Design Exploration of Rocket Based Combined Cycle Engines (RBCC) for Sub-Orbital Vehicles

Contract # 044-RAC-VIII/AU/2021

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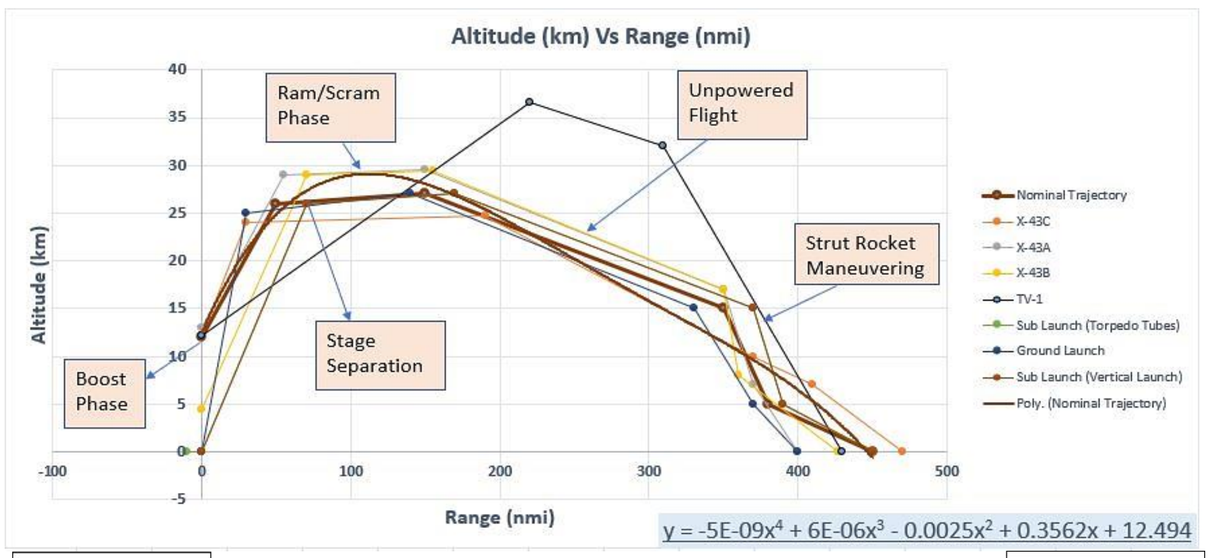
AIM

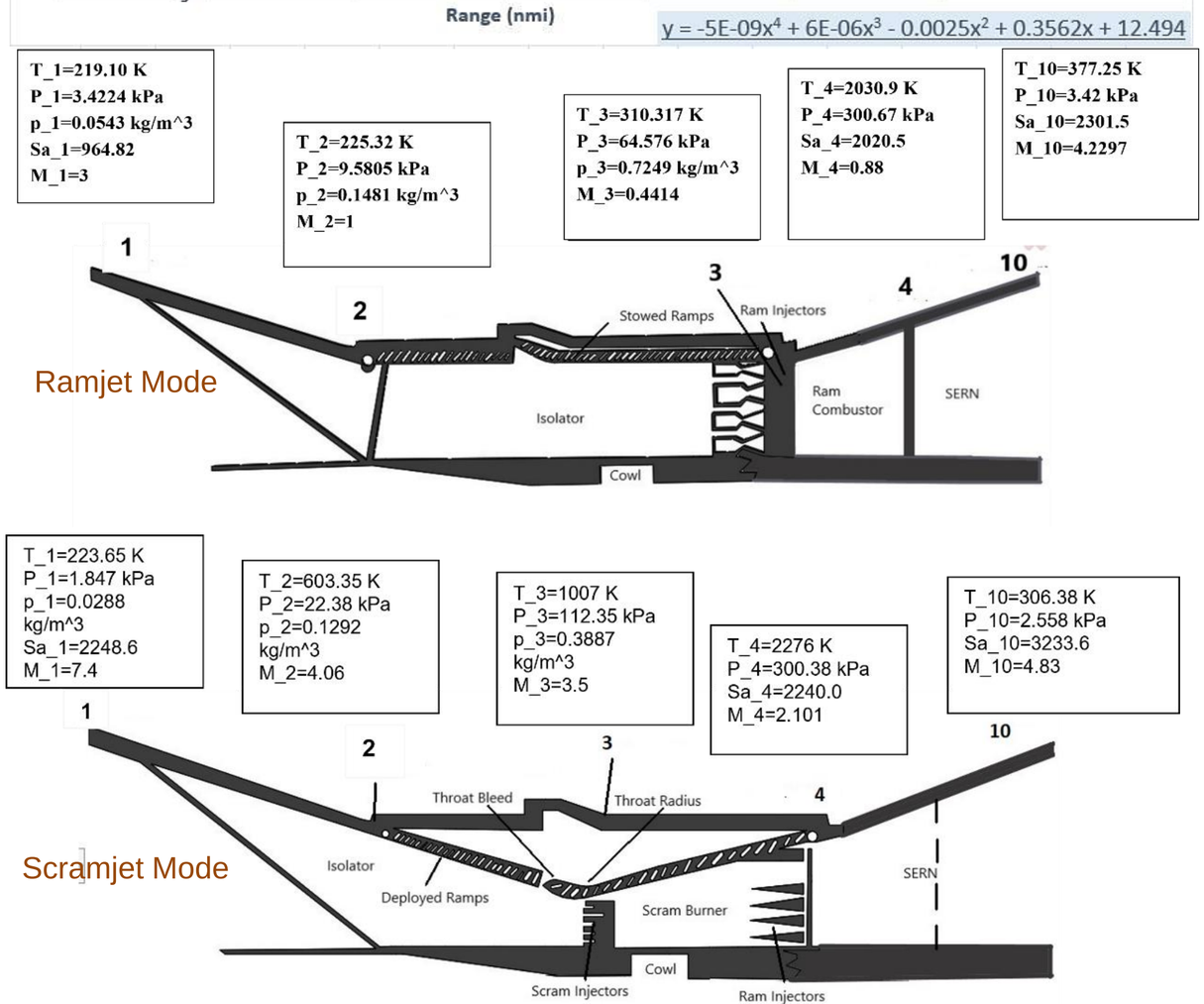
- To explore the most suitable configuration of RBCC engine for Mach 8 Operation in endo-atmospheric regime for Hypersonic Cruise Vehicle
- The design exploration to include the analytical design, performance, and computational analyses

