МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
НАЦІОНАЛЬНИЙ АВІАЦІЙНИЙ УНІВЕРСИТЕТ
АЕРОКОСМІЧНИЙ ФАКУЛЬТЕТ
КАФЕДРА ПІДТРИМАННЯ ЛЬОТНОЇ ПРИДАТНОСТІ ПОВІТРЯНИХ СУДЕН

ДОПУСТИТИ ДО ЗАХИСТУ
Завідувач кафедри
к.т.н., доцент
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«__»_____2020 р.

ДИПЛОМНА РОБОТА

(ПОЯСНЮВАЛЬНА ЗАПИСКА)

ВИПУСКНИКА ОСВІТНЬОГО СТУПЕНЯ МАГІСТРА

ЗА ОСВІТНЬО-ПРОФЕСІЙНОЮ ПРОГРАМОЮ
«ТЕХНІЧНЕ ОБСЛУГОВУВАННЯ ТА РЕМОНТ ПОВІТРЯНИХ СУДЕН І АВІАДВИГУНІВ»

Тема: «Удосконалення системи підтримання льотної придатності літаків Boeing 737 на основі впровадження європейських авіаційних правил»

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Київ 2020

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

NATIONAL AVIATION UNIVERSITY

AEROSPACE FACULTY

AIRCRAFT CONTINUING AIRWORTHINESS DEPARTMENT

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«__»_____2020

DIPLOMA WORK

(EXPLANATORY NOTE)

MASTERS GRADUATE

ACCORDING TO THE EDUCATIONAL PROFESSIONAL PROGRAM
"MAINTENANCE AND REPAIR OF AIRCRAFT AND AIRCRAFT ENGINES"

Topic: "Improvement of the Boeing 737 airworthiness system based on the implementation of European aviation regulations"

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Kyiv 2020

NATIONAL AVIATION UNIVERSITY

Aerospace Faculty
Aircraft Continuing Airworthiness Department
Educational degree "Master"
Specialty 272 "Aviation transport"
Educational and professional program "Maintenance and repair of aircraft and aircraft engines"

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«___» _____ 2020 year

THE TASK
to complete the thesis
KOLPAKOV OLEKSANDR O.

1. Theme of work: **“Improvement of the Boeing 737 airworthiness system based on the implementation of European aviation regulations”** approved by the order of rector of October 02, 2020 No. 1881/ст.
2. Term of work performance: from October 5, 2020 till December 21, 2020.
3. Initial data for work: statistical data on the result of aircraft utilization
4. The content of the explanatory note: analysis of airline fleet planning, reliability program and maintenance program of Boeing 737, analysis continuing airworthiness management exposition and maintenance organization exposition, development of measures for labor and environmental protection.
5. List of mandatory graphic (illustrative) material: research scheme, results of analyzing the experience of operating gas turbine engines, the impact of damage on engine performance, development of neural network architecture, block diagram of the neural network learning process, diagnosis algorithm, diagnosis and recognition results. Graphic (illustrative) material was made using Microsoft Office Excel, Power Point and presented in the form of presentations.

6. Timetable

Task	Due date	Mark of execution
Analysis of the operating experience of aircraft	05.10.20 – 13.10.20	
Analysis of Aircraft fleet planning	14.10.20 – 20.10.20	
Analysis of impact of aircraft failures on the efficiency of fleet utilization	21.10.20 – 26.10.20	
Analysis of maintenance process of Boeing 737 fleet	27.10. 20 – 02.11. 20	
Research of CAME & MOE	03.11. 20 – 15.11. 20	
Development of methodological foundations	16.11. 20 – 27.11. 20	
Implementation of separate sections of work: occupational Safety and Health, environmental protection.	28.11. 20 – 07.12. 20	
Execution of an explanatory note and illustrative material.	08.12. 20 – 12.12. 20	
Preliminary defense of the thesis	13.12. 20 – 15.12. 20	

7. Section-specific consultants

Chapter	Consultant	Data, signature	
		The task given	The task accepted
Labor Protection	PhD, docent Konovalova O.V.		
Environment Protection	PhD, docent Radomska M.M.		

8. Date of issue: «___»_____ 2020 year.

Principal of diploma paper _____ _____

The task was accepted for execution _____ _____

REPORT

Explanatory note to the thesis: "Improvement of the Boeing 737 airworthiness system based on the implementation of European aviation regulations": 106p., 11fig., -- sources.

The object of research - the Boeing 737 airworthiness system

Subject of study – regulation documents of aircraft airworthiness

The aim of the thesis is analysis of various programs, systems and factors affecting the maintenance of airworthiness and development of measures to improve the system of maintaining the airworthiness of Boeing 737 aircraft

Research methods.

To solve the set tasks, elements of the theory of aircraft design, methods were used: mathematical, natural, computer modeling and network classification.

The practical significance of the results of the thesis is to increase the efficiency of the technical operation of aircraft by.

The recommendations developed by the author can be proposed for improving the methods and.

MEL, MOE, CAME, AIRWORTHINESS, RELIABILITY, CRS

LIST OF CONVENTIONAL ABBREVIATIONS, SYMBOLS AND INDICES

AFML – Aircraft Flight and Maintenance Log;

AMC – Acceptable Means of Complience;

AOC – Aircraft Operator Certificate;

CAME – Continuing Airworthiness Management Exposition;

CRS – Certificate Release of Service

DMM – Daily Maintenance Meeting;

EASA – European Aviation Safety Agency;

ETOPS – Extended-Range Twin-Engine Operation Performance Standards;

EDP – Electronic Data Processing;

EM – Engineering Management;

IFSD – In Flight Shutdown;

MAREP – Maintenance Report;

MEL – Minimum Equipment List;

MOE – Maintenance Organization Exposition;

ESG – Engineering Support Group;

MRB – Maintenance Review Board;

MRA – Modification Request Approval;

MSG – Maintenance Steering Group;

MTBF – Mean Time between Failures;

MTBUR – Mean Time between Unscheduled Removals;

NFF – No Failure Found;

OEM – Original Equipment Manufacturer;

OAMP – Operator Aircraft Maintenance Program;

PIREP – Pilot Report;

MD – Material Department;

MM – Part-145 AMO Maintenance Management;

SQM – Safety and Quality Management;

MCC – Maintenance Control Center;

RCM – Reliability Control Meeting;

RCB – Reliability Control Board;

RP – Reliability Program;

SBO – Safety Board;

SDA – System Deficiency Assessment;

TAC – Total Aircraft Cycles;

TAH – Total Aircraft Hours;

UCL – Upper Control Limit;

CONTENTS

INTRODUCTION

One of the fundamental things in the aviation industry is airworthiness. Airworthiness is a characteristic of an aircraft, which is ensured by the principles envisaged and implemented in its design and performance parameters and allows a safe flight to be carried out under the expected conditions and with established operating methods. The expected operating conditions include the range of design conditions defined by the airworthiness standards, as well as the operating limits and recommended flight conditions established for a given aircraft type at the time of certification. Continuing airworthiness of aircraft - one of the most important factors of safety in civil aviation and the efficiency of the air transport industry today.

This paper will analyze the use of the airline's Boeing 737 fleet, analyze the reliability system and the maintenance program. Also, the work will pay attention to the analysis of regulatory documents that regulate the activities of organizations for maintenance and Continuing airworthiness. Innovative paperless manufacturing methods are proposed as suggestions for improving the airworthiness system. The issue of improving the system of training professional personnel in this area is also raised, based on the introduction of European aviation regulations.

1. ANALYSIS OF AIRLINE FLEET PLANNING, RELIABILITY PROGRAM AND MAINTENANCE PROGRAM OF BOEING 737

1.1 Brief analysis of aircraft utilization

The operator company must constantly analyze the state of its fleet and, accordingly, generate a reliability report to ensure all the requirements for maintaining airworthiness. One of the fundamental points of this report is information on the use of the fleet, statistics on the use of aircraft, information on the reliability of technical dispatch.

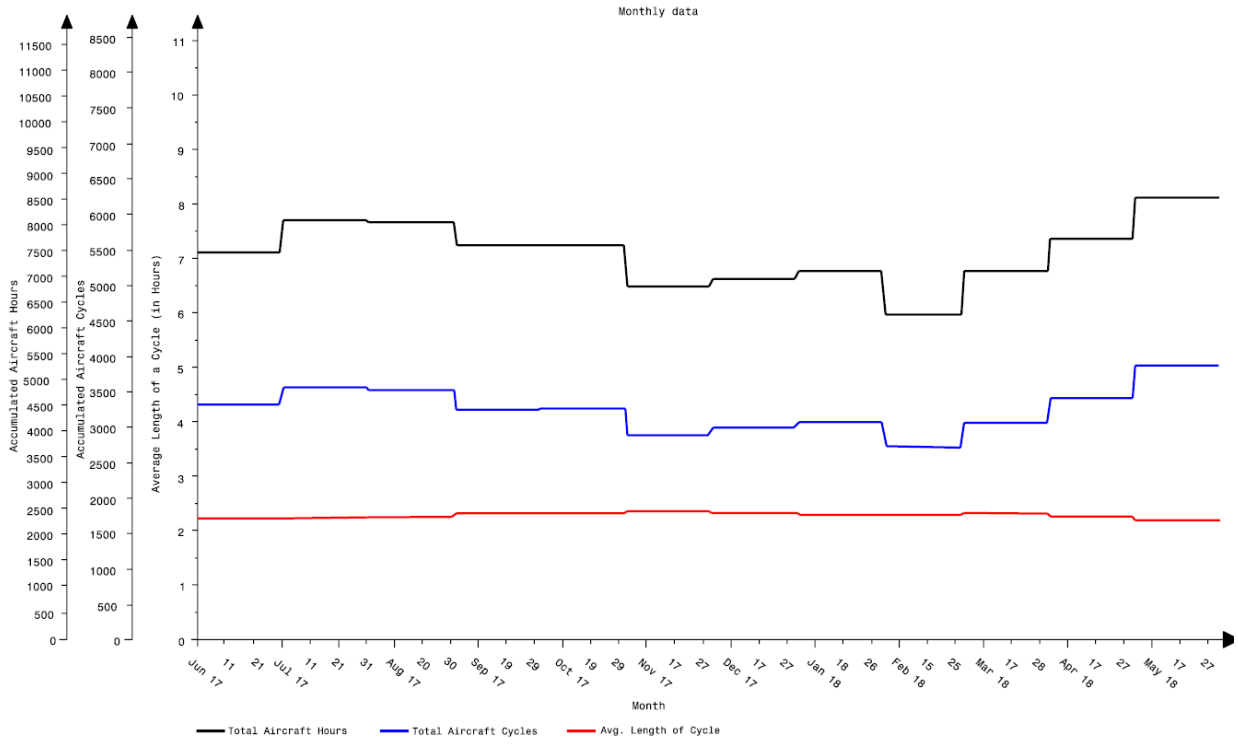

Figure 1.1 – Aircraft Utilization Graph

This Graph contains the following information Total Aircraft Hours, Total Aircraft Cycles, Avg. Length of Cycle (in Hours), Accumulated total aircraft hours for the selected period, Accumulated total aircraft cycles for the selected period, Average number of aircraft hours for each cycle.

The Technical Dispatch Reliability is a ratio of the number of flights delayed because of technical faults to the total number of flights, expressed as a percentage. Delays caused by other reasons are not to be taken into account for this calculation. Technical Dispatch Reliability is one of several methods used by aircraft operators to determine how its fleet is performing. It calculates the percentage of scheduled flights departing without a maintenance related delay, cancellation or diversion.

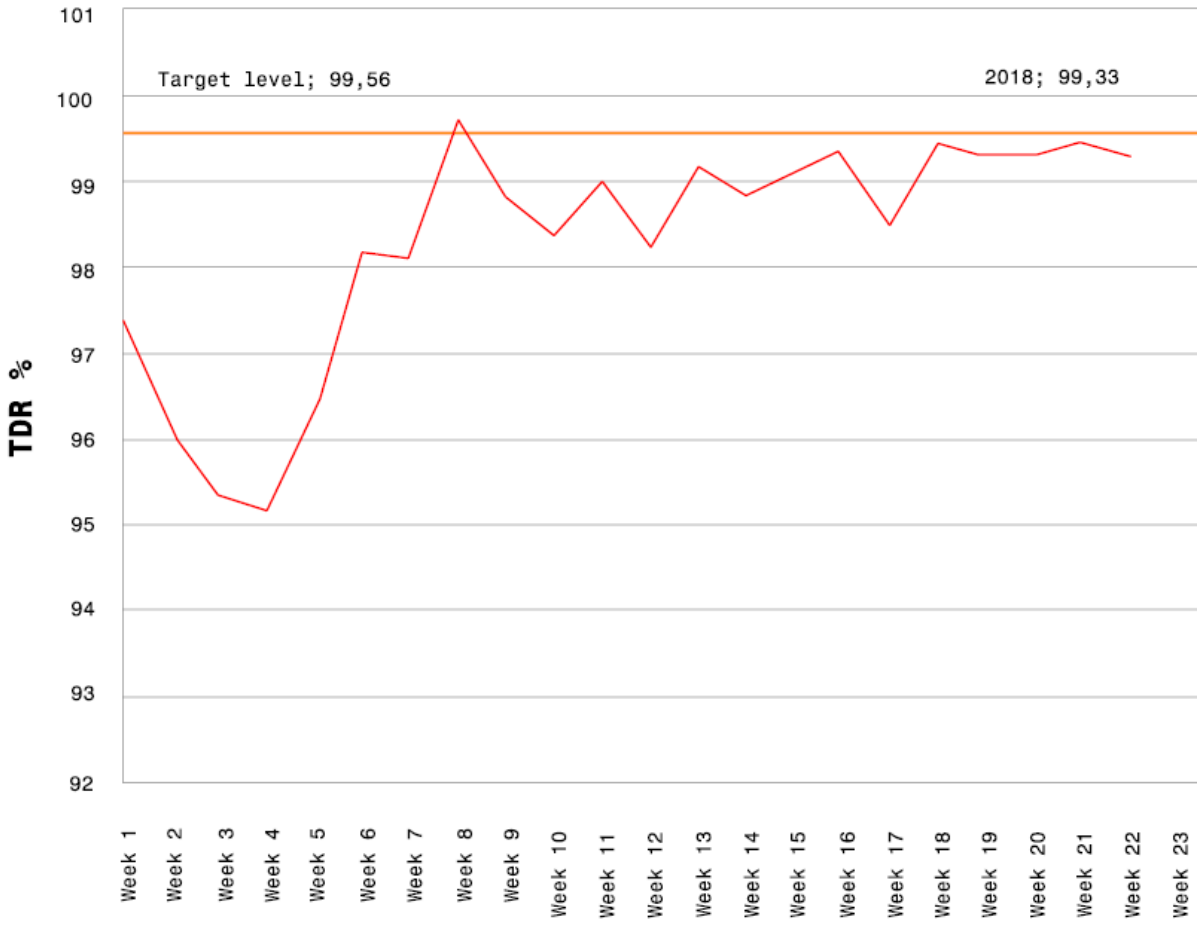

Figure 1.2 – Technical Dispatch Reliability Graph

1.2 Analysis of reliability program

The objective of the Reliability Programme (RP) is to control and maintain components, systems and aircraft operated by Airlines and its customers, as contracted, under the valid AOC within acceptable level of reliability and economics, the primary objective being the SAFE OPERATION of the aircraft.

Reliability Control is based on continuous data collection and analysis process and is done on different levels.

The 1st level is the Daily Maintenance Journal meetings for events evaluation (delays and cancellations). The 2nd level is the Reliability Control Meetings (RCM) and finally the 3rd level is the Reliability Control Board (RCB).

The RP fulfils the requirement of Part M, Appendix 1 to AMC M.A 302, where the maintenance programme must include a Reliability Programme to evaluate the effectiveness of the operators airplane maintenance programme within the company. The used Reliability Programme is defined to be in compliance with Appendix 1 to AMC M.A. 302 and M.B. 301.

In addition, the data used by the RP will be used to demonstrate to authorities, that the airframe/propulsion systems for a particular aircraft can achieve a sufficiently high level of in service reliability to conduct ETOPS operations.

Beside all before mentioned, each Engineer, as well as each employee engaged in technical matters of every other division of the technical department is responsible to initiate an investigation, if an upcoming negative reliability trend or a safety matter is detected. This has to be done by indicating this to the Reliability Group.

The key elements of the Reliability Program are:

1. Maintenance Program development and Maintenance process improvement;

2. Definition of performance parameters;

3. Data collection in EDP AMOS system;

4. Performance measurement and reporting - performance compared to goals and/or alerts, with Reliability Report as the primary tool for performance reporting to the management;

5. Analysis and identification of the causes of unacceptable performance;

6. Corrective action process as required;

7. Follow up actions and effectiveness;

8. Cost analysis.

The performance and behavior of the defined parameters is reported via the operational system AMOS (daily business) and via the strategic reliability reports which are aggregated to monthly/yearly levels.

The strategic reliability report is prepared by Reliability engineers. The reports is distributed internally to:

− Chief Technical Officer

− Manager of Engineering Continuing Airworthiness Department;

− Engineering Management;

− MCC;

− Safety&Quality Management.

A copy of the Reliability Report 1 (once) a month is sent to Competent Authority and Aircraft manufacturers.

On request by Engineering Management (EM) Quality Assurance Management (QAM) or applicable customer or authorities special reliability analysis are performed in order to investigate unfavourable trends in e.g. aircraft

system behaviour, operational occurrences, ground handling damage and component removal rates.

Reliability Engineer is responsible for issuing this RP and for implementation of any applicable changes. Any request for changes of this RP has to be forwarded to Reliability Engineer. In order to provide information contained in RP is up-to-date it should be amended in case of:

• Competent Authority requirements;

• EASA, FAA requirements;

• Changes in the organization or activities;

• ETOPS requirements;

• Changes in fleet types.

In order to obtain sufficient amount of data for accurate reliability analysis for a fleet of aircraft less than 6 aircraft, Reliability Group on a permanent basis conducts an exchange of data with aircraft manufacturers.

Head of Responsibilities of Reliability Group:

- Develop and monitor the implementation of the Reliability Program
- Initiate changes to the maintenance program;
- Initiate and conducting Reliability Meetings;
- Initiate execution of additional inspections to identify the causes of failures;
- Execute instructions of the Competent Authority regarding the fleet reliability;
- Evaluate the effectiveness of maintenance program;
- Timely implementation of corrective actions;

Reliability Engineer responsibilities:

− Preparation of materials for the Reliability Control Board (RCB), Reliability Meeting;

− Monitoring systems and components failure rate;

− Investigating cases of warranty denial;

− Analysis of flight delays and cancelations;

− Analysis of repetitive defects;

− Prepare reliability reports;

− Preparing and Tracking of Alert Level.

Reliability engineer should pass training course for aircraft operated by airlines. Reliability engineer should pass initial training or special reliability training and periodically to undergo special training recommended by manufacturers and update knowledge of reliability. Dedicated reliability trainings must be established and guaranteed. The Reliability Control Board has the overall responsibility for the effective implementation of the Reliability Programme and meets at least quarterly. The RCB has full authority to take the necessary actions to implement the objectives/processes defined in the programme. The Reliability Control Board is composed of permanent and advisory members.

