

ENGINE MAINTENANCE

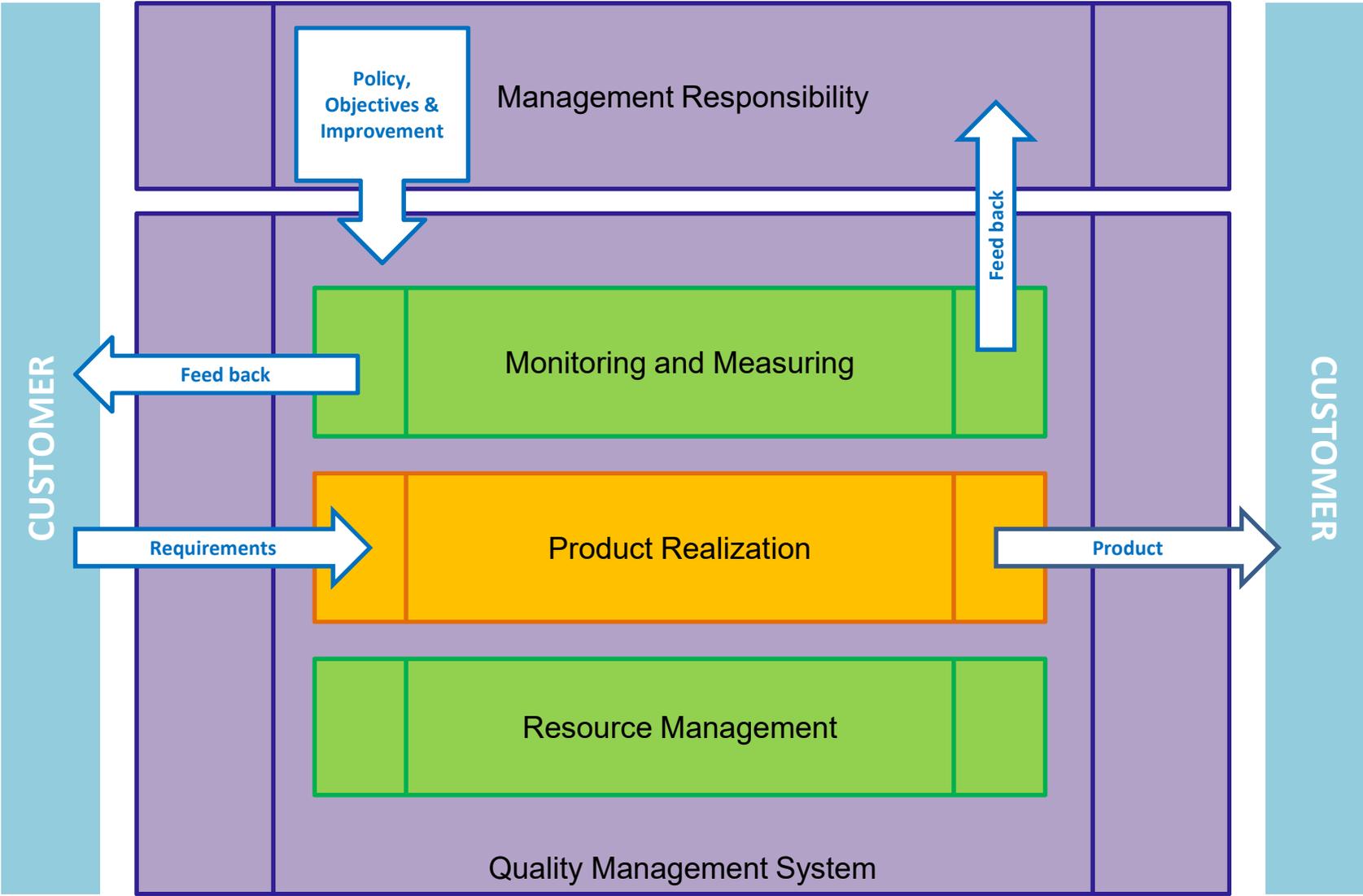
INDUSTRIAL PROCESS & FACILITY



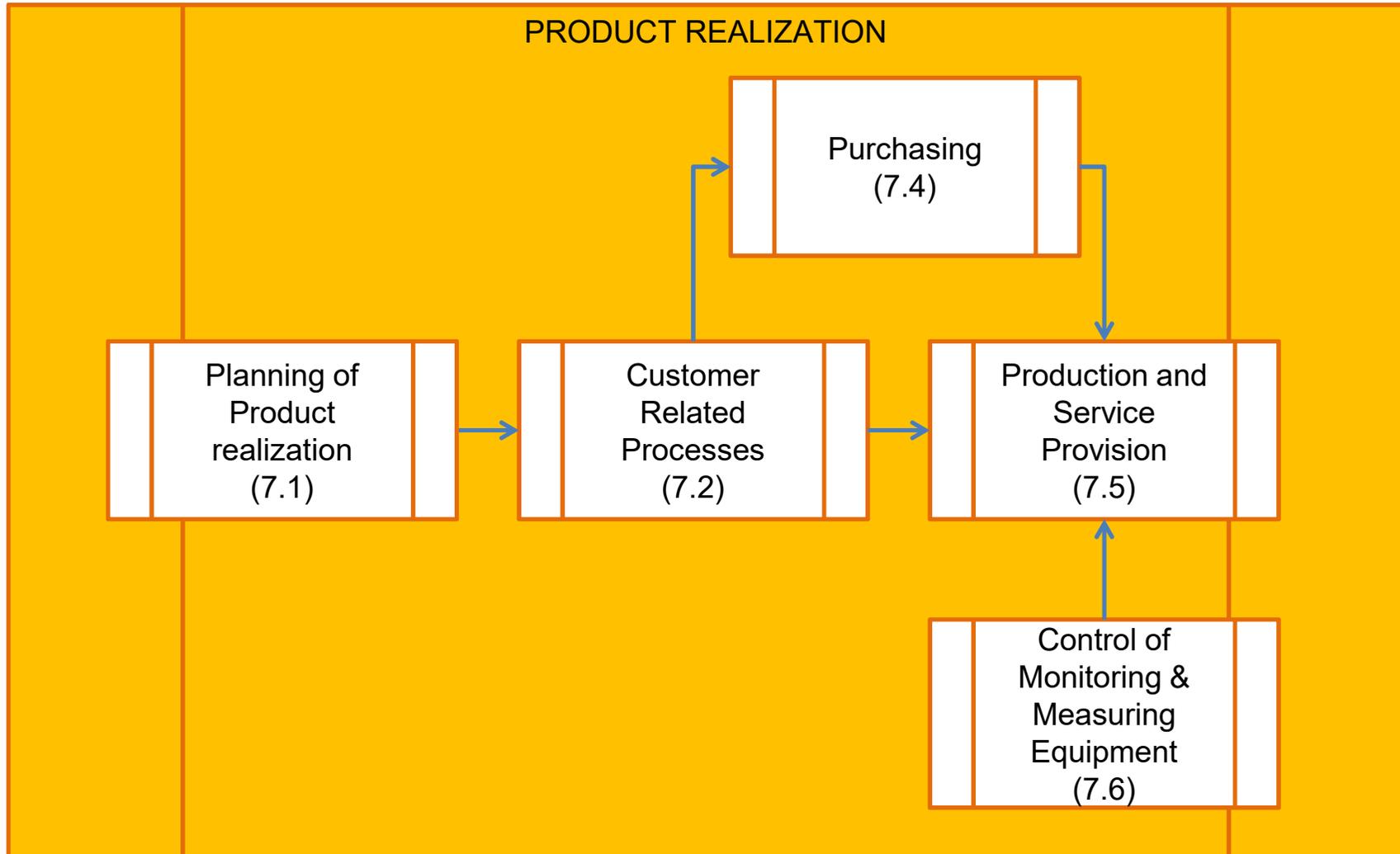
Summary

- Main process : EN 9110
- Aeronautical Certification requirements
- Environmental & Safety requirements
- Engine maintenance process
- Facility
- Tools & Equipment
- Layout definition
- ERP

