

SPACE ENERGETICS

ADVANTAGES OF THE A80K / A160K LOX-CH4 ANNULAR AEROSPIKE ENGINE

- 1 PERFORMANCE – Deliver higher payload mass fractions
 - 1.1 Altitude Compensation: Near-optimal expansion from launch through orbit
 - 1.2 Closed Hybrid Cycle: Nearly all enthalpy results in propulsive work
 - 1.3 Compact Integration: Engine system conforms to vehicle envelope
 - 1.4 Modern: Conventional and proprietary optimization techniques

- 2 COST-EFFECTIVE – Halve upfront and recurring expenses
 - 2.1 Development: Single small chamber design focuses design / analysis
 - 2.2 Testing: Most issues captured with rapid individual chamber tests
 - 2.3 Manufacturing: Numerous identical chambers 3D printed in parallel
 - 2.4 Reduced Exotics: Single plug replaces numerous costly nozzle extensions

- 3 VEHICLE SYNERGY – Consolidate subsystem requirements
 - 3.1 Thrust Vectoring: Discrete throttling eliminates gimbals, actuators, and hydraulics
 - 3.2 Feed Systems: Single pump pair supplies propellant to all chambers
 - 3.3 Common Cryo: Similar components for all propellant systems
 - 3.4 Thrust Structure: Loads efficiently distributed through common ring mount
 - 3.5 Aerodynamics: Conformal plug reduces base drag and engine bay volume

- 4 FAULT-TOLERANT – Safely complete the mission
 - 4.1 Engine-Out Capability: Arrays can compensate for anomalies
 - 4.2 Repeatable Process: Reduced number of unique variables in fault tree

- 5 MODULAR – Reconfigure for variable requirements
 - 5.1 Scale-to-Mission: Customize arrays from 80k to 640k+ lbf
 - 5.2 Upper-Stage Reuse: Individual chambers can be used for less thrust
 - 5.3 Elegant Interface: Chambers couple directly to manifold interconnect

- 6 EXTENSIBLE – Adopt an architecture well-positioned for the future
 - 6.1 Human Flight: Deep throttle for tailored thrust profiles in different phases
 - 6.2 Reusability: Maneuver / land with high dynamic range and fine control
 - 6.3 Hypersonics: Key tech for airbreathing ejector-scramjet vehicles

- 7 FRIENDLY – Consider the impact on people and the environment
 - 7.1 Carbon-Neutral: Methane can be synthesized or captured from organic waste
 - 7.2 Electrical Ignition: Eliminate hazardous / complex hypergolic ignition systems