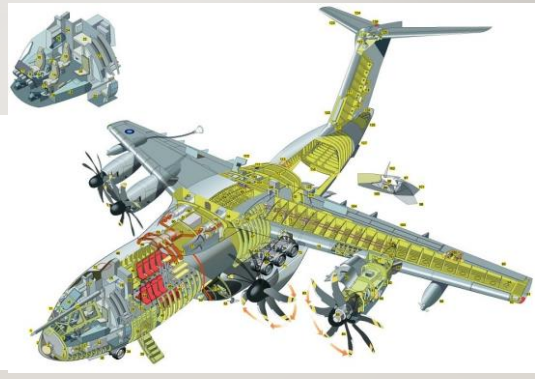
ERCİYES ÜNİVERSİTESİ HUBF
HAVA ARACI BAKIM YÖNETİMİ
Giriş

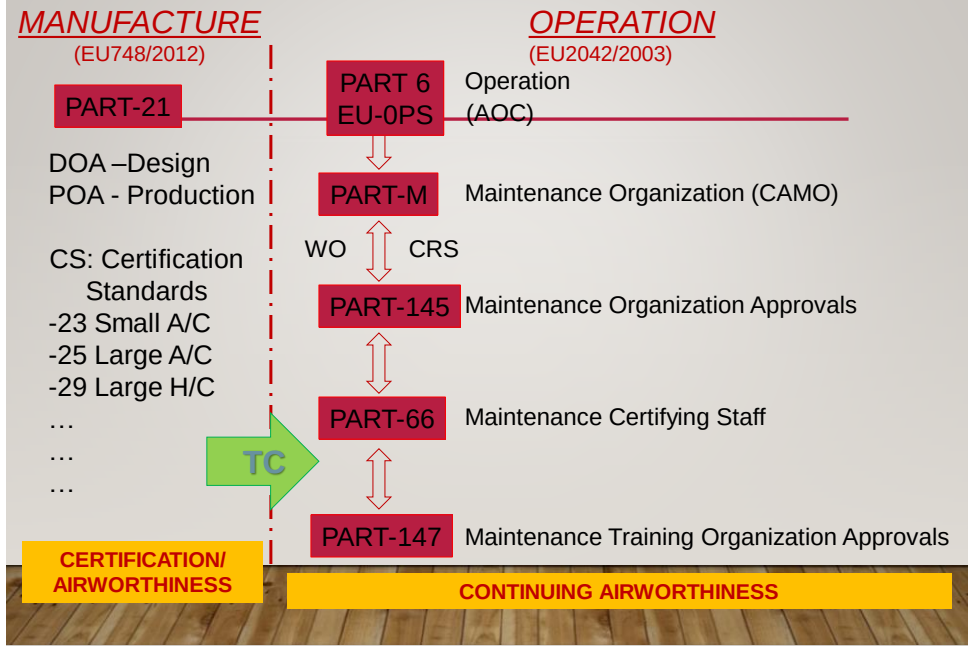


Dr. Melih YILDIZ
melihy@erciyes.edu.tr

OUTLINE

- **Part I** – *Definitions*
- **Part II** – *History*
- **Part III** – *Current Status*
- **Part IV** – Homework