The functions of the Reliability Control Board is formal agreement of Alert Level Changes and Targets, ensure timely implementation of corrective and preventive actions get report of all System Deficiency Assessments (SDA) discussion of Engineering proposals of SDAs based on data made electronically available Maintenance Programme effectiveness assessment; Approves all changes to the Reliability Programme, Responsible for day to day operation of the reliability Programme conducting and controlling of all investigations when it’s need overall responsibility for the Reliability Programme.

The participants of RCB is Manager of Engineering Continuing Airworthiness Division, head of Reliability Group, Reliability Engineer.

Procedural process of RCB-meeting. Fleet Reliability Engineer, in advance (approx., 2 weeks before RCB-meeting takes place) provides "open", "closed on hold" and "closed" System Deficiency Assessments (SDAs) electronically on common team-drive accessible for all RCB members. This in advance provision enables RCB members to perform an advanced judgment of "open" and suggested to be "closed on hold" SDAs. SDA may show following status:

- SDA "open evaluation" = SDA is under engineering investigation;
- SDA "open action" = SDA corrective actions defined by Engineering;
- SDA "closed on hold" = SDA corrective actions performed, statistically improvement effect under evaluation;
- SDA "closed" – improvement confirmed or for any other reason SDA closed by the RCB.

During RCB meeting any RCB-member may ask and request additional explanation to support judgment in addition. To accelerate RCB-meeting, request for supporting data shall be made min. 1 week In advance before the RCB-meeting takes place. Any SDA suggested to be agreed for "closed on hold" without requests/questions raised during or before the RCB-meeting, automatically is acknowledged and can be considered as "closed". SDAs not agreed to be closed, remain open for further processing by the engineering specialist. The Reliability Engineer will present following subjects during the RCB meeting proactively:

- Fleet Reliability;
- Changes of Alert Level and Targets;
- Any SDA to be closed definitely, as improvement effects are evident;
- Any SDA with actions not covered by routine processes requiring boards action/decision;

- SDAs with actions to be taken not fully agreed between involved parties and requiring RCB decision.
- SDAs suggested to be closed without any feasible measurements available.

The above listed Group of Lead-Members can nominate a substitution person, to represent their function as RCB-Member. The Reliability Control Board normally meets quarterly, respectively more frequently on occasion, Additional members can be defined by Reliability Engineer at occasion.

Reliability meetings help establishing reactions on chronic discrepancies and or deterioration of aircraft reliability including airframe, engine, APU, systems, components and procedures. The reliability meeting is used to ensure proper actions and timely coordination of all affected departments to ensure common effort is used to work towards the common company goal. A daily maintenance meeting is held every working day to discuss the technical issues and also delays/cancellations of the previous day (including weekend), to discuss each event and to decide on incorporation of inputs and quick measures, which have immediate and positive impact on reliability and safety. A reliability control meeting for each fleet is held on demand (at least once a quarter), to discuss the system, power-plant, components and structures reliability and the on-going reliability investigations. The participants of the RCM present a status of the open SDAs and may decide, whether an additional SDA shall be issued in order to initiate detailed investigation. Every meeting shall be documented in an appropriate format, describing the items and problems discussed in the meeting with the actions decided. Participants RCM are Manager of Engineering Continuing Airworthiness Department, Head of Reliability Group, Reliability Engineer, Representative of Engineering Management, Representative of Material and Technical, Supply Department for Aircraft Maintenance, Representative of Safety and Quality Management, Representative of Competent Authority (if required). The participants are invited, depending on the meeting subject and the attendance of the Reliability Engineer is mandatory.

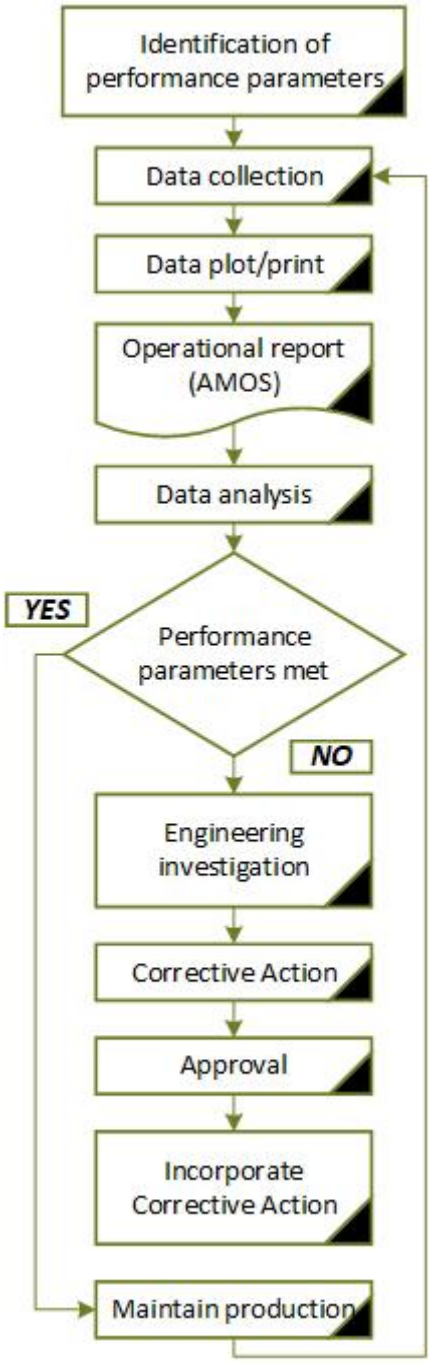

Figure 1.3 - Reliability Control Scheme

Following defines the performance parameters for Airlines Reliability Control System. These parameters are aggregated to certain levels for reliability reporting:

- ATA chapter definition;
- Operational hours and cycles for airframe, engine/APU;
- Dispatch reliability, cancellation, daily utilisation;

- Aircraft events (incl, delays and cancellations), incident and occurrences;
- Complaint rates for PIREPS and MAREPS with UCL comparison;
- Number of unscheduled component removals;
- Unscheduled component removal rates incl. MTBUR- and MTBF calculation with trends;
- ETOPS relevant system monitoring, number of IFSD;
- Maintenance interval usage evaluation and T/C findings;
- Monitoring of corrective action process.

Basic Data Collection are include Operational data Workorder: Pilot Flight Log entries (PIREP), Maintenance Findings (MAREP, incl.check findings); Component removal reports and details, overhaul/shop reports and findings (e,g. NFF, confirmed failures, ...), Task Card Check Finding data, Aircraft irregularity reports (events, incidents, occurrences) and ETOPS data.

Operational data consist of:

- Total Aircraft Hours and Total Aircraft Cycles;
- Pilot Reports (AFML);
- Maintenance Reports;
- Operational days;
- In flight engine parameters data;
- Flight delays and cancelation.

All technical aircraft events and occurrences have to be documented and administrated by appropriate departments.

MAREP/PIREP Workorders, related to a defect finding or a pilot report. Prior data entry the Shift leader of Part-145 AMO Line maintenance department on duty has to guarantee, that all relevant Data are entered correct on the Workorder hardcopy by the applicable Technician with special attention to:

- ATA chapter;

- Project number;
- Performed and/or required working hours;
- Booked/required Parts and – related references (T/C reference for check findings).

The Reliability Programme is focused on rotable categorized parts, where Material Department (MD) has the ultimate responsibility of this definition. All removals and/or installations of each rotable part must be booked/administrated in the AMOS, MD is responsible for those entries. Power Plant Group is responsible for removal and / or installation of engines and the APU in the system. To ensure proper indication of alert levels, component failure rates, and system complaint rates, corrected data shall be available to provide an accurate basis for analysis.

The Aircraft Operational Data contains a summary of the aircraft production for each airplane over the selected period and a separated statistic for the common airplane fleet monitored over a 12-month period. The Workorders Reliability data contains a statistical summary of all workorders issued during the monitored period. The " Systems Reliability Report " report shows both the total number and the rate of: "PIREPS", "MAINTENANCE DEFECTS", "SCHEDULED MAINTENANCE" with the respective Upper Control Limits (UCL) for all systems and subsystems. The UCL is calculated as the previous 24-month average plus standard deviation factor - 2. Any deviation from this definition has to be approved by RCB. For defect rectification and defining root cause of repetitive failure all involved personnel of MM, EM, Reliability Department analyzing troubleshooting history. MM is responsible for documenting troubleshooting steps in Workorder.

The purpose of an alert level is to identify significant deviations from a previously acceptable standard of performance. The level should not be set so high that a major increase in the failure rate does not provide an alert, nor so low that the normal distribution of failures results in excessive alerts. The actual setting of the alert level therefore, will normally depend upon the distribution or "scatter" observed in the failure rates of the system under review.

An alert exists when the monthly average occurrence of a discrepant system exceeds an upper control limit. This system is termed as an "alert" item and requires Reliability Control intervention. If the UCL is exceeded only once with no consecutive exceedances is usually considered as statistical deviation and no reliability control intervention is necessary. System exceeding UCL have to be monitored by the reliability engineer on a monthly basis. If required, corrective action has to be issued and monitored by responsible aircraft/engine engineer and the efficiency/status of this corrective action reported at the upcoming RCB. RCB has to decide if further corrective action is required to bring the affected system reliability back to a non-alerted condition and secure and economic operation.

Only rotable categorized components are monitored with the Reliability programme. The Component Reliability contains a statistical summary of all unscheduled removed components during the observation time. The reliability engineer provides the component statistic for the observation period in the Reliability Report. The basis of the component analysis is the "Part Reliability Basic Data" report. It displays the total number of removals and rates per 1000 flight-hours of the defined observation time. The basic information is derived from the Removal Tag and Shop report and is documented in the "Label booking" programme under responsibility of the P&SD and MD. If repair organization rejected component warranty repair, information is sent by an engineer of P&SD to Reliability Department for the investigation and decision taking to continue the repairs. Sometimes particular single rotable components have a negative impact on the component reliability although the MTBUR doesn't reach a critical level. The AMOS feature "Rogue Units" is able to locate those components to find out about rotables, which are removed with high frequency and in short intervals. Components with a MTBUR lower than the selected alert level have to be analysed to find the root cause of the low MTBUR (e.g, normal wear, design deficiency, etc.). If the alert level is exceeded only once with no consecutive exceedance, this is usually considered as statistical deviation and no reliability control intervention is necessary. As additional guideline for assessing component reliability, MTBUR trend data is

available. Components exceeding the alert level have to be monitored by the reliability engineer on a monthly basis. If required, SDA will be issued. Has to decide if further corrective action is required to bring the affected component reliability back to a non-alerted condition and secure and economic operation.

All aircraft events, regardless of operational consequences (delays, cancellations) as well as incidents and occurrences are part of this data collection and analysis. The delay and cancellation statistics contain a Total time of delays by ATA chapters Graph and Number of delays by ATA chapters Graph, occurred during the monitored period. The Delay Report contains a summary of all events. During the DMM all events (regardless of operational consequences), incidents, and occurrences are discussed to find a corrective action to prevent further events due to same reason.

Standard IATA Delay Codes (41-48 Technical and Aircraft Equipment) are used to classify delays for technical reasons:

- 41 - AIRCRAFT DEFECTS.
- 42 - SCHEDULED MAINTENANCE, late release.
- 43 - NON-SCHEDULED MAINTENANCE, special checks and/or additional works beyond normal maintenance schedule.
- 44 - SPARES AND MAINTENANCE EQUIPMENT, lack of or breakdown.
- 45 - AOG SPARES, to be carried to another station.
- 46 - AIRCRAFT CHANGE, for technical reasons.
- 47 - STAND-BY AIRCRAFT, lack of planned stand-by aircraft for technical reasons.
- 48 - SCHEDULED CABIN CONFIGURATION / VERSION ADJUSTMENTS.

In order to classify Interruptions as Chargeable or Non-Chargeable with an associated exclusion code, it is necessary to use the following norms:

A. Servicing - No corrective maintenance performed.

1. Struts
2. Oil
3. Hydraulic Fluid
4. Lubrication - (no access required)
5. All 'Servicing' activities that do not require the mechanic to physically adjust or replace or defer structural repair and replace hardware/software
6. Fueling related
7. Deicing
8. Water & waste
9. Sanitizing/flushing
10. Moisture & condensation
11. Printer paper replacement
12. Routine cleaning (e.g. cabin and/or windows)
13. Tire pressure servicing
14. Oxygen (routine servicing of crew and portable systems)
15. Routine database update (navigation, weight and balance, in-flight entertainment systems, etc.)
16. Photo Luminescent Emergency Exit Strip Lighting charging
17. Wi-Fi

B. Precautionary Maintenance - no corrective maintenance performed

1. Hydraulic leaks - within limits
2. Fuel leaks -within limits
3. Manual closing passenger/crew/cargo door
4. Oil leaks – within limits

C. Normal Wear Maintenance

1. All re-lamping
2. Tires - worn past limits

3. Brakes - worn past limits
4. Decals/paint/appearance items
5. Normal battery replacement
6. Rub Strips

D. Scheduled Maintenance Activities – completion of planned work content of maintenance checks

E. Logistics – resource deficiency normally available at the point of delay (if resource not normally allocated at the station do not exclude).

1. Parts
2. Tools and equipment
3. Personnel
4. Facilities
5. Aircraft positioning
6. Documents (drawings, etc.)

F. Damage – Directly or indirectly induced by outside force (Aircraft damage, hail, FOD, etc.)

G. Known Human Error

Engine Engineer tracks the Engine Incidents, Events and removals for all applicable engine/APU types and serial numbers. The following Incidents, Events and removals are documented in EDP AMOS system and reported in the Reliability Report Section: "Engine Statistical Summary Report" (This report applies to ETOPS aircrafts):

- All In flight Shut down (IFSD);
- Engine caused IFSD;
- Engine caused aborted take-off;
- Start failures;
- Unscheduled and scheduled removals;

All major and significant structural defects, which are detected during scheduled and/or unscheduled maintenance, have to be must be analysed by the Structure Engineer of the Technological Support Department.

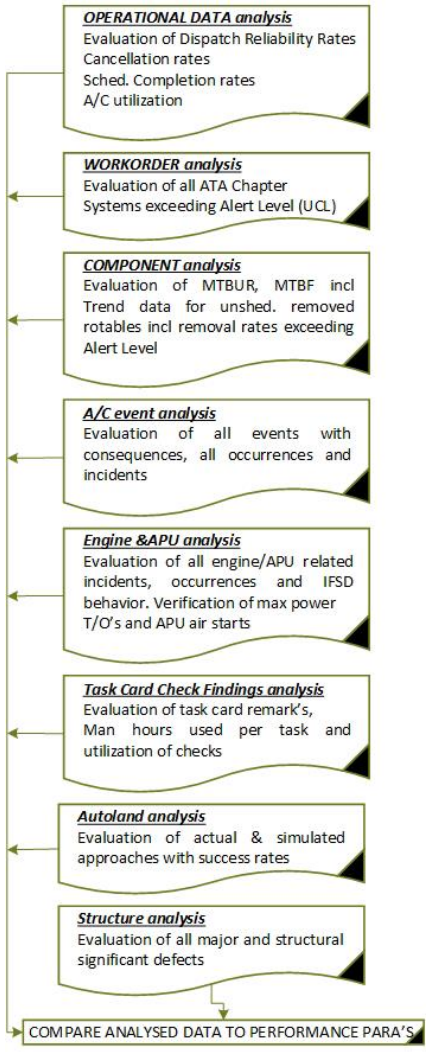

Figure 1.4 - Reliability data analysis scheme

1.3 Analysis of Maintenance Program

The Reliability Programme controls, monitors and measures the effectiveness of the aircraft Maintenance Programme. With an evaluation method required by the MSG-3 Maintenance Programme philosophy a guideline logic has been developed that indicates if a revision in the maintenance programme is required or other corrective action is necessary to improve the reliability of the affected system or component.

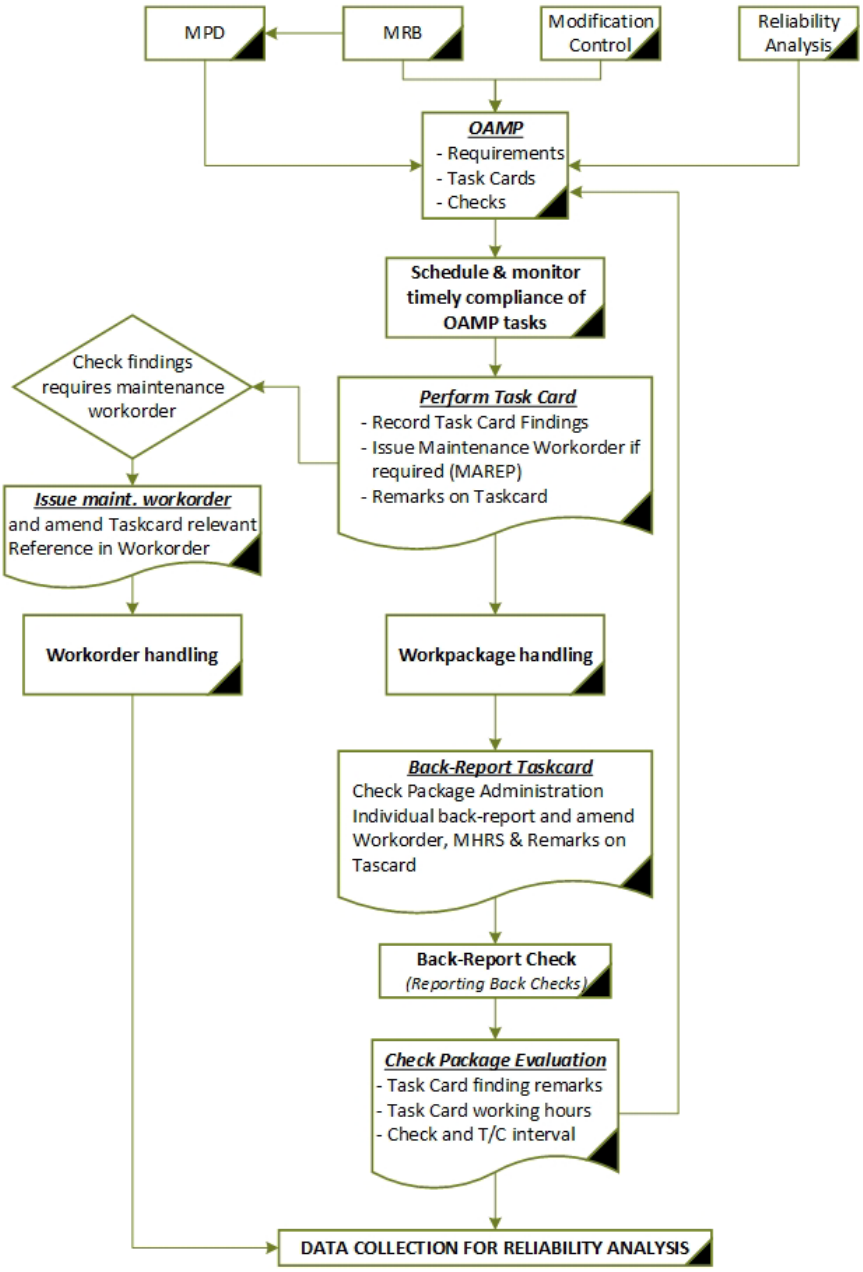

Figure 1.5 - Reliability data analysis

If a workorder or component alert level is exceeded over a long period (refer to item 3.8.2 or 3.8.3), a maintenance task evaluation has to be performed for subject ATA Chapter by the responsible maintenance programme engineer and the reliability engineer in accordance with Maintenance Programme evaluation process. This has to be done in agreement with the responsible system engineer (airframe, avionics, powerplant, structure...).

