

Re-entry Vehicle Shape for Enhanced Performance

NASA has patented a new technology for enhanced aerodynamic performance and/or reduced heat transfer requirements for a space vehicle that re-enters an atmosphere. This invention provides an improvement over prior blunt-body shapes. The new convex shell structure has a fore-body, an aft-body, a longitudinal axis and a transverse cross sectional shape, projected on a plane containing the longitudinal axis. It includes: first and second linear segments, smoothly joined at a first end of each of the first and second linear segments to an end of a third linear segment by respective first and second curvilinear segments. It also includes a fourth linear segment, joined to a second end of each of the first and second segments by curvilinear segments, including first and second ellipses having unequal ellipse parameters. The cross-sectional shape is non-symmetric about the longitudinal axis. The fourth linear segment can be replaced by a sum of one or more polynomials, trigonometric functions or other functions satisfying certain constraints.

This patented technology is available for licensing from NASA's space program to benefit U.S. industry.

Technology Details

The new NASA space vehicle shape is actually of a class of geometric shapes that is describable by a relatively small number of geometry-shape parameters, easily generated automatically by computer, and that provides a broad range of geometric-shapes with favorable aerodynamic and aerothermal properties. These properties can then be rapidly and efficiently analyzed by computerized optimization methods for desired performance.

Optimization of the vehicle geometry-shape parameters can, for example, minimize heating levels subject to constraints that reduce aerodynamic performance such as lift / drag, or can minimize weight of a thermal protection system, allowing a greater payload. Other properties can be optimized or established as constraints on a geometric parameter search, such as a requirement that a minimum lift/drag be met or exceeded, while minimizing center of gravity offset from vehicle centerline, to ease packing of a working vehicle while in space operations.

Commercial Applications

- Aerospace Technology
- Spaceflight
- Systems Engineering
- Thermal Protection Systems

Patent

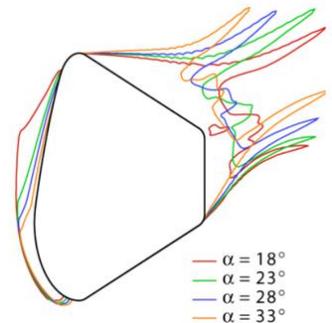
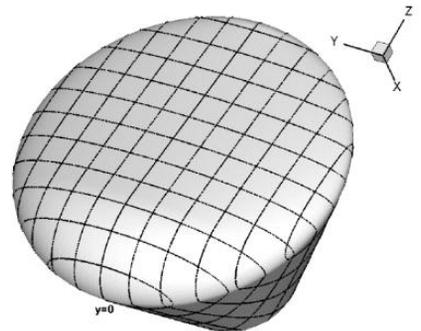
This technology has been patented.

U.S. Patent No. 7,431,242

(Reference No. ARC-15606-1)

Benefits

- Improves blunt body shapes
- Enhances aerodynamic and aerothermal performance
- Minimizes heating levels
- Allows a greater payload in same volume
- Simplifies design performance optimization



Enhanced Performance ReEntry
Blunt Body (Capsule)