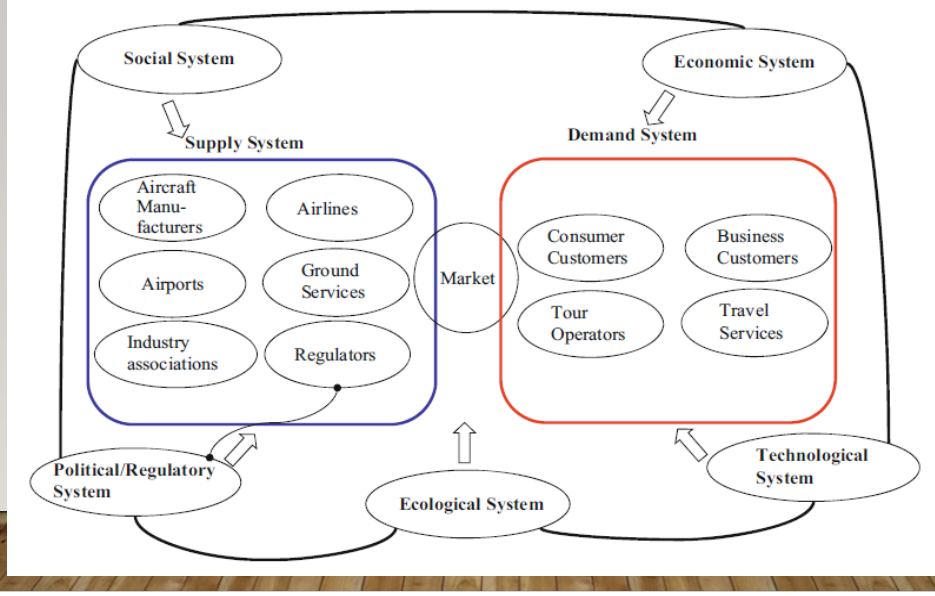
CIVIL AVIATION REGULATIONS OUTLINE



GENERAL

- The ongoing liberalization of markets, rapid technological changes, and the establishment of new businesses in air transportation constantly raise new questions for theory and practice.
- Current and future developments in aviation are thereby shaped by the industry actors and structures, in short, the aviation system.
- The 'Aviation Systems' consists the three major actor groups in aviation: the air transportation industry itself (supply side), the customers (demand side), and the regulatory bodies and organizations (institutional side).

AVIATION SYSTEM



FUNDAMENTALS

- While on several levels of the value chain the industry is characterized by duopolistic (aircraft manufacturers) or oligopolistic (airports) market structures, on other levels of the value chain companies act on a polypolistic market and face fierce competition (airlines).
- Main stages of the aviation value chain, however, face the problem of a high fixed cost structure characterized by specific and capital intensive investments in long-term assets.

FUNDAMENTALS

- Main stages of the aviation value chain, however, face the problem of a high fixed cost structure characterised by specific and capital intensive investments in long-term assets. This creates high exit barriers, but simultaneously it regularly leads to price wars and oversupply.
- **As a consequence, the industry's profitability is very low despite its high historical growth rates of about 5% annually, up to COVID-19 pandemic**.

FUNDAMENTALS

- **The aviation industry is characterised by constant change**.
  - The ongoing liberalisation of markets, technological progress and the establishment of new business models are just a few examples that illustrate the dynamic development of air transportation within the last years.
- The fact that there are various fields of development indicates that the industry development is not only influenced by the industry actors themselves, but also by its structures and institutional surroundings.
- **In turn, the development of the industry shapes its actors and competition structures.**
- The interdependencies among the different stakeholders in aviation and the continuous industry development thereby constantly raise new questions for both theory and practice.

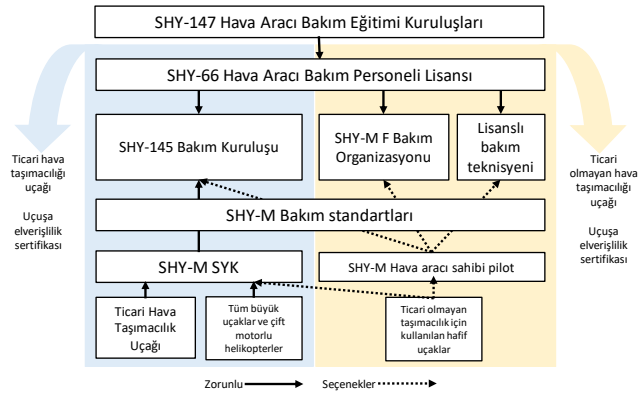
FUNDAMENTALS

- Due to the industry's importance as a provider of employment and as an enabler for social exchange and international trade, its ongoing development is of high practical relevance.
- The aviation industry is;
  - worth over USD 1,000 billion (directly, indirectly and induced effects),
  - employs about 15 million people (ATAG 2008), and
  - transports and services about 4.8 billion passengers a year (ACI 2008).
  - About 40% of the world's manufactured exports (by value) reach their markets by air (Saling 2004),
- making air transportation an important part of international trade.