EN 9110 Process Definition



EN 9110 Process Definition



Aeronautical certification requirements

- The EU Commission Regulation (EC) 2042/2003 as amended by (EU) 1149/2011 , provide rules , acceptable means of compliance and guidelines for the *continuing airworthiness* of civil aviation product .
- The maintenance of an aeronautical product shall be accomplished by an *Approved Maintenance Organization* (AMO) complying with the requirements of Section A of Annex II (Part 145) of Regulation EC 2042/2003 .
- EU Regulations are binding for each Member State and have immediate effect therefore granting an equal flight safety standard applicable everywhere within EU .
- EU Regulations have been also *harmonized* with the corresponding US Code of Federal Rules (Title 14) .

Aeronautical certification requirements (2)

KEY WORDS

- An AMO must set the proper organization in order to comply with Part 145, as applicable.
- Organization set means: put the all process on site & ready for the required Scope of Work.
- Process on site means, the Repair Shop have on its main base all necessary to perform maintenance activity on product (i.e. Engine components) where it wants to apply to EASA.
- Scope of Work means the detail of Class, Rating, Limitation, Base, Line;
- Repair Shop organization set include : Facility (plant) ready with all specific equipment, tooling, machine tools, test benches, etc by components to major assembly products (Engines) if, when & where applicable.
- Personnel must have “sufficient staff to plan, perform, supervise, inspect and quality monitor the organization

Aeronautical certification requirements (3)

KEY WORDS (2)

- Nominated Responsible Persons; must include as minimum: the Accountable Manager, the Base Maintenance Manager and the Quality Manager . Certifying Staff and other technical personnel qualified by Quality Manager, must be included in the Organization as: Managers , Supervisors , Technicians and mechanics staff for products (i.e: Engines and Components) NDT personnel qualified as NDT international standard, aeronautical material Receiving staff, Technical support personnel as Planners, Engineers, Technical record staff, Librarians, Quality Control, Quality Assurance staff, Ground Equipment operators, Contracted staff on above categories if & when needed.
- The above personnel must have the right educational requirements depending of the role in the Organization and has been trained in the right mode on the Engine model/components, as applicable
- Basic Training Requirement, theoretical and practical, is requested for Certifying Staff.
- MOE (Maintenance Exposition Manual) where the Maintenance, Repair & Overhaul Organization describes its own method of compliance to EASA Part 145 rules.

Aeronautical certification requirements (4)

☐ **MANAGEMENT**

- Quality and Safety Policy
- Management personnel
- Mission and responsibilities
- Organization charts
- Manpower resources
- Housing and facilities

☐ **MAINTENANCE PROCEDURES**

- Purchasing and acceptance of parts and materials
- Storage tagging and delivery of aircraft components and materials
- Maintenance instructions, updating and availability
- Maintenance and repairs
- Airworthiness Directives Procedures
- Technical records control
- Maintenance documentation in use and guidance for its compilation

☐ **QUALITY SYSTEM**

- Quality audit of organization procedure
- Internal Reporting System
- Certifying Staff Qualification and Training
- Training on Human Factors Personnel Qualification - Policy

Aeronautical certification requirements (5)

Quality System

Guarantee, by means of adequate quality assurance processes, that the organization and the production system meet constantly the certification and quality standard requirements

Production Planning

Assure resource optimization in order to comply with quality standard and customer requirements

Engineering

Assure necessary technical support to production process by means of documentation development in accordance with approved technical data .

Certifying staff

Ensure correct product release to service according to the technical regulations and aviation regulations

Facility Management

Assure equipment s & tools maintenance in accordance with MOE procedure, environmental , safety , and fire prevention applicable regulations .