BOTTOM-UP APPROACH

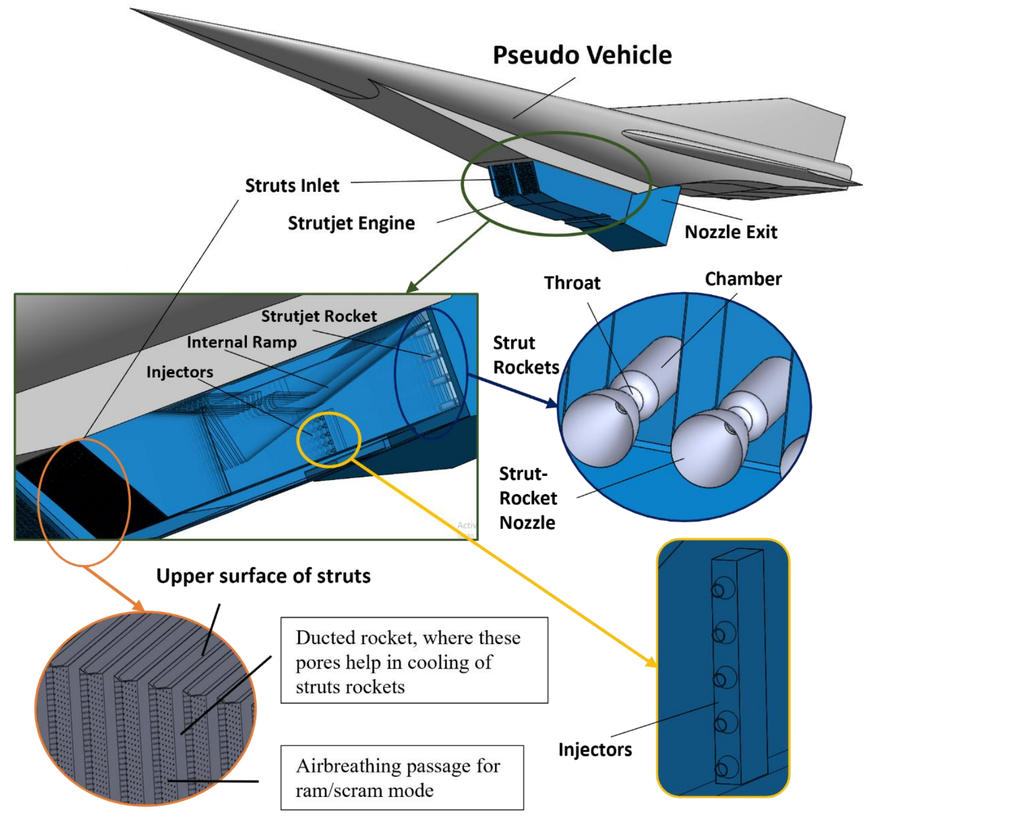
Nominal Mission Profile → Booster Configuration → RBCC Engine Design → SRM Design → CFD Analysis → Unpowered Supersonic Mode → Powered Ramjet and Scramjet → Rocket Mode → Verification of Results

