EMBRAER Being Digital from Design to Manufacturing

João Zerbiní
Sr. Manager - Digital Engineering & Manufacturing Technologies
EMBRAER was founded controlled by the Federal Government as a step to develop the aeronautic industry in 1969.

The company is privatized, combining technological and industrial knowledge with an entrepreneurial culture in 1994.

National Strategic Project to foster the aeronautics in Brazil - CTA (Aerospace Center of Technology) and ITA (Aeronautics Institute of Technology) were created in 1946.

One of the world’s leading manufacturers of commercial and executive aircraft, with strong and growing performance in defense and security in 2019.

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WHERE WE OPERATE

USA
- MESA
- NASHVILLE
- MELBOURNE
- IRWINDALE
- WINDSOR LOCKS
- FORT LAUDERDALE
- JACKSONVILLE

IRELAND
- DUBLIN

PORTUGAL
- ÉVORA

NETHERLANDS
- AMSTERDAM

UNITED KINGDOM
- FARNBOROUGH
- LE BOURGET

FRANCE
- UAE
- DUBAI

CHINA
- BEIJING

BRAZIL
- SÃO JOSÉ DOS CAMPOS
- GAVIÃO PEIXOTO
- BOTUCATU
- TAUBATÉ
- BRASÍLIA
- BELO HORIZONTE
- SÃO PAULO
- RIO DE JANEIRO
- SOROCABA
- CAMPINAS

SINGAPORE
- SINGAPORE
OUR CHALLENGE
A NEW DESIGN ON A PROVEN PLATFORM

- **new wing**
  More efficient, higher aspect ratio

- **fuel**
  17.3% lower fuel consumption over current E190

- **improved avionics**
  45% more display

- **new interior**
  Enhanced PAX experience and more overhead bin volume

- **fuselage**
  Extensive aerodynamic optimization to improve fuel efficiency

- **aircraft system**
  Re-designed to boost performance and reliability and to improve maintenance costs

- **landing gear door**
  Up to 1% fuel burn reduction

- **new engine**
  High By-Pass Ratio, Geared Fan Engines

- **4th Gen Full fly by-wire**
  Digital closed-loop control to improve flying qualities and fuel efficiency
STRATEGIC PLAN FOR ADVANCED DESIGN AND MANUFACTURING

- Guarantee the alignment of resources
- Avoid effort duplication and rework
- Prioritize the initiatives - corporate strategy
- Leverage the competitiveness
ADAM TECHNOLOGY DIMENSION

- **DIGITAL ENGINEERING**
  Anticipate the maturity of the products and processes
  Increase efficiency in the development phase

- **SHOP FLOOR**
  Increase efficiency, flexibility, throughput and quality of the productive process

- **MANUFACTURING INTELLIGENCE**
  Information to supports the decision making intelligence
Digital Engineering

Product Design

Anticipating the product maturity & efficiency
**INITIATIVES**

Digital Engineering
Manufacturing Design

Factory Deployments done
First-Time-Right

- Discrete Event Simulation
- Virtual Commissioning
- Assembly Simulation
- Paperless Online Information
- Machining & Robotics Simulation
Initiatives

AGVs/AMRs

Robotics

Smart Tooling

Additive Manufacturing

Cooperative Systems

Shop Floor Automation
Flow and performance on Discrete Manufacturing

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Shop Floor Augmented Environment

Technology to augment operators capabilities
Initiatives

Manuf. Intelligence
Networked factory
Sensored industrial assets to enable Automation
Manuf. Intelligence
Integrated Systems
Digital enterprise systems:
orchestration & data++
Manuf. Intelligence
Towards Autonomy

Smart decision-support,
Autonomous factory
FACTORY OF THE FUTURE
From Design to Manufacturing
How would a new technology affect our knowledge and skills?
HARD SKILLS

- Digital Ability
- Transversal Knowledge
- Information and Communication Technology
- Sustainable Intelligence
- Robotics Autonomous Machines
- Specific Knowledge
SOFT SKILLS

Critical Sense  Social Intelligence  Collaboration  Market Comprehension  Cognitive Ability  Flexibility
POWER FROM KNOWLEDGE

EMpower

- Learning Ecosystem
- Career tracks
- Self development
- Learning to learn
- Continuous and collaborative learning
WE DEVELOP GREAT HUMANS

PPE

program

EMBRAER DESIGNERS

Preparing technicians to become aeronautical designers.

151 professionals trained in 4 years of operation

PPE

program

ENGINEERING SPECIALIZATION

Professional Master’s in aeronautical engineering, taught on company premises.

More than 1300 engineers trained since 2001.
ENGINEERING SPECIALIZATION PROGRAM - PEE

Phase 1
- Aviation Intro
- Aviation Business
- Etc...
- Aerodynamics
- Propulsion
- Control
- Aeronautical Structures
- Etc...

Phase 2
- Structures
  - Safety Assessment
  - Fatigue
  - NASTRAN KBES
  - Etc...
- Materials
  - Safety Assessment
- Systems
  - Safety Assessment
  - Fly-by-wire
  - MBSE
  - Etc...
- Manufacturing
  - Safety Assessment
  - Manufacturing Processes
  - Industry 4.0
  - Etc...
- Maintenance
  - Safety Assessment
- Safety
  - Etc...

Phase 3
- Aircraft Project
- Thesis

Phase 4 - Master thesis (ITA + EMB)
SCHOOL OF MANUFACTURING ENGINEERING

Basic Courses
- Lean Manufacturing
- Quality
- Human Factors
- Budget, Costs and Investments
- DFMA
- ...

General Technology Courses
- Mechanical Assembly
- Structural Assembly
- Composites
- Milling
- NDT
- ...

Specific Technology Courses
- Robotics
- Process Automation
- Digital Manufacturing
- IIoT
- Process Simulation
- ...

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75 Communities of Practice

- Industry 4.0
- Augmented Reality
- Additive Manufacturing - 3D Printing
- Industrial Automation
- Data Science
- Artificial Intelligence
- System Engineering
- IoT / IIoT
- CAE / CAD / Digital Manufacturing
- Etc.
DAI – ACADEMIC INDUSTRIAL PHD

Support tool for the industry to intensify its interest in R&D and for a natural migration of the researcher trained and established in universities to work in industry.

Professional PHD 7 - 9

TRL 3 - 7

PHD 1 - 3

ITA - CAPES agreement duration of 5 years - July 2022
12 scholarships
Propose actions for the strengthening and modernization engineering courses in Brazil in order to increase innovation and competitiveness of companies operating in the country.

- Curricular structure and education methodologies
- Teacher hiring, training and evaluation/promotion
- Courses evaluation
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