الأكاديمية العربية الدولية
Arab International Academy

Graduation Project

Total Quality management

Degree

Project Topic

Aviation safety and quality management policy

“Problems and obstacles”

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Checked & Amended by

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Project Topic

Aviation safety

&

Quality management policy

“Problems & Obstacles”

Project plan

In the aviation world we interface many difficulties to maintaining the safety of the civil aviation which in order to maintain the safety of aviation we should establish the independent quality system and safety system designated by the **European aviation safety agency** (EASA) procedures and regulations.

In the **introduction of project** I shall explain how we can establish the approved organization to operate the Aircrafts and the approved maintenance organization and the continuing airworthiness management organization.

In this **project we plan** to explain how we can maintain the safety of the civil aviation by establish the quality and safety system in the approved organization as per EASA procedures and Regulations and then we go to demonstrate the problems and obstacles facing this system's and how we can exceed it.

The **Hypotheses of topic** of the study is the main generation of our plan which we can use the experience of many aviation organization "operators" to maintain and improve their systems.

The **Theoretical framework** of the study consists of concepts, together with their definitions, and existing theories that are used for my particular study.

An explicit statement of theoretical assumptions permits the reader to evaluate them critically.

The theoretical framework connects the researcher to existing knowledge. Guided by a relevant theory, given a basis for your hypotheses and choice of research methods.

Articulating the theoretical assumptions of a research study forces to address questions of why and how. It permits to move from simply describing a phenomenon observed to generalizing about various aspects of that phenomenon.

In the **benefits** and **result** of the study, at the end of this project the interested person and reader of this project know how we can

establish the approved organization including the quality and safety system and how the EASA oversight and monitoring of such organization and what is the obstacles facing this systems and how we can exceed it, ultimately to make an aircraft's fly safely.

All the **references** of this project is the European aviation safety agency (EASA) and Federal aviation administration (FAA) and Directorate General Civil Aviation (DGCA).

Project Introduction

In 1944, 52 states met to regulate air traffic that called convention on international civil aviation (also known as Chicago convention).

In 26 November 2014 European Aviation safety agency (EASA) the latest revision of Commission Regulation EU # 1321/2014 to regulate and recognize the air traffic and the organizations which should approved by the competent authority to manufacture the aircrafts, parts and appliances and standard parts of the aircraft and the organizations which establish and approved also by the competent authority to maintain the continuing airworthy of the Aircrafts and the maintenance organizations which we will mentions them in the following statements.

EASA PART 21

Regulation for the manufacturer states like Airbus Company.

EASA PART M

For continuing airworthiness management organization, this Section establishes the measures to be taken to ensure that

airworthiness is maintained, including maintenance. It also specifies the conditions to be met by the persons or organizations involved in such continuing airworthiness management.

Responsibilities

The owner is responsible for the continuing airworthiness of an aircraft and shall ensure that no flight takes place.

Aircraft Maintenance Programme

(a) Maintenance of each aircraft shall be organised in accordance with an aircraft maintenance programme.

(b) The aircraft maintenance programme and any subsequent amendments shall be approved by the competent authority.

(c) When the continuing airworthiness of the aircraft is managed by a continuing airworthiness management organisation approved in accordance with Section A, Subpart G of this Annex (Part M) or when there is a limited contract between the owner and this organisation in

accordance with point, the aircraft maintenance programme and its amendments may be approved through an indirect approval procedure.

(i) In that case, the indirect approval procedure shall be established by the continuing airworthiness management organisation as part of the Continuing Airworthiness Management Exposition and shall be approved by the competent authority responsible for that continuing airworthiness management organisation.

(ii) The continuing airworthiness management organisation shall not use the indirect approval procedure when this organisation is not under the oversight of the Member State of Registry, unless an agreement exists, transferring the responsibility for the approval of the aircraft maintenance programme to the competent authority responsible for the continuing airworthiness management organisation.

(d) The aircraft maintenance programme must establish compliance with:

(i) Instructions issued by the competent authority;

(ii) Instructions for continuing airworthiness.

MAINTENANCE STANDARDS

Maintenance data

(a) The person or organisation maintaining an aircraft shall have access to and use only applicable current maintenance data in the performance of maintenance including modifications and repairs.

(b) For the purposes of this Part, applicable maintenance data is:

1. any applicable requirement, procedure, standard or information issued by the competent authority or the Agency,
2. any applicable airworthiness directive,
3. applicable instructions for continuing airworthiness, issued by type certificate holders, supplementary type certificate holders and any other organisation that publishes such data.

(c) The person or organisation maintaining an aircraft shall ensure that all applicable maintenance data is current and readily available for use when required. The person or organisation shall establish a work card or worksheet system to be used and shall either transcribe accurately the

maintenance data onto such work cards or worksheets or make precise reference to the particular maintenance task or tasks contained in such maintenance data.

Maintenance work orders

Before the commencement of maintenance a written work order shall be agreed between the organisation and the organisation requesting maintenance to clearly establish the maintenance to be carried out.

Aircraft certificate of release to service

At the completion of all required aircraft maintenance in accordance with this Subpart an aircraft certificate of release to service shall be issued.

Component certificate of release to service

At the completion of all required component maintenance in accordance with this Subpart a component certificate of release to service shall be

issued EASA Form 1 shall be issued except for those components maintained, and components fabricated.

The component certificate release to service document, EASA Form 1 may be generated from a computer database.

CONTINUING AIRWORTHINESS MANAGEMENT ORGANISATION

Continuing oversight

Scope

This Subpart establishes the requirements to be met by an organisation to qualify for the issue or continuation of an approval for the management of aircraft continuing airworthiness.

Application

An application for issue or change of a continuing airworthiness management organisation approval shall be made on a form and in a manner established by the competent authority.

Extent of approval

(a) The approval is indicated on a certificate included in Appendix VI issued by the competent authority.

(b) Notwithstanding point (a), for licensed air carriers, the approval shall be part of the air operator certificate issued by the competent authority, for the aircraft operated.

(c) The scope of work deemed to constitute the approval shall be specified in the continuing airworthiness management exposition.

Continuing airworthiness management exposition

(a) The continuing airworthiness management organisation shall provide a continuing airworthiness management exposition containing the following information:

1. A statement signed by the accountable manager to confirm that the organization will work in accordance with this Part and the exposition at all times, and;
2. The organisation's scope of work, and;

3. The title(s) and name(s) of person(s).

4. An organisation chart showing associated chains of responsibility between all the person(s).

5. A list of the airworthiness staff, specifying, where applicable, the staff authorized to issue permits to fly.

6. A general description and location of the facilities, and;

7. Procedures specifying how the continuing airworthiness management organisation ensures compliance with this Part, and;

8. The continuing airworthiness management exposition amendment procedures, and;

9. The list of approved aircraft maintenance programmes, or, for aircraft not used by licenced air carriers in accordance with Regulation (EC) No 1008/2008, the list of 'generic' and 'baseline' maintenance programmes.

(b) The continuing airworthiness management exposition and its amendments shall be approved by the competent authority.

(c) Notwithstanding point (b), minor amendments to the exposition may be approved indirectly through an indirect approval procedure. The indirect

approval procedure shall define the minor amendment eligible, be established by the continuing airworthiness management organisation as part of the exposition and be approved by the competent authority responsible for that continuing airworthiness management organisation.

Facilities

The continuing airworthiness management organisation shall provide suitable office accommodation at appropriate locations for the personnel specified in point M.A.706.

Personnel requirements

(a) The organisation shall appoint an accountable manager, who has corporate authority for ensuring that all continuing airworthiness management activities can be financed and carried out in accordance with this Part.

(b) For licenced air carriers in accordance with Regulation (EC) No 1008/2008 the accountable manager referred to in point (a) shall be the person who also has corporate authority for ensuring that all the operations of the

operator can be financed and carried out to the standard required for the issue of an air operator's certificate.