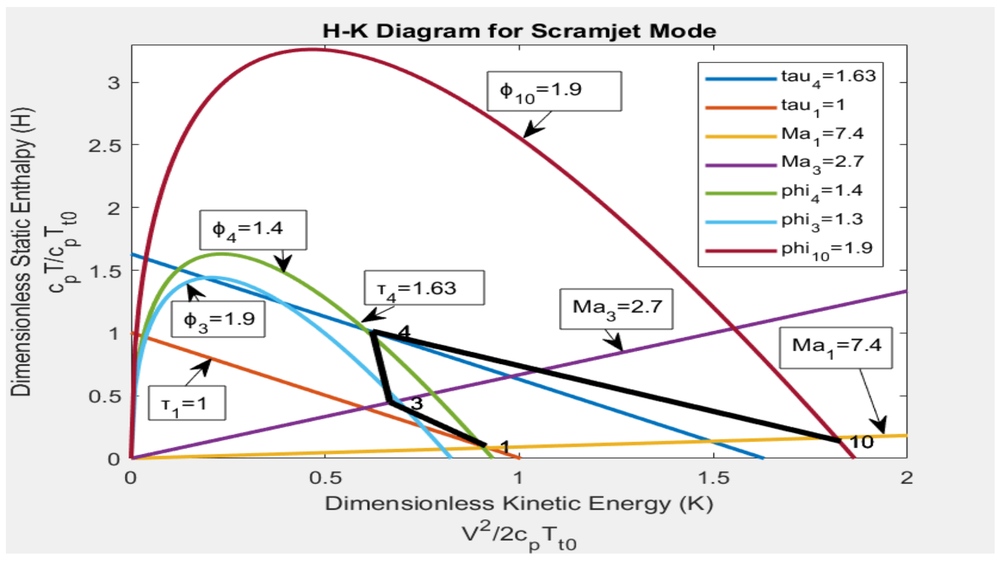
MISSION PROFILE & DESIGN PARAMETERS



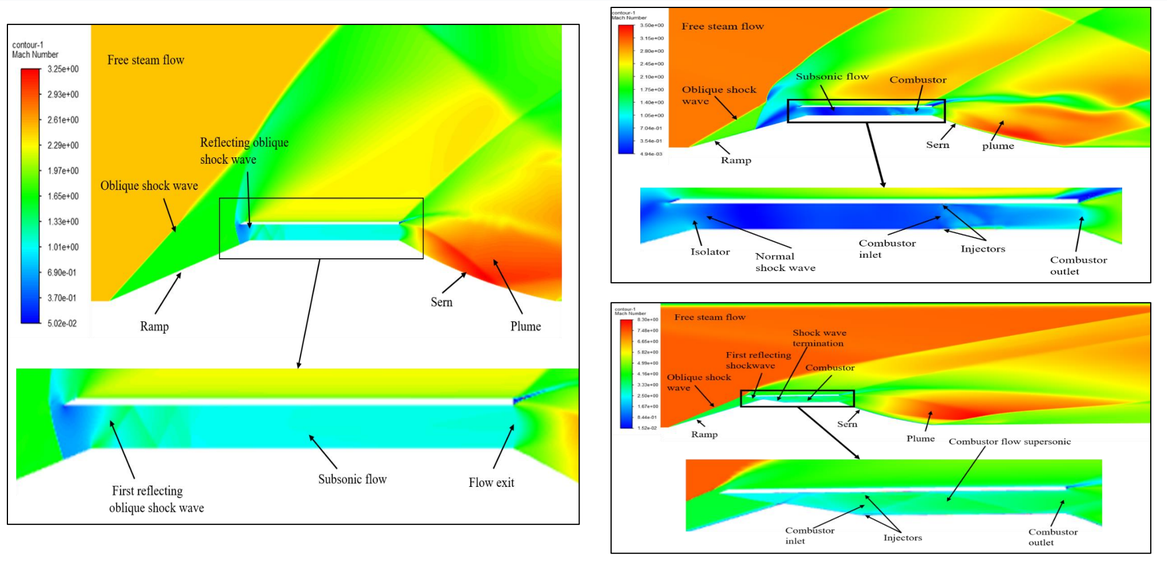


CONCEPTUAL DESIGN & H-K DIAGRAM





CFD Results



CONCLUSION

- Ramjet, Scramjet and Rocket modes in the RBCC engine for the most suitable design configuration were analytically and computationally assessed for Mach 8 regime
- The CFD and analytical results are in good agreement tolerance

FUTURE WORK

A detailed CFD is to be carried out under the next phase RAC-IX. Also, alternative exploration for TBCC engines configurations can be explored