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**THE AIRCRAFT MAINTENANCE ENGINEER COMPETENCE WITHIN THE CONTEXT OF AVIATION SAFETY REGULATIONS**

*This thesis is intended to serve as a guide for operation of a flight safety function within international safety organizations. This paper is specifically focused on the impact of European Aviation Safety Agency (EASA) Regulations as they are strongly applied to Aircraft Maintenance. The paper is intended on responsibilities for releasing Aircraft Maintenance Engineer License to sign off aircraft for flight. It also includes guidance to competency requirements of the Aircraft Maintenance Engineer.*

The strong safety performance notwithstanding, every accident is one too many. So there is no room for complacency. The industry and its regulators remain focused on safety improvements. Airlines continue to work with the International Civil Aviation Organization (ICAO), European Aviation Safety Agency (EASA), International Air Transport Association(IATA),airports, air navigation service providers (ANSPs), manufacturers, regulators, and multiple international safety organizations on initiatives to raise aviation safety performance worldwide.

IATA released a number of documents in 2011 to assist in safety efforts. These included the second edition of the Runway Excursion Risk Reduction Toolkit, in partnership with ICAO and more than a dozen international safety organizations. Also published were implementation material for competency-based training and qualification schemes for engineering and maintenance and the first joint EUROCONTROL-IATA safety bulletin.

All these programs are aligned in IATA’s well-established six-point safety program to systematically tackle the causes of accidents. This focuses on safety data management and analysis, auditing, safety management systems, infra- structure safety, operations and maintenance. The tools and projects developed under the six-point program are in line with ICAO requirements and are being increasingly adopted by governments and regulatory authorities worldwide.

Thus, aviation had its safest year ever in 2012 and the efforts continue for further improvements.

The main tasks of EASA currently include:

•drafting aviation safety legislation and providing technical advice to the European Commission and to the Member States;

•inspections and training to ensure uniform implementation of European aviation safety legislation in all Member States;

•airworthiness and environmental type-certification of aeronautical products, parts and appliances;

•approval of aircraft design organizations world-wide and of production and maintenance organizations outside the EU;

•coordination of the European Community SAFA (Safety Assessment of Foreign Aircraft) program;

•coordination of safety programs, data collection, analysis and research to improve aviation safety.

EASA is responsible for releasing Aircraft Maintenance Engineer License to sign off aircraft for flight. Aircraft anywhere leaves the ground without being checked by a maintenance engineer. Being an aircraft maintenance engineer means working on the most exciting and advanced technology in the world. Aircraft engineers are always in demand by airlines and aviation companies all over the world. Qualified aircraft maintenance personnel must have a full EASA Part-66 Aircraft Maintenance Engineer. To get this license, the maintenance engineers usually need five years’ professional aircraft experience.

Aircraft maintenance engineers need to have an experience in installing, maintaining and repairing aircraft engines; airframes; airframe systems; electrical, instrument and radio systems; and aircraft structures and surface finishes.

Aircraft maintenance engineers may perform the following tasks:

•dismantle, inspect, repair and reassemble aircraft engines, airframe components and systems, electrical components and systems, avionic components and systems, and aircraft structures;

•test aircraft communication equipment, instruments and electronic systems;

•conduct routine pre-flight inspections.

*Specializations:*

*Aircraft Maintenance Engineer (Avionics)*

An aircraft maintenance engineer (avionics) maintains, inspects, tests and undertakes fault diagnosis of electrical, electronic, instrument and radio systems, components and accessories on aircraft. These include generator and power distribution systems; navigation, radar and integrated flight systems; indicating and recording systems; lighting systems; aircraft information systems; autopilot systems; fly by wire flight control systems; digital engine control systems; in-flight entertainment and cabin systems; and communication systems.

*Aircraft Maintenance Engineer (Mechanical)*

An aircraft maintenance engineer (mechanical) maintains, services, inspects, tests and undertakes fault diagnosis of airframe, engine (including propellers and rotors) and electrical systems, components and accessories on aircraft. These include landing gears; wheels and brakes; skids; pneumatic and hydraulic systems; fuel systems; flight control systems; environmental control and pressurization systems; fire detection and prevention systems; oxygen systems; containerized cargo handling systems; doors and windows; lighting systems; and ice and rain protection systems.

*Aircraft Maintenance Engineer (Structures)*

An aircraft maintenance engineer (structures) fabricates, maintains and repairs sheet metal, bonded and non-metallic composite material, and components on pressurized and non-pressurized aircraft. They must be familiar with airframe, engine and electrical components. They carry out a wide variety of metal forming and joining processes using hand and power tools, and work with various fiber-reinforced plastic materials.

*Aircraft Mechanic (Avionics)*

An aircraft mechanic (avionics) overhauls, repairs, modifies and tests a range of electrical, electronic, instrument and radio communications and navigation system components in a workshop environment, after they have been removed from the aircraft. These include generator and power distribution systems, protection systems, autopilot and integrated flight systems, environmental control systems, and radar and communication systems. They may also perform flight simulator maintenance.

