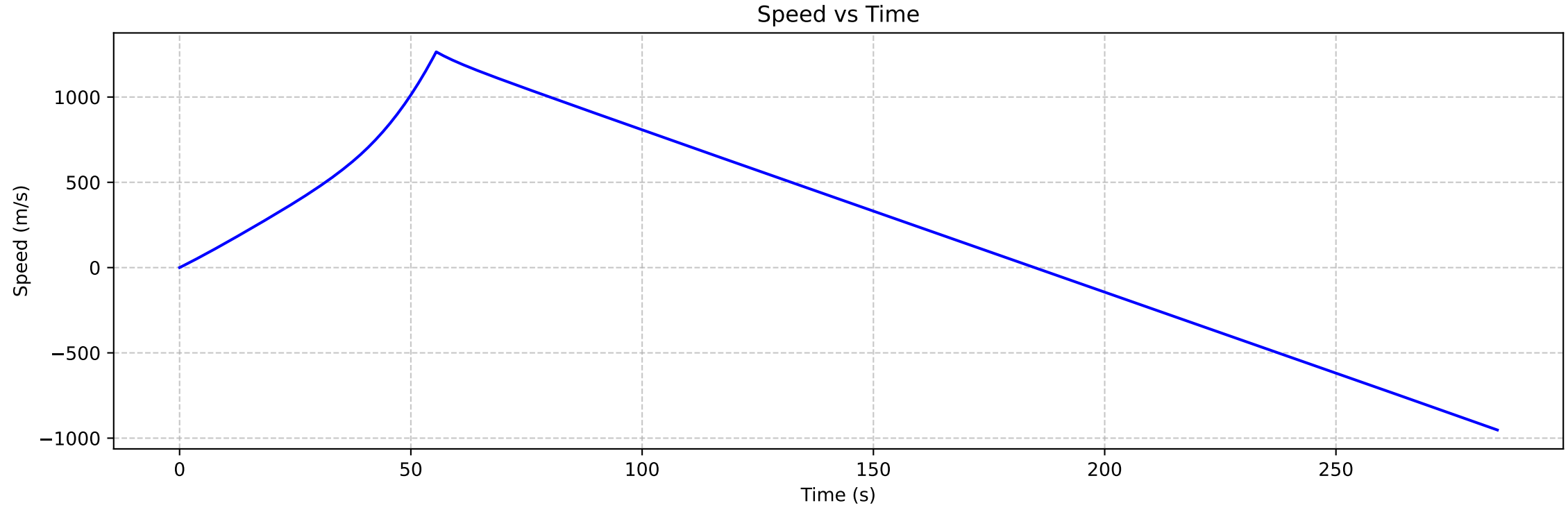
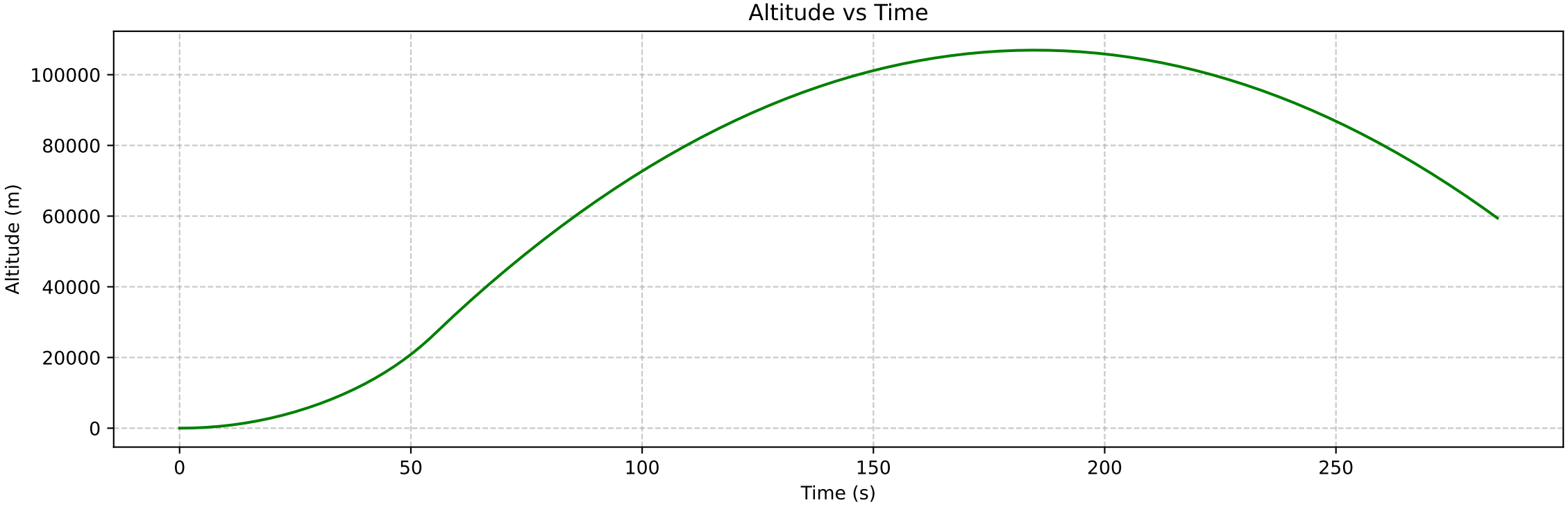