(c) A person or group of persons shall be nominated with the responsibility of ensuring that the organisation is always in compliance with this Subpart. Such person(s) shall be ultimately responsible to the accountable manager.

(d) For licenced air carriers in accordance with Regulation (EC) No 1008/2008, the accountable manager shall designate a nominated post holder. This person shall be responsible for the management and supervision of continuing airworthiness activities, pursuant to point (c).

(e) The nominated post holder referred to in point (d) shall not be employed by a Part-145 approved organisation under contract to the operator, unless specifically agreed by the competent authority.

(f) The organisation shall have sufficient appropriately qualified staff for the expected work.

(g) All point (c) and (d) persons shall be able to show relevant knowledge, background and appropriate experience related to aircraft continuing airworthiness.

(h) The qualification of all personnel involved in continuing airworthiness management shall be recorded.

(i) For organisations extending airworthiness review certificates in accordance, the organisation shall nominate persons authorised to do so, subject to approval by the competent authority.

(j) The organisation shall define and keep updated in the continuing airworthiness management exposition the title(s) and name(s) of person(s).

Continuing airworthiness management

(a) All continuing airworthiness management shall be carried out according to the prescriptions of M.A Subpart C.

(b) For every aircraft managed, the approved continuing airworthiness management organisation shall:

1. develop and control a maintenance programme for the aircraft managed including any applicable reliability programme,
2. present the aircraft maintenance programme and its amendments to the competent authority for approval, unless covered by an indirect approval procedure in accordance with point M.A.302(c), and for aircraft not used by licenced air carriers in accordance with Regulation (EC) No 1008/2008 provide a copy of the programme to the owner or operator responsible in accordance with M.A.201,
3. Manage the approval of modification and repairs.
4. Ensure that all maintenance is carried out in accordance with the approved maintenance programme and released in accordance with Section A, Subpart H of this Annex (Part-M),
5. Ensure that all applicable airworthiness directives and operational directives with a continuing airworthiness impact, are applied,
6. Ensure that all defects discovered during scheduled maintenance or reported are corrected by an appropriately approved maintenance organisation,

7. Ensure that the aircraft is taken to an appropriately approved maintenance organisation whenever necessary,
8. Coordinate scheduled maintenance, the application of airworthiness directives, the replacement of service life limited parts, and component inspection to ensure the work is carried out properly,
9. Manage and archive all continuing airworthiness records and/or operator's technical log.
10. Ensure that the mass and balance statement reflects the current status of the aircraft.

(d) Notwithstanding point (c), the contract may be in the form of individual work orders addressed to the Part-145 or Part-M.A. Subpart-F maintenance organisation in the case of:

1. An aircraft requiring unscheduled line maintenance,
2. Component maintenance, including engine maintenance.

(a) The approved continuing airworthiness management organisation shall hold and use applicable current maintenance data in accordance with point M.A.401 for the performance of continuing airworthiness tasks

referred to in point M.A.708. This data may be provided by the owner or the operator, subject to an appropriate contract being established with such an owner or operator. In such case, the continuing airworthiness management organisation only needs to keep such data for the duration of the contract.

(b) For aircraft not used by licenced air carriers in accordance with Regulation (EC) No 1008/2008, the approved continuing airworthiness management organisation may develop 'baseline' and/or 'generic' maintenance programmes in order to allow for the initial approval and/or the extension of the scope of an approval without having the contracts referred to in Appendix I to this Annex (Part M). These 'baseline' and/or 'generic' maintenance programmes however do not preclude the need to establish an adequate Aircraft Maintenance Programme.

Airworthiness review

(a) To satisfy the requirement for the airworthiness review of an aircraft referred to in point, a full documented review of the aircraft records shall

be carried out by the approved continuing airworthiness management organisation in order to be satisfied that:

1. Airframe, engine and propeller flying hours and associated flight cycles have been properly recorded; and
2. The flight manual is applicable to the aircraft configuration and reflects the latest revision status; and
3. All the maintenance due on the aircraft according to the approved maintenance programme has been carried out; and
4. All known defects have been corrected or, when applicable, carried forward in a controlled manner; and
5. All applicable airworthiness directives have been applied and properly registered; and
6. All modifications and repairs applied to the aircraft have been registered and are in compliance with Annex I (Part-21) to Regulation (EU) No 748/2012; and

7. All service life limited components installed on the aircraft are properly identified, registered and have not exceeded their approved service life limit; and

8. All maintenance has been released in accordance with Annex I (Part-M); and

9. The current mass and balance statement reflects the configuration of the aircraft and is valid; and

10. The aircraft complies with the latest revision of its type design approved by the Agency; and

11. If required, the aircraft holds a noise certificate corresponding to the current configuration of the aircraft in compliance with Subpart I of Annex I (Part-21) to Regulation (EU) No 748/2012.

(b) The airworthiness review staff of the approved continuing airworthiness management organisation shall carry out a physical survey of the aircraft. For this survey, airworthiness review staff not appropriately qualified to Annex III (Part-66) shall be assisted by such qualified personnel.

(c) Through the physical survey of the aircraft, the airworthiness review staff shall ensure that:

1. All required markings and placards are properly installed; and
2. The aircraft complies with its approved flight manual; and
3. The aircraft configuration complies with the approved documentation; and
4. No evident defect can be found that has not been addressed according to point M.A.403; and
5. No inconsistencies can be found between the aircraft and the point (a) documented review of records.

(d) By derogation to point M.A.901 (a), the airworthiness review can be anticipated by a maximum period of 90 days without loss of continuity of the airworthiness review pattern, to allow the physical review to take place during a maintenance check.

(e) The airworthiness review certificate (EASA Form 15b) or the recommendation for the issue of the airworthiness review certificate

(EASA Form 15a) referred to in Appendix III to Annex I (Part-M) can only be issued:

1. By airworthiness review staff appropriately authorized on behalf of the approved continuing airworthiness management organization or by certifying staff in cases and
2. When satisfied that the airworthiness review has been completely carried out and that there is no non-compliance which is known to endanger flight safety.

(f) A copy of any airworthiness review certificate issued or extended for an aircraft shall be sent to the Member State of Registry of that aircraft within 10 days.

(g) Airworthiness review tasks shall not be sub-contracted.

For ELA1 aircraft not involved in commercial operations for which the aircraft maintenance programme has been established, the aircraft maintenance programme shall be reviewed in conjunction with the airworthiness review. This review shall be accomplished by the person who performed the airworthiness review.

(h) Should the outcome of the airworthiness review be inconclusive or should the review show discrepancies on the aircraft linked to deficiencies in the content of the maintenance programme, the competent authority shall be informed by the organisation as soon as practicable but in any case within 72 hours from the moment the organisation identifies the condition to which the review relates. The airworthiness review certificate shall not be issued until all findings have been closed.

Quality system

(a) To ensure that the approved continuing airworthiness management organisation continues to meet the requirements of this Subpart, it shall establish a quality system and designate a quality manager to monitor compliance with, and the adequacy of, procedures required to ensure airworthy aircraft. Compliance monitoring shall include a feedback system to the accountable manager to ensure corrective action as necessary.

(b) The quality system shall monitor activities carried out under Section A, Subpart G of this Annex (Part M). It shall at least include the following functions:

1. monitoring that all activities carried out under Section A, Subpart G of this Annex (Part M) are being performed in accordance with the approved procedures, and;
2. Monitoring that all contracted maintenance is carried out in accordance with the contract.
3. monitoring the continued compliance with the requirements of this Part.

(c) The records of these activities shall be stored for at least two years.

(d) Where the approved continuing airworthiness management organisation is approved in accordance with another Part, the quality system may be combined with that required by the other Part.

(e) For licensed air carriers in accordance with Regulation (EC) No 1008/2008 the M.A. Subpart G quality system shall be an integrated part of the operator's quality system.

