

Spike Injector Geometry 2

Injector port Area, cm<sup>2</sup>  
105.594

Total Throat Flow Area  
1267.13

Port Spacing on Spike, deg.  
30

Gap between Ports, cm  
29.47

collected port diameters  
139.141

Cowl Geometry

Cowl Lip Mach Number  
1

Geometric Aerospike  
15.2503

actual Cowl Height  
2.4651

Gas Properties

Gamma  
1.222

MWght, kg/kg-mol  
21.28

# of points along spike  
1500

% truncation  
77.1683

Operating Conditions

PO, kPa  
5161.41

TO, K  
3455

Pa, kPa  
101.325

# of points along spike  
1500

Draw Spike Mach Lines? to Cowl Lip  
no

thin factor for mach lines  
100

Draw Spike Mach Lines? to Expansion Line?  
no

Spike Injector Geometry

Injector port diameter  
11.5951

Radius of Cowl Upper Lip from CL, cm  
78.4285

Number of Ports  
12

Port CL, Exit Angle, deg  
12.275

Cowl Exit Velocity, m/sec  
1218.52

Cowl Thrust design  
172.156

Cowl Thrust Off-design  
170.362

Cowl Exit Properties

Cowl Lip Exit Angle, deg  
12.275

Effective Cowl Gap Height, cm  
2.58041

Effective Cowl Exit Throat Area, cm<sup>2</sup>  
1267.127

Cowl Exit Prandtl Meyer Function, angle deg.  
0

Cowl Exit Mach Angle, deg.  
90

Cowl Lower Exit radius from CL, cm  
77.8798

Effective Aerodynamic Expansion ratio, A/A\*  
15.2503

Aerodynamic A\*, cm<sup>2</sup>  
1267.13

Integrated Spike Cross section area, cm<sup>2</sup>  
19054.6

Total Spike Cross section area, cm<sup>2</sup>  
19054.6

Rg, J/kg-K  
390.71

Operating Altitude, km  
0

Design (Optimal) Spike Exit Properties

Spike Exit Mach number  
3.65231

Spike Exit Prandtl Meyer Function, angle deg.  
77.725

Spike Exit Mach Angle, deg.  
15.8905

Isentropic Spike Length, cm  
276.625

Design Exit Pressure, kPa  
34.743

Design Exit Velocity  
2978.33

m-dot, ve (kNt)  
1094.39

Spike Exit Properties at Ambient Conditions

Spike Exit Radius Coordinate, cm  
10.7388

Ambient Spike Exit Flow Area, cm<sup>2</sup>  
362.295

Ambient expansion ratio  
6.86886

Ambient exit Mach number  
3.06433

Ambient Exit Prandtl Meyer Function  
63.4281

Expansion flow angle, deg  
14.2969

Design Altitude, km  
8.16813

Design Thrust/Force Data

Design Pressure Thrust (Spike), kNt  
922.223

Massflow, kg/sec  
367.45

Throat Exit (kPa) Momentum Thrust  
809.746

Design Isp, sec  
303.701

Cowl Thrust Axial Direction kNt  
172.156

Design Base Area Thrust, kNt  
0

Design Total Thrust, kNt  
1094.38

Expanded (non Ideal) Operating Exit Flow Properties

Flow Area, cm <sup>2</sup>	Temperature, K	Thrust, kNt
362.295	1691.72	965.72
Mach number	Pressure, kPa	Isp, Sec
3.06433	101.325	109925
massflow, kg/sec	Velocity, m/sec	m-dot, ve (kNt)
0.895846	2754.01	2.46717
Cowl Thrust, kNt	Off-Design Pressure Thrust (Spike), kNt	
170.362	795.358	