Maintenance defect due to check findings: If the result of the evaluation is, that a maintenance programme task is available and applicable, the responsible

engineers have to review the possibilities of improvements into this specific task card, like interval correction, task content, procedure, used consumable materials, task card qualification, tool & support equipment.

General Maintenance findings: If the result of the evaluation is, that a maintenance programme task is available and applicable, but not triggered with the appropriate interval, the responsible engineers have to review the possibilities of improvements into this specific task card interval. If the result of the evaluation is, that an applicable maintenance programme task is not available or applicable, the responsible maintenance programme engineer has to decide if a new maintenance taskcard has to be developed, or if another possibility is available to recover the reliability.

The review of the maintenance programme tasks should be performed on a regular basis. The evaluation records of the maintenance programme review should be kept on file to verify the improvements.

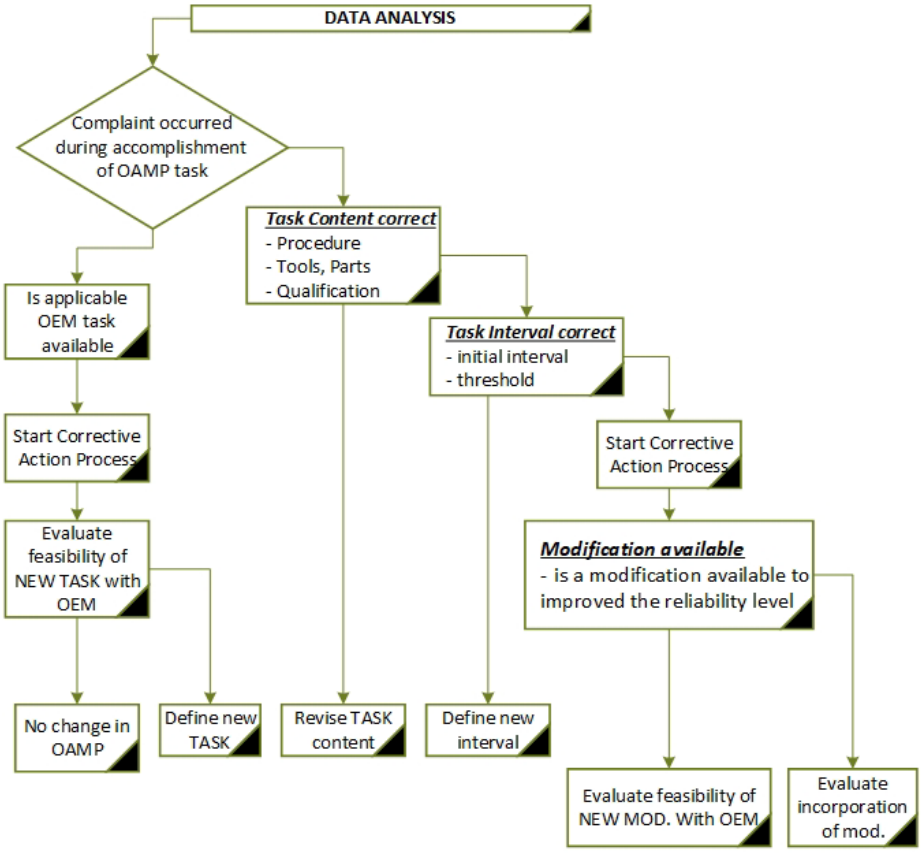

Figure 1.6 - Maintenance programme evaluation process

Responsibility

The reliability engineer has the overall responsibility of the respective SDAs in his fleet. The SDA is triggered (opened) by the responsible reliability engineer (e.g. due to a decision in the RCM or in the RCB, trend shift of one or more reliability parameters). However each person involved in the reliability process can provide suggestions to open a SDA. The initial statement should be in coordination with the system engineering, but shall be within 1 month after issue of the SDA. The system engineering shall perform a monthly update of the SDA until the SDA is finished. The SDA investigation is performed and updated by the aircraft/engine/component engineer. The reliability engineer what includes applicable reliability data and is forwarded to the Aircraft/Engine/Component Engineer for further detailed engineering evaluations will always issue the SDA. The responsible engineer has to take care, that the Corrective Action Process keeps ongoing and that all decisions made are carried out. The Reliability Engineer has to frequently monitor, that the all required steps are done. Reliability Department head have to monitor that the responsible system engineers are working on the SDA.

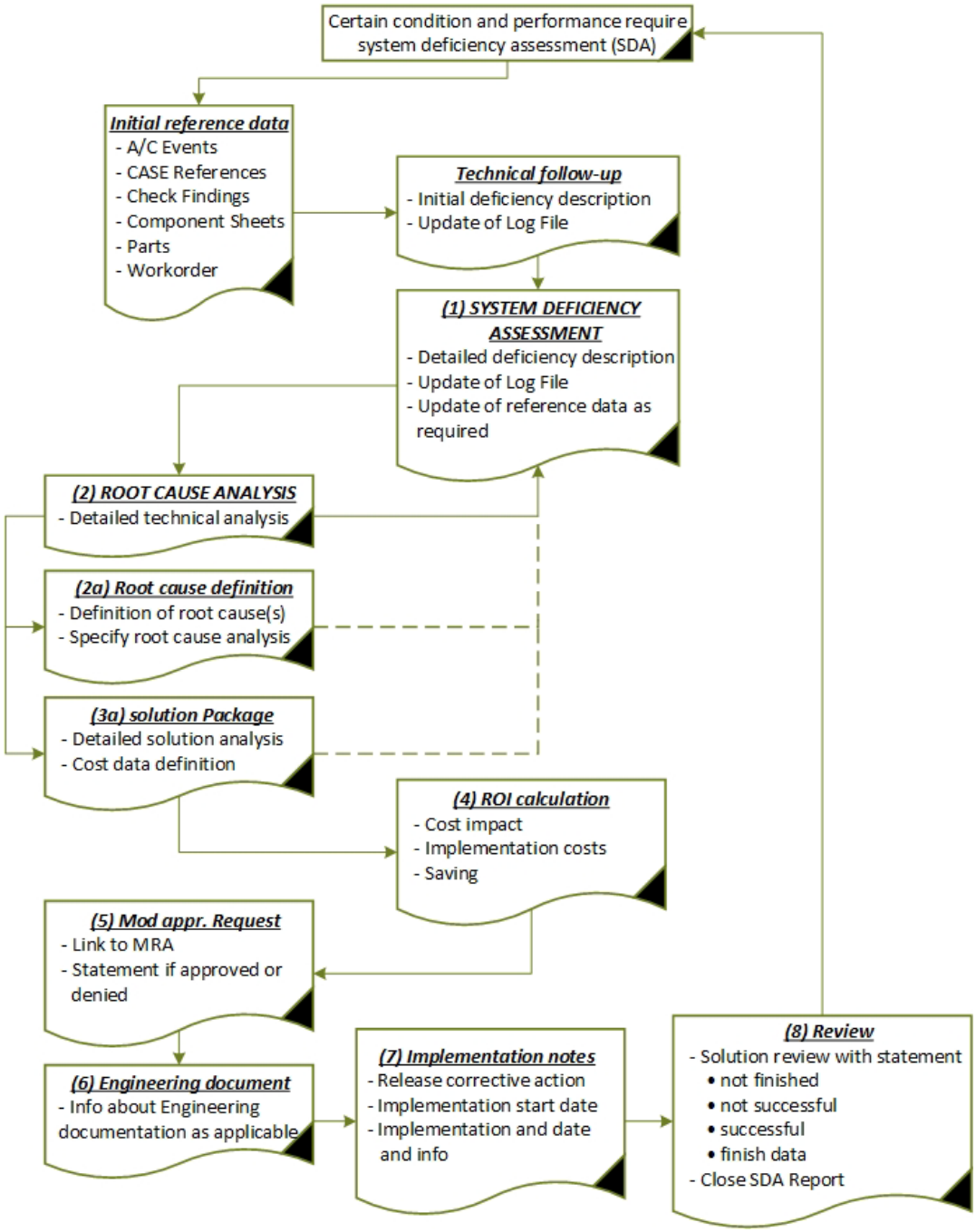

Figure 1.7 - Corrective action process

The SDA is the primary tool to initiate surveys and if necessary corrective actions at the following conditions:

- a system or a component needs further longterm investigation to bring reliability parameters back to an acceptable level, or
- if the airworthiness, the flight safety is affected

- Over alert conditions with a common cause
- Failures of significant systems and components
- Repeating failures in ETOPS Systems
- Components with low MTBUR or low MTBF
- Systems with high complaint rates
- Major Airworthiness irregularities
- Request from the RCB

Examples for such corrective actions are:

- Revision of the maintenance programme content
- Maintenance Programme task interval changes
- Procedural changes
- Operational Procedure change
- Additional training for Maintenance/Flight/Cabin crew
- Modifications to the relevant system
- Modifications to the relevant components

Non-technical items affecting reliability, safety (such as training, quality issues, human factors, tooling, equipment, procedures) are treated the same way as technical issues.

Conclusion of this part

This section provides a comprehensive analysis of the reliability program and the maintenance program. To continually maintain airworthiness requirements, companies must continually develop, review and improve these programs. It should also be noted the degree of responsibility of the company's engineers responsible for airworthiness, as well as the responsibility of the competent state authorities. The main conclusion of this section is to ensure the constant reliability of the technical dispatch in the airways.

2. ANALYSIS CONTINUING AIRWORTHINESS MANAGEMENT EXPOSITION AND MAINTENANCE ORGANIZATION EXPOSITION

2.1 Continuing Airworthiness Management Exposition

The Continuing Airworthiness Management Exposition (CAME) defines the organization and procedures upon which the Airlines approval by State Aviation Administration of Ukraine (hereinafter Competent Authority) under M.A. Subpart G Part-M is based. These procedures are approved by the undersigned and should be complied with, as applicable; in order to ensure that all continuing airworthiness activities for aircraft operated by Airlines are carried out on time to an approved standard. It is accepted that these procedures do not override the necessity of complying with any new or amended regulations published by the Competent Authority from time to time where these new or amended regulations are in conflict with these procedures. It is understood that the Competent Authority will approve this organization whilst the Competent Authority is satisfied that the procedures are being followed and the working standards are maintained. It is understood that the Competent Authority reserves the right to suspend, vary or revoke the M.A. Subpart G continuing airworthiness management approval of the organization or the air operator certificate, as applicable, if the Competent Authority has evidence that the procedures are not followed and the standards not upheld.

Digital part of ATL system is presented by AMOS System, which allows to monitor timeliness and completeness of maintenance, including control of remaining flight hours, cycles, calendar time cycles for components, as it required by M.A.306 (a) 3, by means of collecting the current total time in service (flight hours, flight cycles, landings and calendar time) for each aircraft and all its components including service life-limited components (engines, APU, landing gear, parts and appliances).

The AFML in use with is designed for recording of defects and malfunctions discovered during the operation of the aircraft, recording of particular

maintenance and details of all maintenance carried out on the aircraft during scheduled/unscheduled maintenance and further Aircraft Release to Service (CRS).

Also, AFML is used to record any operating information relevant to flight safety and contains maintenance information that the operating flight crew, CAMO and AMO personnel of needs to know, regarding the technical condition of the individual aircraft. The record in the block of AFML about maintenance check performed, as required by AMC 301-1 (b), serves to inform the crew that the Daily Check (or equivalent maintenance) is timely performed and aircraft will not require performing of any scheduled maintenance during the flight.

Each AFML page includes provision to record the following info:

a) The aircraft type and registration;
b) The date, place of departure and place of arrival and times of take-off and landing;
c) The name and address of the Operator;
d) Particulars of any defects;
e) The post-flight signature of the aircraft commander and the date;
f) The fuel quantity on arrival;
g) Details of rectification action taken in respect of defects together with a pre-printed Certificate of Release to Service (CRS) statement;
h) The quantity of fuel and oil uplifted and the total quantity available at the beginning of each flight;
i) The completion of preflight and/or daily inspections;
j) The times when de-icing was started.

The DMI status is used to record discrepancies whose rectification under certain conditions could be deferred. Control of the statuses onboard of aircraft is performed by technical personnel during every aircraft maintenance. Statuses printing should be done 24 HRS (B733, B735) or 48 HRS (B738, B739) aircraft maintenance, or at nearest suitable opportunity provided that any changes were made

to the status (DMI was Opened or closed). In this case status is generated for each particular aircraft, printed and signed (by person who printed the status), and after that is placed onboard of aircraft.

The AFML, DMI Status, CL, Damage and Repair Chart, FBDC are considered, as official documents and are part of the Airline Aircraft technical log record system and approved by the Competent Authority prior to their release and further usage. AFML, DMI Status, CL. Chief Technical Officer is responsible for submitting the documents of the Aircraft technical log record system and any subsequent amendments of these documents to the Competent Authority for approval. As a part of this Exposition, all documents of the Aircraft technical log record system are approved with the approval of this Exposition and all latest amendments.

Minimum Equipment List (MEL) represents a listing of items of equipment, which may be unserviceable, under certain circumstances. The MEL and instructions for its use are contained within the Operations Manual (OM), Part B, Chapter 9.

When a defect has been raised in “Item Information” column of AFML and is deemed to be within the allowance quoted in the MEL then it may be subject to carry forward action. Deferment of such defects is done by means of DMI procedure. During DMI issue there should be taken into consideration possible affect on airworthiness that multiple and related (to the system) defects may have, even where these are covered as individual items in the MEL. The DMI record must be suitably annotated with details of the defect and a time limit must be specified (date and time or remaining flight hours and/or cycles).

Discrepancies in the MEL may be classified as follows:

- MEL Items do not require specific maintenance or flight crew action prior to deferral;

- MEL Items that require installation of information placards adjacent to the control or indicator of the affected item;
- MEL Items that require specific maintenance action prior to deferral. The items are denoted by the letter “M" in the “Remarks or Exceptions" block of the MEL;
- MEL Items which require specific flight crew action prior to deferral and/or during operation of subsequent flights. The items are denoted by the letter “O" in the “Remarks or Exceptions" block of the MEL or their combinations.

Where the MEL item has been entered by maintenance personnel, the decision to accept the carried forward item allowed by the MEL/CDL remains the responsibility of the pilot in command. This acceptance of any open deferred items is indicated by his/her signature on the AFML page in the “Captain's Acceptance Certificate” space. The time limit for the defect rectification is specified in the MEL in Flight Hours / Cycles / Calendar Time so that the defect rectification may be performed before the specified MMEL limit. All MEL time limitations are managed and controlled (tracked) by ESG personnel in AMOS System, in order to provide defect rectification within the time limit specified in the MEL item. Dispatch of the aircraft is not allowed after expiry of the Rectification Interval specified in the MEL, unless the Rectification Interval is extended in accordance with the procedure specified below or he defect has been rectified. Extension of DMI can be performed not more than 1 (one) time for category "B" and “C” items only, on that same repair interval as established by the respective MEL item. Extension of DMI issued according to MEL categories "A", “D” – is prohibited. Extension of DMI acc. to MEL category "B/C" and CDL is allowed and approved by Chief Technical Officer on request from ESG and in the presence of the issued Deferred Maintenance Item Extension (DMIE, Form AF-04) after ensuring that:

- There are no other aircraft available for substitution of aircraft with MEL time limitations;

- There are no previously MEL/CDL time limitations (the additional inoperative component or system) on the airplane that would preclude of DMI extension;
- No degradation in safety level will occur;
- The inoperative component or system will not cause an undue increase in flight crew work load.

The MEL is developed by Engineering Program Department in a form of separate document and MEL should be revised and approved within 90 (ninety) days since issue of new MMEL revision or any amendments to MEL are necessary. New MEL revisions are agreed and approved by officials of the and Competent Authority, except of temporary revisions. MEL Temporary revisions are used i.a.w. Part 0.2 OM-A, in cases when changes to the MEL should be applied immediately, as prescribed by MMEL or when they could influence flight safety. Each temporary revision is active for the period until next main revision of MEL will be developed and approved. The personnel of Airworthiness Control and Certification Department are responsible for MEL approval by Competent Authority.

Aircraft maintenance programs – development, amendment and approval

The MP contain all repeated maintenance tasks, the associated procedures and standard maintenance practices which have to be performed by the AMO. The MP are established and contained information in accordance with requirements M.A.302, AMC M.A.302, Appendix I to AMC M.A.302(a) and M.B. 301(b) Subpart C Part M. The MP include the following minimum content:

- The type/model and registration number of the aircraft, engines and, where applicable, auxiliary power units;
- The name and address of the owner, operator;
- The reference, the date of issue and issue number of the approved maintenance program;
- A statement signed by the operator;

- Contents/list of effective pages and their revision status of the document;
- Procedures for the escalation of established check periods, where applicable and acceptable to the Competent Authority of registry;
- The tasks and the periods (intervals/frequencies) at which each part of the aircraft, engines, APU's, components, equipment, accessories, instruments, electrical and radio apparatus, together with the associated systems and installations should be inspected. They includes the type and degree of inspection required;
- The periods at which components should be checked, cleaned, lubricated, replenished, adjusted and tested;
- The periods at which overhauls and/or replacements by new or overhauled components should be made;
- Each maintenance task quoted defined in a definition section of the program.

Each Maintenance Task which include task of Certification Maintenance Requirements (CMR) or Airworthiness Directives (AD) has reference to appropriate item of CMR or AD.

In the process of MP developing, the impact of the Human Factors is taken into account which is expressed in the following (but not limited to):

- Layout of the Maintenance Item;
- Language, clear for the user;
- Clear and concise instructions that are as brief and succinct as possible;
- All task are standardized;
- All notes, warnings and cautions are apparent for using and understanding of text.

The company uses instructions issued by Competent Authority, instruction for continuing airworthiness, issued by the holders TC, STC, major repair design

approval or any other relevant approval issued under Part-21 and its Annex as the basis for MP development. The primary source of MP is the Maintenance Planning Document / Data (MPD) which includes the requirements from the TC holder Competent Authority: Maintenance Review Board (MRB) report, Certification Maintenance Requirements (CMR) and Airworthiness Limitation Items (ALI). Also TC, STC holder's recommendations for additional scheduled maintenance tasks are included in MP, to ensure a timely and economical aircraft operation under consideration

The Chief Technical Officer should have sufficient qualified engineering personnel adequately trained and assigned to make changes to MP. The management of CAMO is responsible to have associated procedures in place to ensure, that the individual MP reflects the current TC, STC holder's recommendations and maintenance needs of the aircraft, as well as requirements of Competent Authority and EASA regulations. Reliability Group personnel is responsible for development of Reliability Program. For detailed information on Reliability Program please refer to Chapter 1.10 of this Exposition. The Electronic Data Processing (EDP) application AMOS with the modules "Maintenance Programs Administration", "Parts Administration", and "Check Control" is used for a computer-based administration of the MP and to control the timely performance of the various task card items and checks on all aircraft operated by AOC Holder and for customer operators that have contracted that engineering service to.

