirements, such as recommended fluid change intervals or lubrication schedules, should also be included.
- D. **Maintenance Information Approval.** DGCA may approve the maintenance information developed. The maintenance information must contain:
 - 1) Inspection tasks and task intervals;
 - 2) Instructions and procedures to accomplish the tasks, which are contained in the Aircraft Maintenance Manual (AMM); and
 - 3) Protection and caution instructions and information, which are contained in the standard wiring practice manual (SWPM).

CHAPTER 4 AIRCRAFT FLIGHT MANUAL SUPPLEMENTS

1. GENERAL INFORMATION

This chapter provides guidance for approval of AFMS required for major repairs or alterations which affect the existing Aircraft Flight Manual (AFM).

2. AIRCRAFT FLIGHT MANUAL's (AFMs)

Aircraft operating procedures and performance limitations are provided in one of the following forms:

- AFM (including either airplane flight manual or Rotorcraft Flight Manual (RFM));
- Markings or placards; or
- Combinations of the above.

3. MANUAL SUPPLEMENTS.

Repairs or alterations that result in a change to limitations, procedures, performance, or loading information from the current AFM or placards require that revised or supplemental information is provided by one of the following methods:

- Supplemental Information.** If the aircraft has an AFM, the supplemental information must be provided in an AFMS or Rotorcraft Flight Manual Supplement (RFMS) or Supplemental Aircraft Flight Manual (SAFM). For the purposes of this guidance, AFMS include RFMS and SAFMs, as well. An SAFM is used to complement a pilot's operating handbook (POH), which may not have specific DGCA approval.
- Necessary Information.** If this is not practical, an SAFM should be created so that the necessary information is available to the pilot. Procedures for creating and approving an SAFM are the same as those for an AFMS.
- Presenting Supplemental Information.** The supplemental information may be presented as modified or additional markings and placards in aircraft that were TC'd before AFMs were required.
- Data from a Previous Approval.** Field approval of a major alteration based on data from a previous approval must include an AFMS if the previous approval provided for one. The supplement must contain the same pertinent details as the supplement approved under the original approval and be consistent with the format of that supplement and basic AFM.

4. SUPPLEMENT APPROVAL.

A. Methods of Approval. Approval of the supplement (including placards) is accomplished through one of the following methods:

- 1) Alterations that cause a change to the operating limits of the aircraft, aircraft engine, or propeller require coordination with the Sub Directorate Engineering DAAO for at least the approval of the supplement or placard that stipulates limitations of the aircraft.
- 2) Qualified DGCA Inspector with approval authorization may be specifically authorized by DGCA to review and approve certain AFMS. This is for alterations that are based on data from a prior TC or STC approval and where the AFMS is based on the one that was approved as part of the TC or STC. A list of those alterations is maintained as part of the Major Repair and Alteration Data Approval Job Aid.

Note: In general, the DGCA need approve only the changes to performance, operational conditions, or limitations and any abnormal or emergency procedures.

Note: The DGCA Inspector must be familiar with the airworthiness requirements for flight manuals appropriate to the product when approving the AFMS.

Note: The AFMS should also contain a “General” or “Systems Description” section that may be approved (or not) at the discretion of the DGCA Inspector. However, if a change in the General or Systems Description sections of the DGCA-approved AFM affects certain elements (e.g., the instrument layout or configuration by description or illustration), the DGCA Inspector must refer it to the Sub Directorate Engineering for approval.

- 3) An authorized DER or DOA may approve an AFMS or placards within their authority.

B. Repairs or Alterations Not Resulting in a Change. Repairs or alterations that do not result in a change to limitations, procedures, performance, or loading information may not require a supplement, or the supplemental information may consist of system operating instructions only.

C. Explanation of Operating Procedures. Alterations frequently include an AFMS to explain the operating procedures for a newly installed piece of equipment or system, or the equipment manufacturer’s operating manual containing detailed instructions may be incorporated by reference into the AFMS.