Truncated Thrust terms

Base Pressure, kPa  
19.9261

Base Drag, kNt  
-37.9658

RampThrust, kNt  
808.459

TotalThrust, kNt  
942.649

Isp, sec  
261.595

Data at Truncation

R value at truncation, cm  
38.5312

Theta at truncation, deg  
14.2576

Mach Number at Truncation  
3.06432

Spike Surface Pressure at Truncation, kPa  
101.325

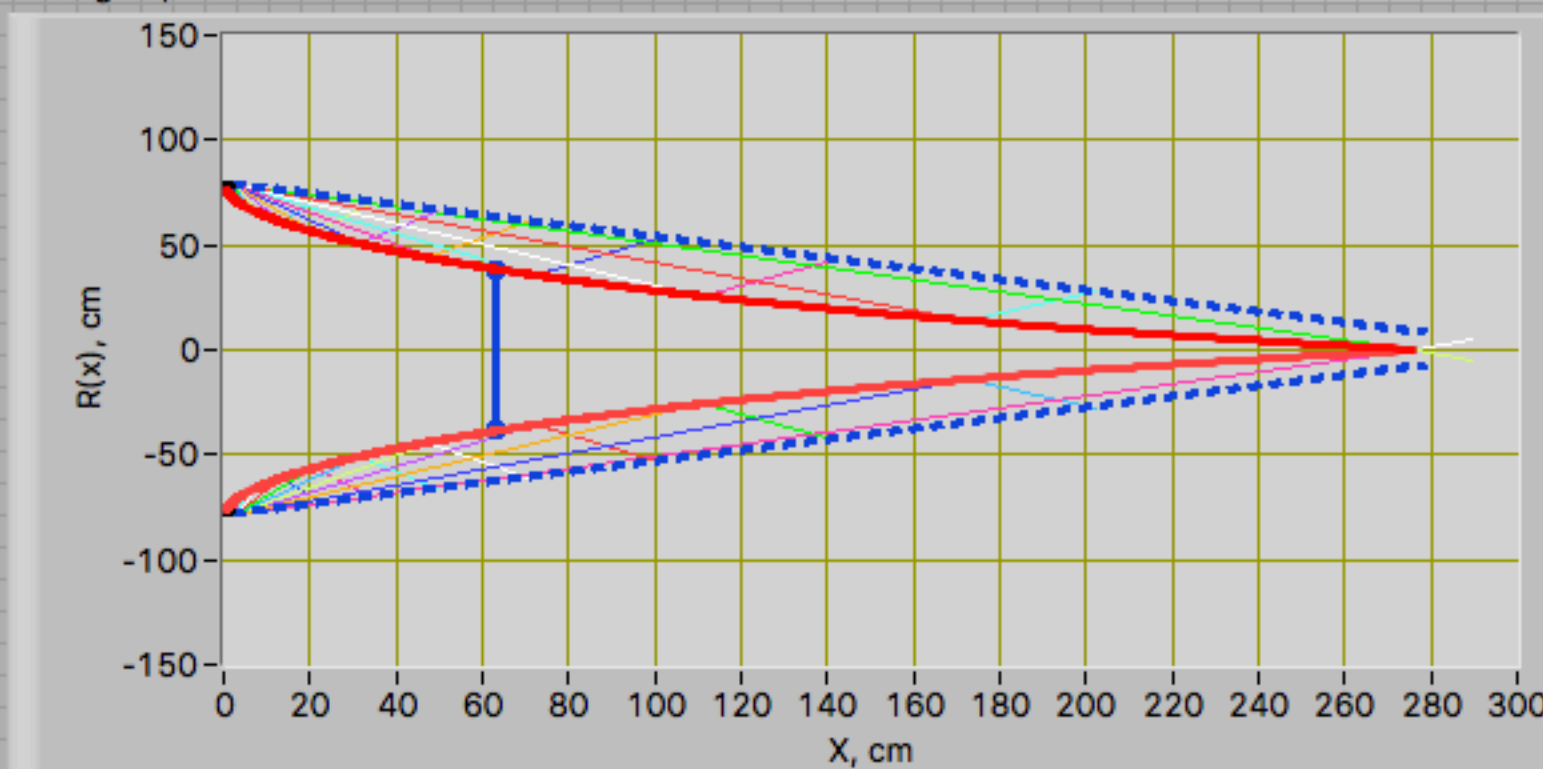
Spike Surface Temperature at Truncation, deg. K  
1691.72

