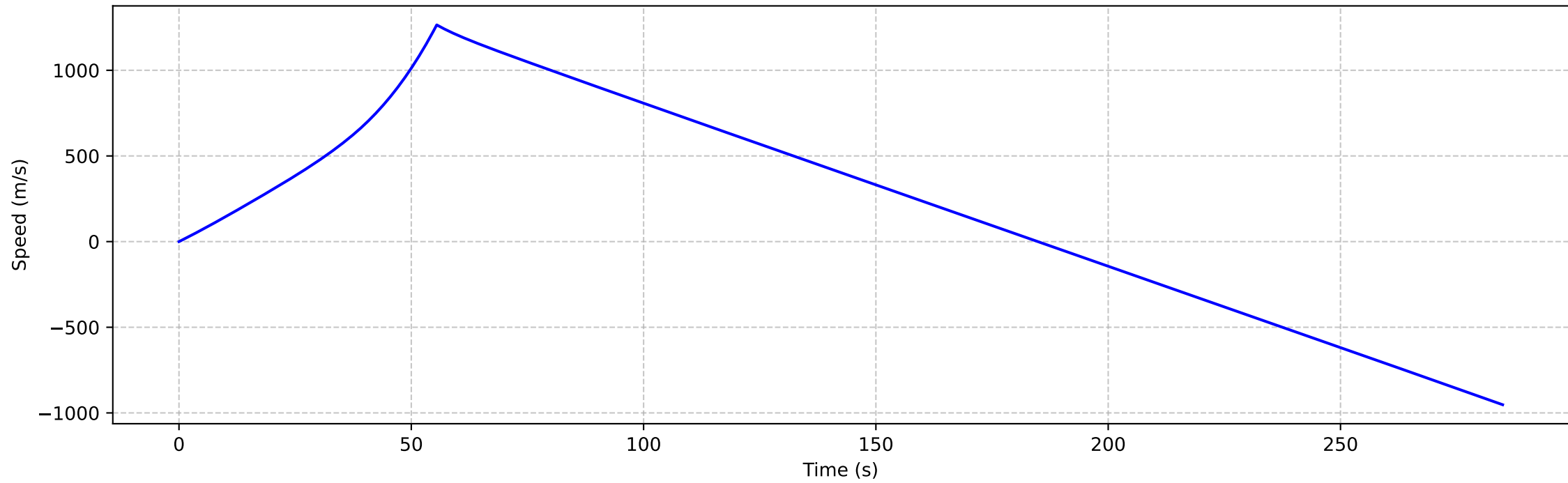
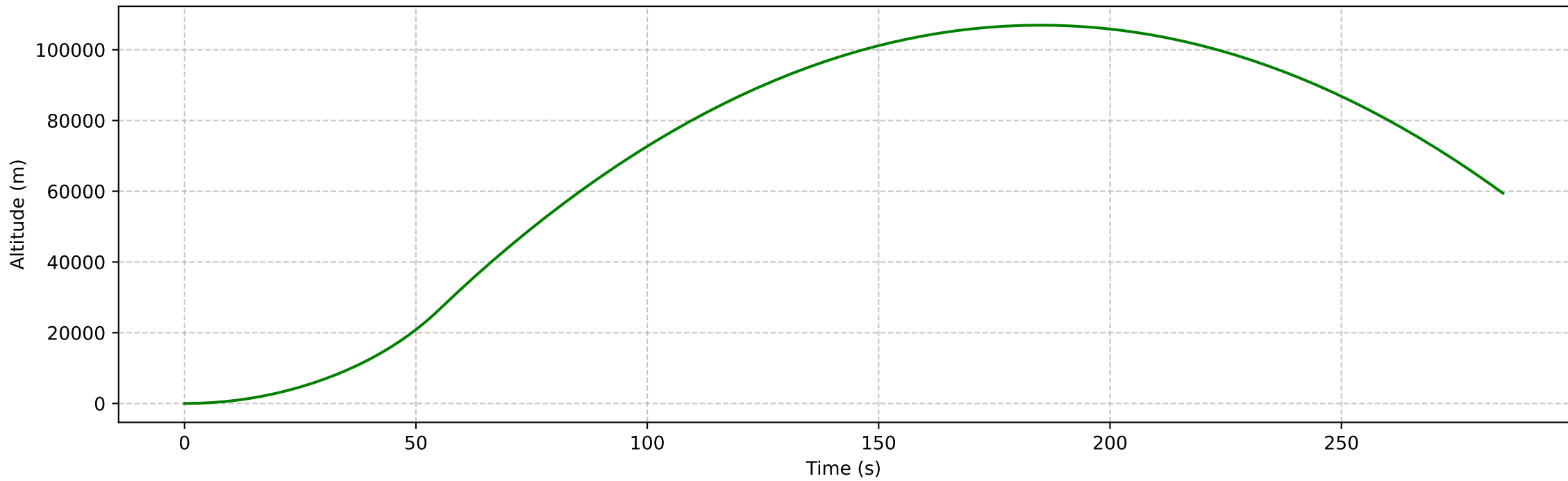


