 <small>AUTORITETI I AVIACIONIT CIVIL</small>	Implementation of the principles of human factors in aircraft maintenance and continuing airworthiness organizations	
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REPUBLIC OF ALBANIA

Civil Aviation Authority



Implementation of the principles of human factors in aircraft maintenance and continuing airworthiness organizations

JULY 2022

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Introduction

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For the Albanian Civil Aviation Authority

Executive Director




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	Name and Position	Date	Signature
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REGISTER OF REVISIONS

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1. Scope of application:

This document is applicable to the maintenance and continuing airworthiness of the following aircraft:

- aeroplanes used for commercial air transport
- helicopters used in commercial air transport
- aeroplanes with a maximum certified take-off mass of more than 5 700 kg; and
- turbojet powered aeroplanes.

Maintenance and continuing airworthiness organisations and aircraft owners/operators other than those mentioned in the previous paragraph are invited to implement the applicable requirements of this Order to raise safety levels.

2. Basis for issuing the Decision:

Article 13, paragraph "g", Law No 10233, dated 11.02.2010 "Law on the Civil Aviation Authority", as amended,

Minister Order No 167, dated 4.6.2020 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organizations and personnel involved in these tasks, M.A. 302, Paragraph (d)/ "I".

Reference guidelines:

ICAO Annex 6

ICAO Annex 8

ICAO Document 9683 Human Factor — School Handbook

ICAO Document 9824 Human factor — Aviation maintenance manual guide

3. Purpose of the Order:

Improving the procedures and methods of operation to improve the quality of maintenance results, as well as harmonising the practice of drawing up the aircraft maintenance programme and manuals used in aircraft maintenance and continuing airworthiness, by introducing the 'Human factors' principles.

4. Reason for the audit:


Initial Issue.

5. Decision of the Civil Aviation Authority (hereinafter: CAA)

5.1 Design of the maintenance programme

The essential requirement under M.O. No 167, dated 4.6.2020 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organizations and personnel involved in these tasks, paragraph M.A. 302, subparagraph "e", adopting ICAO Annex 6, Part I, 11.3.1, is that the maintenance programme contains the following information:

- maintenance tasks and
- the defined intervals at which these tasks are carried out.

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The intended/expected utilisation of the aircraft should be taken into account during the definition of the maintenance intervals and tasks.

The owner/operator has an additional responsibility to design a maintenance programme that includes the principles of Human Factors.

The maintenance programme shall contain information in such a form as to enable organisations to apply it, taking into account the principles of human factors.

The design of the maintenance programme has two aspects:

- defining current assignments; and
- form and presentation of the programme document.

The design of the AMP document shall respect the principles of Human Factors.

The organisation shall establish procedures acceptable to the Authority, taking into account human factors and human performance, to ensure good maintenance and continuing airworthiness practices, as well as compliance with all relevant requirements of this Order, which should include clear work orders or contracts to ensure that aircraft and aircraft components are released to service in a safe condition and in accordance with applicable regulations.


5.2 Maintenance System Documents

The content of the maintenance system documents shall cover the following:

- the operational instructions contained in the approved maintenance programmes shall be easy and precise to understand or be easily and accurately transmitted;
- human factors principles in the description of organisation of hangars or workshops
- procedures, instructions and procedures enabling the implementation of the maintenance programme in a consistent and correct manner; and
- staff shall have knowledge of human factors and skills appropriate to the tasks and responsibilities assigned.

All maintenance system documents, manuals and maintenance programmes should include topics such as:

- establishment and publication of a company aviation safety policy
- establish, in maintenance organisations, a system to manage maintenance errors, as one of the elements of the 'safety culture'.
- specific shift change procedures reflecting industrial "good practice" within industry
- planning of working hours, parts, tools and tasks, taking into account fatigue and pressure on work ability;
- double controls or specific controls on critical points or tests
- avoidance of control and signature of completed tasks by non-authorized staff; and
- company procedures should be written and implemented in such a way as to take into account the principles of the Human Factors.

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The accountable manager (or chief actor) is responsible for establishing and promoting the required security and quality policy.