Spike Surface Velocity at Truncation, deg. K  
2754

Spike Truncated base area cm<sup>2</sup>  
4664.17

Spike Truncated Length cm  
63.16

Design Spike Contour



Select Method

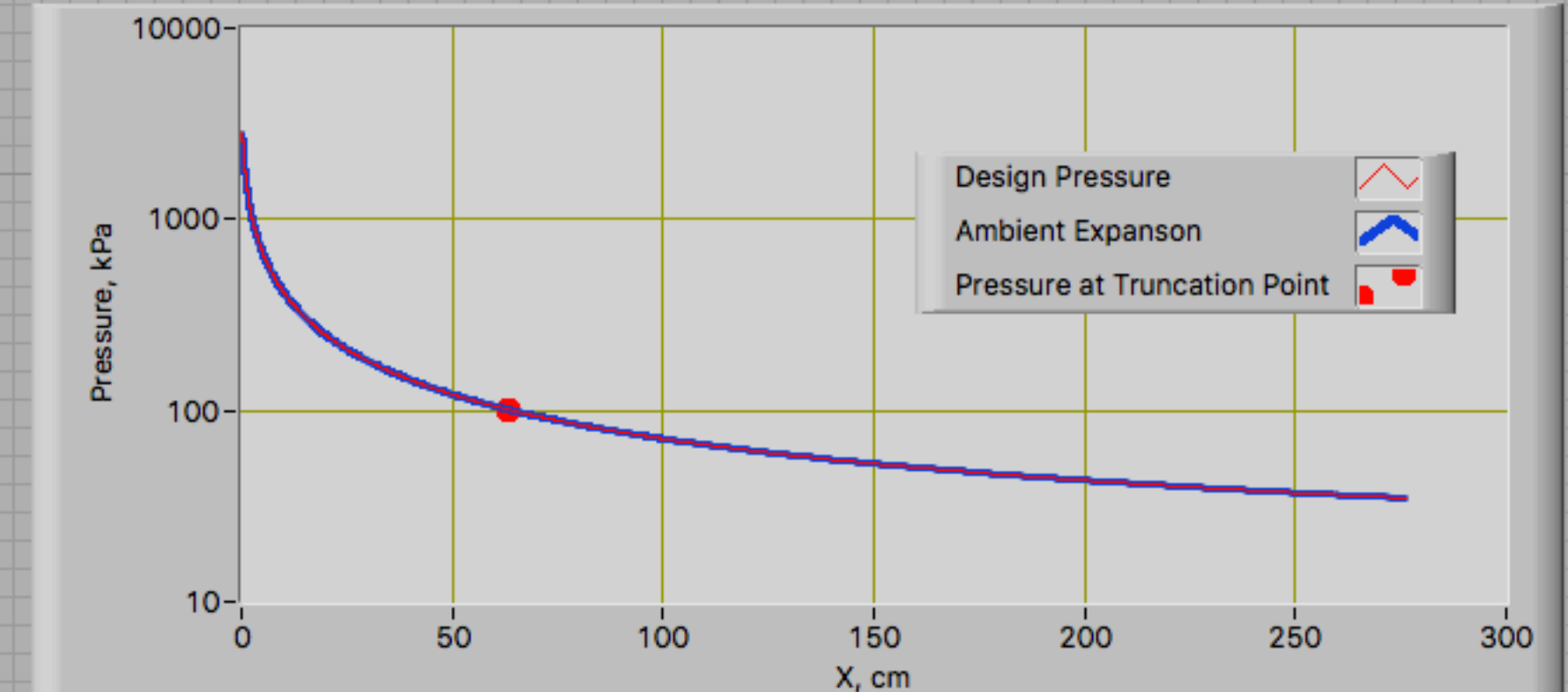
- 5 - Rocketdyne
- 4 - Fick
- 3 - Cylindrical
- 2 - Conical
- 1 - Mean
- 0 - Prandtl-Meyer