(f) In the case of a small organisation not managing the continuing airworthiness of aircraft used by licensed air carriers in accordance with Regulation (EC) No 1008/2008, the quality system may be replaced by regular organisational reviews subject to the approval of the competent authority, except when the organisation issues airworthiness review certificates for aircraft above 2 730 kg MTOM other than balloons. In the case where there is no quality system, the organisation shall not contract continuing airworthiness management tasks to other parties.

Continued validity of approval

An approval shall be issued for an unlimited duration. It shall remain valid subject to:

1. the organisation remaining in compliance with this Part, in accordance with the provisions related to the handling of findings as specified under point M.B.705 and;
2. The competent authority being granted access to the organisation to determine continued compliance with this Part, and;

3. The approval not being surrendered or revoked.

Upon surrender or revocation, the approval certificate shall be returned to the competent authority.

EASA PART 145

European Aviation Safety Agency (EASA) Part 145 Approval is a company level certification to the European Commission Regulation standards of design, production, maintenance and operation of aircraft components. An aircraft component is described as any product, part, or appliance installed in European aircraft. For U.S. based organizations, the standards are harmonized with Federal Aviation Administration (FAA) standards such that a company can gain EASA Part 145 approval upon successful submission of an existing FAA Certified Repair Station certificate.

Certifications are issued exclusively by the EASA. U.S suppliers must submit an application, along with a copy of their FAA Certificate, to the FAA Flight Standards District Office. If the application is approved, the FAA will make a recommendation to the EASA and the EASA will issue an

EASA Part 145 Approval Certificate. Every two years, the repair station must submit evidence of continued compliance to the EASA Part 145 required standards.

For Canadian organizations, a joint committee between the European Community (EC) and the Transport Canada Civil Aviation reviews the application and determines if the company meets the standards. The certification must be renewed through resubmission every two years.

EASA part 145 IS published for the maintenance organization approved to introduce a maintenance services for the Aircraft and Aircraft appliances and should have the following items:

Facility requirements

Facilities are provided appropriate for all planned work, ensuring in particular, protection from the weather elements. Specialized workshops and bays are segregated as appropriate, to ensure that environmental and work area contamination is unlikely to occur.

Personnel requirements

The organization shall establish and control the competence of personnel involved in any maintenance, development of maintenance programmes, airworthiness reviews, management and/or quality audits in accordance with a procedure and to a standard agreed by the competent authority. In addition to the necessary expertise related to the job function, competence must include an understanding of the application of human factors and human performance issues appropriate to that person's function in the organisation. ‘Human factors’ means principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration of human performance. ‘Human performance’ means human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

Certifying staff and support staff

Support staff' means those staff holding an aircraft maintenance license under Annex III (Part-66) in category B1, B2, B2L, B3 and/or L with the appropriate aircraft ratings, working in a base maintenance environment while not necessarily holding certification privileges.

Certifying staff means those staff holding an aircraft maintenance license under annex iii part 66 in category c.

Equipment and tools

The organisation shall have available and use the necessary equipment and tools to perform the approved scope of work

Components

All components shall be classified into the following categories :

- Unserviceable components
- Serviceable components
- Standard parts

Maintenance data

The organisation shall hold and use applicable current maintenance data in the performance of maintenance, including modifications and repairs. ‘Applicable’ means relevant to any aircraft, component or process specified in the organisation's approval class rating schedule and in any associated capability list.

The organisation may only modify maintenance instructions in accordance with a procedure specified in the maintenance organisation's exposition. With respect to those changes, the organisation shall demonstrate that they result in equivalent or improved maintenance standards and shall inform the type-certificate holder of such changes. Maintenance instructions for the purposes of this point means instructions on how to carry out the particular maintenance task: they exclude the engineering design of repairs and modifications.

The organisation shall provide a common work card or worksheet system to be used throughout relevant parts of the organisation. In addition, the organisation shall either transcribe accurately the maintenance data contained in points (b) and (d) onto such work cards or worksheets or make precise reference to the particular maintenance task or tasks contained in such maintenance data. Work cards and worksheets may be computer generated and held on an electronic database subject to both adequate safeguards against unauthorised alteration and a back-up electronic database which shall be updated within 24 hours of any entry made to the main electronic database. Complex maintenance tasks shall be transcribed onto the work cards or worksheets and subdivided into clear stages to ensure a record of the accomplishment of the complete maintenance task.

Maintenance and airworthiness review records

The organisation shall record all details of maintenance work carried out. As a minimum, the organisation shall retain records necessary to

prove that all requirements have been met for the issue of the certificate of release to service, including subcontractor's release documents, and for the issue of any airworthiness review certificate and recommendation.

The organisation shall provide a copy of each certificate of release to service to the aircraft operator, together with a copy of any specific repair/modification data used for repairs/modifications carried out.

The organisation shall retain a copy of all detailed maintenance records and any associated maintenance data for three years from the date the aircraft or component to which the work relates was released from the organisation. In addition, it shall retain a copy of all the records related to the issue of airworthiness review certificates and recommendations for three years from the date of issue and shall provide a copy of them to the owner of the aircraft.

The records under this point shall be stored in a manner that ensures protection from damage, alteration and theft.

Computer backup discs, tapes etc. shall be stored in a different location from that containing the working discs, tapes etc., in an environment that ensures they remain in good condition.

Production planning

The organization shall have a system appropriate to the amount and complexity of work to plan the availability of all necessary personnel, tools equipment, material, maintenance data and facilities in order to ensure the safe completion of the maintenance work.

The planning of maintenance tasks, and the organising of shifts, shall take into account human performance limitations.

Occurrence reporting

the organisation shall report to the competent authority, the state of registry and the organisation responsible for the design of the aircraft or component any condition of the aircraft or component identified by the organisation that has resulted or may result in an unsafe condition that hazards seriously the flight safety.

The organisation shall establish an internal occurrence reporting system as detailed in the exposition to enable the collection and evaluation of such reports, including the assessment and extraction of those occurrences to be reported under point (a). This procedure shall identify adverse trends, corrective actions taken or to be taken by the organisation to address deficiencies and include evaluation of all known relevant information relating to such occurrences and a method to circulate the information as necessary.

The organisation shall make such reports in a form and manner established by the Agency and ensure that they contain all pertinent information about the condition and evaluation results known to the organisation.

Safety and quality policy, maintenance procedures and quality system

The organisation shall establish a safety and quality policy for the organisation to be included in the exposition.

The organisation shall establish procedures agreed by the competent authority taking into account human factors and human performance to ensure good maintenance practices and compliance with the applicable requirements established in 145.A.25 to 145.A.95. The procedures under this point shall: ensure that a clear work order or contract has been agreed between the organisation and the organisation requesting maintenance to clearly establish the maintenance to be carried out so that aircraft and components may be released to service in accordance with 145.A.50; and, cover all aspects of carrying out maintenance, including the provision and control of specialised services and lay down the standards to which the organisation intends to work.

The organisation shall establish a quality system that includes the following:

Independent audits in order to monitor compliance with required aircraft/aircraft component standards and adequacy of the procedures

to ensure that such procedures invoke good maintenance practices and airworthy aircraft/aircraft components. In the smallest organisations the independent audit part of the quality system may be contracted to another organisation approved under this Part or a person with appropriate technical knowledge and proven satisfactory audit experience.

Maintenance organisation exposition

Maintenance organisation exposition' means the document or documents that contain the material specifying the scope of work deemed to constitute approval and showing how the organisation intends to comply with this Annex (Part-145). The organisation shall provide the competent authority with a maintenance organisation exposition.

A statement signed by the accountable manager confirming that the maintenance organisation exposition and any referenced associated manuals define the organisation's compliance with this Annex (Part-

145) and will be complied with at all times. When the accountable manager is not the chief executive officer of the organisation then such chief executive officer shall countersign the statement;

The organisation's safety and quality policy

The title(s) and name(s) of the persons nominated

The duties and responsibilities of the persons nominated under point 145.A.30(b), including matters on which they may deal directly with the competent authority on behalf of the organisation

An organisation chart showing associated chains of responsibility between the persons nominated

A list of certifying staff, support staff and, if applicable, airworthiness review staff and staff responsible for the development and processing of the maintenance programme, with their scope of approval;

A general description of manpower resources.