FUNDAMENTALS

- Today, air transportation is an essential component of leisure and business related travelling, and thus of human connectivity and worldwide economical integration (Sterzenbach and Conrady 2003). **Aviation is also at the heart of travel and tourism, the world's largest industry, employing one in nine workers** (Chan 2000).

Hava Aracı Bakım Süreci



DEFINITIONS

- '**aircraft**' means any machine that can derive support in the atmosphere from the reactions of the air other than reactions of the air against the earth's surface;
- '**certifying staff**' means personnel responsible for the release of an aircraft or a component after maintenance;
- '**component**' means any engine, propeller, part or appliance;

- '**continuing airworthiness**' means all of the processes ensuring that, at any time in its operating life, the aircraft complies with the airworthiness requirements in force and is in a condition for safe operation;
- '**critical maintenance task**' means a maintenance task that involves the assembly or any disturbance of a system or any part on an aircraft, engine or propeller that, if an error occurred during its performance, could directly endanger the flight safety;

- '**commercial air transport (CAT) operation**' means an aircraft operation to transport passengers, cargo or mail for remuneration or other valuable consideration;
- '**maintenance**' means any one or combination of the following activities: overhaul, repair, inspection, replacement, modification or defect rectification of an aircraft or component, with the exception of pre-flight inspection;

- '**organization**' means a natural person, a legal person or part of a legal person. Such an organization may be established at more than one location whether or not within the territory of the Member States;
- '**pre-flight inspection**' means the inspection carried out before flight to ensure that the aircraft is fit for the intended flight;
- '**principal place of business**' means the head office or the registered office of the undertaking within which the principal financial functions and operational control of the activities referred to in this Regulation (Part-145) are exercised.

- **Breakdown maintenance**: repair is done after functional failure of equipment, so it is not possible to Schedule the repair work in advance. It is also termed *on-failure maintenance*.
- **Corrective maintenance**: repair is done after initiation of failure, leading to degraded performance. Usually condition monitoring or inspections will reveal such degradation.
- **On-condition (or condition based) maintenance**: repair is based on the result of inspections or condition-monitoring activities. On-condition maintenance is corrective in nature.

- **Predictive maintenance**: repair is based on predicted time of functional failure, generally by extrapolating from the results of on-condition activities or continuously monitored condition readings. It is synonymous with *on-condition maintenance*.
- **Preventive maintenance**: repair or inspection task is carried out before functional failure. It is carried out on the basis of age-in-service and anticipated time of failure. Thus, if the estimate is pessimistic, it may be done even when the equipment is in perfect operating condition. Scheduled overhauls or replacement, time-based failure-finding, or on-condition tasks are part of the preventive maintenance program.

- **Planned maintenance**: any work that has been thought through in advance. It includes all of the preventive maintenance. Trips and breakdowns that occurred without being aware of them are unplanned.
- When the machine stops by itself, the work we do on it is **reactive maintenance**. If we plan to stop the machine and do the work on a predictive or preventive basis, we call it **proactive maintenance**.

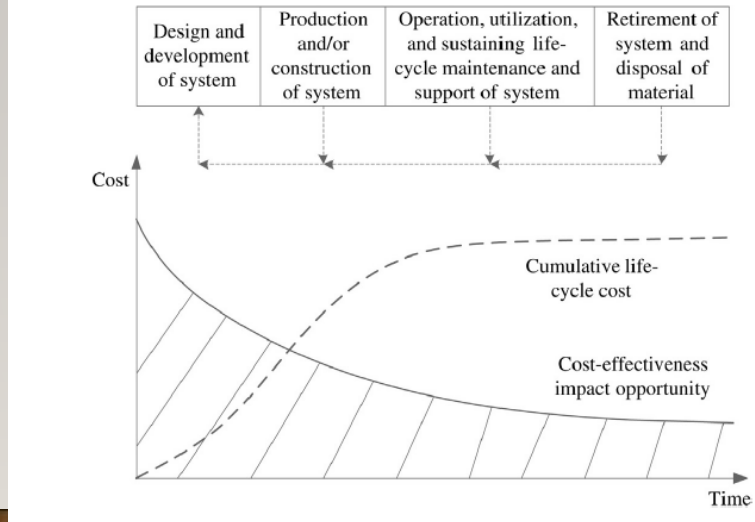
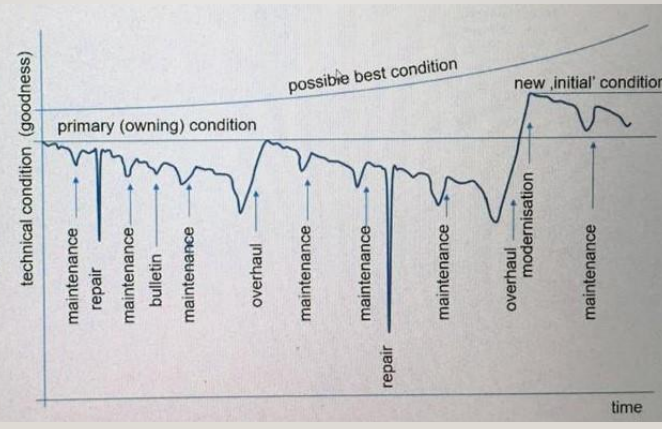