write spike coordinate file output?  
no

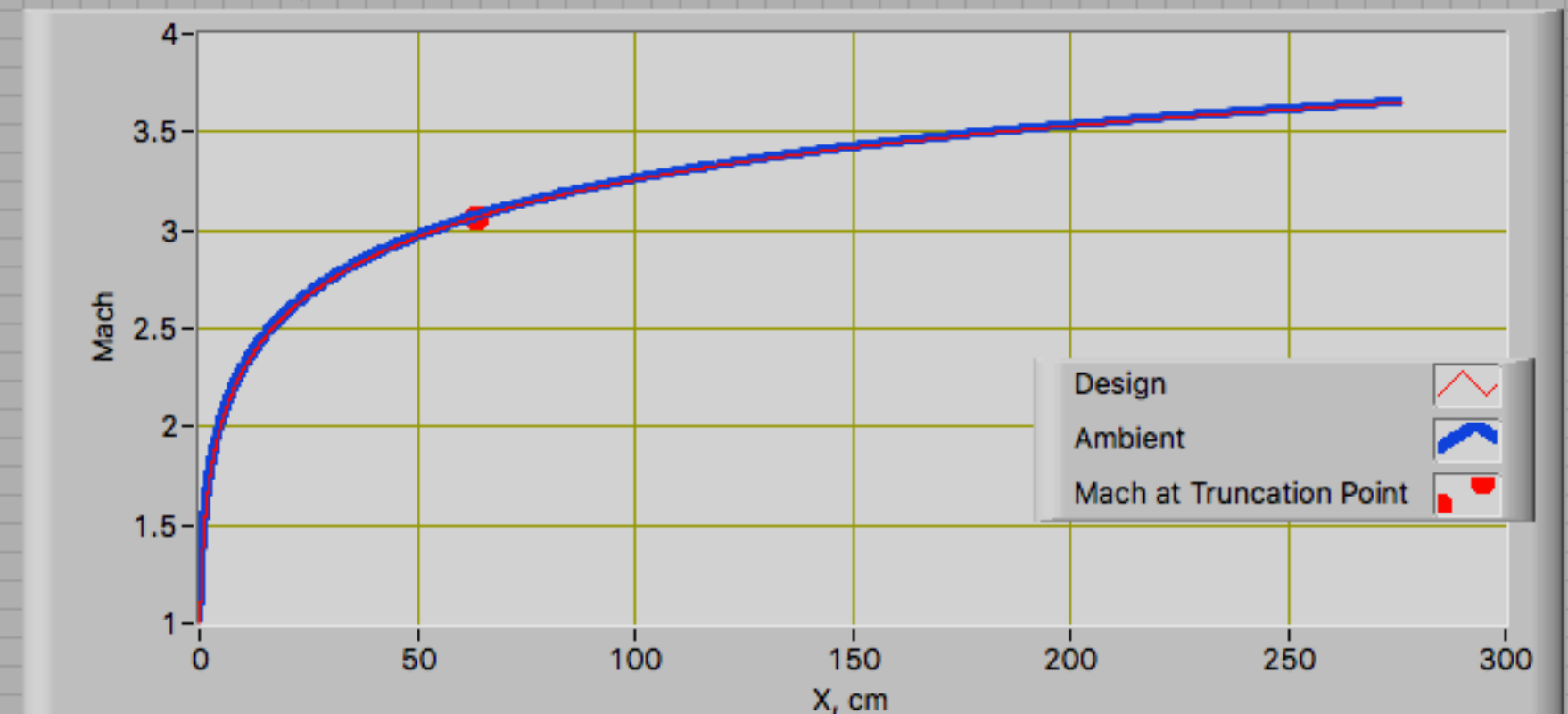
Write file path

/C:/ Documents and Settings/ MechEng/

Spike Pressure



Mach Number on Spike



Accumulated Thrust on Spike 2