Quality Audit of Organization Procedures

Organization have established a quality system based on an independent audits and quality feedback reporting system to enable the Organization to ensure that it can deliver a safe product and remain incompliance with the requirements.

The Quality Systems presented in the MOE is compliant with PART 145 requirements especially with the requirements defined in PART 145 and applicable Part-M requirements.

It is the objective of the Quality Systems to be effective at all levels of the organization to ensure:

- Adequacy of the organizational structure,
- The Organization staff are sufficiently qualified and trained to carry out all tasks,
- All procedures are adequate for the respective tasks, and respected by the staff,

- Maintenance data and documents are available, updated and accessible to the authorized staff,

- Organization is able to perform all maintenance activities within its scope of work.

The audit system is the key element of Quality Systems. All quality audits are based on the intent of the ISO 19011:2011 methodology as long as it does not contradict any EASA Part 145 requirements.

The Quality Systems includes a 'quality audit remedial action procedure' which defines the means by which audit reports containing observations about non-compliance or poor standards can be identified, analyzed and corrected.

Audit Program

The Quality Manager is responsible for establishing an independent audit program that ensure full check of all aspects of PART 145 compliance every 12 months.

MOE Parts 1 to 5 are reviewed. Non-certified sources are audited according to the principles described.

Unscheduled audits may be performed to check the embodiment of corrective actions or following specific events such as accidents or incidents, sampling or authority need, or upon the request of

Accountable manager.

Quality Audit Procedure

The Quality Audit Program is established in order to comply with PART 145 requirements and applicable Part-M requirements. All quality audits are based on the intent of the ISO 19011:2011 methodology as long as it does not contradict any EASA Part 145 requirements.

Objectives of the Audits

- To determine the conformity of a system or product against specified requirements,

• To determine the effectiveness of the system performance in achieving established objectives.

• To support and promote the implementation of corrective actions.

• To improve the audited system and prevent further deviations and discrepancies,

• To enable the evaluation and survey of a direct supplier capability.

Audit Categories

• **System Audit**: Applies to the complete Quality System encompassing a whole organization (including internal and external) or a part of that organization standing as a complete system on its own

• **Procedure Audit**: To determine through detailed verifications that the continuous sequence of tasks or actions required to produce a specific output, are performed in compliance to the relevant

Procedure.

• **Product Audit**: To check by inspections, measurement or test, the conformity of a given product or service.

Privileges of the organisation

In accordance with the exposition, the organisation shall be entitled to carry out the following tasks:

Maintain any aircraft and/or component for which it is approved at the locations identified in the approval certificate and in the exposition;

Arrange for maintenance of any aircraft or component for which it is approved at another organisation that is working under the quality system of the organisation. This refers to work being carried out by an organisation not itself appropriately approved to carry out such maintenance under this Part and is limited to the work scope permitted under procedures) This work scope shall not include a base maintenance check of an aircraft or a complete workshop maintenance check or overhaul of an engine or engine module.

Maintain any aircraft or any component for which it is approved at any location subject to the need for such maintenance arising either from the unserviceability of the aircraft or from the necessity of supporting occasional line maintenance, subject to the conditions specified in the exposition

EASA PART 66

EASA PART 66 for the personal licensed cat. A,B,C.

EASA PART 147

EASA PART 147 for the training organizations.

Now we understand how and who can maintain the airworthy of the aircraft and what is the meaning of the approved organization so let me go with you to what is the problems and obstacles Faces this system depend upon on my experience.

Problems and obstacles of the project topic

Many problems and obstacles faces the world of the aviation (incidents, accident) on ground and on the flight, the agency and competent authority establish a procedures and regulations which usually amended to maintain the standard of the quality of aviation organization and they oversight and compliance monitoring usually as per audit yearly plan to ensure organization compliance with the regulations and procedures, ultimately to reduce the numbers of accidents, incidents that occur.

They establish the occurrence reporting system to ensure that any identified condition of an aircraft or component which endanger flight safety.

In this part we go to one of the incidents and we will talk about all the aspect of it.

On 6th November 2011, a Learjet 60 type aircraft registered A6-IAS operating a medical evacuation flight took off at 14.13.01 Z from runway 17 at BRHIA without take-off clearance.

It came into close contact with Boeing 737-800 that had just taken off from runway 21 at BRHIA. No TCAS was activated and no injuries or damages resulted. The incident was not reported by the flight crew, however, it was reported by the ATC Tower controller and relayed to the UAE GCAA by the Lebanese DGCAA.

Operator : Royal jet

Manufacturer : Learjet

Aircraft model : 60

Nationality : United Arab Emirates

Registration : A6-IAS

State of occurrence : Lebanon

Location : Beirut Rafic Hariri International Airport, Runway17

Date and Time : 6th November 2011, 1413 LT.

Factual Information

History of the flight

On 6th November 2011, a Learjet 60 type aircraft registered A6-IAS operated a medical evacuation flight as royal jet 33 from Al Ain airport, UAE to Hannover international airport, Germany, via Beirut Rafic Hariri international airport- Lebanon. The flight had a total of 5 persons on-board, 2 flight crew (a captain and a first officer), a patient, a doctor and a nurse.

The inbound leg from Abu Dhabi to Beirut was uneventful. Following the technical transit stop at BRHIA, the flight crew initiated the second leg to Hannover. They were given by ATC ground on frequency 121.9 a departure clearance via runaway 17, KALDE 2 D, 3000 feet and a start up clearance. They were then given taxi instruction to runway 17. As they were taxing to runway 17 they were instructed to contact the ATC tower on frequency 118.9.

At 14.09.33 the flight crew initiated its first contact with the ATC Tower and reported “ready for departure”. At 14.09.49 the tower issued

the following instruction “Line-up 17 and wait ROJ33”. Prior to ROJ33 switching frequency to the tower an instruction had already been issued to Turkish 825, inbound to Istanbul, to line-up and wait Runway 21. The departure clearance for THY825 from runway 21 was also KALDE 3 D. 3000 feet.

At 14.11.47 the tower issued the following clearance. “Turkish 825 wind 310/5 clear for takeoff runway 21, right turn out, KALDE 2 D, when airborne control 119.3”. At 14.12.00 THY825 acknowledged the take-off clearance and initiated its take-off roll on runway 21. The flight was identified airborne on radar at 14.12.27.

The following transmission from ROJ33 was recorded at 14.12.47 on the tower recording “ROJ33” cleared for takeoff? To which the tower replied at 14.12.49 “standby”.

ROJ33 initiated its take-off roll on runway 17. AT 14.13.01 Tower called “ROJ33..sir..you don’t have the clearance for takeoff?, to which ROJ33 replied at 14.13.06. “ROJ33 take-off right turn out”. At exactly that time ROJ33 is identified as being just airborne from runway 17. At that

time, THY825 was passing 1000 feet climbing and crossing the extended center line of runway 17 on a south westerly heading. The Tower replied at 14.13.10 “The clearance was for the Turkish sir!” There was no reply from ROJ33. At 14.13.18 Tower called “ROJ33” and the Flight Crew replied at 14.13.20 “ROJ33”. At 14.13.24 Tower instructed ROJ33 to “stop climbing turn and maintain 2000 feet initially”. At 14.13.28 ROJ33 was still on a right turn and reported having “a visual on the aircraft”. ROJ33 passed underneath the Turkish flight path at 14.13.26.

