

HyENA - Hypersonic Experimental Nuclear Aircraft

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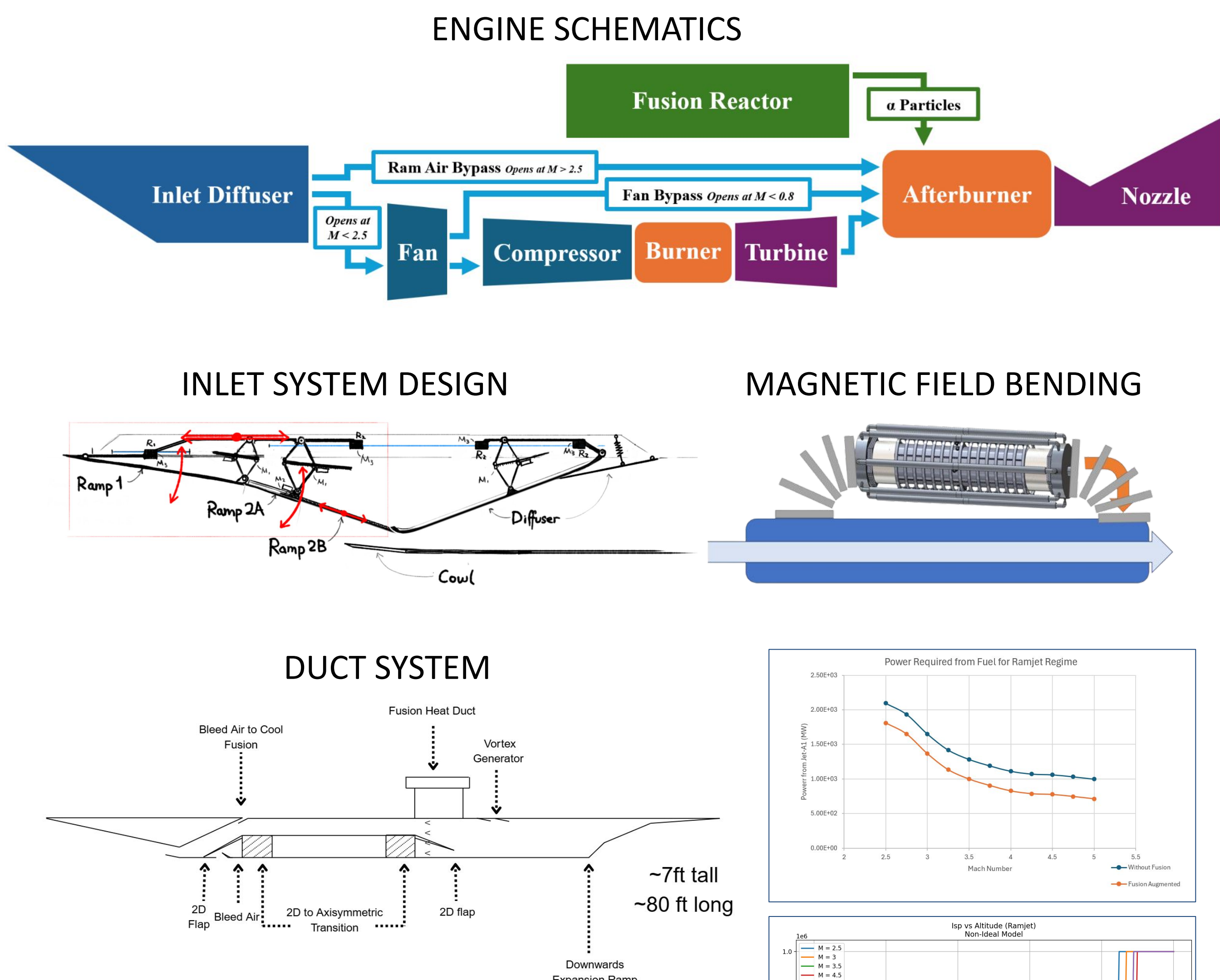
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Mission: Design a high-speed, fusion-powered passenger vehicle that enables climate friendly, affordable, and rapid global travel for the future of commercial aviation.