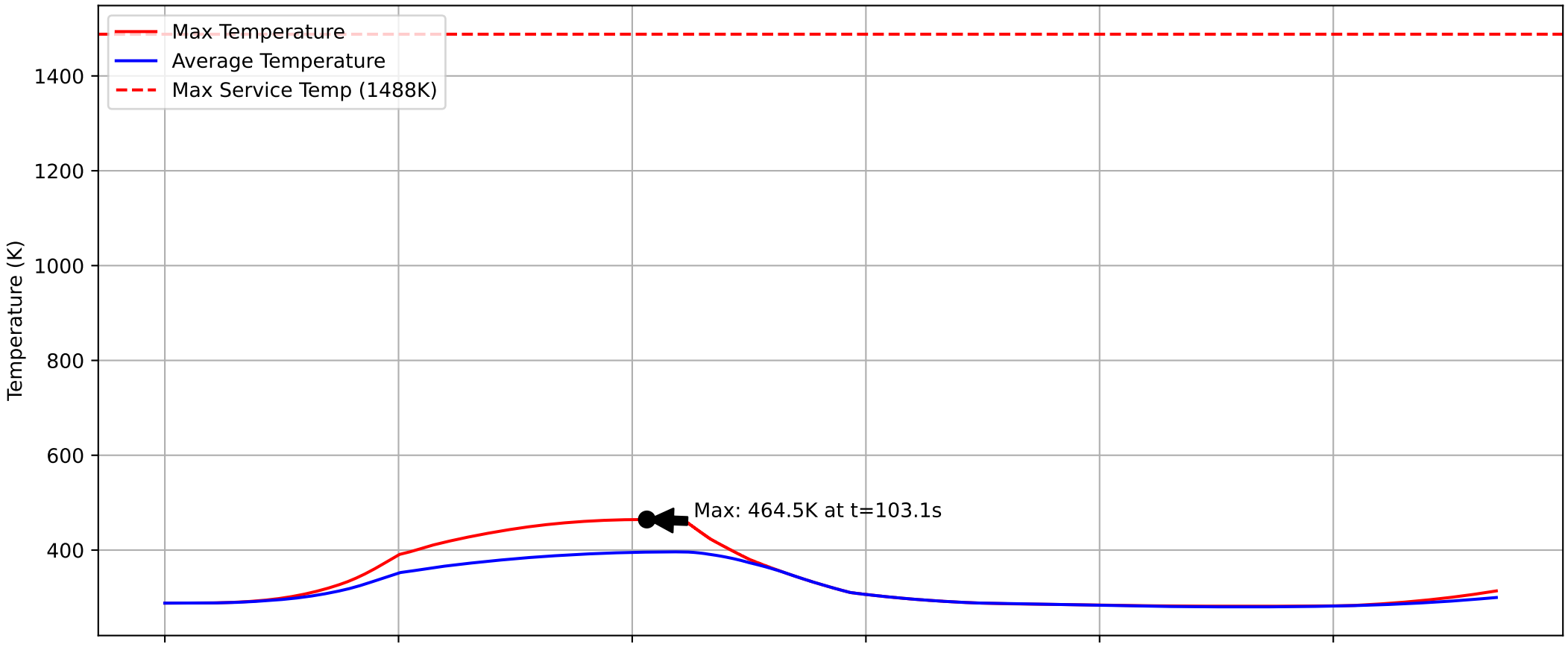
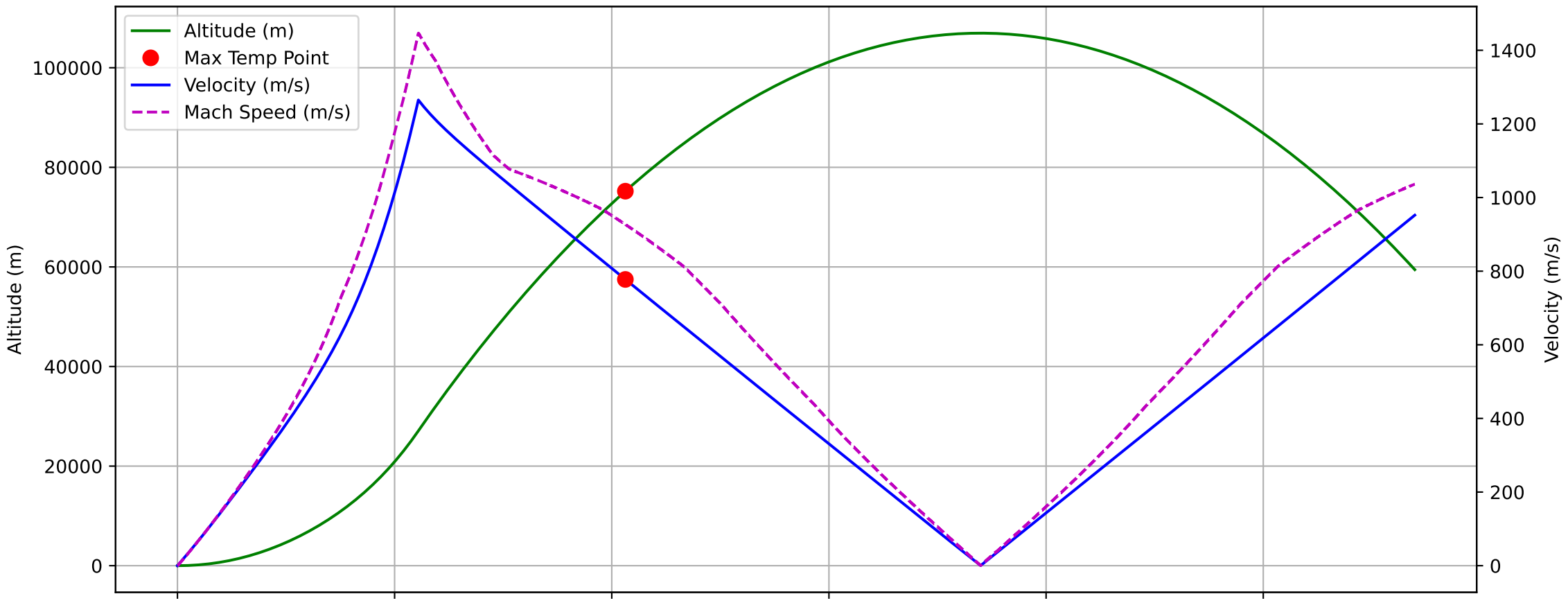