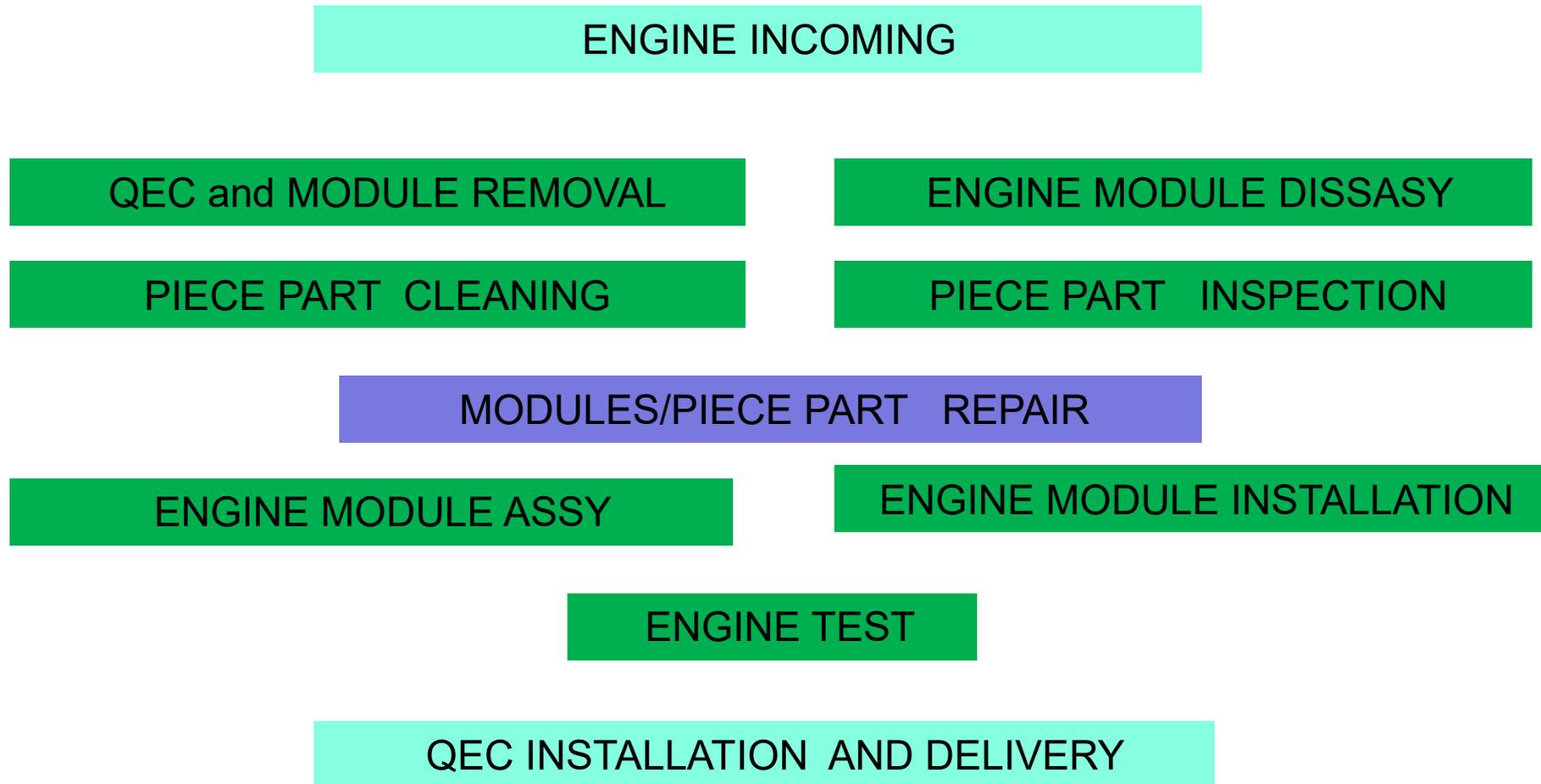
Material Management & Logistics

Assure the handling and storage of the parts and materials in accordance with MOE procedure and the production planning .