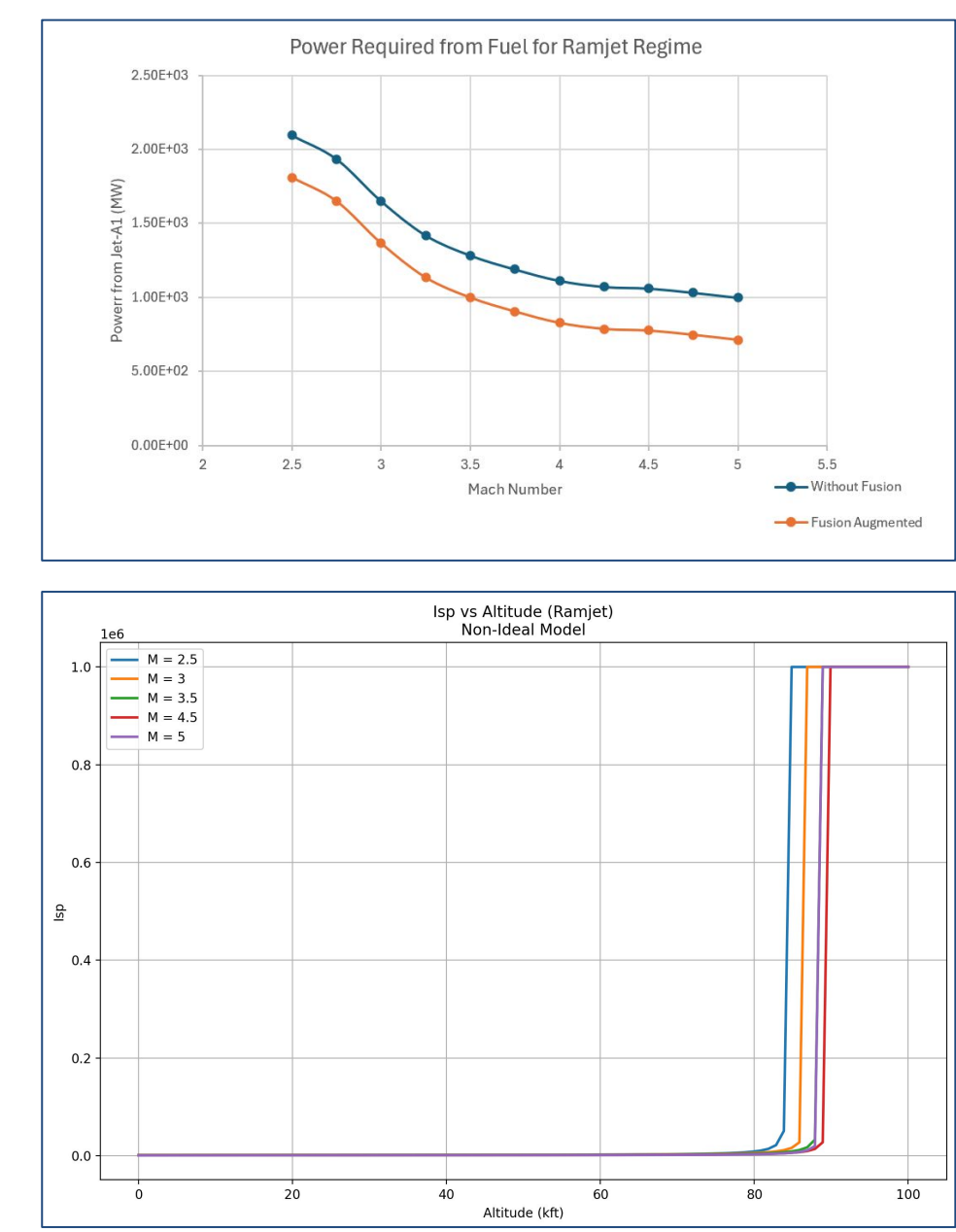
Problem Definition:
Current hypersonic technologies are limited in their range, thermal, altitude, acoustic, and emissions that prevent their adoption to commercial applications.