Speed vs Time
Speed (m/s)
1000
500
0
−500
−1000
0
50
100
150
200
250
Time (s)

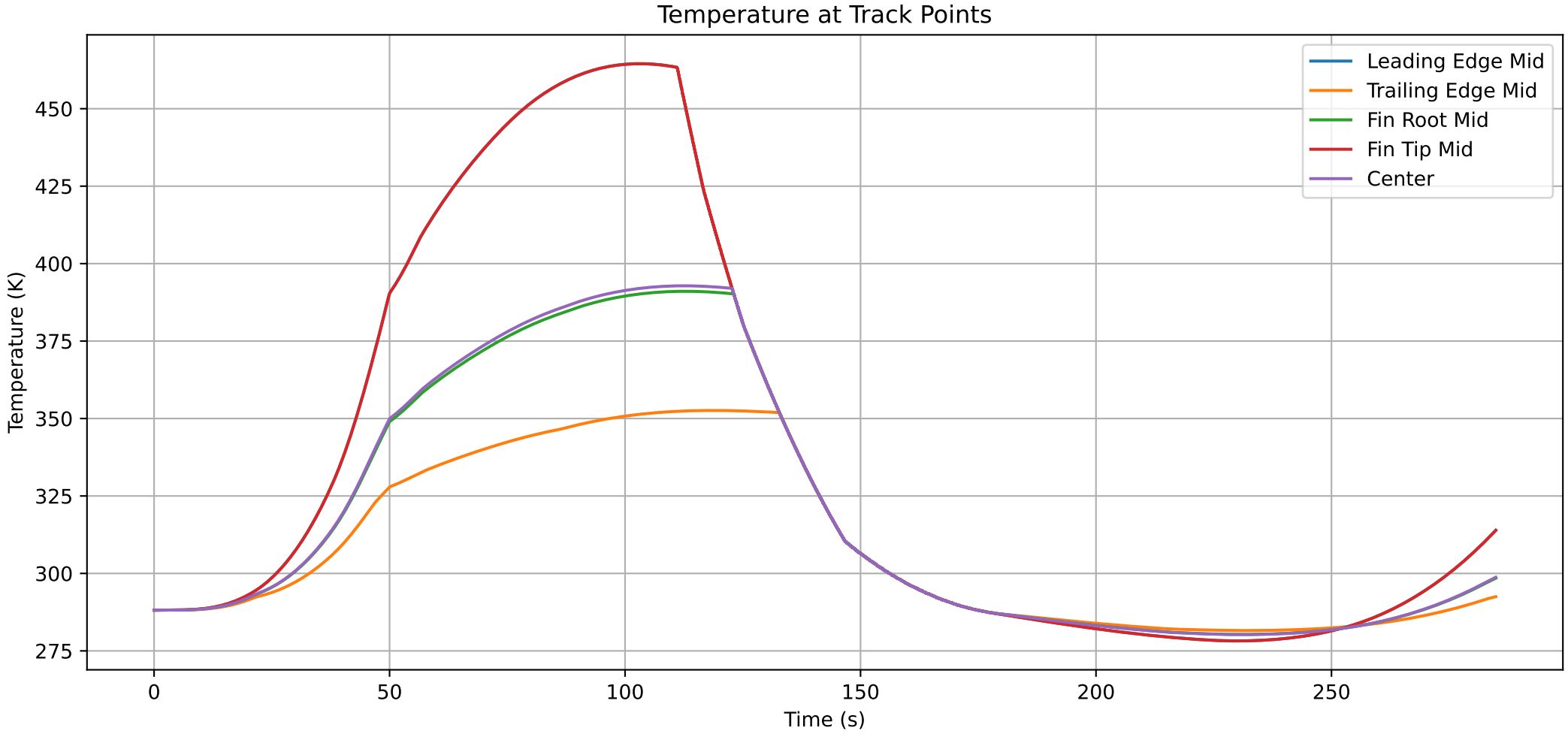

Altitude vs Time
Altitude (m)
100000
80000
60000
40000
20000
0
0
50
100
150
200
250
Time (s)