*Aircraft Mechanic (Mechanical)*

An aircraft mechanic (mechanical) overhauls, inspects, repairs, modifies and tests airframe and engine components in a workshop environment, after they have been removed from the aircraft. These include landing gears; wheels and brakes; fuel, pressurization, pneumatic and hydraulic devices; flight control surfaces and power control packages; environmental control components; piston and gas turbine engines; propellers and rotor blades; transmissions; and associated engine components. They may also perform flight simulator maintenance.

*Personal Requirements:*

•enjoy technical and engineering activities;

•medically fit, with good hearing and vision (colour blindness may make people unsuitable for some aircraft trades);

•good hand-eye coordination;

•able to concentrate for long periods;

•neat and accurate;

•attention to detail;

•able to work in confined spaces and at heights on platforms around aircraft (for some specializations).

Competent engineers are required to take responsibility for engineering projects and programs in the most far-reaching sense. This includes the reliable functioning of all materials, components, sub-systems and technologies used; their integration to form a complete, sustainable and self-consistent system; and all interactions between the technical system and the context within which it functions. The latter includes understanding the requirements of clients, wide ranging stakeholders and of society as a whole; working to optimize social, environmental and economic outcomes over the full lifetime of the engineering product or program; interacting effectively with other disciplines, professions and people; and ensuring that the engineering contribution is properly integrated into the totality of the undertaking. Competent engineers are responsible for interpreting technological possibilities to society, business and government; and for ensuring as far as possible that policy decisions are properly informed by such possibilities and consequences, and that costs, risks and limitations are properly understood as the desirable outcomes.

Competent engineers are responsible for bringing knowledge to bear from multiple sources to develop solutions to complex problems and issues, for ensuring that technical and non-technical considerations are properly integrated, and for managing risk as well as sustainability issues. While the outcomes of engineering have physical forms, the work of professional engineers is predominantly intellectual in nature. In a technical sense, Professional Engineers are primarily concerned with the advancement of technologies and with the development of new technologies and their applications through innovation, creativity and change. Competent engineers may conduct research concerned with advancing the science of engineering and with developing new principles and technologies within a broad engineering discipline. Alternatively, they may contribute to continual improvement in the practice of engineering, and in devising and updating the codes and standards that govern it.

Professional Engineers have a particular responsibility for ensuring that all aspects of a project are soundly based in theory and fundamental principle, and for understanding clearly how new developments relate to established practice and experience and to other disciplines with which they may interact. One hallmark of a professional is the capacity to break new ground in an informed, responsible and sustainable fashion.

The competencies and elements of competency represent the profession's expression of the knowledge and skill base, engineering application abilities, and professional skills, values and attitudes that must be demonstrated at the point of entry to practice.

The maintenance engineers quality of being adequately or well qualified physically and intellectually to accomplish assigned responsibilities. Competency is taken to mean possession of the required level of knowledge, skills, experience and where required, proficiency in English, to permit the safe and efficient provision of aviation services.

The competence of the personnel for the assigned tasks, and where applicable their satisfaction of medical requirements, are fundamental elements of safety achievement, and therefore of safety management in the provision of aviation services. The high importance and priority of competency in aviation is reflected in harmonized safety regulatory requirements adopted at all levels: global - through the ICAO provisions on personnel licensing; regional - through dedicated acts (e.g. European directives); and national - through the appropriate provisions in the aviation legislation.

Historically, competency requirements have first been established for operational personnel (pilots, aircraft maintenance engineers, air traffic controllers) and then gradually extended to other categories of personnel assigned safety related tasks. In general, staff responsible for safety critical tasks are required to comply with detailed, rather prescriptive, licensing requirements and schemes. Other personnel, involved in less safety critical tasks may be subject to less demanding certification requirements, for example the technical and engineering personnel in air traffic management.

Competencies for a specific job are the cluster of skills set required to perform the JOB effectively according to a given performance criteria. In aircraft maintenance, the performance criteria are set by the authorities and the aircraft manufacturers the like of maintenance manual or Civil Aircraft Inspection Procedures (CAIP).

Thus, an aircraft maintenance engineer is responsible for the release (certification) of an aircraft after maintenance, inspection, repair or modification. This is a responsible occupation requiring a high degree of responsibility and skill, which includes:

•certifying airworthiness of airframe, piston and turbine engines, electrical/electronic systems, propellers and rotary systems;

•troubleshooting aircraft structural, mechanical or electrical systems to identify problems;

•adjusting and repairing systems according to specifications, technical drawings, manuals and established procedures;

•repairing and overhauling aircraft structural, mechanical or electrical systems;

•installing or modifying aircraft engines, mechanical, hydraulic, electrical, flight control, fuel and pneumatic systems;

•dismantling airframes, aircraft engines or other aircraft systems for repair, overhaul, inspection and reassembly; and

•supervising, performing and documenting routine maintenance.

**Conclusions**

EASA Regulations are essentially coordinated set of requirements for effectively managing of the Aircraft Maintenance. There might be flight hazards, both real and potential, associated with the Aircraft Maintenance and human failures. The aim of Flight Safety Regulations is to address and control the flight safety. This is achieved through the EASA Regulations of which ensure the proficient monitoring competences of the Aircraft Maintenance Engineerto prevent the recurrence of similar aircraft incidents which could lead to an aircraft accident.