Bell Nozzle Rocket Engine Calculations

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Nomenclature

C_f	Vacuum thrust coefficient
$\dot{m}$	Mass flow rate
M	Molar mass
Ma	Mach number
$mol\%$	Mole percentage
P	Pressure
R	Gas constant
T	Temperature
v	Velocity
ϵ	Nozzle area ratio
γ	Ratio of specific heats
ρ	Density

Subscripts

$_a$	Ambient
$_c$	Chamber
$_e$	Exit
$_s$	Stagnation
$_t$	Throat

Introduction

Documentation of calculations for a bell nozzle rocket engine

1 Propellant

1.1 Propellant Stoichiometry

2 Exhaust Gasses

2.1 Ratio of Specific Heats of a Multi-Compound Gas

$\frac{1}{\gamma-1} = \sum \frac{mol\%}{\gamma_i - 1}$

2.2 Stagnation Pressure

2.3 Stagnation Temperature

3 Combustion Chamber Geometry

4 Throat Geometry

5 Nozzle Geometry