Where it is necessary to hand over maintenance or final maintenance work due to changes to shifts or staff, the relevant information should be adequately shared between outgoing and incoming staff in accordance with procedures acceptable to the Authority.

The planning of maintenance tasks, including the organisation of shift work, should take into account operational capability limitations.

Procedures shall be established in such a way as to detect and correct maintenance defects that may result in a failure in maintenance, malfunction or malfunction and affect the safety of the operation of the aircraft.

The procedures should specify the method of detection of errors, and related maintenance or process tasks.


A typical procedure involves performing a double control where tasks or processes are performed by one suitably qualified person, who is then independently verified and verified by another suitably qualified person, or by additional functional or leak checks.

The organisation shall develop a system appropriate to the quantity and complexity of the work, so that it can plan the availability of the necessary staff, tools, equipment, material, maintenance data and facilities to ensure the safe completion of the maintenance work. When establishing the maintenance planning procedure, account shall be taken of:

- logistics
- inventory control
- accommodation area
- expected working hours
- available working hours
- preparation of works
- availability of hangar
- coordination with internal and external suppliers
- planning security critical tasks during periods when staff are of the highest level of attention.

All maintenance tasks or groups of tasks should be signed. In order to ensure that a task or group of tasks is completed, they should be signed only after completion. The tasks carried out by non-competent staff (staff not holding appropriate licences and authorisations, staff in the training phase, etc.) should be verified by authorised staff before they are signed.

The competence of the managerial staff must be established and controlled according to a procedure and a standard acceptable to the Authority. The required competence for the appropriate position, i.e. training shall include training and understanding of the application of Human factors and performance issues related to the individual function within the organisation.

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5.3 Prevention of faults and error management strategies

Three classes of Aeroplane Maintenance Human Error Management Strategies have been established. Each of these classes is defined in terms of error control method.

5.3.1 Reducing errors

Error reduction strategies plan to intervene directly at the source of error. Examples of error reduction strategies include improving accessibility to aircraft parts, improving the lighting in which maintenance tasks are performed and ensuring better education/training of staff.

5.3.2 Capturing faults

The capture of faults assumes that the fault has already been made. He tries to "capture" before leaving the aircraft. Examples of error capture strategies include post-task inspections, verification of the steps in the task, and functional and operational verification after completion of the work.

5.3.3 Tolerance of errors

Error tolerance calls for the system's ability to accept an error without catastrophic (or serious) consequences. Error tolerance may relate both to the design of the aircraft itself and to the design of the maintenance system. Examples of error tolerance include the incorporation of multiple hydro- or electro-systems on an aircraft (so that a human error may disable only one system) and structural inspection programmes that provide many opportunities to find fatigue cracks before reaching critical length.

5.4 Impact of human factors on aircraft maintenance

Aircraft maintenance organisations should identify the following environmental topics that are relevant in the context of the Human Factors.

5.4.1 Structures and working environments

The working environment has a major impact on the contractor.

5.4.1.1 Lighting


People are not skilled enough to perform precise work under poor lighting. The size of most hangars is a problem for good illumination. For the most part, special task lighting is provided by hand-held lamps or hand-held lamps.

External, night-time maintenance requires special attention for the need for illumination.

5.4.1.2 Noise

Many sounds are indispensable for the proper performance of work, such as voice communication or audio signals of equipment. Noise is undesirable sound and can distract and be stressful. Aircraft maintenance operations are usually noisy at intervals, such as riveting activities, hangar operation, engine testing or start-up. Noise can cause speech interference and affect health. A noisy or intense noisy environment results in intensification of the reaction of the autonomous nervous system. The result may be a bias. Continuous exposure to noise may result in permanent hearing loss.

The actions to be taken by the operator in solving the noise problem will include controlled noise sources by fencing or insulation of machinery, separation of noisy activities so that fewer persons are exposed to noise, providing ear shields and the required use of these, reducing engine starting or testing to the

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minimum acceptable, and measuring the noise level in the working space.

5.4.1.3 Toxic materials

Personnel shall be informed and trained of the hazards associated with the handling of toxic materials. They shall be instructed on appropriate handling methods and provided with protective devices such as protective clothing, rubber gloves and glasses.