Environmental & Safety requirements

- ❑ CEE MANUFACTURING & MAINTENANCE PRODUCT LAW (DLG 81/08)
- ❑ CIVIL/INDUSTRIAL WATER DISCHARGE LAW (DL 152/2006)
- ❑ DANGEROUS INDUSTRIAL WASTE DISCHARGE RULES (DL 152/2006)
- ❑ CRANES INSPECTION/SAFETY LAW (DPR 31/7/80 nr 619)
- ❑ INDUSTRIAL FUMES REDUCTION STANDARD RULES (DLGS 03/04/2006 n 152)
- ❑ FUEL TANKS MANUFACTURING SAFETY LAW DM 20/10/1998 ART 11.
- ❑ OIL STORAGE SAFETY LAW (DLG 504 26/10/95)
- ❑ ELECTRICAL PLANT MANUFACTURING & MAINTENANCE LAW (DPR 462/01)
- ❑ SANITARY LAWS Art. 67 D.Lgs. n. 81/08
- ❑ LIFT DEVICES SAFETY LAWS Art 12 DPR 30/4/1999 nr 162
- ❑ HIGH PRESSURE TANK AND PIPE SAFETY LAWS RD 12/5/27
- ❑ FIRE SUPPRESSION SAFETY (LAW 966 lug 1965 & DPR nr 577 & DM 16.2.82)

Engine maintenance process



Facility (power generation)

ELECTRICAL POWER

Max Power Request 1 MW,

Voltage 380V/220 V

Consumption /YEAR 2,700 MWh

COMPRESSED AIR

Air pressure 8 bar

Consumption / year 2,500 Mc/h

INDUSTRIAL/CIVIL WATER

Consumption /year 60,000 mc

THERMAL ENERGY

High Temperature INPUT WATER 150°C

12 Bar .- return water T 120° C

Consumption / year 2,500,000 MKal

Facility (service area & systems)

- *Medium Voltage Rooms*
- *Thermal Generators*
- *Compressed Air Plants*
- *Suppression Fire Plants*
- *Air Conditioning Plants*
- *Fumes Extraction Plants*
- *Water distribution plants*
- *Industrial waste and chemical product discharge and filtering plants*
- *Safety and air conditioning, according to CEE laws.*

Facility (Test Cell)

- ✓ 8 meters cross section
- ✓ 120K Thrust stand
- ✓ Latest generation data acquisition and control system - engine & facility
- ✓ Complete Fuel system
- ✓ Complete starter air system
- ✓ Inlet and exhaust stack acoustic equipment
- ✓ Lift platform under Thrust Stand
- ✓ Prep area with 4 workstations
- ✓ Monorail delivery system
- ✓ Test Adapter and Cowls kit
- ✓ Adapter and Software configuration
- ✓ Trim Balance software
- ✓ Pressure sensing line adapters
- ✓ Bare Engine Kit

Tools & Equipments



CLEANING & INSPECTION

Sand blasting machines

Manual stripping plant

FPI Plant

MPI bench

High Pressure Cabin

Tools & Equipments (2)