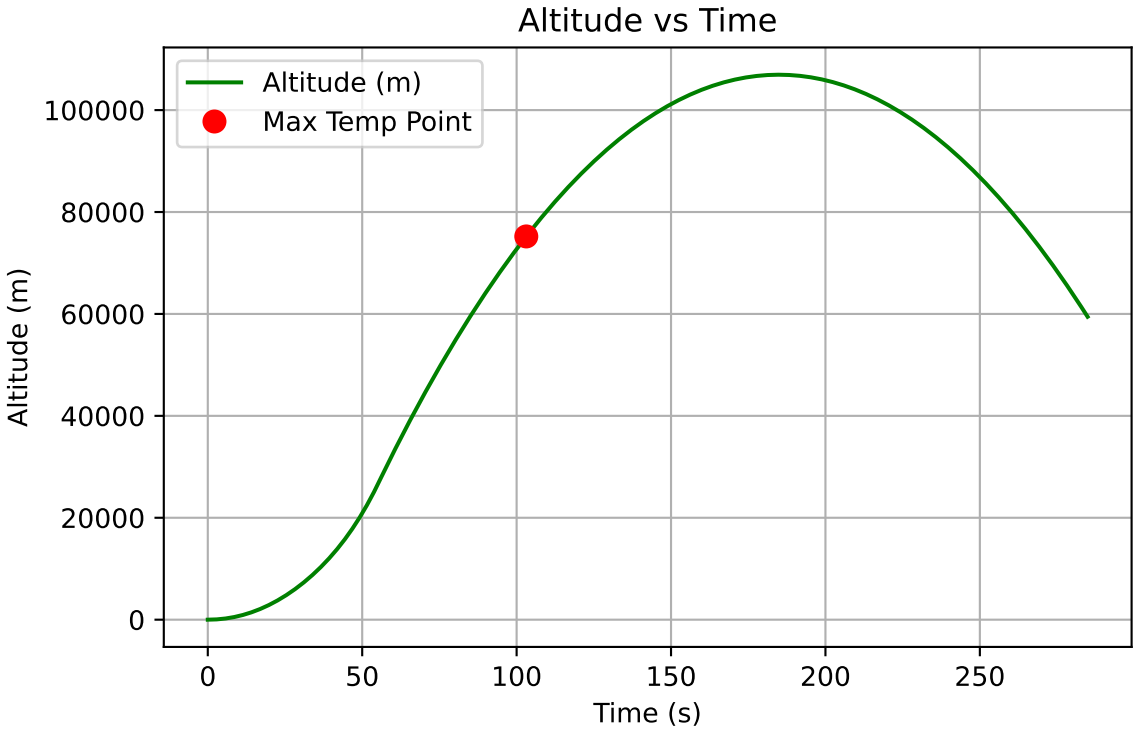
Fin Temperature History - Alumina

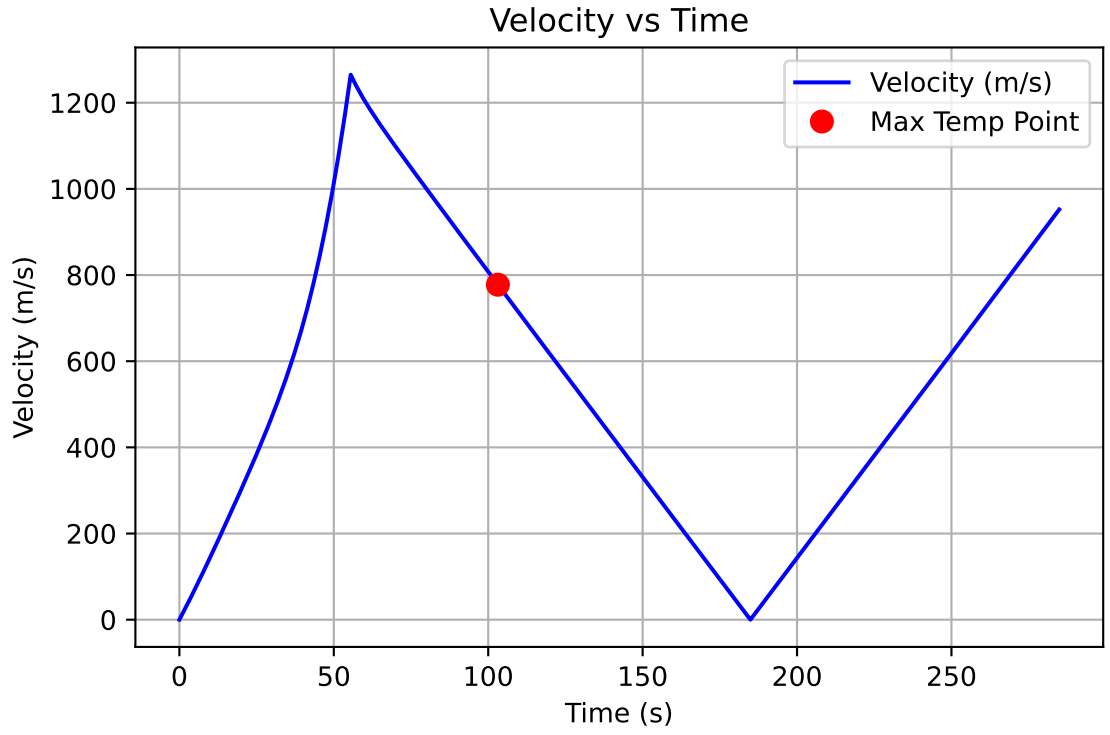


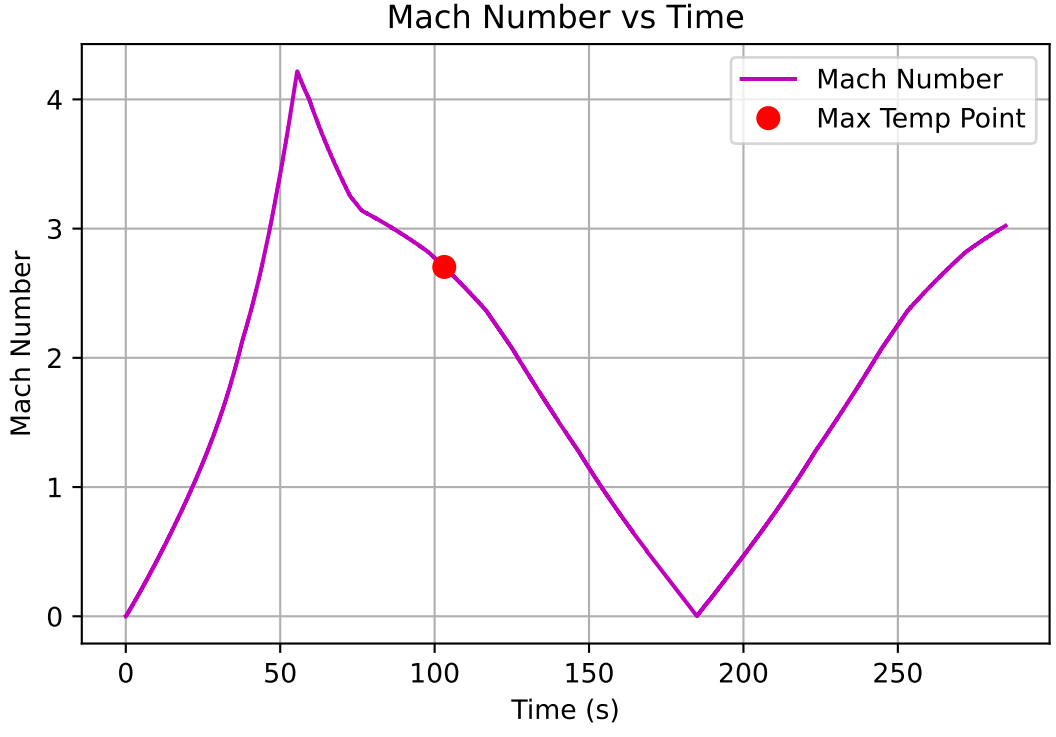


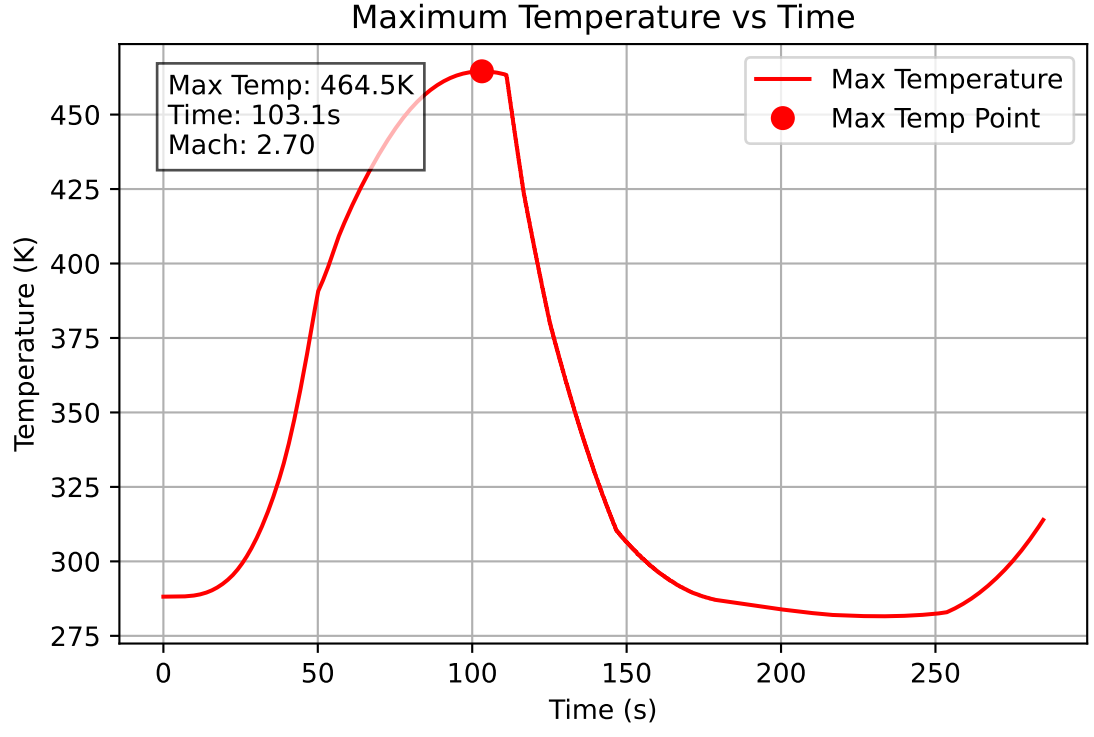
Temperature at Track Points



