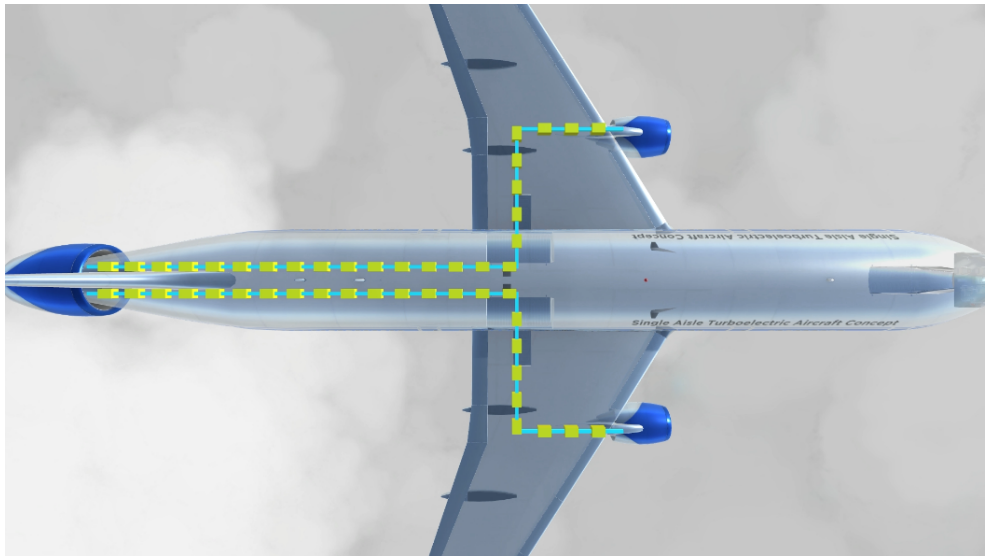
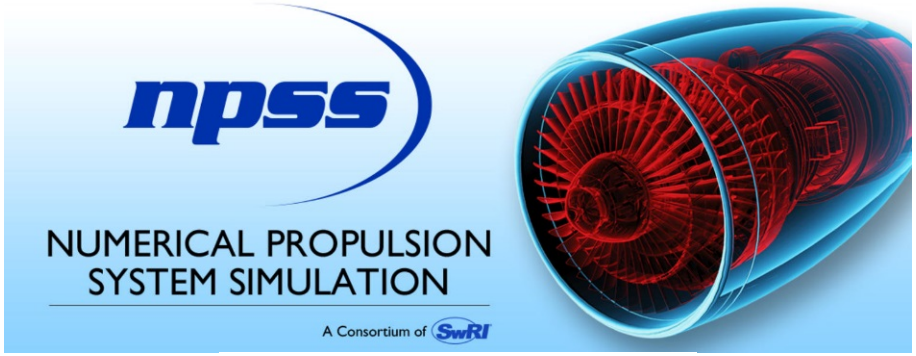
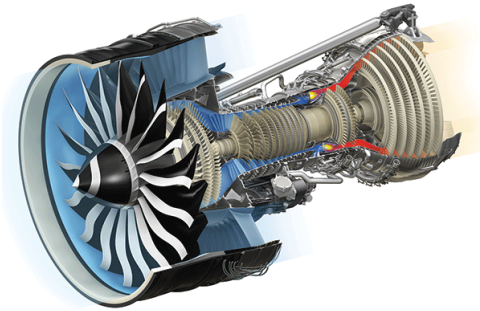
NPSS Power System Library Overview