The introduction of fusion capabilities may provide the incremental improvement necessary to enable economically and technologically viable hypersonic commercial flight?

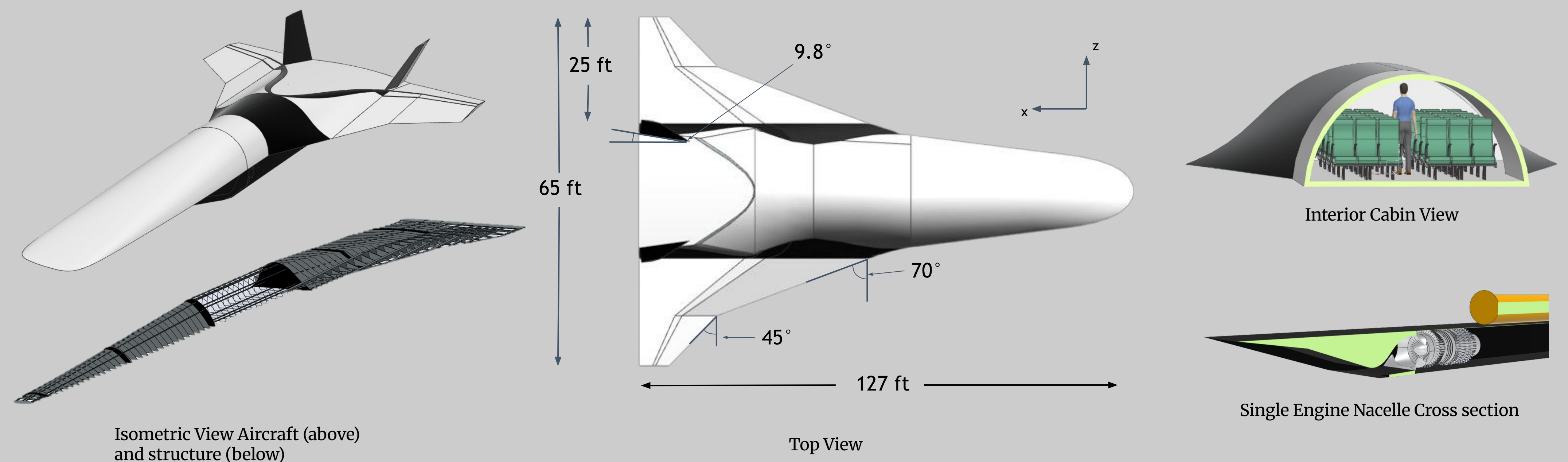
- Fusion Augmented TBCC system:**
- Dual engine TBCC system utilizing compact fusion reactors based on technology from next-gen fusion companies such as *Realta* and *Terr Fusion*.
 - Power density of 10 kW/kg for each reactor
 - Fusion energy replaces combustion at 95,000 ft, leading to unlimited range and increased cruising altitude compared to other TBCC or RBCC cycles
 - Alpha particle byproducts are magnetically guided from the reactor towards the augmentor.