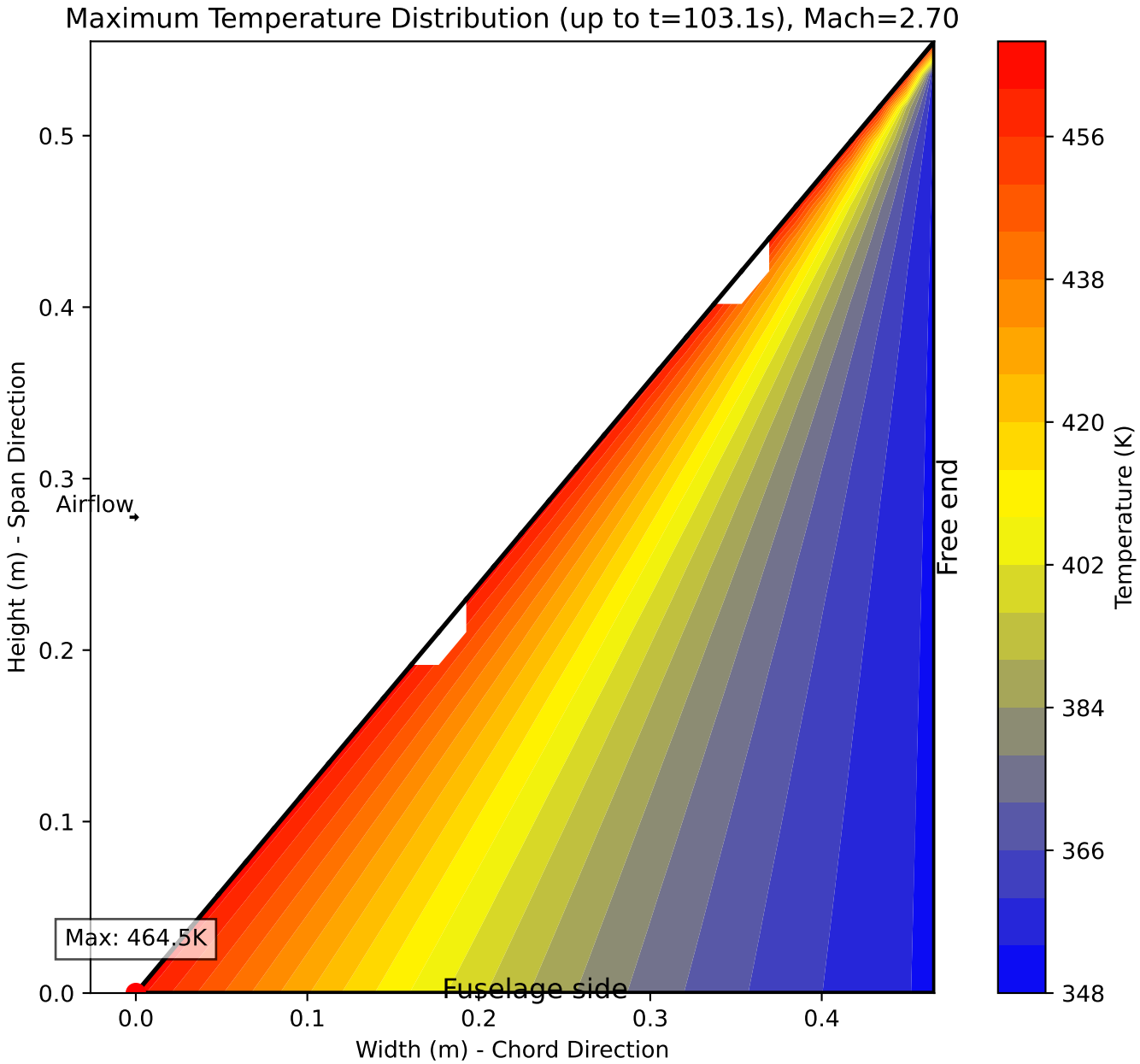

Altitude vs Time
Altitude (m)
Max Temp Point
Altitude (m)
Time (s)
0
20000
40000
60000
80000
100000
0
50
100
150
200
250


Velocity vs Time
Velocity (m/s)
Max Temp Point
