Modeling and Simulation of Aircraft Power System with Distributed Energy Resources

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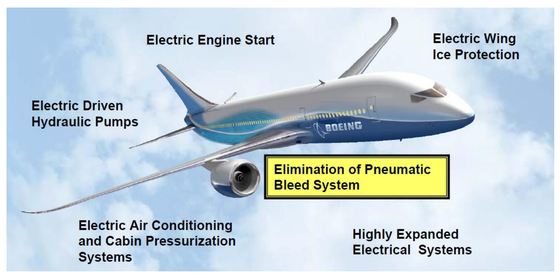
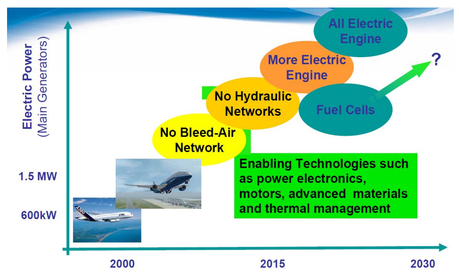
Introduction

- **Aircraft Power System**
  - Micro or Nanogrids with distributed energy resources
  - Increasing demands fuel efficiency
- **More Electric Aircraft (MEA)**
  - Electrical power and control network
  - Removing pneumatic, hydraulic and mechanical network
  - Improved fuel efficiency

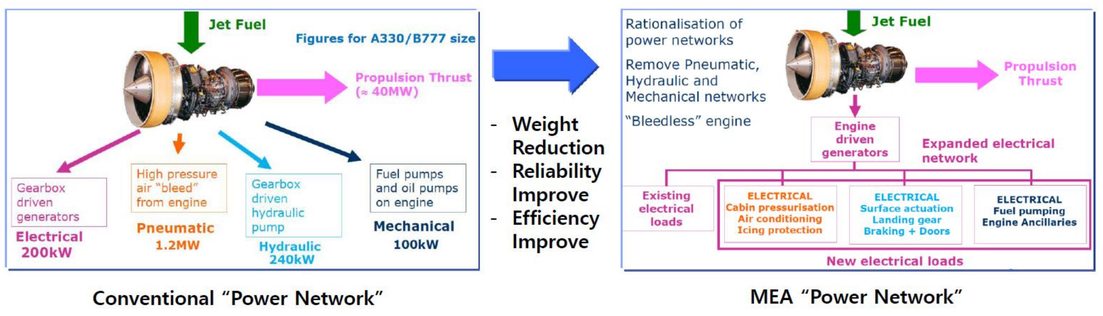


MEA Example (Boeing 787)



Evolution of Aircraft Power System * ref. [1]

- **Conventional vs. MEA Power Networks** * ref. [2]

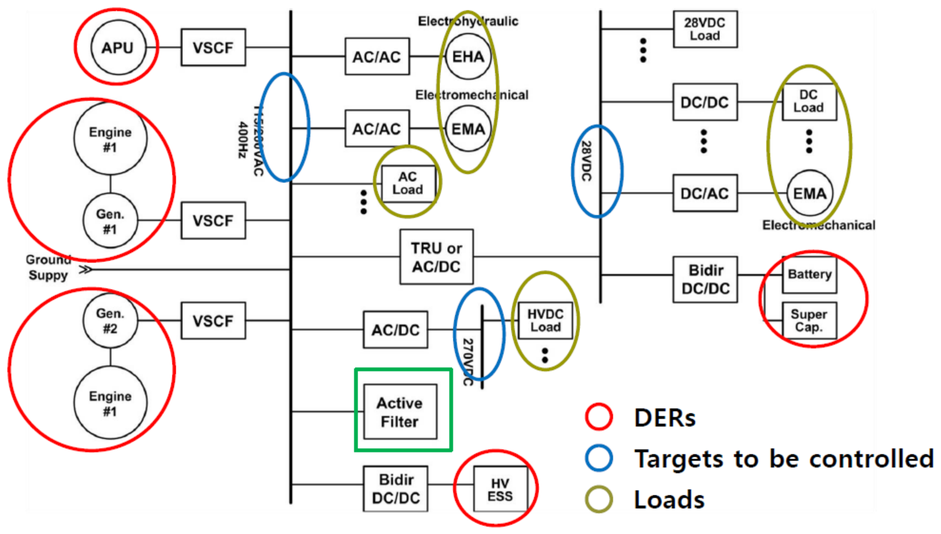


Conventional "Power Network" — MEA "Power Network"

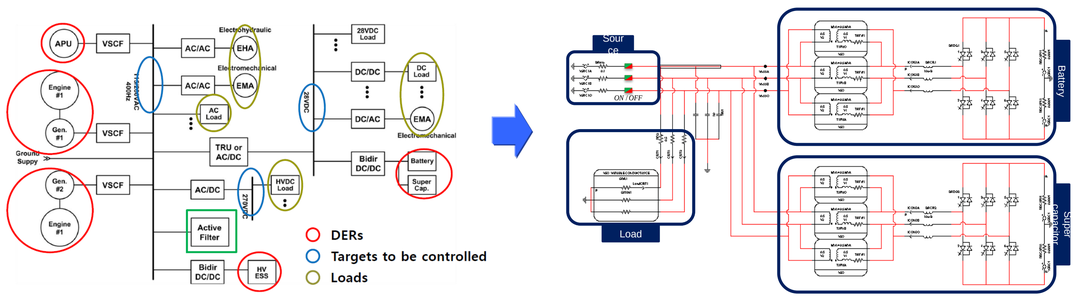
[1] K. J. Karimi, "Future Aircraft Power Systems- Integration Challenges", Boeing, 2007.
[2] J. Clare, "Examples of More Electric Aircraft Research in the Aerospace research Centre"