The MP are subject to periodic engineering review by a review team, which shall be performed at least annually, to ensure that MP reflect the current TC, STC holder's recommendations, revisions of the MRB Reports and revisions of MPD, mandatory requirements and maintenance needs of the aircraft. Also is recommended to use the reliability experience and data for the review of MP.

Head of Reliability Group is responsible for organization of this meeting for engineering review annually, as it stated above, or when there is a necessity of

immediate corrective action implementation as a result of analysis of reliability reports (or other objective reasons) which requires changes to MP.

The first issue of MP, as part of the introduction of a new aircraft type, having an own TC, into the AOC, in addition to the internal approval process, a direct approval by the Competent Authority.

All issues and revisions to MP prepared by authorized engineering personnel, signed and agreed by:

- Head of Maintenance Programs Group;
- Chief Technical Officer;
- Manager of Engineering Continuing Airworthiness Division;
- Vice-president Safety and Quality Management;

All next issues / revisions of maintenance program except Minor revisions also have to be approved by the Competent Authority. Minor changes to MP after signing and concurrence personnel listed above, should be formally accepted by Competent Authority, by means of indirect approval. For this, corresponding MP revision should be sent to Competent Authority with official letter, within 5 working days since the day when it's taken into force within CAMO. Competent Authority reserves the right to reject amendments in the event of significant deviations with the present indirect approval procedure. Maintenance Programs Group stores the old revisions of MP and amendments details in digital format to demonstrate the reason and contents of changes and that the revision of the MP is justified by approved relevant data in accordance with the relevant procedures.

Analysis of the effectiveness of the maintenance programme

This chapter specifies the system used in order to control the reliability of aircraft, engine and components, operated by (any customer operator) and Analysis the effectiveness of the maintenance programme, and to determine any necessary changes to the maintenance programmes. The development of the necessary statistical data is performed in accordance with the guidelines issued by EASA

(Appendix I to AMC M.A. 302) and Competent Authority. The reliability reports, periodically issued by the responsible Reliability Group, are a tool for analysed and developed the recommendations for determining the effectiveness of the Maintenance Programmes, used and/or controlled company or any customer operator, who contracted such services. The responsible Reliability Group establishes the reliability targets for the effectiveness of the maintenance programmes for each aircraft fleet as a part of the Reliability Program. All technical defects and complaint reports issued by flight/cabin crew or any maintenance organization (e.g. AFML, AMOS WO, etc.) which are entered into AMOS by personnel comprise information source for the reliability program, and further Maintenance Program effectiveness determination. The responsible Reliability Group analyses and evaluates the data under the following criteria, which are the essential parameters for the reliability report:

- Critical failures of components or systems;
- Pilot / Maintenance personnel complaints, in particular if reoccurrences of a malfunction / failures / defect are shown by exceeding Alert Levels;
- Operational irregularities (e.g. air turn backs, aborted takeoffs, rapid decompression, etc.);
- Technical incidents;
- Technical delays and cancellations;
- Reliability data.

These data are reviewed during the reliability control meetings, which are conducted by Reliability Group.

A preventive corrective action shall be defined upon exceeding of given Alert Levels and/or noncompliances with a given reliability target as applicable. The Reliability Group develops the aircraft fleet reliability reports on a monthly basis. These reports reflect the actual reliability of a particular aircraft or aircraft fleet according to defined Alert Levels and all given reliability targets.

Continuing airworthiness quality policy, plan and audits procedure

Continuing airworthiness management quality system is integrated with the Quality System as detailed in Compliance monitoring manual. The Quality policy is based on the following:

- commitment of each employee to the highest level of quality and safety is valued and encouraged;
- all levels of management are responsible for
- quality and safety;
- all employees are empowered to provide quality problem solutions;
- Each time quality deficiency is found – either by an audit, an investigation, in the normal course of work - appropriate quality actions will be required.

The CAMO Quality Assurance Program is to be developed according to general procedure defined in item 5.2.1 of Compliance monitoring manual and is a part of the Quality Assurance Program. During 12 (twelve) month period, the Quality Assurance Program shall adequately address the whole continuing airworthiness management activity.

The continuing airworthiness activity to be evaluated by the CAMO Quality Assurance Programme are the following:

- the accomplishment of pre-flight inspections;
- the rectification of defects and damages, MEL/CDL operations;
- adherence to the approved aircraft maintenance programmes, including maintenance check flights when necessary;
- the analysis of effectiveness of the approved maintenance programmes;
- the accomplishment of:

  a) airworthiness directive;

  b) operational directive with a continuing airworthiness impact;

  c) continued airworthiness requirement established by the Competent Authority;

d) measures mandated by the Competent Authority in immediate reaction to a safety problem;

- The accomplishment of modifications and repairs;
- The embodiment of non-mandatory modifications and/or inspections.

The above mentioned tasks shall be audited as parts of the annual Quality Assurance Program based on typical IATA ISM typical areas:

- Management Control;
- Maintenance Control;
- Technical records.

Quality audits – are the basic means used in quality assurance of the continuing airworthiness activity. Subjects to be audited are policies, systems, programs, processes, procedures and records, as well as aircraft. Audits are scheduled to ensure:

- Complying with applicable regulations and standards;
- Satisfying stated maintenance operations needs;
- Identifying undesirable conditions and areas that requires improvement;
- Identifying hazards in airworthiness.

Postholder Maintenances shall ensure identification of root causes of any audit finding and implementation of effective corrective action in response to any audit finding. Remedial actions shall be taken without undue delay to eliminate any deficiency highlighted during an audit as a reason for audit finding.

Yearly Management Evaluation of Quality Assurance Program results, systematic deficiencies and areas of quality & safety possible improvement will be carried out as a part of corporate management review procedure. The Quality Assurance Program makes evaluation of adequacy (documented) and implementation of airworthiness continuing system. Special audit of adequacy shall be carried out when there were changes in binding requirements or major changes

in CAMO procedures. Special audit of implementation shall be carried out when there were detected systematic deficiencies in the aircraft airworthiness. In all cases it is a responsibility of auditor to generate appropriate checklist for the audit to evaluate adequacy and implementation of the applicable requirements and/or CAME items. Quality Manager is responsible for completeness and quality of audits which are carrying out annually

The Quality Manager monitors the effectiveness of Maintenance programmes by means of analyzing:

- Results of Quality Assurance Program;
- Safety Management System (SMS) database results;
- Crew and personnel reports, etc.

The Quality Manager monitors that the effectiveness of the Maintenance programmes is actually analyzed by means of membership, witnessing and being a recipient of records of Reliability Board meetings, Quality and Safety Board meetings held as required, and during which decisions on Maintenance programmes corrective action's system (amendment to the Maintenance programmes) are done. Increasing number of key indicators (targeted reliability levels), which are, also "monitored parameters" for Reliability programme may lead to amendment to the Maintenance programmes as a part of corrective action's system. The Reliability programme corrective action's system may lead not only to escalation or deletion of a maintenance task, as well as the de-escalation or addition of a maintenance task, but also to changes in the following areas:

1) Operational procedures;
2) Personal Training;
3) Maintenance procedures;
4) Spare parts provisioning, storage conditions;
5) Organization;
6) Documentation;

7) Review of contractors;
8) Implementation of modification on the aircraft.

The Head of Reliability Group bears responsibility to warning feedback to Chief Technical Officer and Quality Manager. The Chief Technical Officer bears primary responsibility for setting and coordination of targeted reliability levels.

To assure described above, Quality Manager is responsible for:

- Monitoring that shall not operate an aircraft unless these are maintained and released to service by an AMO appropriately approved/accepted. Reference to aircraft also includes the components fitted to or intended to be fitted to the aircraft;
- Provision of each maintenance organizations (performing maintenance on aircraft /aircraft components) with maintenance questionnaire for self audit
- Completion of special audits of contracted maintenance organization in case of any deficiencies or nonconformities with standards according to results of maintenance contracts monitoring;
- Analysis of notification from MCC about each deviations in maintenance contracts for fleet;
- Granting of approval to contracted maintenance organization.

Quality Manager of any contracted Part-145 maintenance organization provide to Quality Manager information on any actual or foreseen AMO certificate amendment, as prescribed in the contract, to ensure that the maintenance system remains valid and to anticipate any necessary change in the maintenance agreement (contract).

CONTRACTED MAINTENANCE

Any contracted maintenance to be carried out by an appropriately selected maintenance organization according to a contract (maintenance agreement) agreed and signed between and the selected maintenance organization which shall specify in detail the work to be performed. Safety is the top priority for maintenance contractor selection. A detailed List of contracted maintenance organizations (Form AF-20) to be maintained and periodically reviewed.

While selecting maintenance contractors by Maintenance Control Center, the following set of criterias to be used and assessed:

- Safety of services (severity of findings, recurrent findings, management of findings, safety related personnel turn-around, safety culture);
- Punctuality (adherence of agreements provisions);
- Flexibility of procedures (controllability and reasonability of deviations, exemption procedures);
- Planning reliability;
- Limitations to airline (timing, ordering, payment, curfews, etc.);
- Fair price (warranty and claims, repetitive defects);
- Customer related policy;
- Positive evaluation results of Contracted Maintenance Organization Questionnaire

Maintenance agreements together with amendments for aircraft base, scheduled line maintenance and engine (APU) maintenance, approved by Competent Authority, must complies with Appendix XI to AMC M.A.708 (c) and contain as minimum:

- Contractor is a holder of valid certificate issued by Competent Authority;
- A list of facilities where the maintenance is to be carried out, including a list of satellite facilities that the contractor may use;

- A Work of Scope (WS) that contains the detailed technical requirements, including references to maintenance Programme intervals, manuals, Airworthiness Directives (ADs), Service Bulletins (SBs) and special requirements;
- A clear, unambiguous and sufficiently detailed assignment of responsibilities are required to ensure no misunderstanding arises between the , the contracted AMO and Competent Authority that could result in a situation where the work, which has a bearing on the airworthiness or the serviceability of aircraft, is not properly performed;
- A procedures and responsibilities that will ensure, that all maintenance work is performed, SBs are analyzed and decisions taken on accomplishment, ADs are completed on time and all work, including non-mandatory modifications, is carried out in accordance with approved data and to the latest standards;
- A requirement for the contractor to produce a suitable quality plan of the project;
- Requirements for use and control of parts and materials;
- Process for the approval of deviations from maintenance documents;
- Access by ’s quality assurance staff to the contractor facility

Line maintenance of aircraft in transit airports performed according IATA standard ground handling agreements (SGHA) to Line Maintenance Procedure of Annex B to IATA Airport Handling Manual 810. In case when it is necessary to perform unscheduled line maintenance or component maintenance, including one-time engine (APU) maintenance, depending on the workload and complexity of work, the Chief Technical Officer makes a decision concerning individual work order at AMO. In unforeseen cases, when an aircraft has landed at a location where there is no an approved (by Competent Authority) AMO, the contract for maintenance could be in the form of individual work order to maintenance organization with approval AMO Certificate issued by local aviation authority. Such

orders in working days are signed by Chief Technical Officer or his deputy and at weekends should be issued and signed by MCC engineer on duty, after verification that the applicable AMO is appropriately approved by local CAA. In such cases List of maintenance contractors is not updated. In cases, when existing AMO (at landing place) does not fit to any criterion, does not have technical ability or does not confirm to perform required maintenance, or when in landing airport there is no any AMO – than in this case MCC shall with consent of Chief Technical Officer apply to contracted AMO with request to forward its technical staff to location of AOG aircraft in order to perform necessary maintenance.

Maintenance organisation providing components maintenance services for the should be:

- Have a Current and valid maintenance organization approval AMO Certificate issued by EASA or local aviation authority;
- Have a corresponding rating in Approval Schedule of AMO Certificates which corresponds to order component maintenance;
- Have the positive evaluation results of Contracted Maintenance Organization Questionnaire;

Chief Technical Officer is responsible to monitor efficiency of contracted maintenance against selection criteria (see 3.1.3 of this Chapter). MCC is responsible for monitoring that all contracted maintenance is carried out in accordance with the Maintenance agreements (contracts). A yearly meeting regarding contracted maintenance will be scheduled by Chief Technical Officer to review monitoring results and make appropriate decisions.

On the meeting must be present:

- Chief Technical Officer;
- Vice-President Safety and Quality Management;
- MCC Manager;
- Purchasing Manager.

If there Chief Technical Officer will be decided to eliminate a contractor from the List of contracted maintenance organization, such a decision must be supported by Minutes of Risk Assessment and Management Proposal. Vice-president Safety and Quality Management controls the fulfillment of the requirements relating to safety during maintenance contracting, and if necessary, address the specific security initiates unscheduled meeting of the Safety Commission. Safety Reporting System used for gathering safety-related information in maintenance area. Initiation of special audits of contracted maintenance organizations is joint responsibility of Vice-President Safety and Quality Management and Chief Technical Officer.

Maintenance contractor staff training process

Before start of contracted maintenance on airplanes all staff of maintenance contractor has to get the special training which includes relevant procedures, regulations and filling of production documentation requirements. For the Line maintenance, On-call maintenance, purposes special training should be provided in remote manner (all necessary materials should be provided via E-mail or FTP-server by MCC staff during maintenance request with attached contacts of MCC for daily assistance) in case of necessity training could be provided by instructor on-site of the contracted maintenance organization. For the Base maintenance, mandatory personnel training has to be provided on-site of the contracted maintenance organization. As an exception training could be done distantly, in the cases when there is no possibility to provide maintenance staff training on-site of the contracted maintenance organization prior starting of contracted maintenance. In this case MCC personnel send all necessary materials via E-mail or FTP-server. In addition all contacts of MCC for daily assistance are given. In order to provide continuous production process of contracted maintenance organization, it is permitted to train one or small group of persons (instructors) which will provide later training for the remaining staff involved in aircraft maintenance. When the training accomplished, instructor should fill Evaluation Form to confirm that the staff has been trained.

Filling of Evaluation Form is not required after accomplishment of the remote training E-mail with maintenance request with attached or ftp-linked training materials will serve as the evidence of procedure training with mandatory confirmation from maintenance contractors about familiarization. Note: Evaluation form is not needed to be filled due to rare cases of such requests and too many large quantity of out-base contractors of line maintenance where rotation of the personnel could not be controlled by . Contractors on their own will remain responsible for training materials dissemination to their staff. All filled forms stored on server in digital form. Hard copies are not stored. Chief Technical Officer is responsible for the mentioned above training to be carried out. More detailed information like scope of training, responsibility, organization of training process and requirements for the training materials is described in AWP 003.

2.2 Maintenance Organization Exposition

Safety and Quality Policy

Primary objective is and always will be providing of safety through performing of the quality maintenance of aircrafts and components. Quality is a core business of the MRO, a source of our competitive advantage and a precondition for safety. Reliability, punctuality and efficiency – these are the other main goals that we constantly control, review and develop to meet the needs of our customers. We value professional relations with our partners and suppliers. Activity of organisation must be built taking into account principles of Human Factor and it must be a continuous process. All levels of the MRO management will be clearly committed to quality and safety. Enhancement of resources utilization effectiveness and decreasing of operational expenses is the major priority also for all MRO staff and will be achieved by permanent improvement of practice and standards of the airline. In order to demonstrate all time the compliance with Part-145 to Competent Authority, customers, national aviation authorities of customers and other organisations, all records within MRO (such as, but not limited, technical records, quality records, staff records, internal correspondence related to maintenance

processes, etc.) shall be provided in English language, or, at least, be translated on English language or other language, acceptable for Competent Authority. Quality Management System which is implemented in MRO and based on philosophy. Our Quality Management System is intended to help us to achieve our quality objectives and takes account of national, European and international rules, requirements and standards. The MRO Accountable Manager ensures adequate resources and financing of the MRO Quality System according to the Quality Policy and Quality Management Objectives.

The MRO Quality Manager is highest delegate in questions of the quality system and holds an independent function. Quality performances will be audited regularly to assess Quality System efficiency. Audits not only confirm (or not confirm) the effectiveness in achieving the desired performance, but also detect specific problems and help to identify weaknesses. All MRO personnel shall cooperate with the quality auditors in order to provide the effective and deepest Quality System analysis and detect latent discrepancies. Whenever a safety deficiency is found - either by an audit, an investigation, in the normal course of work or by means of voluntary reporting – prompt quality actions are required. Possible errors will be deeply and comprehensively analysed, and problems to decide in a constructive fashion. Any commercial offer or benefit could be viewed only through the safety and quality standards comparison prism. It means that MRO shall find the best correlation between the safety standards and commercial offers, but safety standards shall be first-priority. This Safety and Quality Policy defines quality related activity of all maintenance personnel and will be reviewed by the Accountable Manager for MRO as needed. The MRO management understands, that the initial and continues training of the personnel play the major role in achievement of highest quality and safety standards. That is why the personal training is the one of the foreground direction of the company evolution. MRO management guarantee that the training programs, set in this MOE, is applied for all employed and contracted staff. It is the responsibility and duty of everyone in the organisation to accomplish and maintain this policy and its objectives. We can only achieve our

quality objectives if everyone actively contributes to their implementation. This means that all of us and everyone are responsible as for the quality of own work and for improving quality standards at every opportunity and if errors do occur, we consider this as an opportunity to search for the cause and resolve any problems in a constructive fashion. Only by providing the standard of safety, quality and service demanded by our customers, and constantly striving to maintain and improve the standard, we can continue to be respected provider of maintenance.