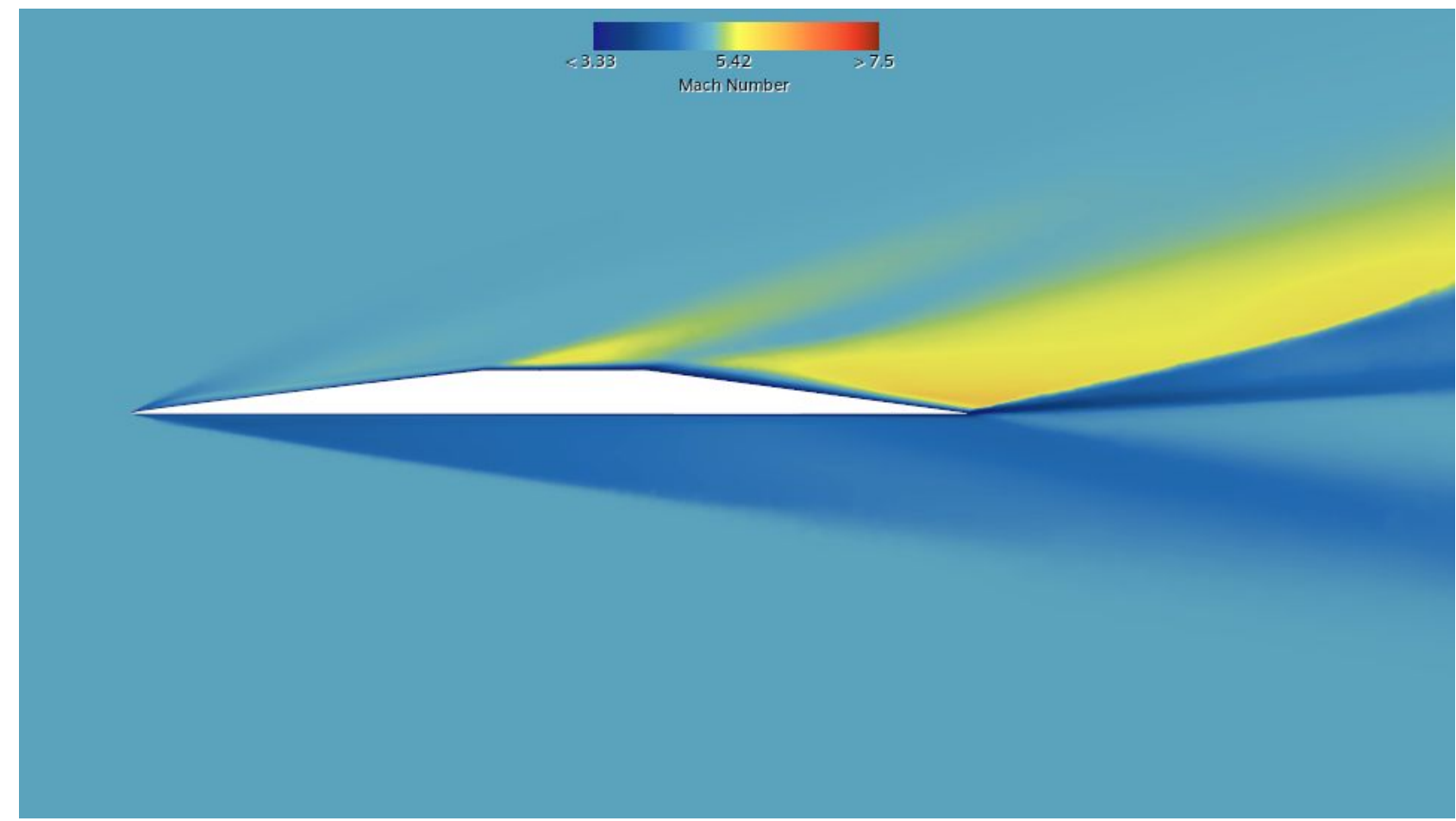
- Estimated 10% decrease in fuel consumption for a ~60000 lbm total fusion reactor mass during Ramjet Acceleration
- Isp goes to 'infinity' during cruise when fusion power replaces fuel.