Velocity (m/s)
Time (s)
0
200
400
600
800
1000
1200
0
50
100
150
200
250


Mach Number vs Time
Mach Number
Max Temp Point
Mach Number
Time (s)
0
1
2
3
4
0
50
100
150
200
250


Maximum Temperature vs Time
Max Temp: 464.5K
Time: 103.1s
Mach: 2.70
Max Temperature
Max Temp Point
Temperature (K)
Time (s)
275
300
325
350
375
400
425
450
0
50
100
150
200
250

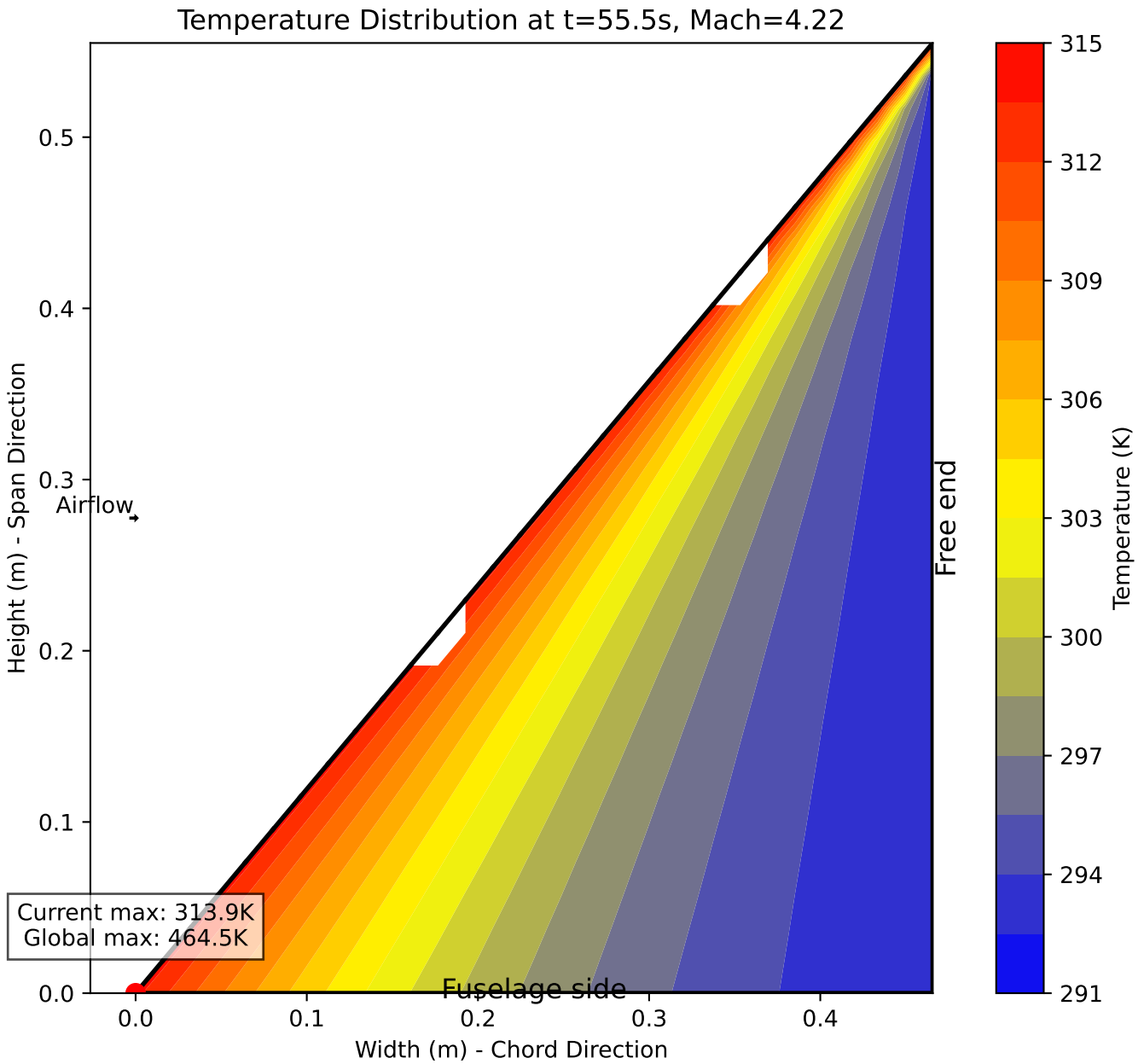
Temperature Distribution at Maximum Temperature



