Gas Turbine Engine Design Workshop

…..Design Considerations for the Combustion System

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Combustion Institute Combustion Summer School 2018 – Day 3

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Problem Statement: We need a conceptual **combustor** design for a small gas turbine that will be a packaged as part of a hybrid-electric mobile platform (hybrid truck or a small VTOL aircraft)

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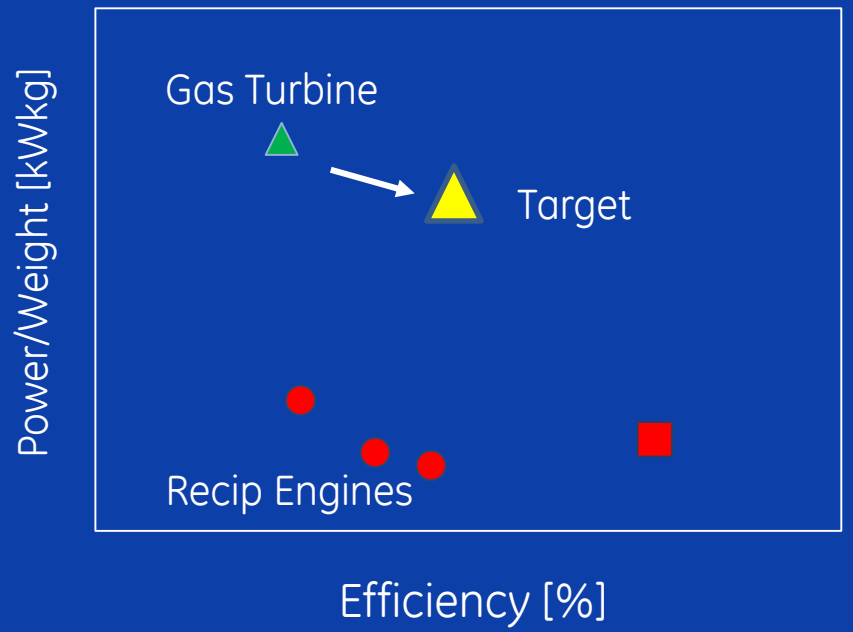

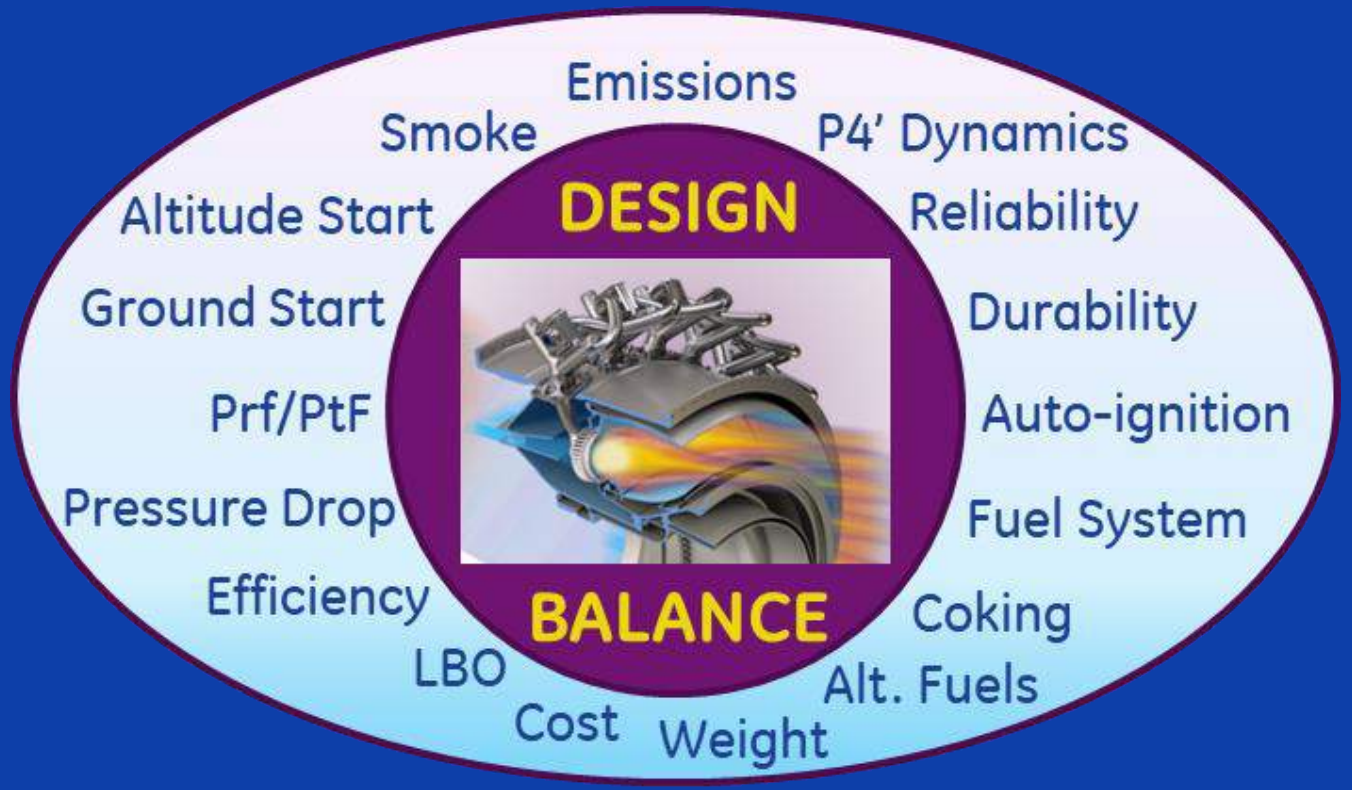

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Combustor Requirements

1. High Combustion Efficiency
2. Reliable and Smooth Ignition
3. Wide Stability Limits
4. No combustion induced instabilities
5. Low pressure loss
6. Combustor exit temperature distribution acceptable to turbine
7. Low emissions of smoke, unburned fuel (UHC, CO), NOx
8. Minimum Cost
9. Ease of maintenance
10. Size and shape compatabile with engine
11. Long life hardware
12. Multi-fuel capable

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Questions for Each Group #	Choice A	Choice B
1. A1 Combustion Architecture:	Annular Combustor	Silo Combustor
2. A2 Flame Stabilization Method:	Swirl Stabilized	Bluff Body Stabilized
3. A3 Fuel-Air Mixing	Diffusion Flame	Lean Premixed
4. A4 Combustor Liner Cooling	Reverse Flow Liner	Wall Effusion Cooling
5. A5 Combustion Efficiency (>50% load):	99.999%	99.8%
6. B1 Combustor Pressure Drop (full load):	4%	6%
7. B2 Combustor Liner Material:	316SS	Hastalloy X (2x cost, 2x life)
8. B3 Velocity in Fuel-air mixing Region:	80 m/s	160 m/s
9. B4 Ignition System	Spark Ignition	Laser Ignition (2x f/a range, 3x cost)
10. B5 Residence Time	4 ms	15 ms

Questions?