The Radar recording at that time shows THY825 climbing through 2200 feet with a rate of climb of 2700 feet/minute while ROJ33 was passing 800 feet with a rate of climb of 1700 feet/minute; at that time the horizontal separation between the two flights was 0.5 NM and the vertical separation 1400 feet. Immediately after, ROJ33 reduced its rate of climb to 900 feet/minute. At 14.13.46 ROJ initiated a left turn on to a heading of 210˚ and again passed underneath the flight path of THY825 at 14.14.46. At that time the Radar recording shows ROJ33 passing 1900 feet at a rate of climb of 600 feet/minute while THY825 was passing 4000

feet with a rate of climb of 1200 feet/minute; the horizontal separation between the two flights was 0.5 miles2 . At the same time ROJ 33 initiated its first contact with Control and reported “levelling 2000 feet

At 14.14.47 Radar instructed ROJ33 to turn right heading 290˚ and climb 4000 feet. At 14.14.54 ROJ acknowledged “heading 290 roger ROJ33”. THY825 was on a heading of 290 climbing through 4400 feet with a rate of climb of 1200 feet/minute and ROJ33 maintaining 2000 feet on a heading of 210˚. The two aircraft were 0.7 NM apart.

However, the radar trace shows that ROJ maintained a heading of 210˚ until contacted again by Radar at 14.16.31 to “turn right now heading 290 heading 300 and climb 8000 feet”. At that time the radar trace shows THY825 passing 8300 feet with a rate of climb of 2000 feet/minute while ROJ33 was approaching 4000 feet with a rate of climb of 1000 feet/minute. The horizontal separation between the two aircraft was more than 6 miles. ROJ33 acknowledged “roger heading 300 climb 8000 feet” and initiated a right turn.

At 14.21.10 ATC Radar asked ROJ33: “Did you get take-off clearance?” ROJ33 replied “Affirm and read back the clearance”. ROJ33 was then transferred to Nicosia control and continued the flight un-eventually to Hannover. No TCAS alert was reported by either flight.

Injuries to persons

Crew : # 3

Passenger’s : # 2

Damage to aircraft : None

Other damage : None

Meteorological information

The flight was conducted in daylight and VFR conditions. Light wind prevailed with no specific weather identified. Weather had no effect in this incident.

Aids to navigation

Not Applicable.

Communications

Communication was carried out between the Flight Crew and ATC Controllers over the VHF radio and between the Flight Crew and the passengers directly. The captain stated in his report that “he had a problem understanding the controller broken English”; however, the ATC recordings did not reveal any communication problem related to language.

Aerodrome information

BRHIA (OLBA) is an international airport with a field elevation of 85’ MSL. It is located on the western Lebanese sea shore to the South of the city of Beirut. The area surrounding the airport comprises the Mediterranean Sea to the West, the city of Beirut to the North and the mountains Incident Investigation Report – A6-IAS 18 of Lebanon to the East. The mountains reach a height of more than 3,000 feet less than 5 NM East and 6900 feet approximately 13 NM East of the airport.

The airport has three Runways:

- Runway 03-21 is 12, 467’ long, 3,800 meters.

- Runway 17-35 is 10,663’ long, 3,250 meters.
- Runway 16-34 is 11,138’ long, 3,395 meters.

Due to the surrounding area, Runways 03 and 16 are used for jet aircraft landing and are served by an Instrument Landing System (ILS). Runways 21, 34 and 35 are used for take-off. Runway 17 is also equipped with an ILS and is primarily used for landing; however, it is also used as a take-off runway for general aviation and business aviation jet aircraft due to its proximity to the General Aviation (GA) Terminal (TML) B3 .

Due to the position of the Airport Main Terminal (TML A) and other buildings related to the airport operation and/or airline activities, Flight Crew members of aircraft taking-off from either Runway 16 or 17 are unable to visually see aircraft on the first part of runway 21 and vice versa 4 .

The airport is served by a Raytheon Primary Radar system, ASR-10SS and a Secondary Radar System, MMSR Condor, MK-2 with Automatic Auto Tract 2 Display and weather display. All radars and equipment were fully operational on the day of the incident.

Flight recorders

The Cockpit Voice Recorder (CVR) and the Digital Flight Data Recorder (DFDR) were not retrieved from the aircraft in due time. Therefore no data from these sources was available for analysis.

Wreckage and impact information

Not Applicable.

Medical and pathological information

Not Applicable

Fire

Not Applicable.

Survival aspects

N/A

Tests and research

Aircraft Flight Paths.

A reconstruction of ROJ33 and THY825 flight paths based on radar recorded data was carried out by the Lebanese CAA5.

1.16.2 Traffic Collision Avoidance System.

Both aircraft were equipped with a Traffic Collision Avoidance System (TCAS), however, no TCAS alert was reported by the crew of either aircraft. The manufacturer of the ROJ33 TCAS was contacted to ascertain whether the system was equipped with non-volatile memory capable of recording TCAS events.

Although the system is equipped with non-volatile memory the function of this memory is to record serviceability issues. It is not capable of recording events. Therefore no information on TCAS performance, in the case of this particular incident, could be obtained.

Organizational and management information

The Operator

The aircraft operator is a charter airline based in Abu Dhabi, United Arab Emirates. It is certified for the carriage of passengers by the UAE GCAA and operates a fleet of 6 BBJ, 2 Gulfstream 300 and a Learjet 60. It also operates medical evacuation flights and is a member of Med Link, a service of Med Air Incorporated.

In line with the UAE GCAA policy, the operator has implemented a Safety Management System (SMS), which has been approved by the GCAA. The SMS includes a non-punitive incident reporting policy and procedure stipulated in the operator's manuals providing the Flight Crew with several means of reporting safety concerns; a dedicated Safety Report can be submitted, Safety concerns can also be mentioned on other types of reports such as delay reports and reports can be provided personally to the Safety Manager.

The operator complies with the UAE AC OPS 1.037 (c) that stipulates "An operator of an aero plane of a maximum certificated take-off mass in excess of 27000 kg shall establish and 5 Refer to Figure 1 in this report. Incident Investigation Report – A6-IAS 20 maintain a flight data analysis programme as part of its safety management system." In that regard, the operator has a Flight Data Monitoring (FDM) program, also known as Flight Operation Quality Assurance (FOQA); however, that program does not cover the Learjet 60 as it take-off mass is 10660 Kg and

so the operator is not required to monitor the aircraft using an FDM program.

As for medical evacuation flights, the operator risk assesses each flight with reference to risk due to the medical condition of the evacuee(s) and also any additional flight safety risks that need to be considered. Based on the result of the risk assessment appropriate mitigation strategies are put in place on a flight by flight basis.

The ATC services at Beirut are part of the Directorate General of Civil Aviation. The Lebanese DGCA controls the ATC Services located at BRHIA. According to documents provided by the Lebanese DGCA, the ATC system consists of a Manager, a chief for the ACC and also a chief for the Aerodrome Control.

Each team working at the ACC consists of a Supervisor and six Air Traffic Controllers who work as Area and Approach Controllers and as assistants. The Tower team consists of a Supervisor and four Controllers who work as Tower and Ground Controllers. In addition there is the Flight

Information Centre where there are some personnel from the ATC staff & Telecom Department staff handling the work.

Typically, the Ground controller handles flights on taxiways and at gates. He also issues the initial ATC clearance, start-up and taxi permissions. The Tower Controller issues the departure and landing clearances and controls the air traffic within the airport airspace up to 3,000 feet. Above that altitude, the ACC is responsible for the control of arriving, departing and overflying air traffic.

According to ATC records, at the time of the incident one Ground Controller, one Tower Controller and a Supervisor were on duty handling the traffic in the Tower. An Approach Controller, an Assistant Controller and a Supervisor were on duty handling the traffic in the ACC. All controllers reported for duty at 0700 LT on the morning of 6 November 2011 and were scheduled to come off duty at 0700 LT on 7 November 2011. During this twenty four work period, the Supervisor scheduled all shift and rest times. The Lebanese CAA confirmed these times as correct.