- D. **Operating Instructions.** Manufacturers' operating instructions for systems or equipment, such as those for navigation systems, that are included or referenced in the AFMS do not require specific approval; however, the AFMS itself must be approved, and the approval can be accomplished by a qualified DGCA Inspector.
- Note:** Inclusion of a reference to an operating manual in an AFMS, and requiring its carriage on board during flight, ensures that the information is available to the pilot.
- E. **Operational Limitations.** In some cases, operational limitations are not affected by an alteration. Additionally, no requirements may exist for the equipment or system to be installed. Therefore, an AFMS may not be necessary.
- F. **Granting Field Approval.** A qualified DGCA Inspector with approval authorization may review the language and grant field approval of an appropriately affixed placard (see CASR 23.1541, CASR 25.1541, CASR 27.1541, or CASR 29.1541) that specifically characterizes operating limitations or information such as that stipulating the use of certain equipment and systems. For examples of such placards—"Not For IFR" or "VFR Only"—refer to Kinds of Operations in CASR 23.1525, CASR 25.1525, CASR 27.1525, or CASR 29.1525.
- G. **Conditions to Consider an Alteration Minor.** If all of the following conditions are met, an AFMS is not required. For certain systems such as Global Navigation Satellite System (GNSS) for visual flight rules (VFR) use only, the alteration may be considered minor and DGCA Form 43-337 is not required:
- 1) Does not restrict, displace, or limit the use of required equipment;
 - 2) All new limitations can be addressed via placards;
 - 3) The aircraft performance is not negatively affected;
 - 4) Does not require a placard per TC or STC;
 - 5) VFR use only; and
 - 6) Is non-required equipment (refer to AC 20-138, Airworthiness Approval of Positioning and Navigation Systems).
- H. **VFR Operations.** For equipment limited to VFR, a readable placard must be installed in clear view of the pilot stating that the equipment is only to be used for VFR operations, unless the equipment automatically displays this message on start-up and pilot action is required to clear the message. An AFMS or RFMS is not required since the placard or display contains the equipment limitation.

5. APPROVAL PROCESS

- A. **Data Package Submittal.** In those cases where the DAAO-DGCA must approve the AFMS, the applicant submits the data package, including proposed AFMS, to the DAAO.
- B. **Verification.** When submitting the AFMS to the DAAO-DGCA for approval, the DGCA Inspector responsible for the approval must verify the applicant has conducted an analysis of the system and equipment operational conditions, limitations, abnormal and emergency procedures, and whether performance sections or paragraphs are compatible with instructions in the AFMS.
- C. **Review.** During DAAO review, the AFMS may be routed to the appropriate DAAO flight test personnel for review.
- D. **Documentation.** At the conclusion of review and approval of the AFMS or limitations placard (by the DAAO), the applicant is responsible for ensuring that the AFMS is recorded in block 8 of DGCA Form 43-337 by reference to the approval date, document name, and number. Such entry must indicate that the AFMS is inserted or affixed to the AFM or POH.
- E. **Subsequent Review and Approval.** The DGCA Inspector should advise the applicant that, if a manufacturer of installed equipment upgrades the equipment (e.g., changes the operating system software or associated hardware), it may invalidate the DGCA-approved AFMS and may require subsequent review and approval of a revised AFMS.

6. FORMAT AND CONTENT

- A. **Updated Information.** The AFMS or placards must contain any new or changed limitations, emergency or abnormal operating procedures, normal operating procedures, performance, and system operating instructions. The supplement must be consistent with the format of the basic AFM and applicable to the specific installation configuration for the installed equipment and systems. Approvals of AFMS should not contain conditional operation descriptions and need to be explicit for the configuration of the targeted aircraft.
- B. **Requirements.** Whether being approved directly by the DGCA Inspector or designee, or coordinated with the DAAO, the detail contained in the proposed AFMS must conform to the requirements described below.
- C. **Necessary Information.** The AFMS should include:

- 1) The aircraft manufacturer's name;
- 2) Model number;
- 3) Serial number; and
- 4) Registration number. The approved AFMS is applicable only to the specific serial number aircraft.

D. **Additional Information.** The following must also be included, as applicable:

- 1) Abnormal or emergency procedures;
- 2) Normal operating procedures;
- 3) Aircraft performance; and
- 4) Aircraft W&B and loading information.

E. **Placement of Placards.** Placards must be installed in clear view of the pilot and, as applicable, in proximity to the affected equipment. Refer to CASR 23.1541, CASR 25.1541, CASR 27.1541, or CASR 29.1541.

CHAPTER 5 FLIGHT EVALUATION AND FLIGHT TEST

1. INTRODUCTION.

This chapter provides guidance for flight evaluation and flight test requirements related to field approvals.