5.4.1.4 Storage and access

Rapid access to tools, built-in devices, test equipment, materials, parts, working platforms, procedures and technical documentation should be ensured.

5.4.1.5 Working platforms

Many parts of large commercial aeroplanes are far above what can be reached from the ground. To reach these areas, work platforms of different sizes and types are needed.

5.4.1.6 Temperature, humidity and flow of air

Changes in conditions affecting tolerable temperature, humidity and air flow may impair performance — both physical and mental.

5.4.1.7 Exchange of information and communication

Communication is probably the most important topic of the human factors in aircraft maintenance. In the field of maintenance, very many information has to be created, transmitted, adopted, used and recorded in order to maintain the fleet by navigation. It is very important that maintenance information is understandable for the intended users.

5.4.1.8 Schooling


Staff shall be trained for the tasks to be performed. Education is essential in particular for newly-formed groups of staff who are used to work independently. Schooling should include methods of group decision-making, developing skills among themselves and working with other members of the team. In such a case, productivity will not be excessively reduced if individual members of the team are unable to carry out an operation.

5.5 Design of aircraft maintenance documents


5.5.1 Drafting principles

The following principles shall be taken into account in the production of aircraft maintenance documents:

- ensure that the design and changes to the procedures involve staff with a good knowledge of their tasks;
- confirm all procedures and changes to procedures before use
- ensure that the procedures are accurate, appropriate and applicable, and include good aeronautical practice;
- take into account the level of expertise and experience of the user;
- take into account in which work environment the procedure will be used
- ensure that all relevant information is included, without unnecessary complexity of the procedure;

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- where appropriate, explain why the procedure has been established
- ensure that the order of tasks and steps reflects good practice
- if the sequence of steps is not given, consider grouping procedures according to logic or space, contrary to alphabetic order or ATA chapters (e.g. work on aircraft parts, as pilot check lists)
- group steps into “parts” and plan breaks
- ensure consistency in the design of procedures and the use of terminology, abbreviations, references, etc.
- try, where possible, to ensure that the full procedure or part of the information is on a single page
- where the procedure is on more than one page, it is clear and indicated
- include clear titles at the top of each page and sections of procedure
- when the content of the document is modified, tick the line or paragraph in the manual in such a way that the text that has been amended is unambiguously marked
- record the changes by means of a list which shall be systematically updated whenever a new document is amended, and this list, with the description of any changes, shall form part of the document.
- note the date of revision at the bottom of the page
- avoid cross-references wherever possible;
- the logical sequence should be clear, using flow diagrams if necessary
- group the related steps on the page
- separate unrelated steps on the page
- use suitably emptied rows or spaces
- use consistent emphasis (e.g. *inclined* or **expressed**)
- avoid excessive use of capital letters for emphasis; smaller characters are easier to read
- avoid excessive use of inclined letters, reserve them for a single word or a short phrase, or for a note
- boxing is useful to distinguish very important steps or parts from minor parts or steps
- diagrams or photographs can be very useful
- insert alerts and notes in procedures wherever necessary
- consider using warnings, warnings or notes to highlight important points and steps where errors are possible
- orders, references, warnings, reminders, notes, procedures and methods highlighted
- use reminders and warnings directly above the text
- reminders, warnings and notes must be on the same page as the text to which they relate
- where practical, embed the fields in procedures to enable and ensure that the user can verify that all steps of the procedure have been completed;
- clearly tick the link of the check box with the corresponding step, e.g. by using intermittent dashboards
- provide sufficient space if information needs to be entered
- emphasise the importance of legible manuscripts if written information is to be used by another person
- ensure that printing/copy is of good quality and that there are enough sticks, copiers, etc.; and
- provide training in the technology to use access and print of maintenance procedures and data.

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5.5.2.9 do not use too much prominence techniques to avoid confusion and reduce understanding.

5.5.2.10 Replies:

- if you use check fields with the related instruction, do not use a large interval between the check field and the instructional
- avoid entering "not required" or "XXXXX" in the signature fields, if the user of the document is not responsible for carrying out instructions/task.
- use a consistent layout of the checkbox(s) throughout the document, where possible; and
- provide sufficient space if the user of the document is expected to respond.