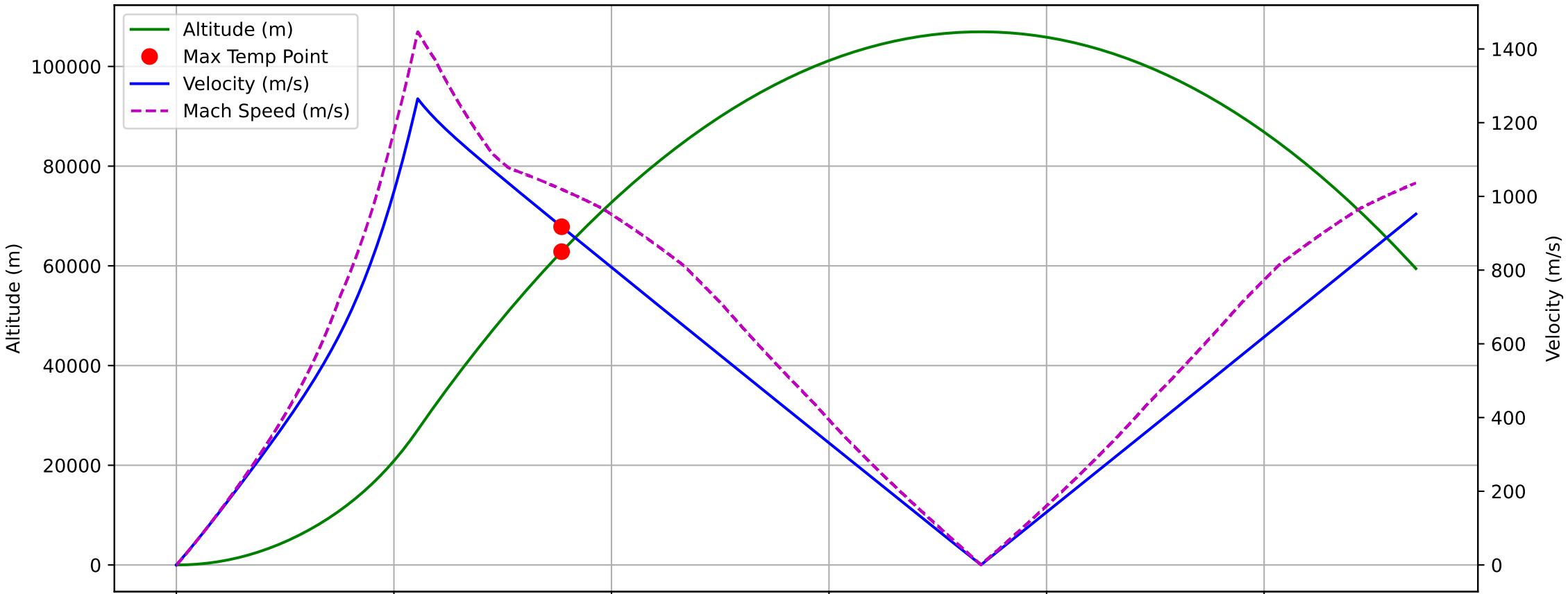
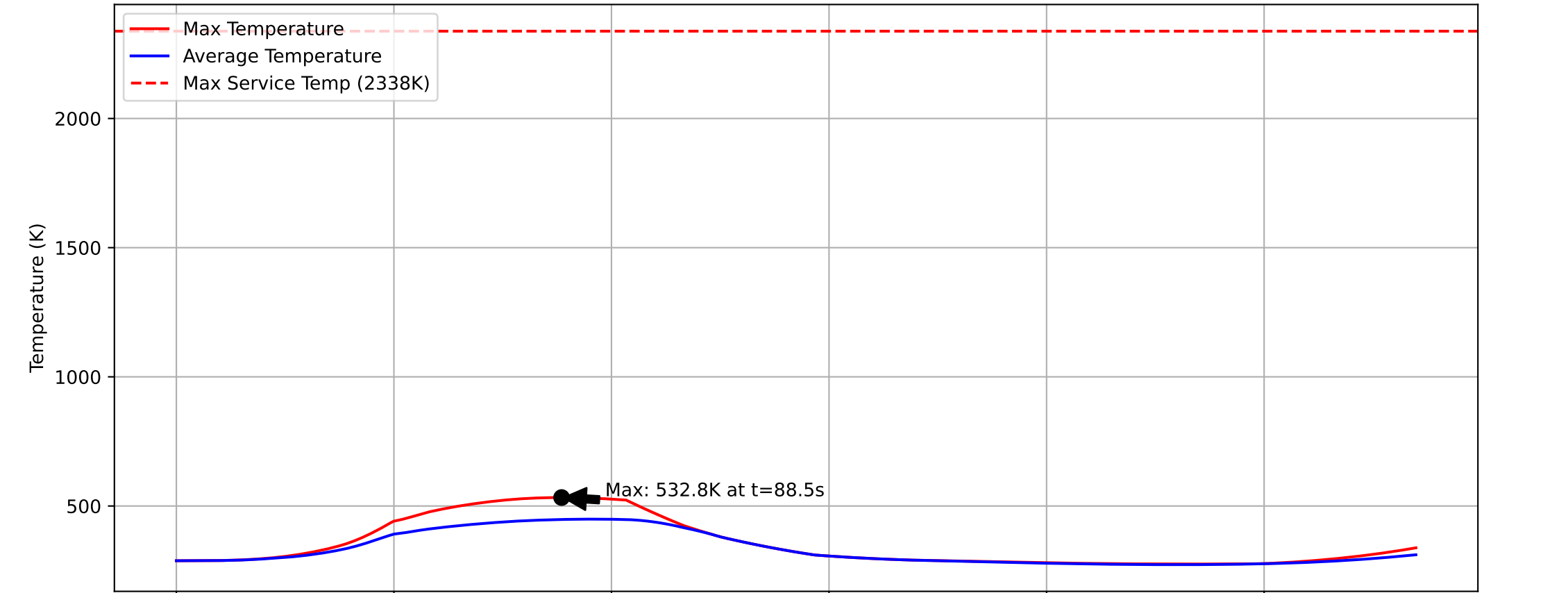