2. FLIGHT EVALUATION.

- A. **Operational Evaluation.** A flight evaluation, also referred to as flight check, is an operational evaluation of an aircraft or system after maintenance or alteration to ensure proper function.
- B. **Purpose of Operational Evaluation.** Any major repair that may substantially affect the aircraft's operation may require the applicant to conduct an operational flight evaluation, in accordance with CASR 91.407(a) and (b). The purpose of this flight is to ensure that the repair or alteration that was accomplished with all of the DGCA-approved data functionally works correctly. The purpose of the operational flight is not to gain additional data that is needed to show compliance with the regulations. A flight evaluation can be conducted by an appropriately rated pilot with at least a private pilot certificate. Following successful completion, the results are recorded in the aircraft records. The specific criteria evaluated must be part of the record entry. For some coordinated field approvals, the DAAO may want to conduct these flight evaluations.

3. FLIGHT TEST.

- A. **Gathering Substantiating Data.** A flight test is performed to develop and gather substantiating data for an airworthiness approval on an aircraft or system that has been altered. Flight testing is generally performed during an article's first approval by TC, amended TC, or STC.
- B. **Coordinating a Flight Test.** An alteration that requires a flight test to show compliance with the regulations in accordance with requirements of CASR 21.191(b) must be coordinated with the DAAO. In order to gather additional flight test data for the purposes of showing compliance, an Experimental, Show Compliance Airworthiness Certificate is needed. In some cases, an alteration that requires a flight test to show compliance with the applicable regulations may be a major change to type design, and therefore ineligible for using the field approval process. The DGCA Inspector should contact the DAAO for further guidance on the requirements for approval of the proposed modification.

CHAPTER 6 TECHNICAL CONSIDERATIONS

1. INTRODUCTION

- A. **Technical Considerations.** This chapter provides a series of discussions of the technical considerations that a data package for a proposed major repair or alteration should address. As new technology or new applications of existing technology occur, related concerns may become apparent and should be addressed by the applicant. In particular, the introduction of new or novel technology will generally warrant coordination with an Directorate of Airworthiness and Aircraft Operations (DAAO) to ensure that a thorough evaluation of the data is accomplished.
- B. **Additional Guidance.** This chapter is intended to be generic and is not all-inclusive. The Major Repair and Alteration Data Approval Job Aid provides additional guidance for specific alterations.
- C. **Addressing Technical Considerations.** Not all considerations will be applicable to a particular repair or alteration. The DGCA Inspector is encouraged to develop their own aids, such as checklists, to ensure that they address the appropriate technical considerations for each data package.

2. POWERPLANT.

- A. **Unpermitted Engine Installations.** Approvals of turbine or turboprop engine installations on piston engine-powered aircraft are not permitted. Engine changes that alter an aircraft from a reciprocating engine to a turbine engine require the use of either an amended type certificate (ATC) or a Supplemental Type Certificate (STC).
- B. **Powerplant Major Repairs and Alterations.** Refer to CASR part 43 appendix A (a)(2), for a description of powerplant major alterations, and CASR part 43 appendix A (b)(2), for a description of powerplant major repairs.

3. PROPELLER.

Only an appropriately rated approved maintenance organization may accomplish major repairs or major alterations. CASR 145.201 provides that an appropriately rated approved maintenance organizations may perform such major repairs or major alterations provided the work is done in accordance with technical data approved by the DGCA.

4. ROTORCRAFT.

- A. **Evaluation of Potential Alterations.** Rotorcraft, due to specifics of regulations, their design, and their operational environment, require considerations in the evaluation of potential alterations that are not common to other categories of aircraft.
- B. **Strict Alterations.** Even a visual flight rules (VFR)-only helicopter cannot be altered as freely as a fixed wing aircraft.
- C. **Considerations Unique to Rotorcraft.** Below is a list of rotorcraft-unique considerations that must be addressed, as appropriate, in addition to those common to all aircraft:
 - 1) Handling Qualities. Rotorcraft are not aerodynamically stable like fixed-wing aircraft; they induce a higher pilot workload.
 - 2) Temperature. The greenhouse effect on the temperature requirements for equipment, due to the amount of large glass windows typically found in rotorcraft.
 - 3) Vibration spectrum is more severe compared to fixed-wing.
 - 4) System separation is more challenging due to the smaller size compared to most fixed wing aircraft.
 - 5) High Intensity Radiated Fields (HIRF) environment is more severe since rotorcraft operate in closer proximity to HIRF sources.
 - 6) Fewer options for antenna or line replaceable unit (LRU) placement. This results in more challenges in reduction or elimination of electromagnetic interference (EMI) with required systems, such as full-authority digital electronic control (FADEC) or navigation systems.
 - 7) Instrument panels are smaller.
 - 8) Rotorcraft capabilities expose it to environments and operations that generally increase risk.
 - 9) Rotorcraft VFR visibility requirements.