Modeling and Simulation

- **Configuration of Aircraft Power System - Example**

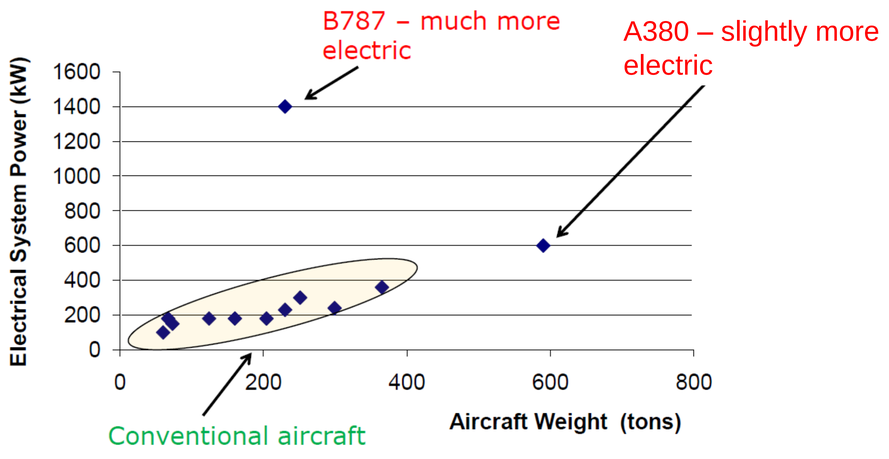


- **Structure of Power System - Microgrids**
  - DERs: Engine generator, APU, Battery, Super-capacitor
  - Power buses: 115/200VAC, 270VDC, 28VAC
  - Bus interface: Power electronic converters, EMS
  - Loads: Dynamic and static loads, EHA, EMA

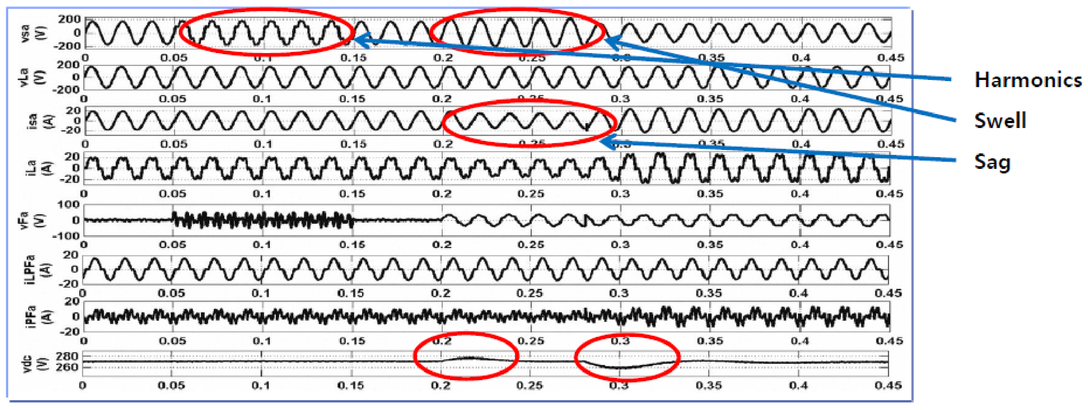


Power System Analysis

- **Needs for Aircraft Power System Analysis**
  - Increased power capacity due to MEA design
  - Improvement of fuel efficiency
  - Power quality issues : MIL-STD 704F
- **Power Capacity**



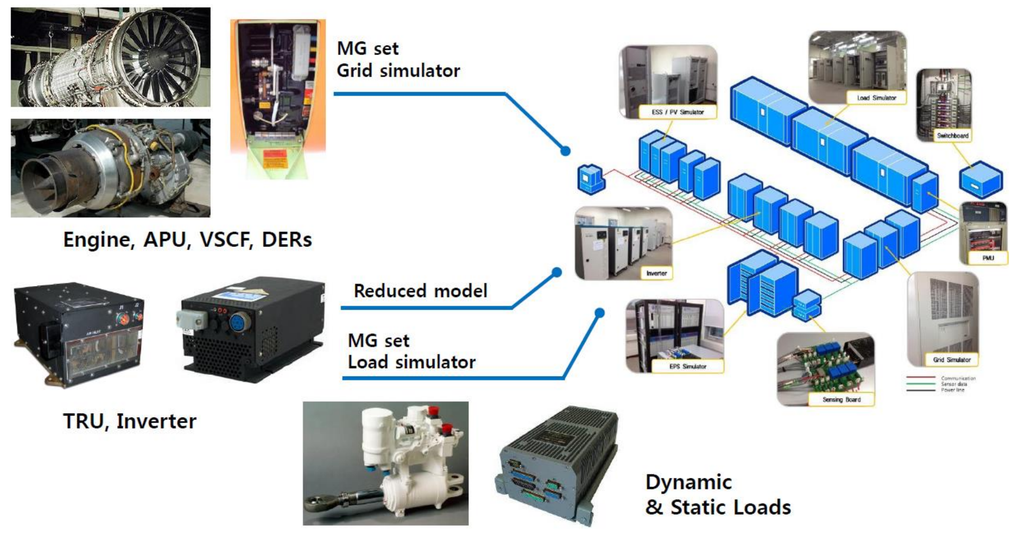
- **Power Quality Issues**



PHILS Test System

- **KIER PHILS Test Beds**

- **Structure of PHILS for Aircraft Power System**



- **Conclusions**
  - Microgrids approach for aircraft power system analysis
  - Reducing the design time for aircraft power system