5.5.2.11 Colours:

- avoid regular use of paints in illustrations
- use black and white shading instead of colours
- coloured paper shall not be photocopied well and
- black ink on white paper is recommended.

5.5.2.12 Page numbering:

- avoid using any back references, to the previous text
- avoid references to other parts of the document, if possible
- inevitable cross-references must be precise and not misleading
- the page should look like a naturally generated information set; e.g. an appropriate number of tasks should be included and no transfer of tasks to another page should be avoided. Any task that starts on one page should also end on that page, and
- minimise routing; in other words, it does not direct the user from the page to the page where this may lead to serious errors.

5.5.2.13 Letters and numbers:


- use lower case letters instead of large letters, as they are much easier to read
- take into account that capital letters occupy more space (40 to 45 per cent more than small) and reduce reading speeds by 13-20 per cent
- use capitals and lower-case letters in titles and subtitles, instead of capital letters, to improve readability
- avoid hyphens where the sole function is to disassemble words at the end of the order
- in a series of words or statements representing mutually exclusive choices, insert 'or' through a series to increase understanding
- avoid using Roman numerals as they are not easily legible and may cause confusion
- where numbers are used in the list, use Arabic numbers followed by a point, for each item on the sheet
- where numbers are not used in the enumeration, use signs or hyphens to draw the attention of users;
- do not place numbers in brackets, and
- use the common dash-number of style (ATA) as chapter-section-thema pages (e.g. 26-09-01-02).

5.5.2.14 Words:

- avoid using different terms for the same term
- use precise, unambitious and common words, of which the users of the document are familiar, consistently with the document; and
- make little use of the proposals; this leads to a slower reading.

5.5.2.15 Abbreviations:

- use only known abbreviations and corresponding nouns

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5.5.2 Readability of the information

5.5.2.1 Page size:

- use standard paper size (A4).

5.5.2.2 Page layout:

- use a single column, as this appearance makes it easier to read
- tick each page with its title at the top
- number each page in the bottom right corner; and
- there is no need to finish each page at the same place, e.g. the end of the page may be in a different location.

5.5.2.3 Clearance:

- use left-hand clearing because central and right clearance is confusing and slows down reading.

5.5.2.4 Paragraphs and retractions:

- use a two-line style to separate paragraphs
- tick the order of each heading and subtitle, e.g. 1, 1.1, 1.1.1.
- under one heading, write paragraphs below half of the page in length, to help the reader's concentration
- leave one row empty between the paragraphs; and
- do not retract the beginning of each paragraph.

5.5.2.5 Rigging:

- use 1:2 the relationship between the passage of sentences and the passage of the paragraphs
- use an empty line to separate paragraphs and titles
- use one empty position behind the comma, colon and semicolon; and
- use two empty places behind the period, questionnaires and excavators.

5.5.2.6 Letters (fonta) forms:


- use a font form with a relatively high height, moderate width, convincing before a pleasant appearance, and fully uniform, e.g. Times Roman, Century Series, New Gothic or Helvetica; and
- keep a consistent letter format within and between documents.

5.5.2.7 Font size:

- use a size between 9 and 12 points to facilitate reading, the best size is 11 or 12 points.

5.5.2.8 Emphasis:

- adhere to a consistent way of emphasis within and between documents
- for displaying one word, it uses **expressed** (primarily) expressed (primarily) and wrapped, inclined or all VELIKA letters elsewhere
- to highlight longer passages, use **expressed** or wrapped on. Avoid VELIKA letters or tilt as *they* slow down reading and reduce understanding of the text
- use only one or two emphasis techniques within the document in order to increase understanding. A good choice is **expressed** or attracted; and

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- avoid abbreviations. If they must be used in a consistent manner and use the first pair of letters to remind the reader of the word; and
- provide an explanation of the abbreviations in the document.