10) The certification regulations for rotorcraft (i.e., CASR parts 27 and CASR part 29) have significant certification and regulation differences than the corresponding regulations for other aircraft.

11) Different regulations apply to alterations requiring instrument flight rules (IFR) certification versus those that require only VFR certification. Appendix B, for CASR parts 27 and CASR part 29, drive the requirements for IFR certification for systems and equipment, as well as for handling qualities.

5. SYSTEM FAILURE MODES AND EFFECTS.

A. **Perform an Analysis.** During development of the data package to support a major alteration, the applicant will perform an analysis in order to determine the failure effects of systems or equipment being installed or modified. There are several methods and types of analysis, and the choice will depend on the complexity and criticality of the particular system or equipment.

B. **Analysis as Part of a Data Package.** In many cases, the analysis may have been accomplished as part of a data package for an STC or other approval that is being used as the basis for an alteration. In these cases, it is not necessary that it be done again provided it is appropriate to the alteration in question. Like the entire approval process, the goal is to ensure operational safety and aircraft airworthiness.

C. **Documenting the Analysis.** The applicant can choose the manner in which the analysis is documented.

D. **Confirmation.** The DGCA Inspector must confirm that the applicant has addressed the failure modes and effects of the proposed alteration.

6. STRUCTURE.

Effects of Alteration of Structure. The applicant must consider the structural requirements that may be affected by the repair or alteration as well as the W&B computations. Depending on the repair or alteration, the structural requirements may include, but are not limited to, those pertaining to loads, materials, fasteners, flutter, fatigue, damage tolerance, and environmental considerations as defined in the certification basis.

7. SYSTEMS.

A. **Addressing Applicable Considerations.** Major repairs or major alterations to aircraft systems must address applicable considerations provided in this chapter. The certification basis of the particular aircraft

provides the requirements of the specific system. The Major Repair and Alteration Data Approval Job Aid contains additional guidance for systems.

B. Compatibility of Systems.

- 1) When interfacing a new system into an aircraft, compatibility of the new and existing aircraft systems must be evaluated and substantiated. Often, manufacturers will provide interface connection information concerning other manufacturers' products designed to similar standards. However, unless specifically identified, these interfaces may not actually have been tested to determine that they are indeed compatible. If the interface being proposed has not been previously approved, the assumption should be that compatibility has not been demonstrated. An appropriate evaluation is the best approach to ensure that adequate analysis, testing, and verification of interface has been shown, and that the system performs its intended function and is safe.
- 2) Previous installations may also be a source of information concerning compatibility. Be careful that any differences are identified and considered. A specific test plan might be included in the alteration data to provide showing of compatibility.
- 3) Anytime you have questions regarding compatibility, consider coordinating with the DAAO. This could be the DAAO that issued a referenced or previous STC, or the DAAO that issued the design and production authorization for a major component.
- 4) Remember that compatibility could be dependent on operating system or software revision. Many manufacturers introduce additional functions as their product line evolves and is updated. When compatibility is not ensured, the effect of the alteration or installation on other avionics systems is unpredictable.

C. Configuration Requirements.

- 1) The post-alteration system is configured following the installation instructions. Configuration could consist of a specific wire termination at the radio rack connector, or be done via software using a flight deck multifunction display (MFD) to access configuration or settings menus.
- 2) Some form of configuration record should be created that can be referenced for maintenance or future alteration. Information such as

software and modification level of avionics hardware should be included in addition to the individual configuration items.

- 3) Future updates may warrant re-approval, as functionality and hardware changes could have a negative impact on compatibility of the system under question and could result in interference to other required systems.