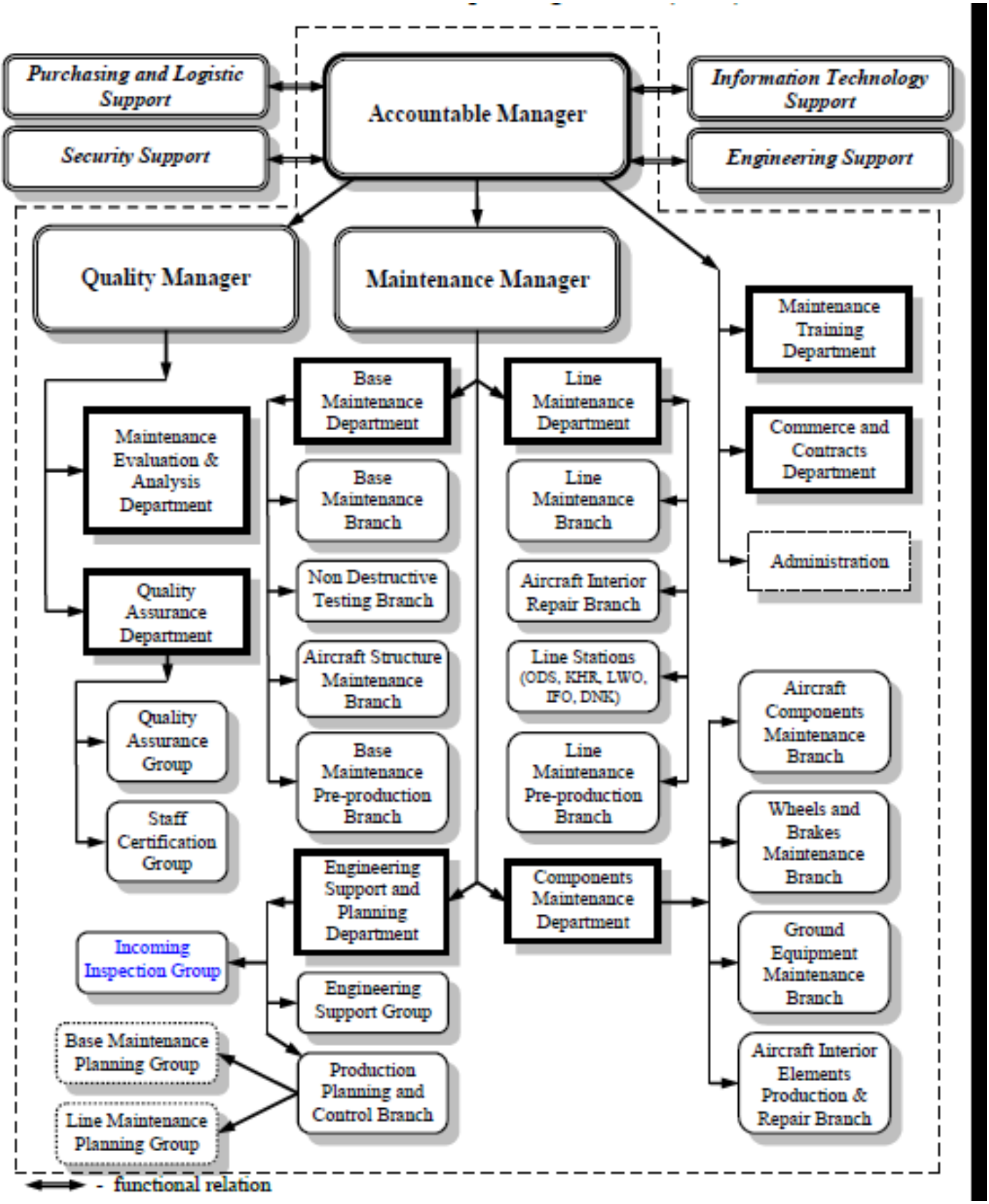

Figure 2.1 - Part-145 Maintenance Repair Organisation Chart

Organisation Intended Scope of Work

MRO could perform Line and Base maintenance, boroscoping inspection of the aircraft structure, which are indicated in this chapter, below mentioned engines and APU as a aircraft part, in accordance with approved maintenance data for particular aircraft type or under separate procedures, approved by Competent Authority: CFM 56-3; CFM 56-7. Line Maintenance should be understood as any maintenance that is carried out before flight to ensure that the aircraft is fit for the intended flight. Line Maintenance may include:

- Trouble shooting;
- Defect rectification;
- Component replacement with use of external test equipment if required. Component replacement may include components such as engmes;

- Scheduled maintenance and/or checks including visual inspections that will detect obvious unsatisfactory conditions/discrepancies but do not require extensive in depth inspection. It may also include internal structure, systems and powerplant items which are visible through quick opening access panels/doors;

- Minor repairs and modifications which do not require extensive disassembly and can be accomplished by simple means.

For the detailed reflection of organisation capability concerning components maintenance in accordance with Competent Authority Part-145 Approval the «Capability List» (Form MD-01) is generated. The purpose of the «Capability List» is to provide detailed identification of all components for which MRO has received Competent Authority approval (via the MOE approved procedure), to maintain and certify for release to service of components under Part-145. «Capability List» are separate document and revised in cases:

- Adding in the list new items;
- Removal items from the list;
- Findings any mistakes or mismatching in the list;

Insertion manufactures Authority of changes that required by of components or Competent Such changes are incorporated in order to ensure that the contents are accurate and complete in order to adapt to the changing needs, requirements, and capabilities of MRO, and to ensure continued compliance with all relevant Competent Authority requirements. Head of Components Maintenance Department and Head of Aircraft Structure Repair Branch are responsible for preparing and updating the data contained in the «Capability List». It is the responsibility of the head of relevant MRO division to guarantee, that all necessary component maintenance pre-conditions are fulfilled in order to comply with standard(s) defined by Part-145. Only airplane components listed in the «Capability List» will be maintained in, and released to service by the relevant divisions as per Part-145. Updates (addition or cancellation of PIN or ratings) to the «Capability List» must run through an approval proced If a decision is accepted to maintain any components, related division management evaluates the availability of the maintenance data, tools and equipments, facility requirements and qualified personnel, which is sufficiently trained to perform the new components maintenance. If alternate or equivalent tools and/or test equipment are used, performance and accuracy of such tools/test equipment must be equal to or better than that of those recommended by the original equipment manufacturer (OEM).

Verification of equivalency of such tools and amendment of maintenance data have to be done in accordance with the MRO MOE. New components may be introduced in the «Capability List» when the criteria stated in. If the evaluation results are found sufficient, related MRO division management applies to Quality Manager for an approval of the components maintenance.

The Quality Assurance Managementperfonns an audit for verification of related division preparedness for the components maintenance. In case the audit results are satisfactory, Quality Manager gives an approval bysigning the updated «Capability List». For initial approval or introduction of amendments to valid approval, a Statement signed by the Quality Manager shall always be provided to

the Competent Authority confining that processes, areas and personnel that related to the amendments have been reviewed and audited showing satisfactory compliance with all applicable Part 145 requirements. The relevant audit report shall be provided to the Competent Authorities on request.

Quality Manager is responsible for notification and/or approval by the Civil Aviation Authority of any changes to the «Capability List». The «Capability List» are approved by Competent Authority as approval of the MOE and amendment thereto. The approval and introduction of new PIN of components type already existing in the approved ratings of «Capability List» is going on through the approval of minor amendment to MOE by Competent Authorities, taking into account the fact, that only after Competent Authority approval letter of MOE minor revision receiving, the stated component maintenance could be started. The approval and introduction of new components type PIN or the adding of new ratings to the «Capability List» is going on through the approval of major amendment to MOE by Competent Authorities according to direct approval procedure. In this case, EASA Form 2 is prepared in relation to amendments and sent to the Competent Authorities. If a decision is accepted to maintenance of any component, related workshop manager infonns of Quality Manager about the necessity deletion of this component from «Capability List». A copy of the updated «Capability List» must be sent to SAAU in case of any changes to it. The «Capability List» may be provided for appropriate workshops and Competent Authorities as hard copy. If MRO temporary interrupt their activity under any approved ratings or on any maintenance location, when all relevant equipment, tools, materials, technical staff and documentation are not temporary available on the maintenance location or for the product, in order to not delete product or location from the approval, the Quality Manager commitment shall be prepared and sent to Competent Authority, as prescribed by AMC 14S.A.80.

The indicated Commitment shall be sent to the Competent Authority within 30 days period after activity interruption. Such temporary interruption of activity specified in subsection may be carried out for a tenn not exceeding 6 months or until

the 2 years validity period of the Maintenance Organisation Approval Certificate, whichever comes first. Prior to the expiration of the time periods specified in subsection 1.9.11.3, the corresponding activity in any approved rating or at any approved maintenance location must be either restored or withdrawn from the MRO Part-145 approval. The renewal of activity, could be done only after:

- the all means for maintenance be reacquired;
- quality assurance audit have been conducted the received results are positive;
- relevant Quality Manager message have been sent to the Competent Authority.

Maintenance Instruction and Relationship to Aircraft / Aircraft Component Manufacturers Instructions Including Updating and Availability to Staff. The Technical Publications (further TP) are:

- all pieces of the technical documentation required to support the maintenance activities, which are issued relating to the maintenance of aircraft and aircraft components by responsible Competent Authority, aircraft or aircraft components type certificate holders and other appropriate design organizations;

- manufacturers directives such as alterations, modifications, type certificate related data (i.e., service bulletins, service letters, airworthiness limitation items, etc.) and so forth;

- documentation of the appropriate Competent Authority requires to be on hand;

- instructions from national aviation authorities of aircraft or engine type certificate holder

- documents, which specify MRO activity related to the works, indicated in MRO MRO chapter 1.9;

- internal regulations such as technical instructions, engineering bulletins, etc., and operational instructions and task cards. 2.8.2.2. Each MRO department shall define

the TP required for operations as per the scope of work, and provide the information to ESPD.

After analisys, ESPD transfer the information to the company that provides the engineering support to MRO in accordance with the signed contract. Appropriate TP shall be ordered by mentioned MRO contractor in accordance with their internal procedure. Documents shall be ordered and received directly from the developer or from the organization, who is the official distributor of it from developer. TP used by the MRO shall be approved and of last valid revision (or that revision that available to the MRO at the time of works performance). In the case of TP is provided by an customer, MRO staff must be ensured, that:

- it either has written confirmation from the operator or customer that all such maintenance data provided is up to date;

- it has work orders specifying the amendment status of the maintenance data to be used;

- or MRO can show that it is in the operator's or customer's maintenance data documents delivery list. 2.8.2.5.1. Anyway, such evidence shall contain the name of the document, number of current revision and any time during maintenance, be available to the stuff performing this maintenance. ESPD is responsible for receiving of such evidence (if not been delivered with customer TP) and contractor, indicated in Section is responsible to make it available for the staff on MRO server If such evidence is not presented, the stated documents could not be made available for technical staff and the aircraft maintenance shall not been started. For line maintenance it is accepted to use specific documentation (customized), which is on-board of aircraft. In this case, the requirements shall be met. The documents issued by the Competent Authority are monitored monthly by the MRO auditors on the official site of the SAAU: https://avia.gov.ua. Auditors are responsible for ensuring that all documents revision are current, placing documents on the MRO server Contractor, is responsible for registration of the TP and revision of it in the

Department Documentation List on the Server (Form AF-34). Each piece of received technical publication shall be stored at least in the digital copy on MRO server.

Each sub-division supplied by contractor, with the individual and updated "Department Documentation List" (Form AF-33), which contains the TP, available in paper and/or in CD/DVD format. If documents used by the staff only from the company server, "Department Documentation List" (Form AF-33) is not required. Contractor is responsible for: inventory registration, distribution and ensuring that all TP provided by operator or customer to staff for the performing approved scope of work maintenance are kept up to date and made readily available to the staff.

The periodic control of TP validity shall be established. No TP shall be distributed to users unless it is found effective, taking into account the requirements of this chapter. In case of subscribed TP, contractor, shall receive the notice about new revision issuance. Agreement or ordering (registration) on relevant web-site for such service shall be valid. In case of other registered TP, contractor, shall at least once a half year check the revision status of such TP. This control should be done by mean the E-mail request to TP publisher, checking the publisher WEB site, or by any other accessible method. It is required, that possibility to demonstrate for auditors the evidence of this control can be demonstrated Users obliged to check the applicability of the TP and inform in writing the QAM about any discrepancy found. For this purpose they shall use "Maintenance Error Finding" (Form MD-52). QAM shall take an action as prescribed in MRO MOE. The following manuals shall be provided to MRO by the customer or aircraft operator:

- Aircraft Maintenance Manuals (AMM);
- Standard Overhaul Practice Manual (SOPM);
- Service Letters (SL);
- Fault Isolation Manuals (FIM);
- Wiring Diagram Manuals (WDM);
- Dispatch Deviation Procedure Guides (DDPG);
- System Schematics Manuals (SSM);

- Technical Circulars (TCI);
- Bite Manuals (BIM);
- Corrosion Prevention Manual (CPM);

Following documents are controlled for the MRO needs:

- Component Maintenance Manuals (CMM);
- Component Overhaul Manuals (COM);
- NDT national and international standards;
- NDT Manuals;
- Illustrated Parts Catalogues (IPC);
- Structural Repair Manuals (SRM);

Aircraft Maintenance Programme Compliance It is fully operator's responsibility to comply with the approved Maintenance Program and to provide MRO with the works, forecasted by stated program. MRO is only responsible for performing the quality and on time maintenance tasks contracted for by a Customer. Also MRO denies any and all liability or responsibility for the aircraft performed maintenance periodicity versus Type Certificate Holder recommendations and operator maintenance schedule, except cases agreed in additional contracts. MRO PPCB is responsible only for aircraft planning of line maintenance indicated in the item versus provided maintenance program.

This procedure contains the requirements concerning the implementation of Airworthiness Directive (AD) issued by any aviation authority relating to aircraft component maintained or stored by MRO, and to aircraft, maintained by MRO. Maintenance contracts between MRO and customers shall specify that AD, that supervised by customer and which have to be applied to the particular aircraft, included in MRO MOE. All AD, issued for aircraft and components, must be incorporated before the time limit set forth in the respective AD is reached, thus

allowing continued airworthiness and safe operation of aircraft and components. This concerns, at least, the following:

- AD issued by Competent Authority;

- AD видані EASA;

- AD issued by the National Aviation Authority of the aircraft or component type certificate holder, supplemental type certificate holder, or manufacturer. Any change to, or alternate method of compliance with an AD which customer may request, whether with respect to the time schedule or the accomplishment procedure, must receive prior approval from the

Competent Authority before being implemented. ESPD will perform study, selection and preliminary evaluation of AD to determineits applicability for aircraft components from MRO MOE. General AD Status is used by MRO for:

- determination of the components, stored in MRO store and wich subjected to the maintenance under AD;

- determination of the required maintenance must be performed on the component provided to MRO for maintenance. AD that has to be performed on component is applicable as for components installed on aircraft, as well as to stored ones. For the components' AD, the corresponding information shall be provided from the ESPD to the MD and MD incoming inspectors in order to determine, if corresponding components stored on in the MRO store and for information utilization during the incoming inspection. The MRO aircraft maintenance or workshop departments are directly responsible for the proper accomplishment of AD based on the production documentation, issued by the customer or prepared by ESPD. Production documentation shall be in accordance with MRO MOE. If materials, parts, tools or equipment are needed to accomplish AD, the availability of them must be ensured by ESPD (ordered if it lack). As well ESPD performs evaluation of provided documentation, determination, if the works within the MRO scope of works and if preliminary personal training is required for AD

accomplishment. Accomplished AD on aircraft shall be released to service by aircraft technical logbook or work package to CRS (Form MD-02).

Rectification Of Defects Arising During Base Maintenance

A WO must be opened for all aircraft defects that are detected by MRO staff during base maintenance. The WO must contain a clear reference to the other production documentation related to works, during performance of which the finding was detected. Operators and/or customers must be informed in writing of any defects found. They shall approve in written the rectification of such defects, as well, if required, the methods of such rectifications. If defect detected brings the aircraft to un-airworthy condition and it have a significant influence for flight safety, these conditions must be reported in accordance to MRO MOE All detected defects on aircraft must either be rectified or properly deferred prior to issuing a CRS after base maintenance. MRO support staff is responsible for determining the method of defect rectification according to valid technical documentation. All necessary preparation (staff skills, material means, tools, documentation) must be available. If remedial actions are required and these actions are not covered by manufacturer documentation, refer to MRO MOE. Deferral of corrective action prescribed in the technical documentation for defects identified during maintenance, shall be only in accordance

with operators/customer’s permissions /orders (in

accordance with operators/customer’s

approved procedures) under the conditions, that

such procedures does not conflict with MRO

MOE and Ukraine valid regulation. Reference to such permissions /orders shall be done in accordance with MRO MOE. If arising defect resulted from any aircraft component defect, such component should be sent to the relevant MRO shop or external organization for repair. In case of in-house component repair, WO should

be issued and Ident Tag (Form MD-91) and WO with corresponding information shall be issued and attached to the component before it be sent to relevant MRO division for repair. If the indicated works is performed on components, it is not necessary to issue ARC Form 1, if the component is installed to the same aircraft has been removed from, and until the aircraft is under the current maintenance process. The works can be released by aircraft CRS. In exceptional cases, if the component removed from the aircraft.is not in MRO approved scope of work, and it not possible to send it to correspondingly approved organisation, MRO can perform such maintenance, but: At the time period when the aircraft under base maintenance and under written approval of customer.

Release to Service Procedure

It is a required to issue the release to service document related to aircraft or component intended for fitment to an aircraft in following cases:

- at the completion of any package of scheduled line maintenance (except "Pre-flight inspection" because it is not considered to be maintenance),

- at the completion of any package of aircraft scheduled base maintenance;

- at the completion of defect rectification, repair, modification, inspection of aircraft, etc;

- at the completion of any shop activities on components intended for fitment to an aircraft or removal of the components in serviceable conditions from aircraft. MRO may only maintain an aircraft or aircraft component for which it is approved when all necessary facilities, approved maintenance data, equipment, tooling, component and material which comply to approved maintenance data or this MOE provisions, certifying/support staff necessary are available while performing the maintenance in question. It must be ensured that any repair or maintenance performed maintains the approved configuration. A release to service document must not be issued in the case of any non-compliance known which could hazard flight safety. Release to service document shall be issued in accordance with PART-

145.A.50. The release to service document shall be issued only under MRO Part 145 Ukraine Approval. No reference on the other held approvals is acceptable in release to service document CRS (English wording) - “Certifies that the work specified, except as otherwise specified, was carried out in accordance with

PART-145 under the National aviation law of Ukraine and in respect to that work the aircraft / aircraft component is considered ready for release to service." ARC Form 1 – “Certifies that unless otherwise specified in block 12, the work identified in block 11 and described in block 12, was accomplished in accordance with Part-145 and in respect to that work the items are considered ready for release to service.” Aircraft maintenance log book – shall contain, at least, reference on Part 145.A.50 and contain the statement about release to service. For works till and including the Weekly Check (or equivalent maintenance), plus rectification of any defects and component changes, as well as completion of orders (single running task cards), which not exceed the line maintenance work scope, means the signed before flight in appropriate block page of the valid customer’s aircraft technical log. Additionally, for works, the scope of which upper then Weekly Check, also for the works, containing the tasks on several systems, periodicity of which is indicated in aircraft maintenance program (i.e. A1-check, 1A-check, etc.), means the signed before flight in appropriate block the certificate of release to service, Form MD-02. In this case the cross references shall be made as required by the MRO MOE. Release to service document after base maintenance and after unscheduled maintenance (structure repairs, modifications, main unit of structure replacement, such as landing gear, control units, engines, etc.) means the signed in the appropriate blocks the valid “Certificate of Release to Service” (Form MD-02). If the component maintained in MRO shop – signed with standard signature in the appropriate block of the ARC Form 1. If the component removed from the aircraft in serviceable condition and it is intended to install at the same time to the other aircraft of the same operator - signed with the standard signature in the appropriate block the valid ARC Form 1. If the component removed from the aircraft in serviceable condition and is intended to be sent to the store or be installed to the aircraft of the other operator -

signed with the standard signature in the appropriate block the ARC Form 1. Prior to the issue of the release to service document the evidence of the following conditions shall be ensured:

- the given maintenance was carried out completely, in accordance with MRO MOE and related procedures as a Part-145 approved maintenance organization; the tasks to be carried out are recorded completely, the completion of those complies with organization requirements and there is no known conditions which may endanger the aircraft safety. New defects or incomplete maintenance identified during the above maintenance brought to the attention of the aircraft operator for the specific purpose; at the completion of the shop activities carried out on components the certificate complies with the requirements laid down in Part-145. ARC Form 1 is strictly required after component maintenance (except the cases, indicated in MRO MOE Section 2.15.4). In case of AOG situation, the component, not covered by release to service document but covered but other acceptable release to service document, could be temporary fitted on aircraft under the following conditions: agreement of the customer in written, checking the status of the equipment, technical log recording and no more than 30 hours of flight until the first return to the MRO approved maintenance base. Remedial action when this aircraft returned to the MRO approved base (replacement on the correspondingly released component) is mandatory Person authorized to issue the release to service document performs control between the launched work documents and the customer work order, control of delayed tasks are fixed by operator. Signature of release to service document certifying that the aircraft or component is fit for service in respect to the work performed provided that no deviation from requirements was found by him. The release to service document must only be issued if and when all paperwork (i.e., task cards, WO, component labels, etc.) has been correctly completed and signed. Whenever such maintenance touches upon any fuel system feature which is classified as being a critical design configuration control limitation such maintenance work must clearly be listed as being a ‘CDCCL task’. It must be ensured that any repair or maintenance performed maintains the correct

configuration. The release to service document should not be issued for any aircraft or ite when it is known that the it is unserviceable, except In the case the aircraft component undergoing a series of maintenance processes at several maintenance organizations approve under PART 145. A clear statement should be endorsed in block 12 of ARC Form 1 that the item passes not the whole maintenance, but only part of it, indicating the scope of passed maintenance and condition of father operation. In case, during the corresponding maintenance, the additional works have occurred, or customer requested such additional works, but hey could not been performed in view of MRO policy, because:

- the necessary actions exceed MRO approved the requested by customer diversion violates airworthiness, flight safety or technical regulations, MRO reserves the right to refuse such an action. Issuing a Release to Service Document for an Aircraft after Unscheduled Maintenance release to service document is necessary after completing of any defect rectification and prior to next flight when the aircraft operates flight services between scheduled maintenance events. If the defect rectified as line maintenance, the release to service should be signed in customer aircraft technical log. The member of the authorized certifying staff who signs the release will check if the pilot entered a comment about defect into the aircraft technical log and if the performed correction action are indicated there by technician and certified by them. If the defect rectified as base maintenance scope, the MRO CRS shall be issued for such works. The following procedure may be used: on maintenance stations which are not the MRO certified maintenance base, defect rectification or component change, and all related works, line maintenance work in case of long time flight (more than 48 hours) could be performed by MRO authorized certifying staff.

