Aerospace, new shuttle service

Engineering

Aerospace, New Shuttle Service Space shuttle system has been one of NASA's most versatile mode of space transportation. The mathematics formulas applicable to the operation of the aerospace are mainly two-dimensional aerodynamics formulas, which depicts that atmosphere is equivalent to the prevailing weight of the air column at the top. Mathematic formulas aids in derivation of the total drag force of the aerospace.

The air density value at maximum q utilizes the simple exponential atmosphere model for the dependence of ρ on altitude h. The peak drag force on the shuttle is estimated as;

D= (1/2 ρv2) CdA

Where D= Drag force on the shuttle

ρ= air density (kg/m3)

V= the speed of the airplane relative to the air (m/s)

A= Aspect ratio

Cd= Drag coefficient

Computation of drag loss entails approximation of the Shuttle's mass at maximum time q. Shuttle mass is a function of time and normally derived from the propellant mass versus time relationship of the equation expressed as: m (t) = mi [1- (Me. 1st/Mi)t]

Where the first stage of the flight the average mass flow rate is (Me. 1st/Mi)

The shuttle's mass at qmax decreases by 31% of its takeoff mass due to the consumption of the significant portion of the SRB and corresponding SSME propellants (Alber, 2012).

Induced drag use a coefficient CD = C2L/∏Ae. The relationship amidst the length and the corresponding width of the wing gives the aspect ratio, A. Multiplying the ratio A(wing span/wing width) on both sides of the fractions by the corresponding wing span; $A= b2/S$.

Total drag force= $(1/2\ \rho v2)\ Cd\ S$

Where S= the wing surface (m2)

Reference

Alber, I. E. (2012). Aerospace engineering on the back of an envelope. Berlin: Springer.