FIGURE 1.1 Opportunity for affecting logistics and system effectiveness.

- technical ground service
- maintenance
- repair
- overhaul
- directives, bulletins
- upgrading
- modernisation



HISTORY

- Every system needs maintenance
- First aviators were also the maintainers.
- Commercial aviation made it necessary to train Professional maintenance personnel.
- Government certification became a need
- Universality gradually established to certify the technician in order to work on all transport aircraft.
- It became mandatory to develop a proactive maintenance approach.

HISTORY

- **Earliest scheduled maintenance consisted of examining the airplane in detail prior to each flight.**
- **As airplanes were improved, maintenance intervals were established.**
- Intervals became established at which major parts of the structure were disassembled, inspected for wear or distress, repaired or replaced, and reassembled.
- These checks became known as major or overhaul checks and could require 30 or more days to accomplish, often more than 12,000 man-hours, and cost up to 1 million USD.

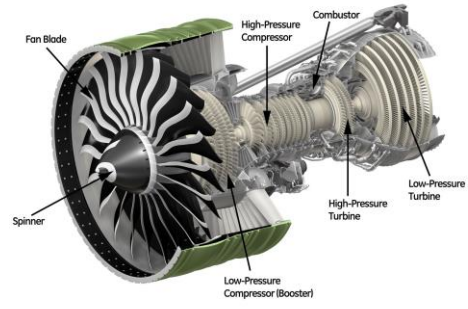
HISTORY

- For aircraft components, such as hydraulic actuators, fuel pumps, and generators; again the original maintenance systems required full disassembly, inspection, repair, and replacement of parts worn beyond original tolerances.
- Being a major unit, composed of many subcomponents, the engines (or powerplants) had their own intervals.
- In most instances, the overhauls occurred following an engine failure
- Overhauls intervals determined on an estimation basis which after usage statistics, it is updated. Engine failure could be catastrophic to itself, the aircraft and the human.

CURRENT STATUS

- Today maintenance department responsibilities and capabilities are broad and complex.

- **Engines have their specific need for maintenance: Internal combustion engines create vibration, jet engines are subject to high temperatures.**
- They need different approach to ensure safety and reliability.



CURRENT STATUS

- Originally the maintenance program applied to internal combustion engines was applied to jet engines, with fixed intervals.
- This was found to be inefficient and inadequate to cater the needs of jet powerplants.
- The design of the jet engine allowed to concentrate to major components or modules of the engine.
- **This approach to maintenance has various terminologies; such as IEC: Individual Engine Control.**