This works shall be released as prescribed in this chapter. In this case, a WO in paper form must be issued and completed with a clear reference to the release to service certificate. Upon aircraft return on main base, all information from paper WO form shall be transferred in AMOS.

Quality Audit of Organisation Procedures

This procedure determines the main objectives, methods and rules to complete quality audit of the organisation procedures. The primary purpose of the MRO quality management system is to ensure safe aircraft operation and the airworthiness of aircraft, including engines and components, maintained by MRO. This is achieved by monitoring compliance with the requirements of Part-145 as well as compliance with the essential procedures and standards specified in the MRO MOE and the relevant procedures. The MRO quality management system provides for monitoring and auditing the adequacy of processes, procedures, maintenance management and maintenance practices. The quality management system includes a feedback system in order to ensure that corrective actions are both identified and carried out according to schedule. All audits, as described in this chapter, will be performed by personnel as described in MRO MOE chapter 3.6. These independently working and qualified quality auditors are assigned to perform all duties that are included in these quality system procedures. Accountable Manager carries the overall responsibility for the quality management system of the MRO Part-145 approved maintenance organization. The Quality Manager has direct access to the Accountable Manager and reports directly to him. As far as QAM is responsible for the specific items in MRO according this MOE, their activity is subjected to the audit procedures. Such audits are conducted during Competent Authority planned annual and other audits, during customers' and contractors' audit. QAM is responsible to manage such audits, receive the reports, report to the Accountable Manager and make an action to rectify the findings.

Audit Program

The quality management system, which is based on Part-145.A.65, includes a quality audit program for organizational procedures. This is required in order to ensure that all organizational procedures which are laid down in the MOE and the relevant procedures, and which are relevant for Part-145 compliance, are followed in a practical manner by the all departments of MRO.

Line maintenance stations and subcontractors will be periodically audited on all matters relevant to Part-145 requirements. The audit of suppliers is performed as prescribed in MRO MOE. Unscheduled audits will be performed upon management request (new contractor, new line station or maintenance base, etc), or if problems which could have a negative impact on the MRO organization have been detected by the QAM. The audit plan gives an overview of the scheduled audits. After each audit, an Audit report (Form MD-34) must be prepared by the auditor in question and will be distributed to the responsible management of audited division, to other involved persons and to the Quality Manager. The audit report must describe what was checked and what the resulting findings were, when compared against the relevant requirements, procedures and products. The term of "Audit Report" issue-14 calendar days from the date of audit completion. All audits (except scope of approval extension, product and records audits) must be performed under pre-defined "Auditor's Check List" (Form MD-94) based upon the requirements of Part-145, MRO MOE and relevant procedures. Audit results and related information will be discussed, shared and documented by mean of protocol during quality meetings. Such meetings must take place on a regular basis two time per year in order to guarantee a fully functional quality system. Quality meetings will be attended by all relevant quality auditors and headsof MRO divisions. Quality Manager may requires additional quality meetings, if the situation requires it. The independent quality audit is an objective process of routine sample checks of the Part-145 approved maintenance organizations ability to carry out all maintenance to the required standards. This also includes some product sampling since this is the net result of the maintenance process. The organizational procedures, processes and standards that are to be inspected must be defined in an approved audit "Auditor's Check List". The "Auditor's Check List" are the basic working documents for quality auditors during the audit, but the "Auditor's Check List" should not limit the areas of inspection. The minimum requirement for the scheduled internal audit program is that all aspects of the Part-145 approved maintenance organization (covered in MRO MOE) and all essential procedures of MRO compliance are checked within

prescribed terms. The audit does not require each procedure to be checked against each product line (“A”, “B”, “C” and “D” ratings of the approval) when it can be shown that the particular procedure is common to more than one product line and the procedure has been checked every 12 months without resultant level one (1) or two (2) findings. The minimum requirements for quality audits of MRO line maintenance stations (or other contracted and subcontracted organizations) are such that all aspects of Part-145 (Part-145.A.25 through Part-145.A.65) compliance relevant to such activity are verified . Maintenance contracts will be monitored by quality staff during external audits in order to ensure that all maintenance activities are carried out per the contract in question. During each audit, the quality auditor must verify that all personnel involved are thoroughly familiar with the latest relevant procedures as defined in the current version of the MRO MOE and the relevant procedures. If the MRO implement the new procedure, arose from the new regulations requirements or from the internal decision, such procedure shall be audited before and after implementation. The positive audit results shall be achieved prior the process be implemented and applied to Competent Authority. The term of first audit after implementation shall be determined by Quality Manager, but no later than three month after implementation.

Quality Audit of Aircraft and/or Components

It is the policy of MRO to audit periodically the aircraft and the aircraft components during the maintenance or any phase of maintenance. Main principles of realisation of product audits: witnessing relevant controls, visual inspection of the maintenance, checking any associated documentation. In addition to what is stated in MRO MOE, aircraft and aircraft component audits are performed by random auditing. This is part of a compliance monitoring program which is carried out within a twelve (12) month period and with which all relevant aspects of Part-145 for each aircraft and aircraft component product line (which is maintained by MRO) are verified by the responsible quality auditor. These random audit checks will be carried out in such a manner that maintenance being carried out during the night will

be audited as well. A complete audit sample check (an independent audit of a product line) means selecting one specific product from any product line, such as an aircraft, engine, component and checking the effectiveness of the maintenance and other relevant procedures and requirements associated with the specific product, in order to ensure that the end result is an airworthy product.

Documentation:

a) maintenance data for the aircraft and/or component;
b) documentation of the maintenance work performed;
c) operating time records;
d) documentation of each material and component used during the maintenance works;
e) reliability of the computer data;
f) safety equipment/placards.

The stated in this chapter quality audits will be carried out i.a.w. annual audit schedule. It is the responsibility of auditor in question to perform audit of product other, then been audited in previous audit. The number of these sample audits shall cover at least one sample product of relevant production line per year. Product audit is conducted in accordance with Part 145.A.65 (b). Auditors Check List is not mandatory during the product audit conduction. But in the audit report the audit steps shall be indicated.

Quality Audit Corrective Action Procedure

Remedial actions on quality audit findings are generated by auditors to ensure that all activities of the company shall always be in compliance with the effective rules and regulations. Corrective actions shall be performed on every audit finding in accordance with their classification and proof of such corrective actions shall be checked by auditor:

- within one (1) working day for level one (1) finding,

- within thirty (30) calendar days for level two (2) finding - after receiving of corresponding report. The audit shall be completed after the findings are found as being closed and corrective action plan completed. The root causes of deviation must be indicated for each finding. A preventive action shall be initiated in order to eliminate the root cause of deviation, perform it then check its efficiency. The QAM will assist and advise on the work to be done and the changes to be made. If necessary, the QAM must also coordinate between departments in order to make sure that all limitations and procedures are fulfilled. Heads of MRO divisions and auditors is personally responsible for compliance with requirements of this chapter in stated terms and volume in items, related to them. This chapter contains the requirements as for the internal MRO audits, as well as for MRO outside audits of contracted/cooperated under manuals organizations. For each non-conformity, indicated “Audit Report” (Form MD-34) the “Corrective Actions Request” (Form MD-34R) shall be issued and provided to that head of MRO division, who, under auditor opinion, relates to this non-conformity. The term of “Audit Report” and “Corrective Actions Request” delivery – seven (7) calendar days since audit de-briefing took place. Head of department by his signature in designated blocks of “Corrective Actions Request” accepts the findings or rejects it under well founded explanations. The quality auditor must evaluate all discrepancies found. Audit discrepancies may be given one of three different classifications. A major discrepancy must be classified as a level one (1) finding. Level one (1) audit findings are defined as being discrepancies which could affect the airworthiness or operational safety of an entire aircraft or an aircraft component, or which are major violations of valid procedures and requirements or repeated systematically. quality auditor has any findings which could be classified as level 1 finding, then they must immediately inform the Quality Manager and the head of department concerned.

The Quality Manager will then immediately inform the Accountable Manager on the findings and also on the measures being applied. Findings which do not affect the airworthiness or operational safety of an entire aircraft or an aircraft component and which are not major violations of valid procedures and requirements,

but which are also not defined as being recommendations or comments must be classified as level two (2) findings. Any comments or recommendations made by the auditor in respect with improvements of different aspects, which however are optional, are classified as level three (3) findings observations, remarks). “Audit Report” та “Corrective Actions Request” are retained in electronic database and in hard-copies in QAG. In order to ensure a good, working quality system, all audit results will be reviewed during the regularly held quality meetings at least twice per year with the issuance of relevant protocol and approval of it by the Accountable Manager. Such meetings are assembled by Quality Manager and he decides who shall attend these meetings. Anyway, Accountable Manager, heads of QAD and MEAD and QAG shall be permanent participants of such meetings. The items that shall be discussed at the meetings as well be reflected in the mentioned in section analysis, shall, at least, include:

- internal and external conducted audits results;
- suppliers evaluations results;
- previous meeting plans conductions results;
- received internal reports results (MEF, SMS, etc.).

If situation is required, Quality Manager could assemble additional quality meeting. Anyway, quality system situation in MRO is subjected to day to day analysis by Quality Manager. Till 1-st of May of the next year, the annual audit analysis for the previous year shall be prepared by QAM, approved by Accountable Manager and distributed to all MRO managers. Regular meetings between the Quality Manager, Maintenance Manager and the Accountable Manager will be held four times per month. The quality system items are a part of scope of discussion during such meetings. But they may also take place out of schedule, and be solely on quality system items whenever it is felt necessary to do so because specific and/or urgent items require discussion.

Additionally, one time per week, the Quality Manager or his deputy takes a part in ordered maintenance regularity and accuracy meetings, taking into account all criteria and conditions, which make an influence on such maintenance.

Based on such meeting, as well on common situation in organization, QAM may issue the “QAM Prescription List” (Form MD-30) in case the preventive or corrective actions are required (feedback actions from addressed person is mandatory within stated time), or “QAM Signalling List” (Form MD-36) in case the recommendations, requirements or information shall be provided for the staff.

Conclusion of this part

In this part, we conducted a comprehensive analysis of the guidance documents that govern the activities of the maintenance organization and the organization for the extension of airworthiness. It should be noted the degree of elaboration of all parts of the documents and a detailed description of the procedures. But from my personal experience in such organizations, I can conclude that in some cases the procedures written in the documents are visually impossible to follow, therefore it is necessary to constantly audit these procedures directly paying attention to the comments and suggestions of the staff working in the field.

3. PROPOSED CHANGES OF COMPANIES' GUIDANCE DOCUMENTS ACCORDING TO EUROPEAN AVIATION REGULATION

3.1 Global trend of Maintenance Repair Organization sector

The Global Trend of MRO sector is paperless technology. The term "paperless office" was first encountered in the mid 70s of the last century. Then it was a kind of prediction, a kind of fantastic idea, which in 40 years was supposed to become a reality.

40 years have passed, and now we can really appreciate what has changed. In the context of the development of electronic technology, references to a paperless office are increasingly common. Many companies and environmental activists are promoting the idea of a "smart" office of the future, in which operational processes are organized with maximum efficiency and taking into account corporate social responsibility of the business.

The idea of a paperless office is flawed. Today you can find many arguments for and against. This is mainly due not so much to the implementation of such a model, but to the need of the business user to have proof that a document actually existed and was signed, or that some transaction actually took place. In other words, companies need a "paper trail" to protect themselves.

However, no one disputes today that electronic technology can completely change the manufacturing and business processes of a company. Their competent use saves employees from time-consuming work with paper documents, which ultimately increases their efficiency. And if a completely paperless work environment is still an elusive dream, you still need to strive for it. Moreover, everything you need to achieve this goal is already available - the tools available today allow you to carry out numerous daily work processes of any company without printing a single sheet of paper.

The use of these concepts brings the organization of office work to a qualitatively new level. A paperless office means an optimization of the working

environment: transition to electronic document flow, electronic procurement, electronic document archive, electronic communication.

The advantages of replacing paper-based processes with electronic ones are obvious:

- Access to the necessary information anytime anywhere, fast information search
- The ability to participate in teamwork, even if the employee is outside the office
- Remote management of tasks, assignments, projects and the ability to track their status in real time
- Higher level of security of storage and access to confidential information
- Decrease in operating costs associated with paperwork, staff maintenance, etc.
- Improving overall operational productivity, providing flexibility in work

Not to mention the trivial, but still true, - reducing the use of paper will have extremely positive consequences for our planet, allowing us to save natural resources.

The changes in the organization of office work are not revolutionary. Rather, they are evolutionary and are associated with a gradual change in information flows across the office, building an intelligent infrastructure.

It is obvious that building a paperless office should not become an end in itself, since at this stage, without appropriate regulatory support, this is probably impossible. The goal of any company should be to build an effective office taking into account the social responsibility of the business, that is, the refusal of paper where possible.

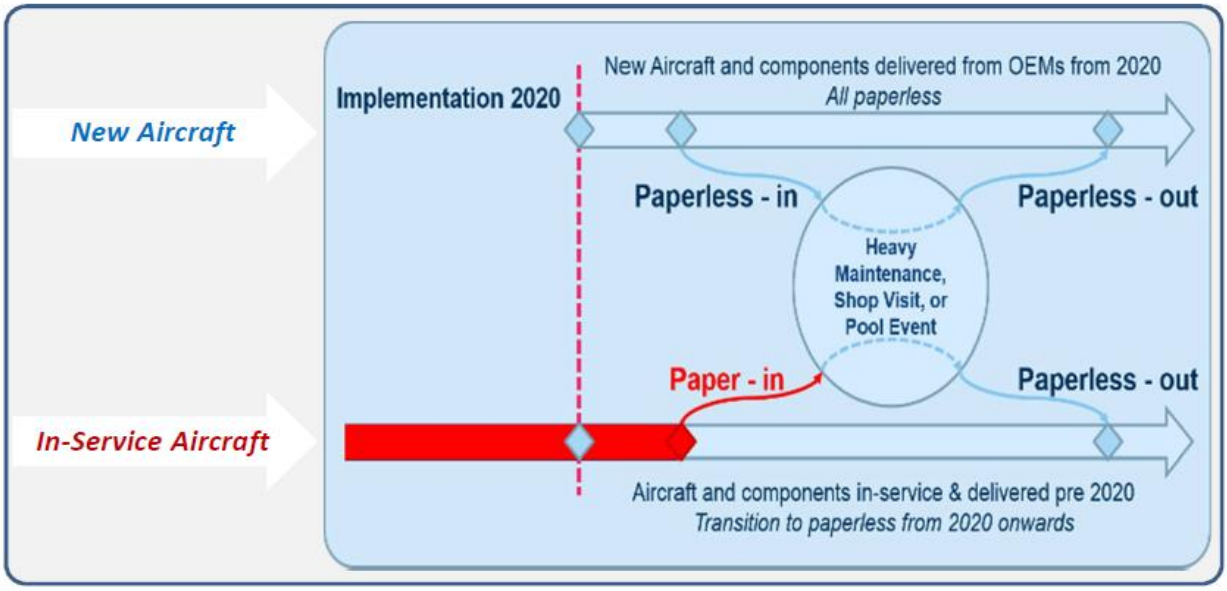

Figure 3.1 – Scheme of Digitizing of current paper systems is a transition phase towards ultimate e-business

It should be noted that all the leading aviation manufacturers are trying to stick to paperless technology. New aircraft are designed, produced and released into use with a minimum amount of paper documentation, all provided in electronic format. Maintenance organizations that deal with aircraft produced long before such a global trend are trying to organize their business using paperless technologies, thereby digitalizing the production process. It is worth noting the importance of the cybersecurity of these technologies. It is necessary to ensure total control over security and have reliable protection.

This trend of paperless technology will help to significantly increase the efficiency of the maintenance organization and the economic feasibility of introducing these technologies is very high. In addition to the economy, it should be noted the convenience of electronic document management and paperless technologies during operation.

3.2 Proposed changes according to European aviation regulations

Proceeding from the shortage of professional personnel of various levels in the direction of aircraft maintenance and maintaining airworthiness, in particular, I have proposed changes to the training of technical specialists. It should be noted that today students of 272 specialties graduating from the university do not have full qualifications and recognition in the aviation industry of Ukraine as a whole. Therefore, proceeding from modern challenges and from our own experience, understanding the depth of the problem both on the part of young specialists and on the part of state authorities, the university and directly employers. My proposal is a new approach in teaching students specialty 272 “Aviation Transport. Aircraft Maintenance” according to EASA Part-66 described in the following steps:

- Create of Part-147 organization for training to Boeing-737 NG/MAX on the basis of NAU
- Cooperation between Part-147 and Part-145 organization
- Issue Aircraft Maintenance License with Diploma (without type rating)
- To provide Type Training and OJT in Institute of Continuing Education with cooperation Part-145 Organization

When teaching students at each stage, it is necessary to follow the standards described in the diagram below.

