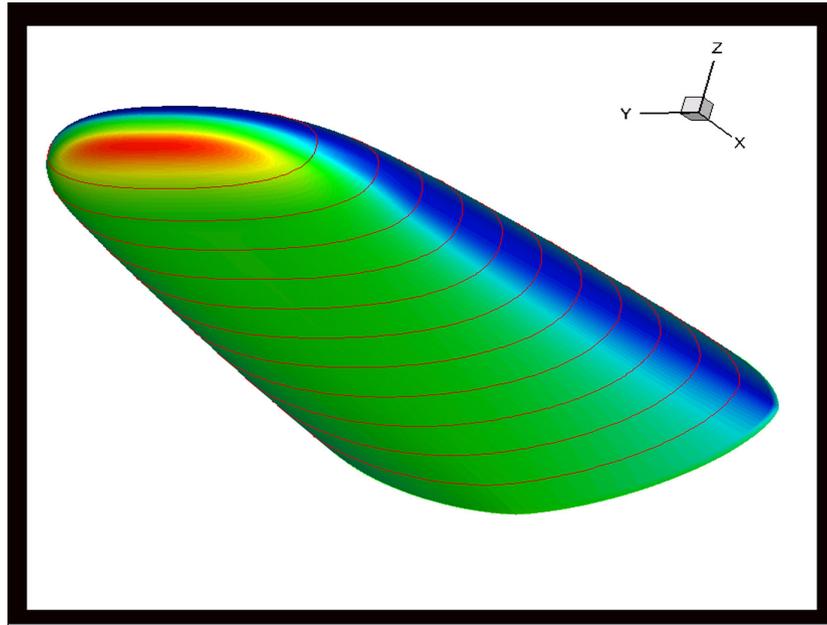




TECHNOLOGY SOLUTION

Aerospace



Co-Optimization of Blunt Body Shapes for Moving Vehicles

Patent Only, No Software Available For License.

NASA has patented a design optimization method for optimal shapes for hypersonic vehicles with mid-range lift/drag ratios that enter or operate in planetary atmospheres, including Earth. The design method provides optimized aerodynamic properties (maximizing maneuverability and stability) and aero-thermodynamic properties. The method provides automatic generation of geometry and analysis grids (meshes) rapidly created from a small set of parameters, which can be interpreted in a straightforward and intuitive manner. The vehicle shapes are known as Co-Optimized Blunt Re-Entry Aero (COBRA) geometries. A key advantage for design work is that this approach uses a parameterization that fully defines the vehicle shape without need for human intervention and is thus suitable for rapid automated optimization methods. The method automatically produces a Pareto optimized subset, from which human judgement can then be used to further explore this optimum set and down select to a particular vehicle concept based on trajectory, thermal protection sizing, structural sizing and final vehicle closure.

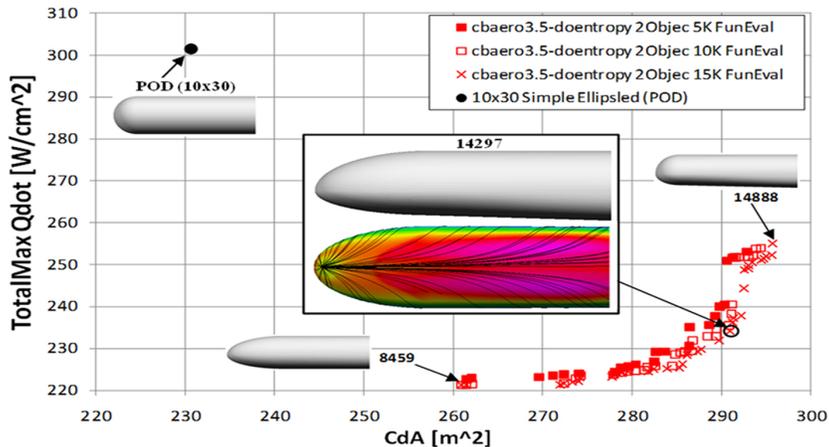
BENEFITS

- Automated optimization routines
- Built-in design configuration management
- Co-optimization for shape, trajectory, thermal protection system (TPS) and vehicle closure
- Rapid re-meshing for iterative shape representation
- Allows geometry and analysis grids (meshes) to be rapidly and automatically created- without human intervention- from a small set of parameters
- It allows for flexible trajectory design



THE TECHNOLOGY

Vehicles designed for purposes of exploration of the planets and other atmospheric bodies in the Solar System favor the use of mid-Lift/ Drag blunt body geometries. Such shapes can be designed so as to yield favorable hypersonic aerothermodynamic properties for low heating and hypersonic aerodynamic properties for maneuverability and stability. The entry trajectory selected influences entry peak heating and integrated heating loads which in turn influences the design of the thermal protection system. A nominal is used to compare each shape considered. The vehicle will be subject to both launch and entry loading along with structural integrity constraints that may further influence shape design. Further, such vehicles must be sized so as to fit on existing or realizable launch vehicles, often within existing launch payload shroud constraints.



Application of the COBRA technology

APPLICATIONS

The technology has several potential applications:

- Aeronautics
- Aerospace
- Computer Software
- Defense Industry
- Transportation

PUBLICATIONS

Patent No: 8,725,470

More Information
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