8. AVIONICS GENERAL.

A. Data Bus Standards, Protocols, and Format.

- 1) Integration of different components requires compatibility of communications.
- 2) There are several data bus standards applied to aircraft systems. ARINC 429 is one of the more common standards, but several others, like RS-232 and more recently Ethernet-based aviation data buses, are used.
- 3) Data bus standards provide a basis for determining compatibility, but fall short of ensuring compatibility. Some standards may establish more commonality of elements than other standards. Data bus standards may (or may not) provide a basis for the protocol or format employed to transfer data between components or systems. The design standards for a specific system generally employ industry standards, yet ultimately the equipment manufacturers establish the criteria for their system, so the actual method of employment of the standard may vary. The ability of equipment to interface with other equipment on the same aircraft depends on a manufacturer's decision to employ an industry convention. This is why it is especially important to conduct a rigorous analysis of data availability and compatibility when integration decisions are made between equipment of different manufacturers.

- B. Design-Specific Elements.** Even when communications are possible, it is necessary to ensure appropriateness and adequacy of information. For example, Global Positioning System (GPS) information provided by a GPS sensor without wide area augmentation system (WAAS) augmentation does not qualify with the same accuracy as information provided by a WAAS augmented sensor. Design characteristics of one system may impose additional requirements. These requirements may not be readily

apparent. How the configuration of the equipment is set up will dictate how the equipment will function.

C. Effects on Other Avionics Systems and Undesirable Effects.

- 1) When compatibility is not ensured, the effect of the alteration or installation on other avionics systems is unpredictable.
- 2) Some obvious effects that can occur when the avionics systems are truly incompatible are smoke and flames. Some less obvious ones include functional issues, such as system interruption or transfer of failure modes.
- 3) Erroneous or missing information must be flagged so it is known to the user.
- 4) If additional data will be provided for transmission, the duty cycles of the transmitters should be considered.
- 5) Display characteristics and Flight Technical Error (FTE).
 - a) FTE relates to a pilot's or autopilot's ability to follow the defined path or track, including any display error. Adding weather or other imagery to a display may affect the current settings of the display's brightness and update response time, impacting latency of display. Additionally, adding more imagery to the display may cause the operator to misinterpret the information displayed.
 - b) For example, consider a display providing steering information during an approach that has had terrain imagery added. It is possible that the aircraft could be off course and the display may not show it immediately because the display was refreshing pictures of all the added images.
- 6) Failure transfer.
 - a) The impact of a failure of one component or system on another integrated system must be minimized. An example would be a recorder added to an audio system to help a pilot remember his clearance. The recorder must be designed so that its failure could not prevent the audio system from working.
 - b) Error protection should be robust enough to alert a user prior to the display of erroneous information. Protection against, or lack of failure transfer, should be substantiated in the data.
- 7) Isolation.
 - a) Isolation of separate avionics systems prevents transfer of failure modes and avoids installing dependencies that were not previously present.

- b) The applicant may perform a safety assessment of each system and the combined functionality to determine if it is capable of meeting safety requirements.

D. Integration of Systems. Considerations of other factors, such as adding equipment and functionality to aircraft, are referred to as integration concerns. Integration includes connectivity, communication, and other factors necessary to ensure compatibility. As systems and applications are integrated into the aircraft, a safety assessment may need to be conducted in order to identify and substantiate the areas affected by the introduction. This is achieved by conducting an analysis on the interaction of the system and application with other functions on the aircraft. If the system and applications interface with other systems on the aircraft, such as a flight management system (FMS), Flight Guidance System (FGS), navigation display, or radar display, then the safety assessment should consider potential failure conditions of the other functions.

E. Isolation of Systems.

- 1) Systems should be designed to prevent undesirable results on other systems or functions when operating normally. Additionally, any failures of a newly integrated system should not adversely affect other installed systems.
- 2) Where redundancy requirements exist, systems must be isolated.

9. CIRCUIT PROTECTION. In most cases, some form of circuit protection will be necessary. A proposed alteration should address the need for such protection. Refer to CASR 23.1357, CASR 25.1357 or the circuit protection-related sections of other airworthiness standards.

10. LIGHTNING, HIRF, AND ELECTROMAGNETIC COMPATIBILITY (EMC).

A. Assessing Changes to Aircraft Protection. Aircraft or system repairs or alterations should be assessed for the impact that any changes will have on the HIRF and lightning protection. Shielding and bonding are two of the basic methods of providing that protection for the aircraft. Some systems or equipment may require specific features to provide HIRF and lightning protection. Repairs and alterations must not compromise existing protection features and may require new or additional protection features for the affected systems or equipment.