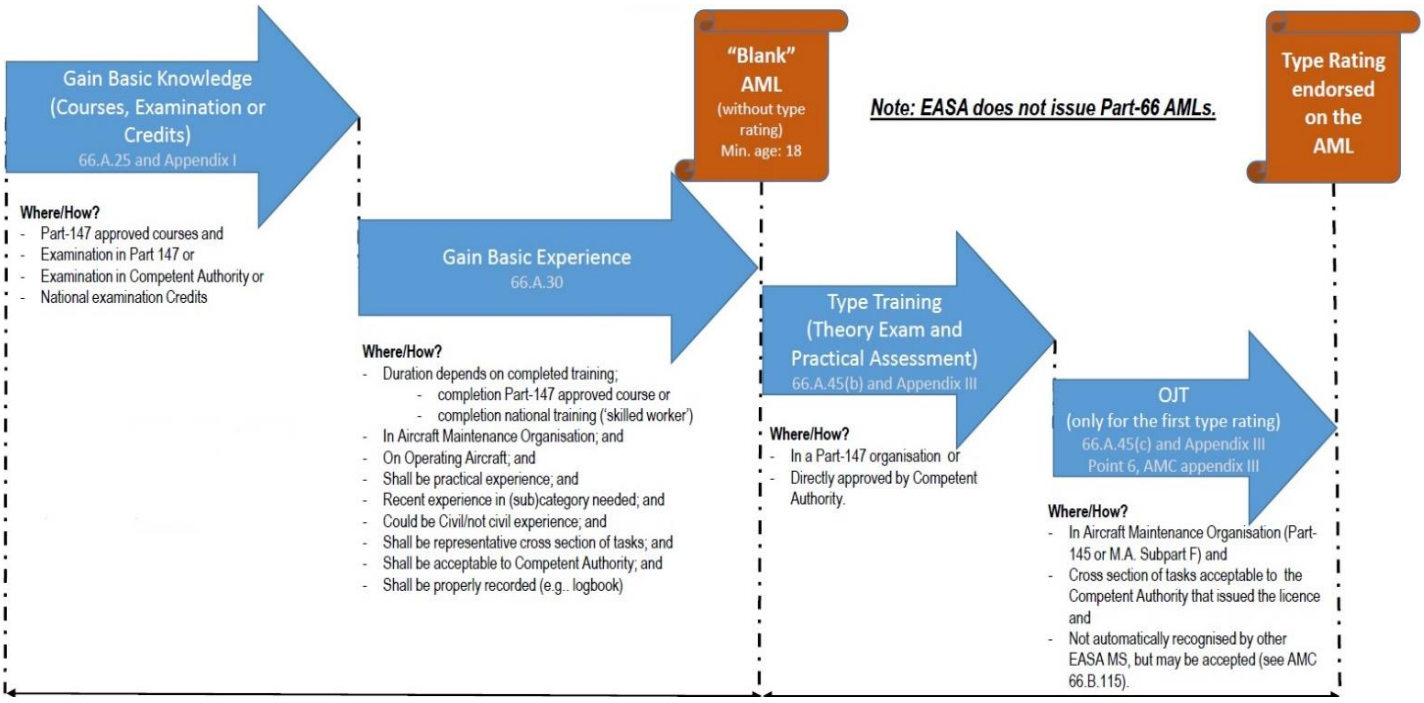

Figure 3.2 –Training Steps of Part-66 Aircraft Maintenance License (AML) – B1 and B2 categories with Group 1 Aircraft

Thanks to this approach to training, the state, within the framework of the state order for the university, will receive highly qualified personnel who will be in demand both in Ukraine and in European. Only by modernizing the educational process and bringing the material and technical base to world standards and modern trends can we get both the prestige of the country and the university itself, and the demand for our aviation specialty.

Conclusion of this part

After analyzing the work of enterprises and familiarizing yourself with global trends and new European requirements, we can conclude that these measures must be urgently harmed in our state. It should also be noted the training of specialists, a question that has been relevant for several decades and cannot be resolved today.

4. OCCUPATIONAL SAFETY

4.1 Analysis of harmful and dangerous production factors.

Harmful and dangerous production factors for aircraft technician according to the standard ГОСТ 12.0.003-74:

Physical:

moving machines and mechanisms; moving parts of production equipment; moving products;

the increased dustiness and gassiness of air of a working zone;

increased or decreased temperature of surfaces of equipment, materials;

increased or decreased air temperature of the working area;

increased noise in the workplace;

increased vibration level;

increased voltage in the electrical circuit, the short circuit of which can occur through the human body;

increased level of static electricity;

lack or absence of natural light;

insufficient lighting of the working area;

sharp edges, burrs and roughness on the surfaces of workpieces, tools and equipment;

location of the workplace at a significant height relative to the ground (floor);

Chemical:

toxic;

annoying;

by penetration into the human body through:

- respiratory organs;
- skin and mucous membranes.

Psychophysiological.

physical overload;

- static;
- dynamic.

b) neuropsychiatric overload.

- analyser overvoltage;
- monotony of work;
- emotional overload.

4.2 Measures to reduce the impact of harmful and dangerous production factors.

Based on the production capacity of the enterprise, namely the hangar for aircraft maintenance, one negative factor affecting production should be highlighted this is insufficient illumination. I have proposed calculations for the artificial lighting of the production facilities of the hangar.

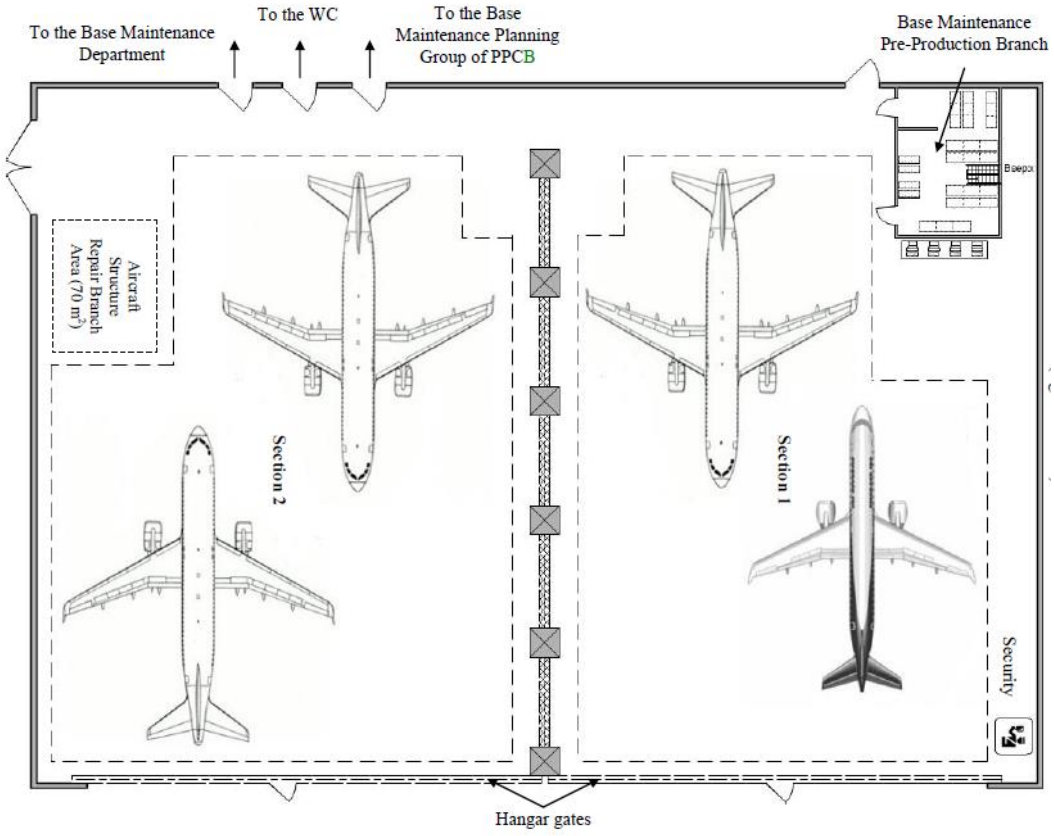

Figure 4.1 – General Plan MRO Hangar

Artificial lighting calculation

For hangar illumination by ДБН В.2.5–28–2006 “Природне і штучне освітлення” of at least 200 lx (lux). The actual value of light is 200 – 250 lx. Total light output is given by:

$E_{gen}=(E_n \cdot S \cdot k_1 \cdot k_2)/V$ (4.1)

where En – normalized illumination (En=200lx);

S – area of application;

"k" _"1" – Coefficient taking into account the aging of lamps and lighting pollution ($k_1=1,2$);

"k" _"2 " – Coefficient taking into account the uneven illumination space ("k" _"2" = 1.1);

V – Ratio of luminous flux, defined according to the reflection coefficient of walls, work surfaces, ceilings, room geometry and types of lamps.

Hangar size up: A = 96 m, B = 74 m, H = 11. m.

$S = A \cdot B=74 \cdot 96= 7104$ m2 (4.2)

Choose the table using the light flux ratios:

Reflection coefficient of whitewashed ceiling (Rceiling = 70%);R=70%;

Index of refraction of white walls (Rwall = 55%);

Reflection coefficient from the dark hardwood floors (Rfloor= 10%);

Index space ($i=(A \cdot B)/(h_p \cdot (A+B))$).

$h_p=H-h_n$ (4.3)

where hn– work surface height over the floor (hn=0.7 m).

Defining the room rate:

hp=11.2 – 0.7=14,3m

The utilization of light flux:

"i =" ("96" ·" 74")/("14,3 " ·" (96+74)") "≈ 2,92." (4.4)

Now we define the value of the total luminous flux: (V=0.7)

E_gen (200·7104·1,2·1,1)/2,92=642279,4 lm (4.5)

To ensure total artificial lighting, selected LED bulbs LED 300W and replace fluorescent lamps.

Thus, El=18150 lm.

Now we define the number of lamps required to illuminate the room:

N=E_gen/E_l =642279,4/18150=36 lamps (4.6)

Power of 36 LED lamps:

Wgen=WN · N=150 · 36 = 5,3 kW (4.7)

4.3 Occupational Safety Instruction

During aircraft maintenance in the hangar, it is often necessary to use various additional equipment. One of these equipment is a crane beam.

Instruction on labor protection when working with a crane beam

GENERAL LABOR PROTECTION REQUIREMENTS

1.1. This Instruction provides for the basic labor protection requirements when working with a 2-ton beam crane (hereinafter referred to as a beam crane).

1.2. When working with a crane, a worker may be exposed to the following hazardous and harmful production factors:

- moving parts of crane equipment, lifted and moved cargo, ropes, chains, slings, hooks, traverses, tongs, balancers, grippers, etc.,

- sharp edges of the load being lifted and moved, burrs and roughness on the surface of cables, chains, hooks, grips, etc.

- drop of cargo from a height;

- increased noise level at the workplace;

- a dangerous level of voltage in an electrical circuit, the closure of which can occur through the human body;

- insufficient illumination of the working area;

Sources of harmful and hazardous production factors:

- moving machines and mechanisms;

- faulty production equipment or improper operation;

- faulty electrical equipment or improper operation;

- sharp edges, burrs and roughness on the surface of equipment and tools;

- absence, malfunction, improper use of PPE;

- absence, malfunction, improper operation of lighting devices;

- non-fulfillment or improper fulfillment by the employee of the equipment operation manual, labor protection instructions, internal labor regulations, local regulations governing the procedure for organizing labor protection work, working conditions at the facility.

1.3. When working with a beam crane, an employee notifies his immediate supervisor about any situation that threatens the life and health of people, about

every accident that occurs at work, about the deterioration of his health, including the manifestation of signs of an acute illness.

1.4. Persons at least 18 years of age who do not have medical contraindications and who have passed:

- theoretical and practical training, testing of knowledge and skills in operating a girder crane, slinging loads in the order established by the owner of the crane;

- training in labor protection, testing of knowledge of labor protection requirements when working on a crane;

- training in electrical safety rules, testing knowledge of electrical safety rules when working on a crane;

- training in fire safety rules, testing knowledge of fire safety rules;

- training in methods of rendering first aid to the injured person in case of industrial accidents;

- training and testing knowledge of safe methods and techniques for performing work when moving goods;

- preliminary and periodic medical examinations.

Workers who have a certificate of a crane operator who have undergone training under the program for training crane operators are allowed to operate the crane by radio.

1.5. When working with a beam crane, an employee must undergo training in labor protection in the form of: introductory briefing, initial briefing at the workplace, re-briefing, unscheduled briefing, targeted briefing and special training in the scope of the training program for the profession, including occupational safety issues and job requirements responsibilities in the profession.

Before being admitted to independent work, the employee must complete an internship under the guidance of an experienced employee.

1.6. When working with a crane beam, the employee is provided with overalls and footwear in accordance with the current regulations.

1.7. When working with a crane, the employee should:

- perform work that is part of his duties or assigned by the administration, provided that he is trained in the rules for the safe performance of this work;

- strictly observe the operating rules of the crane beam established by the manufacturer;

- do not overload the crane. The mass of the transported cargo should not exceed the carrying capacity established by the manufacturer;

- do not deviate from the values of the voltage applied to it, established by the operating manual;

- correctly use overalls, safety footwear and other personal protective equipment;

- to be attentive, not to be distracted by extraneous matters and conversations;

- when working together, coordinate their actions with the actions of other workers;

- noticing a violation of labor protection requirements by another employee, warn him about the need to comply with them;

- throughout the working day to keep the workplace in order and cleanliness, not to block the approaches to the workplace, to use only the established passages;

- know and strictly observe the requirements of labor protection, fire safety, industrial sanitation, the Rules for the technical operation of electrical installations of consumers;

- comply with the requirements of this instruction, other local regulations on labor protection, fire safety, industrial sanitation, regulating working conditions and the procedure for organizing work at a specific facility;

- timely and accurately comply with the internal labor regulations, observe labor discipline, work and rest regime;

- comply with the established operating mode what time, regulated work breaks;

- strictly follow the orders and orders of the enterprise management, officials responsible for the implementation of production control in a timely manner;

- apply safe work practices;

- take good care of the employer's property;

- be able to provide first aid to victims, use fire extinguishing means in the event of a fire, call the fire brigade.

1.8. Smoking and eating is allowed only in specially designated places.

2. LABOR PROTECTION REQUIREMENTS BEFORE STARTING WORK

2.1. Check the availability and serviceability of personal protective equipment, put on overalls and safety shoes that are in accordance with the norms, and put them in order.

2.2. Fasten all of the buttons of your clothing, avoiding hanging ends of the clothing. Do not pin clothes with pins, needles, do not keep sharp, fragile objects in pockets.

2.3. Receive an assignment from the manager to perform work with a crane.

2.4. Check the serviceability of the crane, the presence and serviceability (integrity) of ropes, chains, slings, hooks, traverses, etc., as well as other equipment required when working on the crane. It is convenient to place it.

2.5. Prepare protective equipment and devices necessary for the work.

2.6. Prepare the workplace for safe work:

- inspect it, remove all unnecessary items without cluttering the passages;

- check the approaches to the workplace, evacuation routes for compliance with labor protection requirements;

- check the presence and serviceability of fences and safety devices;

- check the presence of signaling means;

- check the availability of fire-fighting equipment, first aid kit;

- establish the sequence of operations.

2.7. Check by visual inspection:

- no hanging bare wires;

- sufficiency of lighting of the workplace;

- Reliability of closure of all current-carrying and starting devices of equipment;

- presence and reliability of grounding connections (absence of breaks, strength of contact between metal non-current-carrying parts of equipment and the grounding wire);

- the presence of limiters for lifting capacity and lifting height;

- absence of foreign objects around the equipment;

- condition of floors (absence of potholes, unevenness, oil stains, etc.).

2.8. Inform your immediate supervisor about all detected malfunctions of equipment, inventory, electrical wiring and other problems and start work only after they are eliminated.

2.9. Work with a crane-beam must be organized in accordance with the requirements of the current technological documents (norms, instructions, regulations), approved in the prescribed manner.

2.10. It is forbidden to start work on a crane with the following violations of labor protection requirements:

- in the presence of a malfunction specified in the operating manual of the manufacturer of the crane-beam, in which its use is not allowed;

- when the period of its technical examination has expired;

- in case of failure to comply with the instructions of the state supervision authorities;

- in case of unacceptable wear of hooks, ropes, chains, running wheels;

- in the event of a malfunction of the lift limiter, load limiter, signal device and other equipment that threatens safe operation;

- in the absence of constant control by the responsible persons for the safe performance of work on the movement of goods by a crane.

- in the absence or malfunction of personal protective equipment;

- in the absence of fire-fighting equipment, first aid kit;

- with insufficient illumination of the workplace and approaches to it;

- without undergoing targeted instruction for the production of work.

3. REQUIREMENTS OF LABOR PROTECTION DURING WORK

3.1. Carry out only the work for which you have been trained, instructed in labor protection and to which the employee responsible for the safe performance of work is admitted.

3.2. Do not allow untrained and unauthorized persons to work.

3.3. Use serviceable equipment, tools, fixtures necessary for safe work; use them only for the work for which they are intended.

3.4. Monitor the work of the crane, periodically carry out a visual inspection.

3.5. If you find faulty equipment, fixtures, rigging, tools, other violations of labor protection requirements that cannot be eliminated on their own, and a threat to health, personal or collective safety, the employee should be reported to the management. Do not start work until the identified violations are eliminated.

Defective equipment must be disconnected from the power supply and display a no-work poster.

3.6. When working with a crane, observe the rules of its operation in accordance with the instructions for labor protection.

3.7. Correctly perform work techniques when moving cargo:

- slinging of loads must be carried out in accordance with slinging schemes;

- after slinging the load to check its reliability, the load rises to a height of no more than 1 m from the floor (platform) level, and the worker who has slinged the load goes to a safe place determined by the work plan or flow chart;

- it is allowed to lower the cargo being moved only to the place designated for this, where the possibility of falling, overturning or sliding of the installed cargo is excluded.

- it is prohibited to move the load suspended on the crane hook above the workplaces when there are people in the area of the load movement;

- if it is necessary to inspect, repair, adjust mechanisms, electrical equipment of the crane beam, inspect and repair metal structures, the switch of the input device must be disconnected.

3.8. When working on a crane, it is not allowed:

- finding people and carrying out any work within the movement of goods. Workplaces must be fenced and marked with warning signs;

- finding people (including the employee himself) when lifting a load installed near a wall, column, stack, machine tool or other equipment between the load being lifted and the specified parts of the building or equipment;

- lowering the load onto the car, as well as lifting it when people are in the body or cabin of the car;

- moving a load in an unstable position or suspended by one horn of a two-horned hook;

- landing in a container raised by a crane-beam, and finding people in it;

- movement of people or cargo with people on it;

- lifting of a load covered with earth, frozen to the ground, laid by other loads, reinforced with bolts, filled with concrete, etc.;

- pulling the load along the ground, the floor by the hook of the crane beam with the inclined position of the cargo ropes without the use of guide blocks that ensure the vertical position of the cargo ropes;

- release of slings, ropes or chains pinched by the load by the crane beam;

- pulling the load during its lifting, moving and lowering. For turning long and bulky goods during their movement, hooks or guys of appropriate length should be used;

- alignment of the transported load by hand, as well as the correction of slings by weight;

- work with disabled or faulty safety devices and brakes;

- Leaving the load suspended at the end of work or during a break.

4. LABOR PROTECTION REQUIREMENTS IN EMERGENCY SITUATIONS

4.1. In the event of a breakdown of equipment, a threatening accident at the workplace or in the workshop:

- stop its operation, as well as the supply of electricity to it, etc .;

- report on the measures taken to the immediate supervisor (the person responsible for the safe operation of the equipment)

- act in accordance with the instructions received.

4.2. In an emergency:

- notify people around about the danger,

- report to the immediate supervisor about the incident

- act in accordance with the emergency response plan.