All of the controllers handling ROJ33 on 6 November 2011 hold licenses issued by Lebanese DGCA in accordance with the LAR provisions and ICAO standards. Records provided by the Lebanese CAA indicate all of the above mentioned Controllers had completed the required initial and recurrent training.

Additional information

Flight Crew Statements and Interviews

Additional information was obtained from the ROJ33 Flight Crew through their written statements and interviews. The Flight Crew did not report the incident; however, when the operator received the incident report from the Lebanese DGCA through the UAE GCAA they asked the crew to provide written statements describing what happened. The captain's statement is dated 4 December 2011 and the F/O's statement is dated 8 December 2011.

In addition both Flight Crew members were interviewed on the 5th of June 2012. During the interview, both crew members stated that prior to take-off the Captain was busy looking into the cabin in order to ensure

that the escorts to the sick passenger were securely seated and that the patient was also secured for take-off. At the same time the F/O was busy ensuring that the aircraft was properly configured and prepared for take-off.

They also indicated that during the time the aircraft was on the Runway they had completed the before take-off checks and were ready for take-off. They estimated they waited on the Runway “around 4 minutes”. They also reported that they were expecting to receive a take-off clearance at any second, having a priority being a medical evacuation flight.

In his written statement, the F/O mentioned that while they were on Runway 17 the Flight Crew “saw an aircraft departing runway 21 most probably Lufthansa”. He specified that this was 2-3 minutes before being cleared for take-off. He also mentioned that the Captain “asked the doctors back if they were ready” prior to releasing the brakes for take-off. He confirmed that the Flight Crew had visual contact with the airborne THY825 that had just taken-off from Runway 21 while on the

take-off roll. That information was confirmed by both pilots during the interview and both of them confirmed that they had already passed V17 when they saw THY825.

Although in their previous written statements8 and their communication with Beirut Control following the incident both pilots stated that they had received a take-off clearance, they reported during the interviews that they now have doubts about this and that they could have misread the Tower take-off clearance to THY825 to be for their flight. Both expressed concern that the Tower controller did not clearly instruct them to stop or reject take-off when they called “ROJ33 cleared for take-off?” or when he saw them rolling.

Air Traffic Control Procedures

International Civil Aviation Organization Document 4444 (ICAO Doc 4444) Air Traffic Management sets out the functions and procedures for Aerodrome Control Towers. Section 7.9.3.3 stipulates that “the take-off clearance shall be issued when the aircraft is ready for takeoff and at or approaching the departure Runway, and the traffic situation permits. To

reduce the potential for misunderstanding, the take-off clearance shall include the designator of the departure runway." 7.1.1.1 (a) requires Control Towers to "issue information and clearances to aircraft under their control to achieve a safe, orderly and expeditious flow of air traffic on and in the vicinity of an aerodrome with the object of preventing collision(s) between aircraft flying within the designated area of responsibility of the control tower" in 7.1.1.1(b), (c), (d) and (e) it gives examples of such traffic without mentioning aircraft taking-off from two different Runways.

Section 7.1.1.2 requires Aerodrome Controllers to "maintain a continuous watch on all flight operations on and in the vicinity of an aerodrome....Watch shall be maintained by visual observation".

Section 7.92 of the same ICAO document addresses the issue of "Separation of departing aircraft". It stipulates that "a departing aircraft will not normally be permitted to commence take-off until the preceding departing aircraft has crossed the end of the runway-in-use or has started a turn".

Hypotheses of topic

In this section we shall take the hypotheses of the case which we talking about it.

The flight crew were properly certificated and qualified and had received the training and off duty time prescribed by the GCAA regulations. Interviews with the captain and the First Officer indicate that the Captain was Pilot Flying (PF) and the F/O was Pilot Monitoring (PM). The Flight Director (FD) was ON during all the flight and the Auto-Pilot (AP) was OFF for take-off and throughout the period of the incident. The Captain carried the avoidance action manually.

No evidence reported to the IIC indicated any pre-existing history of medical or behavioral conditions that might have adversely affected the Flight Crew's performance during the incident flight.

The airplane was certificated, equipped, and dispatched in accordance with GCAA regulations and approved operator procedures.

No evidence of any warning linked to a system malfunction, or a major failure occurring during the flight was reported.

At the time of the incident, there were light north westerly winds and no identified weather.

Analysis of the Flight Events

In order to facilitate the analysis and allow a better understanding of the incident within the operational context of the flight; the flight scenario, as reproduced from the radar trace, ATC transcript and Flight Crew interviews has been broken down into 4 parts; pre-take-off, take-off, avoidance action and the post incident phases

Pre-Take-Off

Both aircraft, THY825 and ROJ33, taking off respectively from Runway 21 and Runway 17, were given the same departure clearance “KALDE 2 D” and the same initial altitude “3,000 feet”; as per BRHIA departure routes and ATC SOP.

When ROJ33 was transferred to Tower frequency, THY825 had already received permission to “line-up and wait Runway 21”. Once on

the Tower frequency, ROJ33 was also given permission to “line-up and wait Runway 17”. The elapsed time between the line-up of ROJ33 and the takeoff clearance issued to THY825 on Runway 21 was 1 minute 58 seconds. The time elapsed between the line-up of ROJ33 and the airborne time for that aircraft as depicted from the ATC transcript was 2 minutes 58 seconds.

During the interview of the Flight Crew, they reported that, despite a pre-departure briefing to the passengers, the Captain was busy as the aircraft entered the Runway and lined up giving instruction to the escorts of the patient so that they were secured and prepared for take-off. He had to ensure visually that they were ready and properly secured, as no flight attendant is required by the operator’s Civil Aviation Authority’s regulation, nor was available, for that flight.

The F/O was busy ensuring that the aircraft was set for take-off. The Flight Crew estimated the time that had elapsed between their line-up and take-off clearance issued as being “around 4 minutes”. Furthermore, in the F/O written statement he mentioned that while

“holding on Runway 17 when we saw an aircraft departing runway 21 most probably Lufthansa. 2 to 3 minutes later I heard Royal Jet 33 cleared for to take off right turn after take-off climb to 3000 feet KAD2D contact departure 120.3”.

The Tower and the radar tracks recordings clearly show that no Lufthansa departed at that time. The Control frequency given to departing traffic from BRHIA on that particular day was 119.3. The only aircraft the F/O might have seen would have been THY825. The time elapsed between the passage of that aircraft and the actual take-off of ROJ33 was less than 1 minute. This misjudgment of time and confusion in recalling the facts suggest that the distraction caused by ensuring that the passengers were secured for take-off diverted the Flight Crew’s attention as the aircraft entered the Runway, lined up and waited for take-off clearance at that time.

This raises a CRM issue; the Captain had already given a safety brief to the passengers before the aircraft left the Stand. As the aircraft entered the Runway the Captain was again engaged in finally ensuring

that the cabin was secure as no method of communication, such as headsets, was available to the medical team to allow communications to and from the Flight Crew. At a vital time in the flight the Captain's focus was diverted from operating the aircraft and his area of attention moved, for a significant amount of time, from the cockpit to the cabin. This distraction facilitated the crew's assumption that the take-off clearance issued to THK825 during this time, was in fact issued to them. It also caused the crew to undertake a rushed take-off.

Furthermore, the Taxi, the Before Take-off and the Runway Lineup Checklists contain at least eighteen items. The taxi distance between the GA Terminal at BRHIA and Runway 18 is short, that surely added to the Flight Crew workload as the aircraft is taxied to the Runway. Reviewing the feasibility of moving some of these items to the Before Taxi Checklist is worth consideration.

Take-off of ROJ33

In line with ICAO Doc 4444, section 7.1.1.1, the take-off clearance was clearly issued at 14.11.47 to THY825 in the following terms: "Turkish

825 wind 310/5 clear for take-off Runway 21, right turn out, KALDE 2 D, when airborne Control 119.3". At 14.12.00 THY825 acknowledged the take-off clearance, initiated its take-off roll on runway 21 and became airborne at 14.12.27.