Speed vs Time



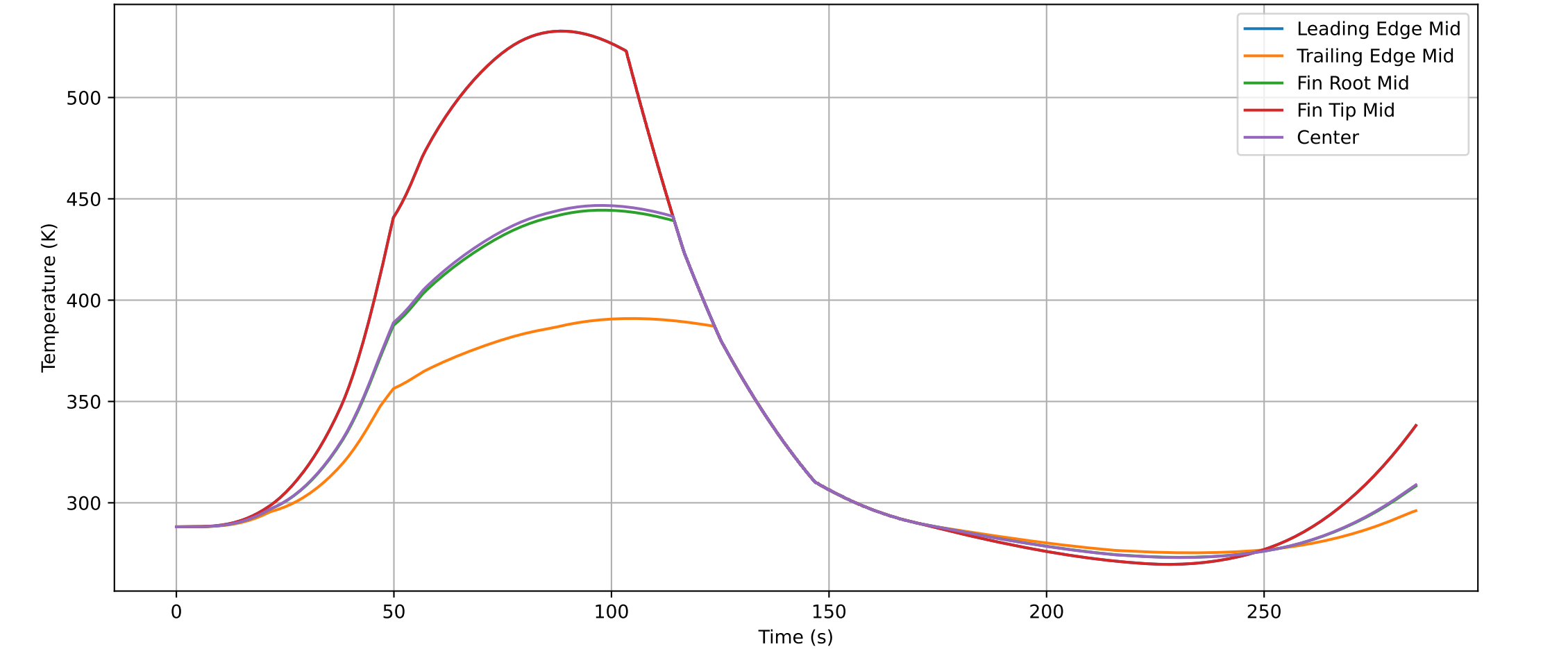
Altitude vs Time