4.3. When a fire source appears, you must:

- turn off electrical equipment;

- stop working;

- organize the evacuation of people;

- immediately start extinguishing the fire;

When electrical equipment catches fire, only carbon dioxide or powder extinguishers should be used.

4.4. If it is impossible to carry out extinguishing on his own, the employee should call the fire department by phone 101 or 112 and inform the immediate supervisor or management of the enterprise.

4.5. In case of injury or deterioration of health, the employee must stop work, notify the management and contact the first-aid post (call the ambulance by phone 103 or 112).

4.6. If an accident occurs, which the employee has witnessed, he should:

- stop working;

- immediately inform the immediate supervisor;

- Immediately withdraw or remove the victim from the danger zone;

- provide the victim with first aid,

- call a doctor or city ambulance;

- to help organize the delivery of the victim to the nearest medical facility.

4.7. In case of electric shock, you must:

- stop the effect of electric current on the victim. This can be achieved by disconnecting the current source, breaking the supply wires, switch, or by diverting the source of exposure from the victim. This should be done with a dry rope, stick, etc.

Do not touch the victim who is under the influence of the current with your hands.

- call a doctor or city ambulance;

- examine the victim. External damage must be treated and covered with a bandage;

- in the absence of pulse, perform an indirect heart massage and artificial respiration.

It is necessary to carry out measures before the restoration of body functions, or the appearance of signs of death.

4.8. When investigating the circumstances and causes of an accident, the employee should inform the commission of information known to him about the accident.

5. LABOR PROTECTION REQUIREMENTS AT THE END OF WORK

5.1. Disable equipment.

5.2. Inspect and tidy up the workplace.

5.3. Tools, fixtures, accessories, cleaning material, etc. should be removed to the places intended for their storage.

5.4. Take off your overalls. Contaminated overalls must be washed.

5.5. Wash hands and face thoroughly with soap, or shower.

5.6. Report to the management of the organization about all violations of the production process, labor protection requirements, cases of injuries at work.

5. ENVIRONMENTAL PROTECTION

The impact of aircraft on the atmosphere is determined by the level of its pollution due to the emission of harmful substances from the exhaust gases of aircraft engines.

Aircraft move from one airport to another during the flight, and the atmosphere is polluted on a global scale, ie significant pollution occurs both in the areas of airports and on the routes of flight. Moreover, if on the flight paths (at an altitude of 8-12 km) the danger of this pollution is small (flights of aircraft at high altitudes and at high speeds cause the scattering of combustion products in the upper atmosphere and large areas, which reduces their impact on living organisms), then in the airport area can not be considered such pollution is impossible.

Gases are emitted into the atmosphere by engine nozzles and exhaust pipes, which is defined by the term "aircraft engine emissions".

Gases generated by aircraft engines account for 87% of all civil aviation emissions, which also include emissions from special vehicles and stationary sources.

The most unfavorable modes of operation are low speeds and "idling" of the engine, when pollutants are emitted into the atmosphere in quantities significantly exceeding the emission at load modes.

The main components of exhaust gases of modern aircraft engines that pollute the atmosphere are:

• sulfur oxides SOx;

• nitrogen oxides NOx;

• carbon monoxide CO;

• hydrocarbons that are not completely burned, SHNU (methane CH4, acetylene C2H2, ethane C2Hb, benzene SbNb, etc.);

• aldehydes (formaldehyde HCNO, acrolein CH2 = CH = CHO, acetaldehyde CH3CHO, etc.);

• soot (fine particles of pure carbon) - is released in the form of a train behind the engine nozzles during takeoff (soot is released in general a little).

The NOx content in the exhaust gases of an aircraft engine depends on:

• the temperature of the mixture in the combustion chamber (the higher it is, the more NOX is formed), and it is the maximum (2500 ... 3000 K) in the takeoff mode;

• the residence time of the mixture in the combustion chamber (the larger it is, the more NOx is formed), and this occurs at low aircraft speeds.

That is, the maximum emission NOX occurs on the take-off mode of the engine and modes close to it (when taking off and taking off the altitude of the aircraft).

Hydrocarbons (SHNU) are the main component of liquid and gaseous fuels. Aviation fuels - gasoline, kerosene - differ in the content of paraffin, petroleum and aromatic hydrocarbons, as well as sulfur compounds.

During the take-off of the aircraft, approximately 50% of emissions in the form of microparticles, including many heavy metals, are immediately dispersed in areas adjacent to the airport. The rest is in the air for several hours in the form of aerosols, and then also settles on the ground.

Each engine developed (for aircraft) undergoes a series of tests (certification) before being put into series production, including environmental safety research, so the International Civil Aviation Organization (ICAO) has developed strict emission standards for aircraft engines.

The quantitative characteristic of emissions of harmful substances by aircraft engines is the emission index (EI), which shows how many grams of this harmful

substance is emitted into the air when burning 1 kg of fuel in the engine. The dimension of the emission index is g / kg.

The most common are the three ingredients that pollute the atmosphere the most and their emissions are the largest - EICO, EICxHy, EINOx.

EI characterizes the quality of the organization of the combustion process in the combustion chamber of each engine sample and is associated with the design and operational characteristics of the chamber. Therefore, it is often called the emission characteristic of the engine.

Emission indices are determined during their certification tests. The content of CO and CxHy ingredients in the exhaust gases of aircraft engines is due to incomplete combustion of fuel in the engine, and this process, in turn, depends on the characteristics of its combustion parameters, ie, the value of the completeness of combustion and engine operation.

In order to create a unified approach to the standardization of pollutant emissions, IKAO introduced the concept of a standard take-off and landing cycle, which includes all aircraft operations from the moment of engine start to 1000 m altitude, as well as from landing from 1000 m to engine stop. after landing the plane.

The most long and environmentally harmful is the low gas mode (relative thrust is 3 ... 9% of its maximum value). Such small values of the relative thrust of the engine occur during taxiing before takeoff and after landing, as well as during engine warm-up after start-up, occurring in the airport area (airport area means space limited by 1000 m altitude and aerodrome size).

Therefore, the pollution in the airport area is greater (on the route the value of relative thrust varies between 0.6-0.8). In addition, the local pollution of the surface layer of air in the area of the airport, where many people work, is more concentrated and stable than the general pollution of the upper layers of the troposphere on the flight route, the fragment Engine operation is stable at high speeds, and contaminants dissipate quickly.

Therefore, the calculation of emissions from aircraft engines in the airport area is the most important and should be given more attention. And it is these factors that should be taken into account when building new or expanding existing airports in the immediate vicinity of settlements, as well as these factors should be taken into account by developers in their construction plans in the immediate vicinity of the airport.

One of the most important areas of air transport development is to increase the safety, efficiency and environmental friendliness of air transportation.

The main danger to the environment and public health from air transport is the burning of fuel by air. For example, a Boeing aircraft burns 16 tons of fuel in one hour of flight, and consumes 7.8 tons at takeoff. Air transport consumes about 14% of world fuel production. A special danger is the entry of combustion products into the upper atmosphere. Thanks to aircraft, 180,000 tons of sulfur dioxide and more than 1.5 million tons of nitrogen oxides enter the ozone zone every year, which accelerates the destruction of the ozone screen.

Carbon monoxide CO, or carbon monoxide, has no color or odor and is one of the biggest air pollutants. It is formed during incomplete combustion of fuel. At concentrations in the air of more than 1%, it has a negative effect on plants, animals and humans, more than 4% - causes the death of organisms. The toxicity of carbon monoxide is its ability to prevent red blood cells from retaining oxygen, resulting in oxygen starvation of the body, which can lead to death.

Nitrogen oxides (N2O, NO, NO2, N2O3, N2O5) are 10 times more dangerous for humans than CO. They are formed due to imperfect fuel combustion technology. They also cause acid rain. When combined with water in the respiratory tract, they form nitric acid, which causes severe irritation of the mucous membranes and severe disease. They are also absorbed by the leaves of plants, which then lose their forage qualities and get sick.

Sulfur dioxide SO2, SO3 are released mainly during the combustion of diesel fuel. At high concentrations in plants, chlorophyll disappears, cells die and tissue death occurs. In the case of intensive exposure to sulfur dioxide can be observed almost complete necrosis of branches of coniferous trees, their complete decline. Sulfur oxide (IV) and similar compounds are irritants to the mucous membranes of the eyes and respiratory tract. Prolonged exposure to this gas leads to chronic gastritis, gupatopathy, bronchitis, laryngitis and other diseases. There is also a link between air sulfur dioxide levels and lung cancer mortality rates.

Noise pollution. Noise is understood as all unpleasant or unwanted sounds or their combination, which interfere with normal work, rest, etc. and lead to various disturbances of ecosystems. Noise has a negative impact on human health, reduces their ability to work, leads to diseases of the cardiovascular system, nervous and endocrine systems and hearing organs. The sources of noise are mainly vehicles: trains, cars, planes and more. In order to prevent harmful noise to human health, it is necessary to create noise screens, plantings of green plants and various devices. Another way to reduce noise is to use silent mechanisms.

Vibrations occur due to the activities of rail, road, air transport, the construction of roads and more. Prolonged vibrations lead to severe fatigue and significant violations of many body functions - concussion, muscle deformities, disorders of the nervous and cardiovascular systems, blood circulation, etc.

The Convention on International Civil Aviation (Chicago, 1944) (hereinafter - the Convention) entered into force for Ukraine on 09.09.1992. Under Article 37 of the Convention, each Contracting State undertakes to co-operate in ensuring the greatest possible degree of uniformity of rules, standards and procedures. In order to fulfill the requirements contained in the Convention and its annexes, it is necessary that the states' own legal acts be based on the requirements of the Convention itself.

In accordance with paragraph 1 of the Procedure for participation of central executive bodies in the activities of international organizations of which Ukraine is a member, approved by the Cabinet of Ministers of Ukraine from 13.09.2002 № 1371, central executive bodies included in the list of central executive bodies, other state bodies responsible for fulfillment of obligations arising from Ukraine's membership in international organizations (hereinafter - the list), participate in the activities of international organizations of which Ukraine is a member in accordance with concluded international agreements of Ukraine, and are responsible for fulfillment of obligations arising from membership Ukraine in these organizations.

The Ministry of Infrastructure of Ukraine and the State Aviation Service of Ukraine are responsible for fulfilling the obligations arising from Ukraine's membership in the International Civil Aviation Organization (ICAO).

In October 2010, during the 37th session of the ICAO General Assembly, member states set a goal to stabilize the level of greenhouse gas emissions from international civil aviation from 2020. The resolutions were supported by Ukraine during the 39th session of the ICAO General Assembly in October 2016, which testified to Ukraine's readiness to implement the CORSIA market measures system initiated by ICAO.

Ukraine decided to voluntarily participate in CORSIA, which was reported to ICAO in a letter from the State Aviation Service dated 09.09.2016 № 1.26-9119.

CORSIA is a global sectoral market measure designed to offset CO2 emissions from international civil aviation in order to stabilize such emissions from 2020. As of October 2018, 75 countries, representing 75.96% of international aviation, intend to participate in the global scheme of market measures CORSIA from the beginning. Ukraine is also among them, which leads to the need to start monitoring emissions from international flights of Ukrainian aircraft operators from January 2019 (2019-2020 - CORSIA baseline), which will allow monitoring of CO2 emissions from the beginning of 2019, which is required for establishing a baseline

level of emissions from civil aviation, which in the future will allow to calculate changes in the quantitative characteristics of CO2 emissions, which will be subject to compensation costs.

CORSIA is implemented in stages, starting with the participation of states on a voluntary basis, followed by the participation of all states except the liberated ones.

All ICAO Member States are required to monitor, report and verify (MRV) the CO2 emissions from international aircraft flights annually from 2019, regardless of their participation in the CORSIA project. This ICAO requirement is necessary in order to obtain accurate statistics on CO2 emissions (emissions). As international flights facilitate the transboundary movement of pollutants, including greenhouse gas CO2, the data obtained will be the basis for calculating compensation payments and the initial value, which will be further compared with the effectiveness of the CORSIA project.

Ukraine's participation from the very beginning of the base stage will allow to compile statistics on the level of CO2 emissions from international flights based on the real intensity of flights and taking into account the dynamics of international air traffic by Ukrainian airlines.

The lack of Ukraine's participation in the full cycle of the CORSIA project implies risks of establishing a baseline for domestic operators within the global average compensation, as for civil aviation companies whose countries do not participate in the basic and experimental stages of the CORSIA project.

Among the main measures to prevent, reduce and mitigate the negative effects are the following:

- optimization of ground handling infrastructure at airports to reduce the movement of aircraft and ground vehicles on taxiways and at idle at the gates;

- renewal of the land vehicle fleet;

- minimization of fugitive air emissions from aviation kerosene and other fuel depots and from fuel handling;

- supply of electricity and air conditioning through ground equipment to minimize the use of NSU aircraft;

- initial use of mechanical methods of ice removal, such as sweepers and plows, supplemented with chemicals;

- providing a stormwater management system for the collection and treatment of surface runoff, containing air and aerodrome fluids to protect against icing, including water from a pile of snow cleared of aprons and runways.

In addition, it is considered appropriate to inform the public through the media about the local and regional levels about the strategy being implemented.

Promote the use of renewable energy sources (such as photovoltaics) for street lighting or airport and access road lighting.

Plan the airport site (new construction and expansion of existing facilities), as well as the orientation of routes for arriving and departing aircraft, taking into account the actual and projected housing and other noise-sensitive receptors in the surrounding areas. This may include coordination with local authorities that have an impact on land use planning and overall transportation planning activities.

Plan flight routes, timing and altitude for aircraft (aircraft and helicopters) flying over residential buildings.

In areas where significant impacts are expected, preferred procedures and routes for landing and take-off (LTO) should be implemented to minimize potential noise from aircraft approaching and moving away for noise-sensitive areas. These procedures may include instructions on the use of reduction profiles or “predominant noise” (NPR) routes, for example, a “continuous reduction approach” to avoid noise-

sensitive areas, the use of a “low power / low drag” (LPLD) procedure to fly the aircraft in a "clean" condition (for example, without flaps or wheels), if possible, to minimize aircraft noise and instructions for minimizing traction during landing. An alternative approach may include noise dissipation through the equal use of multiple flight paths, as opposed to the use of a preferred flight path.

It is also advisable to use night or other operating restrictions.

If necessary, work with local authorities to identify and implement noise prevention and control strategies in noise abatement areas (eg soundproofing of buildings exposed to airborne noise above local government levels or to limit the nighttime operation of certain landing routes).

Implement waste management plans, which should include waste prevention / generation / minimization, segregation, reuse, recycling, transportation, disposal and monitoring of hazardous waste in accordance with Ukrainian and EU waste legislation.

Create a solid waste recycling program, depending on the availability of local facilities, including the placement of labeled waste containers in passenger terminals for metals, glass, paper and plastics. Passenger operators and cleaning contractors should be encouraged to separate waste in vehicles by separating rubbish from newspapers / papers, plastic and metal containers and used pillows.

The draft Strategy covers the development of the aviation industry until 2030 in order to integrate into the global air transport network, which will require the creation of modern aviation transport infrastructure, realization of aviation transit potential of Ukraine, increasing accessibility of air transport for the general population, promoting free competition and liberalization. Thus, it is expected that the development and modernization of airport infrastructure will stimulate an increase in air traffic and, accordingly, the number of aircraft in the airspace of Ukraine.

The impact of aircraft on the atmosphere is determined by the level of its pollution due to the emission of harmful substances from the exhaust gases of aircraft engines.

Aircraft move from one airport to another during the flight, and the atmosphere is polluted on a global scale, ie significant pollution occurs both in the areas of airports and on the routes of flight. Moreover, if on the flight paths (at an altitude of 8-12 km) the danger of this pollution is small (flights of aircraft at high altitudes and at high speeds cause the scattering of combustion products in the upper atmosphere and large areas, which reduces their impact on living organisms), then in the airport area can not be considered such pollution is impossible.

Pollution in the airport area is the largest (on the route the value of relative thrust varies between 0.6-0.8), and local air pollution in the airport area, where many people work, is more concentrated and persistent than the total pollution of the upper troposphere on the flight route , because the operation of the engines is stable at high speeds, and pollutants dissipate quickly. Therefore, the calculation of emissions from aircraft engines in the airport area is the most important and should be given more attention.

Therefore, the site of the airport (new construction and expansion of existing facilities) should be planned, as well as the orientation of routes for arriving and departing aircraft, taking into account the actual and projected housing and other noise-sensitive receptors in the surrounding areas. This may include, in particular, coordination with local authorities that have an impact on land use planning and overall transportation planning activities. It is also necessary to carefully plan flight routes, timing and altitude for aircraft (aircraft and helicopters) flying over residential buildings, to establish cooperation with local authorities to identify and implement strategies to prevent and control noise in noise reduction areas (eg soundproofing of buildings, which are affected by airborne noise above the levels provided by local authorities, or restrictions on the night time of operation of certain landing routes).

In order to create a unified approach to the standardization of pollutant emissions, the International Civil Aviation Organization (IKAO) has introduced the concept of a standard take-off and landing cycle, which includes all aircraft operations from engine start to 1000 m altitude, as well as from landing altitude of 1000 m before stopping the engine after landing.

It is proposed to solve the problems by adopting the relevant aviation rules of Ukraine:

- Lack of emission monitoring system in the field of civil aviation in Ukraine, which would sufficiently meet Ukraine's obligations to comply with ICAO requirements;

- calculation of emissions without the use of a single methodology, which leads to a lack of representative data and, as a consequence, makes it impossible for Ukraine to participate in the CORSIA system;

- lack of proper control and measures to stimulate proper emission calculation;

- introduction of an effective mechanism for the functioning of the monitoring and reporting system;

- Lack of a base for CO2 emissions in the field of civil aviation into the atmosphere.

Thus, in the implementation of modern state policy in the field of civil aviation, namely in the field of environmental safety of civil aviation, issues of state regulation primarily require special attention from public authorities and can not be resolved through market mechanisms.

GENERAL CONCLUSION

This thesis addressed a very important topic in the aviation industry - airworthiness renewal. As part of this work, a comprehensive analysis of the use of the Boeing 737 aircraft fleet was carried out, and the reliability control system was analyzed. Also, special attention was paid to the analysis of the aircraft maintenance program. It should be noted that these programs were worked out in detail and many factors were taken into account in the next revision and improvement of these programs. Further in the work, a study of the MOE and CAME documents was carried out, where all the procedures performed during the maintenance and extension of airworthiness are described in more detail. But from my personal experience in such organizations, I can conclude that in some cases the procedures written in the documents are visually impossible to follow, therefore it is necessary to constantly audit these procedures directly paying attention to the comments and suggestions of the staff working in the field. Particular attention was paid to the responsibility during maintenance. After analyzing the work of enterprises and familiarizing yourself with global trends and new European requirements, we can conclude that these measures must be urgently harmed in our state. It should also be noted the training of specialists, a question that has been relevant for several decades and cannot be resolved today. Based on the presented material and the research conducted, I can draw the main conclusion that the issue of improving airworthiness in Ukraine will always be relevant, since the world does not stand still and a variety of procedures are constantly being improved. I believe that our country deserves to be at the forefront in the aviation field, therefore, special attention should be paid to these issues.

REFERENCES