At 14.12.47, exactly one minute after the issue of the take-off clearance to THY825, as recorded on the ATC transcript, the ROJ33 Flight Crew contacted the Tower asking: "ROJ33 cleared for take-off?" to which the Tower replied at 14.12.49 with a simple: "Stand-by".

ROJ33 did not have direct visual contact with THY825 while they were both lined-up respectively on Runways 17 and 21; however, at the time of that transmission, 14.12.49, THY825 had been airborne for 18 seconds and crossing 1000 feet and the extended centerline of Runway 17. At this point THY825 should have been visual to the ROJ33 Flight Crew. This fact was recognized by the Captain and the F/O of ROJ33 in their statements and during the interviews; however, they mentioned that when they saw the airborne aircraft they had already exceeded the V1 decision speed. This suggests that they were engaged in a rushed

take-off as they thought that they had received the take-off clearance earlier, while the Captain was distracted confirming that the passengers were secured for take-off and the F/O was ensuring that the aircraft was correctly configured for take-off.

ROJ33 became airborne at 14.13.06, 1 minute 19 seconds after the Tower issued take-off clearance to THY825 and 39 seconds after that flight was airborne. ROJ33 airborne time was also 19 seconds after its flight crew transmission to the Tower for take-off and 17 seconds after the "ROJ33 33 cleared for take-off?" and 17 seconds after the Tower's simple "Stand-by" reply.

While the preset mindset of the ROJ33 Flight Crew was to expect an expeditious take-off clearance for a medical evacuation flight, together with the distraction caused by the Captain's attempts to ensure that the cabin was secured, could have contributed to the ROJ33 Flight Crew's assumption that the take-off clearance issued to THY825 was for them; the fact remains that the take-off clearance clearly indicated a different flight number than theirs and a different Runway for take-off.

Calculations indicate that the time required for a Learjet 60 to become airborne, with a similar take-off weight and in similar conditions, is 17 seconds. This clearly suggests that a more standardized and clearer instruction by the Tower in reply to the ROJ33 transmission at 14.12.45, “ROJ33 33 cleared for take-off?” could have resulted in ROJ33 rejecting its take-off roll in a timely manner.

During the interview with the Tower Controller and the Supervisor on duty at the time of the incident and the IIC visit to BRHIA Tower, it was clear that the Controller handling the departing traffic was focusing his attention on the THY825 flight taking-off from Runway 21. When he called “standby” in reply to ROJ33 clear for take-off call, he maintained his focus on the THY flight. It was the Supervisor who noticed the ROJ33 rolling on Runway 17 and alerted the Controller, who immediately advised ROJ33 that the take-off clearance was for THY not for ROJ; however, ROJ33 had already exceeded V1, the speed beyond which the Flight Crew are committed to continue the take-off.

The above mentioned facts indicate that by simultaneously instructing ROJ33 and THY825 to line up on Runways 17 and 21, it became impossible for a single Controller to maintain visual contact simultaneously with both aircraft, as required by Doc 4444, section 7.1.1.2. This has contributed to the delay in identifying the fact that ROJ33 was commencing take-off without clearance; the Controller having assumed that his instructions to THY825 were clear and that he had addressed the ROJ33 transmission enquiring about take-off clearance by transmitting “standby”.

Avoidance

Once airborne, the initial response of the ROJ33 Flight Crew to the ATC transmissions informing them that they had taken-off without clearance and that the clearance was for THY825 clearly indicates that they were confused. Furthermore, when the Tower instructed ROJ33 to “stop climbing turn and maintain 2000 feet initially”; the Captain, who was PF, was heard replying to ATC that he had “a visual on the aircraft”. He must have realized at that time that some misunderstanding must

have happened. His avoidance actions following that transmission clearly indicate that he realized the seriousness of the situation.

In fact, the Captain reduced the rate of climb from 1900 feet/minute to 600 feet/minute. He also stopped the right turn as instructed by the Tower and turned again left on to an approximate heading of 210 degrees, which he maintained for 1 minute 37 seconds after the Tower instruction to turn right heading 290. It took another call from the Tower for ROJ33 to turn right on to the new heading. This delay in executing the Tower instruction reflects ROJ33 Flight Crew awareness of the seriousness of the situation in which they were and their fear of jeopardizing again the safety of their flight, hence the confusion they faced.

Post event

After the situation was resolved, ROJ33 Flight Crew continued to insist that they had received a take-off clearance and that they had read it back. This was confirmed to Beirut Control prior to changing frequency

to Nicosia. This was also reflected in their written statements submitted in response to ROJ Operations management instructions.

During the interviews with the flight crew they confirmed their knowledge of the availability of confidential safety reporting systems, both operated by their company and also by the GCAA. They also stated that they realized the necessity of reporting such incidents through the Mandatory Reporting System.

Theoretical framework of the study

In this section we will talking about the conclusion of our incident which we talking about it and we will extraction the finding, causes and safety recommendations to avoid such accidents or incidents.

CONCLUSIONS

Findings

The aircraft was certified, equipped, airworthy and maintained in accordance with existing regulations and approved procedures.

The aircraft was equipped with a DFDR and CVR; however, both were not used during the investigation as the information on the CVR would have been erased by the end of the flight to Hannover, and the DFDR information was not available as it was overwritten, before the commencement of the investigation.

The Flight Crew were properly licensed, medically fit and qualified for the flight in accordance with existing regulations. They were also in compliance with the flight and duty time limitation regulations; they

confirmed that they were rested and did not feel any tiredness or fatigue.

The Flight Crew became aware of the potential conflict with THY825 at a late stage during the take-off roll and carried visual avoidance actions which did not comply exactly with the Tower instructions in terms of heading.

The Flight Crew did not report the incident either through the Mandatory Reporting Scheme nor through the Confidential Reporting Scheme, both of which were available to them through the GCAA and operator. Both confirmed having knowledge of these schemes and being told by Beirut Tower and Beirut Control that they took-off without clearance.

The Flight Crew insisted, during their communication with Beirut Tower and Beirut Control following the occurrence and when submitting their statements at a later date that they had received a valid take-off clearance from Tower. Such a clearance was not, in fact, issued to them as confirmed by the ATC recordings

The operator has a Safety Management System that includes both mandatory and confidential non-punitive reporting schemes, in line with their Just Culture policy.

The GCAA, as the regulatory and oversight Authority, operates mandatory and confidential reporting schemes. 3.1.9 The Ground, Tower and Area Control controllers were all licensed, medically fit and correctly rated to provide the service.

The Tower Controller was unable to maintain visual contact with THY825 and ROJ33 simultaneously and did not use standard and firm terminology in reply to the ROJ33 Flight Crew call for take-off.

The Tower controller issued the proper instructions to maintain vertical and lateral separation between the two involved flights once both were airborne.

Neither the Tower nor the Control Controllers were firm enough in confirming to ROJ33 Flight Crew that they did take-off without clearance and that they were going to report that incident.

The flight was dispatched in accordance with the requirements of the operator's approved Operations Manual.

No TCAS alert was reported by either Flight Crew involved.

Vertical separation was always maintained between the two flights.

No method of communication, such as headsets, was available to the medical team to allow communications to and from the Flight Crew, other than direct visual or verbal communication.

Causes

Probable Cause

The ROJ Flight Crew assumed that the Take-Off clearance given to THY 825 on Runway 21, was issued to them and took-off without clearance from Runway 17.

Contributing Factors

1-The Flight Crew were distracted as the aircraft entered the Runway and lined up while the Captain ensured that the cabin was secure for take-off.

2- The Flight Crew, who had taken the clearance for THY825 to be their take-off clearance, engaged in a rushed take-off.

3-The Tower Controller did not firmly and assertively instruct ROJ33 to stop their take-off roll when they asked him “ROJ33 cleared for take-off?”and initiated their take-off roll.