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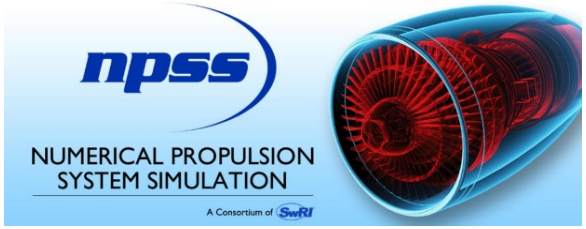
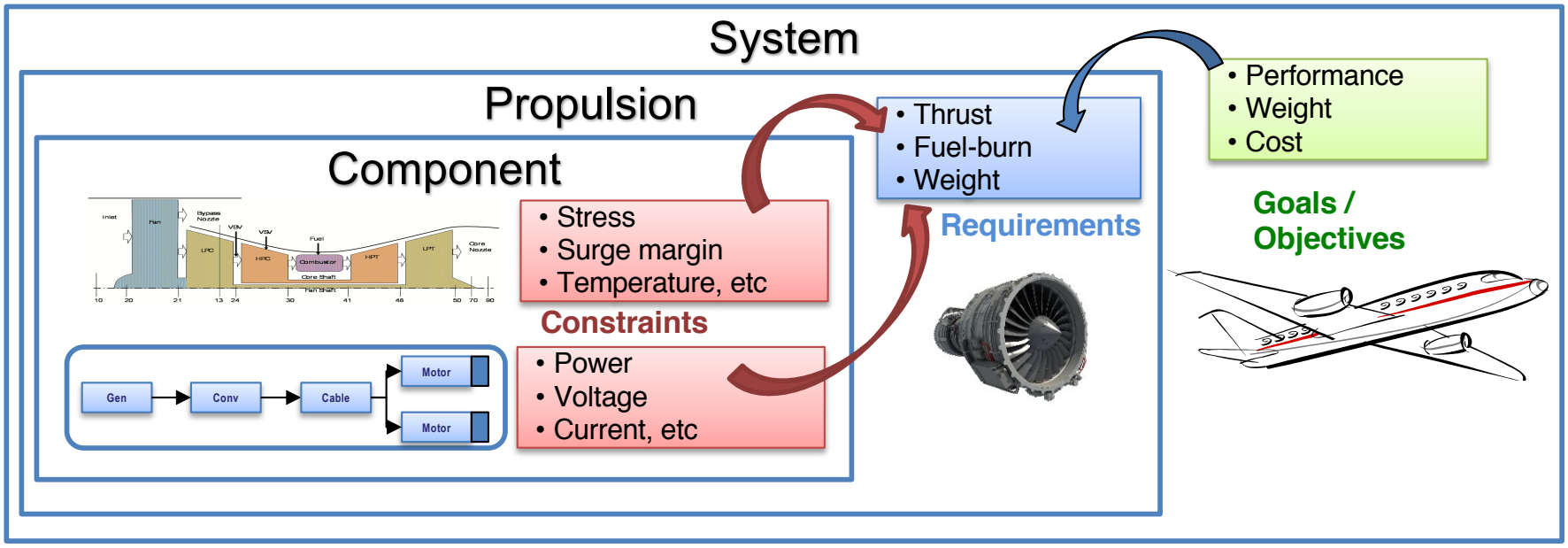
Introduction

- Engines are designed using systems analysis
  - Steady-state system-level simulations (e.g. cycle decks)
- Numerical Propulsion System Simulation (NPSS)
  - Object-oriented, multiphysics, engineering and design simulation environment
- Propulsion systems designed given objectives and constraints
  - Objectives: fuel burn, emissions, noise, cost, performance
  - Constraints: component min/max operating conditions (e.g. temperatures)
- Electrified propulsion presents need for tools to model power and propulsion
  - Difficult to produce good designs without tools that simultaneously model both

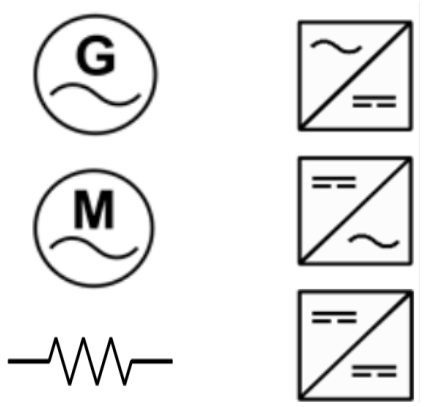




NPSS Power System Library

- Address by adding power system simulation capabilities to NPSS
- NPSS adding electrical port to allow constructing power system models
- NASA developing open source library of NPSS power components
  - https://github.com/nasa/NPSS-Power-System-Library

ELEMENT	MAP	MDP	DC	AC, 1-PHASE	AC, 3-PHASE
CABLE			X	X	X
MOTOR	X	X			X
GENERATOR	X				X
RECTIFIER	X		X		X
INVERTER	X		X		X
DC-DC CONVERTER	X		X		
BREAKER			X	X	X
LOAD			X	X	X
SOURCE		X	X	X	X
RESISTOR			X	X	
CAPACITOR			X	X	
INDUCTOR			X	X	



- Capabilities
  - Performance (efficiency) maps
  - Sizing logic (multi design-point (MDP), cable)
  - Integration with thermal/propulsion
  - Transients (thermal and shaft dynamics)