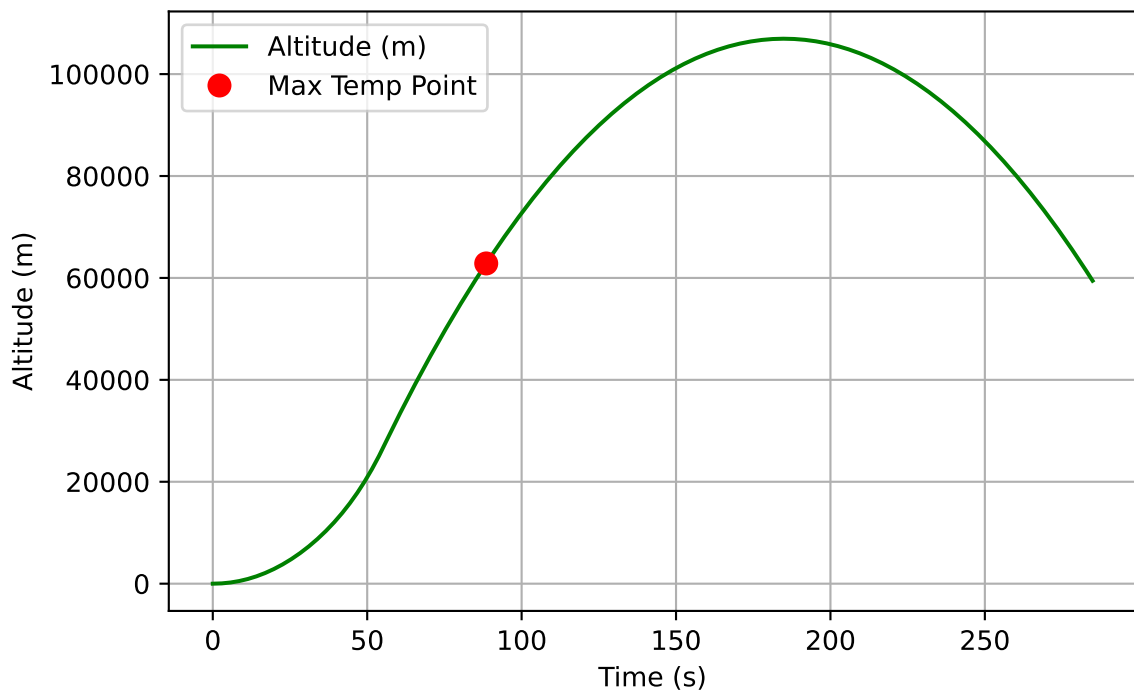
Fin Temperature History - Carbon carbon matrix composite