6.5.3 Good writing

6.5.3.1 On writing in general:


- try to achieve the ratio between conciseness, maturity and overly broad information;
- write clear, simple, precise and self-explaining instructions
- minimise written requests for document users
- sum the main ideas
- use appropriate information in the instruction steps
- the text should be written in a consistent and standard agreement of the words in the sentence
- the text should be as short and clear as practical, and
- use the logical structure of sentences and paragraphs to make them easier to understand and remember, according to the following:
 - general requirements prior to specific requirements
 - important requirements before minor requirements
 - frequent requests and standing requests before occasional requests.

6.5.3.2 Sentences:

- use simplified vocabulary as much as possible
- use short sentences instead of long, as short sentences are easier to read and understand
- use clear and affirmative sentences in active time, instead of negative phrases and passive time, as active form increases understanding
- use sentences with personal substitutes to increase the reader's understanding and motivation
- sentences with more dependent clauses are difficult to understand
- use verbs in active form as they are easier to read and understand
- not to use long nouns in the sentence, as they are difficult to understand
- use the full sentence 'who' and 'who' to make it clearer;
- use third faces for definition as in the following: 'The torso assembly shall transmit the torso load from the shaft to the shock absorber.'
- use a second face only in operational procedures such as: 'Check oil level'.
- ideas expressed in a positive form are clearer for understanding and
- express directly what to say without superfluous or unnecessary words, as the sentence with unnecessary words is more difficult to read and understand and to be read for longer.

6.5.3.3 List and tables:

- the data and information shown in the tables make it possible to understand and compare
- in enumerations and tables, do not leave any gaps in the order of more than five empty spaces
- group rows in enumerations and tables according to content
- not to group more than five rows together
- separate groups in enumerations and tables in rows
- write the items listed in the parallel version, as it makes it easier to read and remember
- list the series of items, conditions, etc. rather than show them in series separated by commas;
- avoid using complex questions and allegations
- minimise logically related issues, as far as possible; and
- draft questions in a way that requires the minimum memory of document users.

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6.5.3.4 Graphical information:

- set the visual items in the text of the document next to the text to which they relate, and if this is not possible to set the visual items in the appendix, tick and refer to the items
- use clear headlines with a number of images or tables in the queue directly below all illustrations
- use the same heading for illustrations used as the title of the text it refers to
- consistently use both horizontal and laid format starting illustration at the link edge or vertical alignment to display graphic information for easy reading and cross-references
- the relevant text must be indicated to support the illustrations, not vice versa
- draw illustrations in the size and significance of order so that they can be used without any modification to display material on the projector's screen for schooling purposes;
- illustrations should have limited information to avoid imprecise appearance
- use illustrations as a primary source of information transfer
- display all spatial information in graphic format instead of text format
- mark each table and image with an Arabic number, such as Table 1 and Figure 1.
- use simple drawings, which are best in most cases
- use image layout and numbering consistently
- use illustrations whenever they will simplify, shorten or facilitate the understanding of the text
- do not use complicated image reference numbers, such as T07-40423-001
- avoid using parts of drawings in a perspective as an image
- view the image (*figure view*) should be like the user see
- use standards and correct technical drawing terminology, e.g. avoid the replacement use of the terms "section" and "reputation"
- refer to all tables and images in text numbers
- use laid bar charts to enable a comparison of figures whenever possible; and
- line graphs help to understand trends and allow comparisons between two and more figures.

6.5.3.5 Printing and copying quality:

- check toner regularly to ensure consistent quality of copies
- ensure that the master image remains visible and clear when copying from the original
- use paper with a reflection of at least 70 per cent
- use weak visual resolution and larger font size if the user will use a document under poor illumination
- readers prefer shinless paper over medium or gloss paper
- more blurred paper is preferable
- use black ink on white paper as it is more effective than white ink on black paper; and
- develop and use standards for replacing printing lanes, toners, etc., to ensure consistent quality of copies at all times.

6.5.3.6 Organisational issues:

- enable potential users of work cards to participate in document creation
- check each individual instruction by testing it in a real situation
- if the document will have multiple copies, colours will be a useful aid in distribution; and
- have a feedback system to help users know how to correct a wrong entry.

6. Entry into force:

This document shall enter into force on the day of its publication on the Authority's website.