- B. **Compatibility of Systems.** Newly installed or altered systems or equipment must be compatible with the function of other systems or equipment. The extent of a post alteration EMC test will depend on the specific system involved. Several generic checklists are available or a customized checklist may be developed by the applicant. When evaluating a data package for approval, ensure that HIRF, lightning protection, and EMC have been addressed as necessary.
- C. **Documenting Compliance.** HIRF, lightning, and EMC compliance should be documented.

11. ELECTRICAL LOAD ANALYSIS (ELA).

- A. **Purpose of an ELA.** The purpose of an ELA is to determine that the demand on the aircraft's electrical system does not result in the undesirable situation that, during operations in the most adverse circumstances, the electrical system would be inadequate in meeting those system demands or where the emergency reserves are insufficient to meet the requirements during an emergency.
- B. **Explanation of an ELA.** An ELA is a complete and accurate analysis of available aircraft power and all electrical loads under the most adverse operating conditions during taxi, takeoff and climb, slow cruise, normal cruise, and landing operations. Special considerations must be given to the emergency electrical demands due to the safety impact an inaccurate analysis could have. An aircraft electrical emergency architecture is designed to provide only essential systems to support safe flight and landing in a reasonable time for a worst-case emergency.
- C. **Determining System Capacity.** Anyone performing an alteration that may have an effect on an aircraft's electrical power system must determine that the system has the capacity to accommodate that change and does not negatively impact electrical power availability for previously installed, required systems.
- D. **Importance of an ELA.** An ELA needs to be performed in order to establish the baseline electrical capacity of the aircraft. The form this analysis takes will depend on the type, age, and complexity of the aircraft. From this baseline, it can be determined whether the modification is viable and remains compliant with the applicable standards.
- E. **Limitations of the Original ELA.** The aircraft manufacturer's original ELA applies only to the original delivered configuration.

F. **Information on Creating or Revising an ELA.** Detailed information on the creation or revision of an ELA is provided by ASTM F2490 05e1, Standard Guide for Aircraft Electrical Load and Power Source Capacity Analysis, or MIL-E-7016, Electric Load and Power Source Capacity, Aircraft.

G. **Ensuring an ELA has been Accomplished.** When evaluating a data package for an approval, ensure that an ELA has been accomplished and is referenced on DGCA Form 43-337, Major Repair and Alteration (Airframe, Powerplant, Propeller, or Appliance).

12. SOFTWARE CONSIDERATIONS. The role of the DGCA Inspector for a software change or installation to avionics hardware or systems is limited. The DGCA Inspector primary function with regard to software should be determining if the article to be installed on an aircraft has the appropriate approval and that the software has been developed to at least the software level required by the safety assessment for the installation. For example, if the applicant proposes to install an MFD, the software development level must be commensurate with the MFD's safety assessment determination. This verification of regulatory requirements is usually coordinated with the DAAO or Designated Engineering Representative (DER).

13. HUMAN FACTORS (HF).

A. Considering HF. Alterations to aircraft systems, especially those relating to avionics systems and equipment, may impact human performance and decision making. Because of this, HF issues should be considered when installing new or altered equipment, or changing components. Effective HF design will help operators understand their environment, provide accessible information that is clear, relevant, and timely, and support decision making. In the design and operation of aircraft systems, failure to consider relevant HF issues may lead to problems ranging from inefficiencies to unsafe conditions.

B. Ensuring Desired Outcomes. When evaluating or ensuring proper substantiation of the data, ensure that the interaction between the altered or new equipment and the human operator leads to the desired outcome.

C. Potential HF. Some of the HF issues you might encounter and will need to consider when evaluating the outcomes associated with a change to aircraft systems include:

- 1) Arrangement and location;
- 2) Visibility;
- 3) Readability;
- 4) Usability;
- 5) Pilot workload; and
- 6) Symbology.

Note: As an example, one of the more obvious HF affecting installations would be that of electronic displays. Title CASR 23.1311 addresses these installations.

- D. **Avoiding Human Errors.** Consider the interaction between the altered or new piece of equipment and existing equipment or systems in order to ensure that this interaction does not result in human errors. HF issues should be considered when evaluating data required for proper substantiation of an alteration.

APPENDIX

APPLICABLE FORMS

DGCA Form No. 21-09, Application For Approval Of Modification And Major Repair
DGCA Form No. 43-337, Return to Service After Embodiment Of Alteration Or
Major Repair.

DIREKTUR JENDERAL PERHUBUNGAN UDARA

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Salinan sesuai dengan aslinya
KEPALA BAGIAN HUKUM