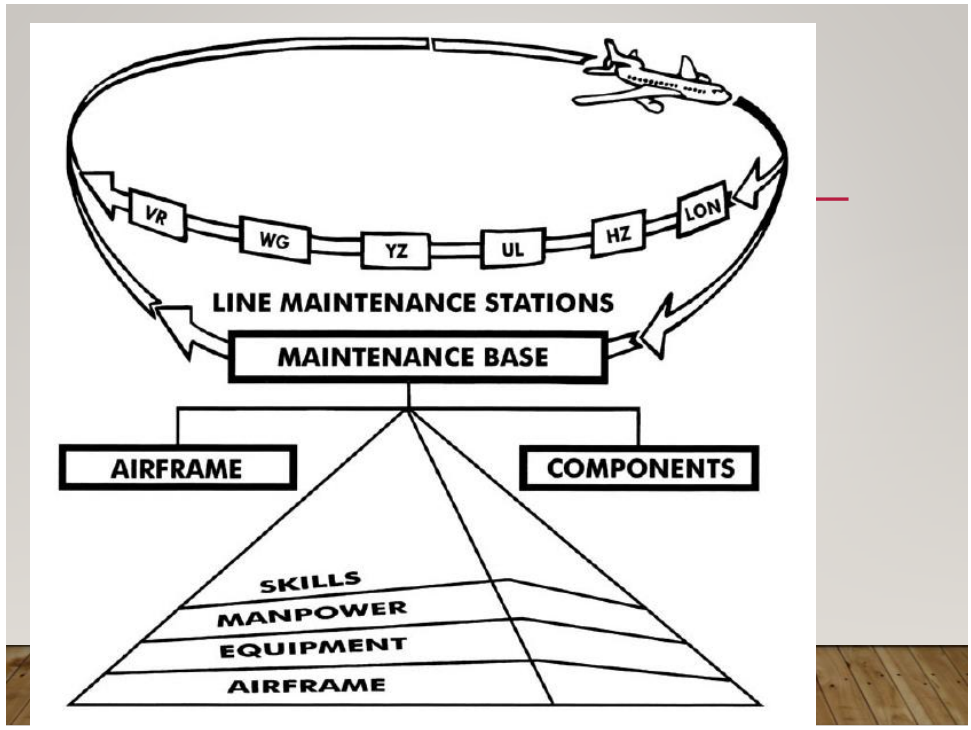
CURRENT STATUS

- Each major component has its own failure characteristics:
  - Compressor: affected by rotational stresses, erosion from airborne particles, damage from failed blades etc.
  - Turbines: suffer from heat cycles, creep, burning.
- Each must have an individual maintenance system applied.
- **These components are interchangeable and transferable among engines: each have its own maintenance process and records.**
- Result of the IEC maintenance program, engines could be maintained on the wing without removal. Reducing aircraft downtime.

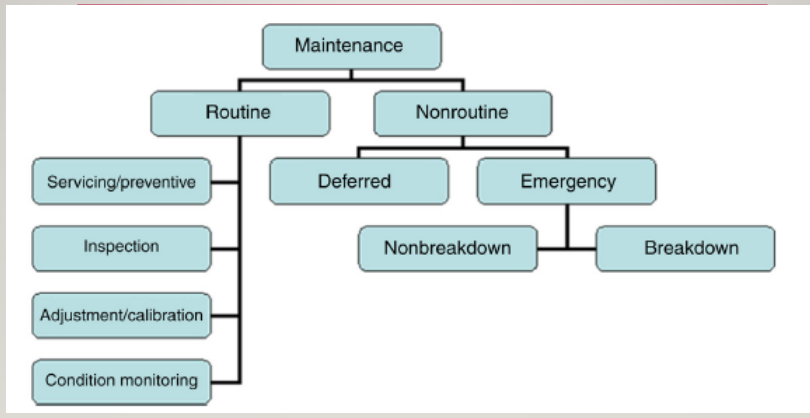
CURRENT STATUS

- Other benefits of the advancement of engine are:
- The reduction in vibration had a significant effect on the rest of the aircraft. This allowed "on-condition" maintenance for all aircraft components and significant life extension of the parts subject to fatigue related stress.
- **The maintenance system subsequently evolved into a series of minor and major checks.**

- Each maintenance system is developed by the individual airline (Continuous Airworthiness Maintenance Organization- CAMO) to ensure ongoing safety and reliability, not only in accordance with the specifications mandated by the regulatory authorities of the nations in which the airlines operate, but also in accordance with a complex set of operational variables, such as duration of flights, environmental and weather considerations, and passenger and Cargo loading characteristics.



TYPES OF MAINTENANCE



- **QUESTIONS**