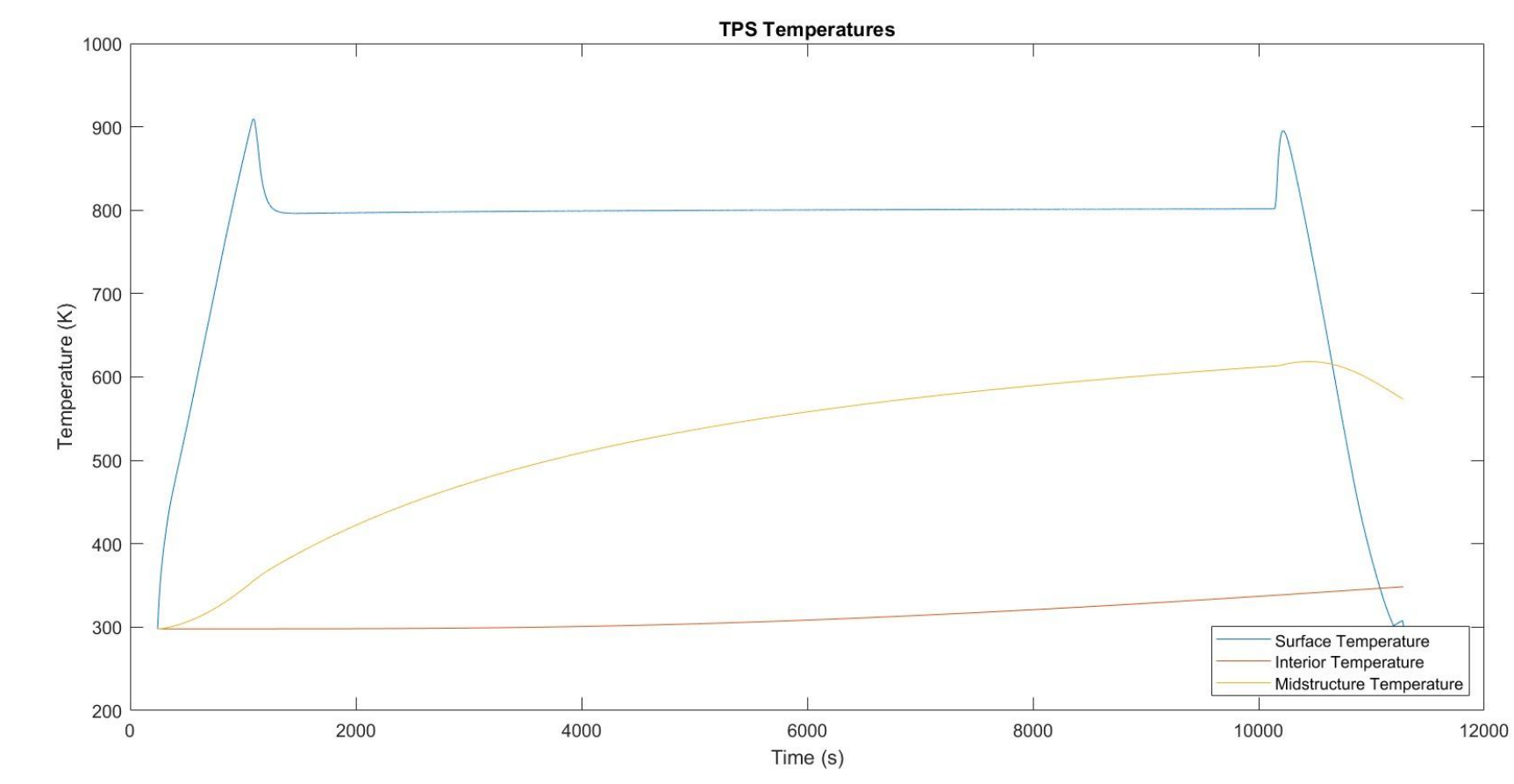
Conceptual Design:



Aerodynamics and Thermals:



Takeoff AoA	9°
Cruise AoA	6°
Cruise Altitude	100,000 ft
Cruise L/D	5.5



Skin, midstructure, and interior temperature over entire flight regime

- Thermal management design uses a cold structure. With a Titanium skin a Min-K insulation

Financial and Market Analysis:

- Flight data from BTS on US domestic and international flights utilized to determine passenger volume for each top 100 routes.
- Value based market capture model developed. Roughly projects 2M addressable passengers by 2070.
- \$2.3B project R&D costs with average \$517M / plane over first 30 years after first deployment. Breakeven projected at year 7.
- Projected ~45B in profit over 55 years with ~16-20% IRR