Flight Conditions:
Time: 103.1 s
Velocity: 777.6 m/s
Altitude: 75208.3 m
Mach: 2.70

Material: Alumina
Max Service Temp: 1488 K
Peak Fin Temp: 464.5 K
Safety Margin: 1023.5 K

Temperature Distribution at Maximum Velocity



Flight Conditions:
Time: 55.5 s
Velocity: 1265.0 m/s
Altitude: 27079.4 m
Mach: 4.22

Material: Alumina
Max Service Temp: 1488 K
Peak Fin Temp: 464.5 K
Safety Margin: 1023.5 K

INITIAL CONDITIONS AND PARAMETERS
FLIGHT SIMULATION

Generated: 2025-11-13 00:36:13

```
======================================================================
SIMULATION PARAMETERS
======================================================================
Fin Material:               Alumina
Fast Mode:                  False
Time Step (dt):             0.01 s
After Top Reached:          10000 cycles
Animation Enabled:          False

======================================================================
COMPONENT MASSES AND POSITIONS
======================================================================
Component                 Mass (kg)    Position (m)    Team
----------------------------------------------------------------------
nose cone                 10.230       0.450           aero
fuselage_oxi              55.330       4.500           fuselage
propellant                244.080      3.000           fuselage
helium_tank               43.500       1.400           fuselage
fuselage_shell            60.250       4.000           fuselage
combustion_chamber        12.830       5.500           fuselage
nozzle                    7.993        7.349           nozzle
fins (calculated)         7.754        2.100           aero
----------------------------------------------------------------------
Total Dry Mass            197.887
Total Propellant          244.080
Total Mass                441.967
Mass Ratio                2.233

======================================================================
ROCKET GEOMETRY
======================================================================
Rocket Length:              2.5 m
Rocket Diameter:            0.5 m
Rocket Radius:              0.175 m
Nose Cone Length:           0.3 m
Nose Cone Shape:            ogive

======================================================================
ENGINE PARAMETERS
======================================================================
ISP Sea Level:              235 s
ISP Vacuum:                 300 s
Fuel Flow Rate:             4.4 kg/s

======================================================================
INITIAL CONDITIONS
======================================================================
Initial Velocity:           0 m/s
Initial Altitude:           0 m
Initial Dynamic Pressure:   0 Pa

======================================================================
AERODYNAMIC PARAMETERS
======================================================================
Drag Coefficient:           0.5
Max Dynamic Pressure:       82800.0 Pa
```

INITIAL CONDITIONS (CONTINUED) - PAGE 2
FLIGHT SIMULATION

Fin Width:	465.70 mm
Fin Mass (single):	1.938490 kg
Total Fin Mass:	7.753962 kg
Wall Thickness:	4 mm
Fin Set CG Position:	2.1 m

MATERIAL PROPERTIES

Thermal Conductivity:	33 W/(m·K)
Density:	3750 kg/m³
Specific Heat:	690 J/(kg·K)
Max Service Temperature:	1488 K
Yield Strength:	270 MPa
Thermal Expansion:	6e-06 1/K
Emissivity:	0.2