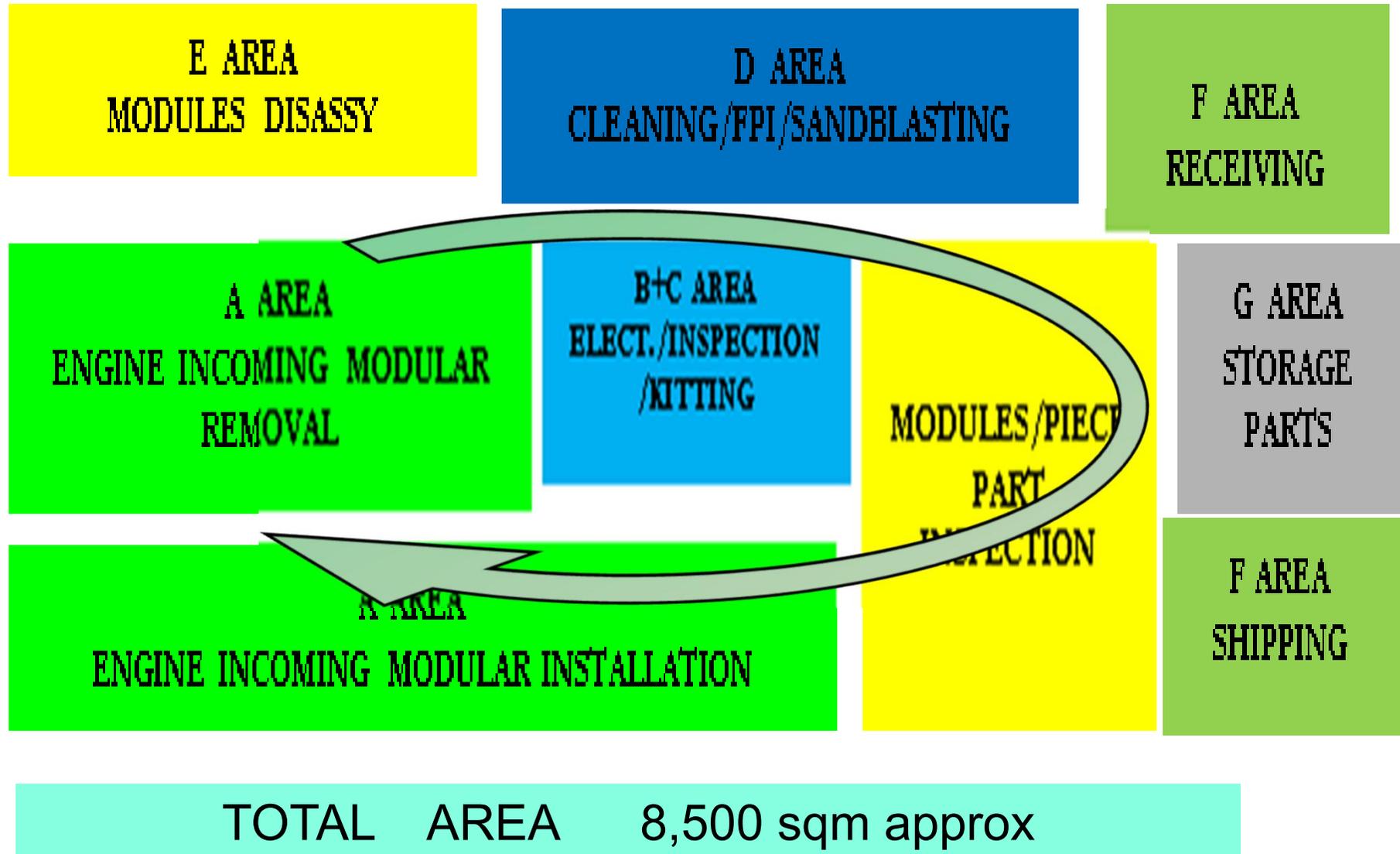


MODULES ASSY/DISASSY

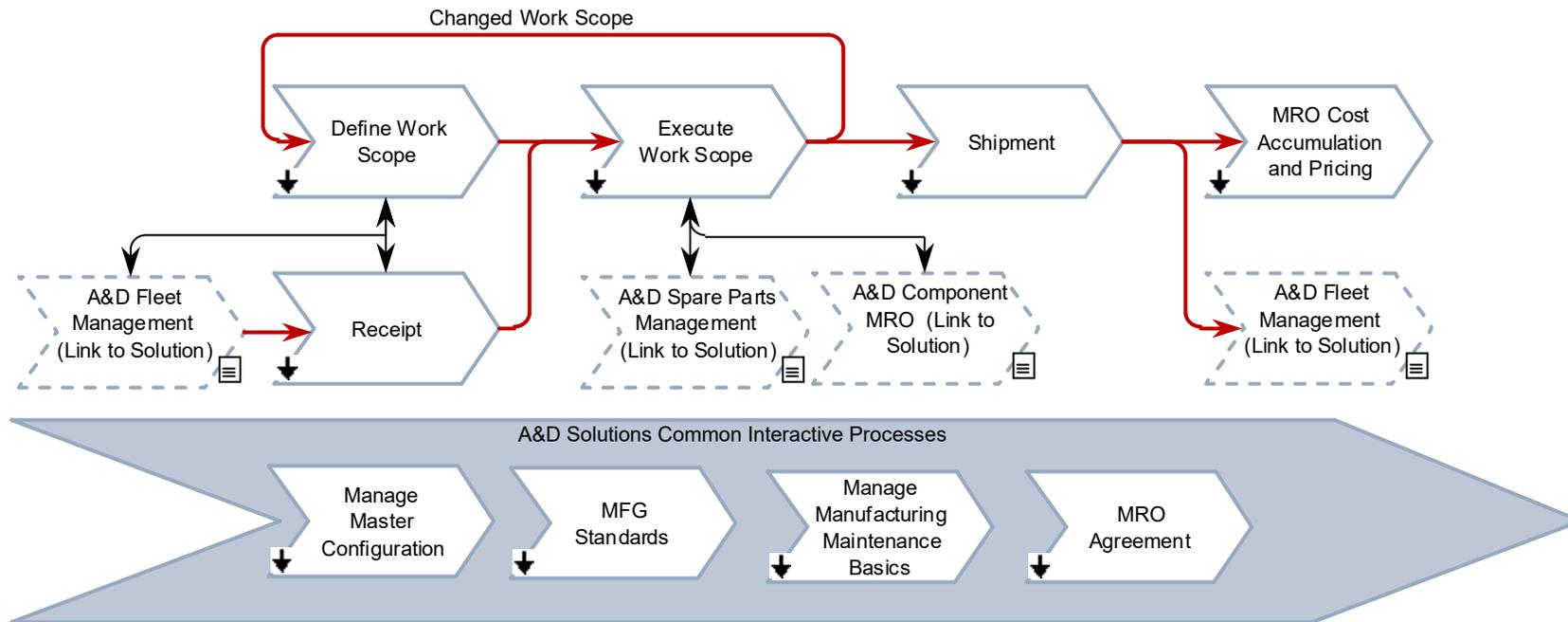
VTL 5axes Vertical Lathe & Measurement system
High Speed Grinder
Horizontal Balancing Machine
Vertical Balancing Machine

Cranes 0,5 – 10 Tons

Layout definition



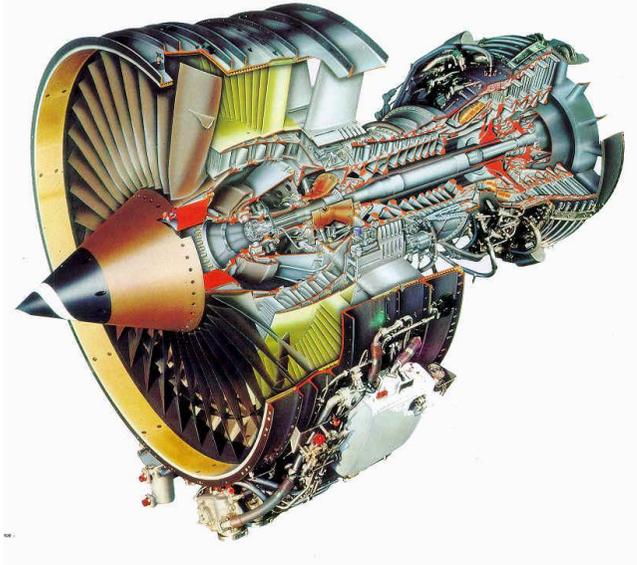
ERP



Basic Elements

- ▶ Engine Structure Templates
- ▶ Disassembly Structures & Routings
- ▶ Maintenance Levels
- ▶ Disposition Codes
- ▶ Repairs
- ▶ Work Center
- ▶ Labour Classes
- ▶ Parts
- ▶ Locations
- ▶ Etc...

CFM International CFM56 Engines



IMPIANTO

LAVAGGIO



Engine Maintenance - Industrial Process & Facility

ATTREZZATURE SPECIALI



Engine Maintenance - Industrial Process & Facility

AREA ASSEMBLAGGIO MOTORI







Thank You

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