4-The Terminal and other airport buildings formed a visual obstruction between the first half of Runway 17 and that of Runway 21 making it impossible for aircraft lined up for take-off on the two Runways to see each other and for the Controller to maintain simultaneous visual contact with both aircraft.

5-The SID departures from both Runway 17 and 21 carry the same identifier.

6-The Flight Crew believed that medical evacuation flights received expedited Air Traffic Control clearances.

Safety recommendations

In accordance with Annex 13 to the Chicago Convention, the sole objective of the investigation shall be the prevention of accidents and incidents. Therefore, the following recommendations aim at preventing other incidents or accidents resulting from similar causes.

The Operator

1- The operator should emphasize to Flight Crew the importance and necessity to admit any incident and encourage them to report such occurrences in a timely manner through the available reporting schemes and within the scope of a Just Culture policy.

2- The operator should review the Taxi, Before Take-off and Runway Lineup Checklists with the intention of identifying items that can be removed from these checklists and incorporated in the Before Taxi Checklist.

3- The operator should consider establishing a communication system on board to allow communications between the medical team and the Flight Crew during Medevac flights.

The UAE - GCAA

1- The UAE GCAA should encourage and emphasize to all operators and licence holders the importance of reporting errors and/or safety occurrences through the available reporting schemes, in a timely manner, within the scope of a Just Culture policy.

2- The GCAA should ensure that the recommendation to the operator is being implemented.

The Lebanese ATS

1- Simultaneous line up instruction on two intersecting Runways should not be permitted.

2- The identification of the same departure SID from two different Runways should carry a different identification related to each take-off Runway.

The Lebanese DGCA

The Lebanese DGCA should ensure that the recommendations to the ATS are implemented.

ICAO

The International Civil Aviation Organization should consider revising the wording of Document 4444 Section 7.1.1.4 to address the case of Intersecting Runway Operation.

Benefits of Study

The benefits of a study program are demonstrated by discussion of selected studies of general aviation safety that have employed a variety of data collection procedures, analysis techniques, and study methodologies.

These studies resulted in the issuance of safety recommendations to the Federal Aviation Administration (FAA) and aviation industry groups.

Examples discussed in this paper include risk factors associated with weather-related general aviation accidents using a case–control analysis; safety effects of the introduction of electronic flight displays (i.e., glass cockpit avionics) and of inflatable occupant restraint systems (i.e., airbags) into light aircraft using proactive assessments; and an examination of the safety of the experimental amateur-built aircraft using retrospective data analysis, targeted prospective data collection, and a large-scale voluntary survey.

The U.S. National Transportation Safety Board's (NTSB) aviation safety interests go far beyond accident investigations. In fact, the NTSB's enabling legislation that it "carry out special studies and investigations about transportation safety."

This mandate comprises a major element of the Board's proactive safety agenda. The Board's safety study program efficiently augments the conventional approaches of identifying safety issues and developing safety recommendations through accident investigation by conducting analysis of safety issues beyond the circumstances of a single event.

The National Transportation Safety Board (NTSB) employs safety studies as a complement to its accident investigation activity. Safety studies serve as a vital component of an effective safety management program and represent an inherently proactive approach to identifying, assessing, and mitigating safety risks.

Studies complement traditional accident and incident investigations by expanding safety analysis beyond the circumstances of discrete events to include evidence of safety risks derived from

aggregate analyses of existing information held in databases and prospective data collections. Conventional wisdom regarding a proactive aviation safety management program includes data inputs such as near-miss events, voluntary safety reporting, and flight data monitoring that can potentially identify safety hazards before they cause a serious incident or accident. This conventional wisdom may suggest that the accident or incident investigation is merely a reactive response to a missed opportunity for prevention.

The bridge between these efforts, however, is the safety study. Whereas accident and incident investigations provide the motivation and opportunity to identify and collect safety data, safety studies go beyond the investigation and recordation of accident circumstances to proactively pursue peripheral information and focus detailed attention to issues that may identify effective safety mitigations or previously unidentified safety hazards.

Similarly, directed safety studies can collect and analyze comparison data from nominal operations to support truly predictive

measures of safety risks. NTSB safety studies differ from accident investigations in that they examine safety issues from an aggregate perspective. In most cases, the NTSB uses safety studies to gain a more thorough understanding of safety issues identified during the course of its accident and incident investigations.

These issues are often best analyzed, and the resulting safety recommendations are most persuasive, when the power of numbers is put to work. In some cases, the NTSB has used its safety studies to gain a new and unique perspective on persistent safety problems. One example, discussed later in this report, was the application of research techniques commonly used in the field of public health to the examination of weather related general aviation accidents. By expanding its accident investigations to include the collection of information from non-accident flights.

The study identified risk factors predictive of weather-related accidents. The NTSB has also used its safety studies to assess new and

emerging issues. Two examples described in this report are the NTSB's assessments of glass cockpit avionics and airbags in light aircraft.

Using targeted prospective data collection protocols during its accident and incident investigations, the NTSB was able to proactively assess the real-world performance of these technologies—including the possibility of unanticipated negative safety effects. Both approaches highlight an important characteristic of the NTSB's safety studies—their integration with the agency's investigations.

When integrated with an effective safety studies program, investigations identify potential safety areas for further study; provide the fundamental data upon which these studies are based; and provide a vehicle for targeted data collection.

The combination of studies and investigations is unique aspect of the NTSB's safety study program.

Unlike other safety researchers who may be limited to archival data or research activities, independent investigation authorities typically have access to a wealth of detailed information regarding the

circumstances surrounding safety management failures and hazardous events.

This opportunity underscores the sometimes overlooked value of comprehensive accident investigations as an important aspect of proactive safety study programs. Directed studies allow for a range of data collection and analysis techniques.

A comprehensive study methodology is usually based upon hazardous event reports and investigation data, augmented with other sources of information. Examples of additional sources used in NTSB safety studies include prospective supplemental data collection, focus groups, interviews, surveys, and records review.

The opportunity and authority to access those data is typically based in the responsibility to conduct thorough safety investigations. Frequently, safety studies include analysis techniques that may be described as “proactive” or “predictive.” Prospective data gathering and examination of emerging technologies are two such techniques that were employed in the studies described here.

Prospective data gathering is a technique where screening and selection techniques are determined in advance to help identify and obtain specific data believed to be factors in a safety issue. Examination of emerging technologies is equally important and provides a validation (or nullification) of a supposed safety benefit.

This attribute can identify any potential for unintended consequences from using the emerging technology.

Results of the Study

This study have proven to be an efficient means to achieve a significant safety benefit. They are based firmly on accident investigation findings, but go beyond the single accident to include an aggregate analysis of operations and populations. In doing so, safety studies effectively bridge the gap of the safety analysis spectrum, lying between conventional accident investigation and predictive safety analysis techniques. Through careful selection of study topics, and by employing a variety of research methodologies, studies can provide an effective tool for proactively identifying safety issues. The focus on emerging technologies in both the airbag and glass cockpit avionics studies served to proactively examine the presumed safety benefit and potential unintended consequences of these technologies early in their introduction and deployment. Prospective data collection provides another opportunity for safety studies to proactively seek out additional information from safety investigations, using expanded investigation

protocols or selection criteria. Further, the use of supplemental data collections such as the case-control methodology employed in the study of weather-related accidents, and the voluntary survey of study populations used in the experimental amateur-built aircraft study, allow study findings to be applied to the wider population.

At the result of this project the interested person and reader know how we can establish the approved aviation organization including the quality and safety system and how the EASA oversight and monitoring of such organization and what is the obstacles facing this systems and how we can exceed it, ultimately to make an aircraft's fly safely.

References

EASA regulations

- Part M. Continuing airworthiness management organization.
- Part 145. Maintenance organization.
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- Part 66 Personal License organization

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- FAR 43. Repair station.

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- Investigation report Lear jet 60 / A6 – IAS.

National Transportation Safety Board's (NTSB)

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