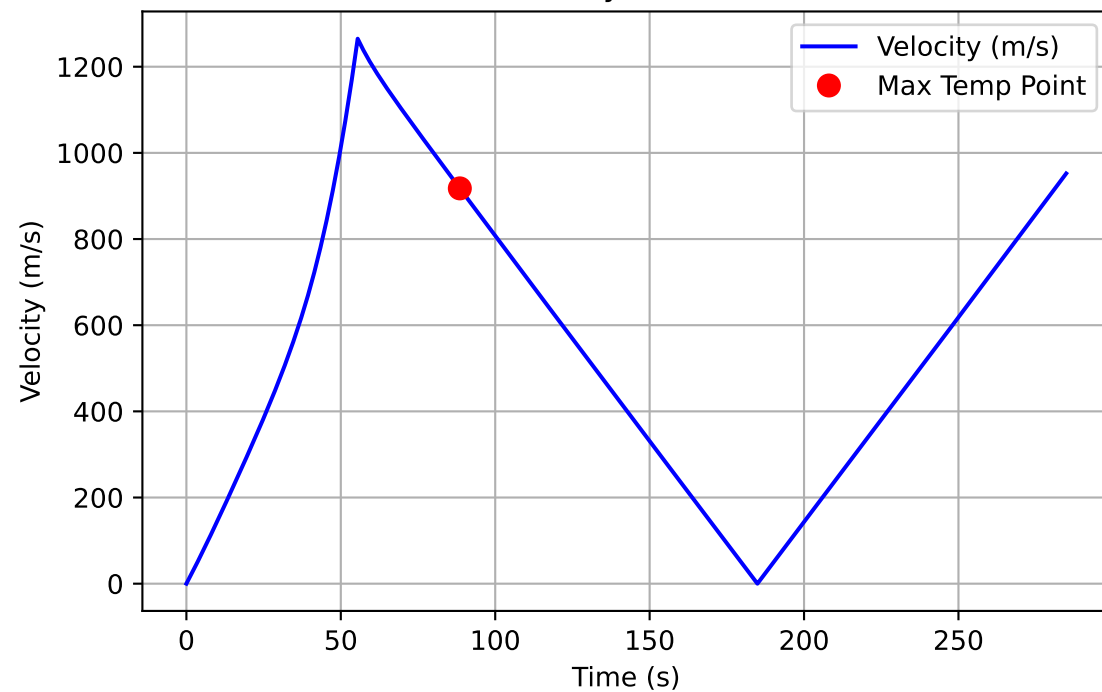
Temperature at Track Points



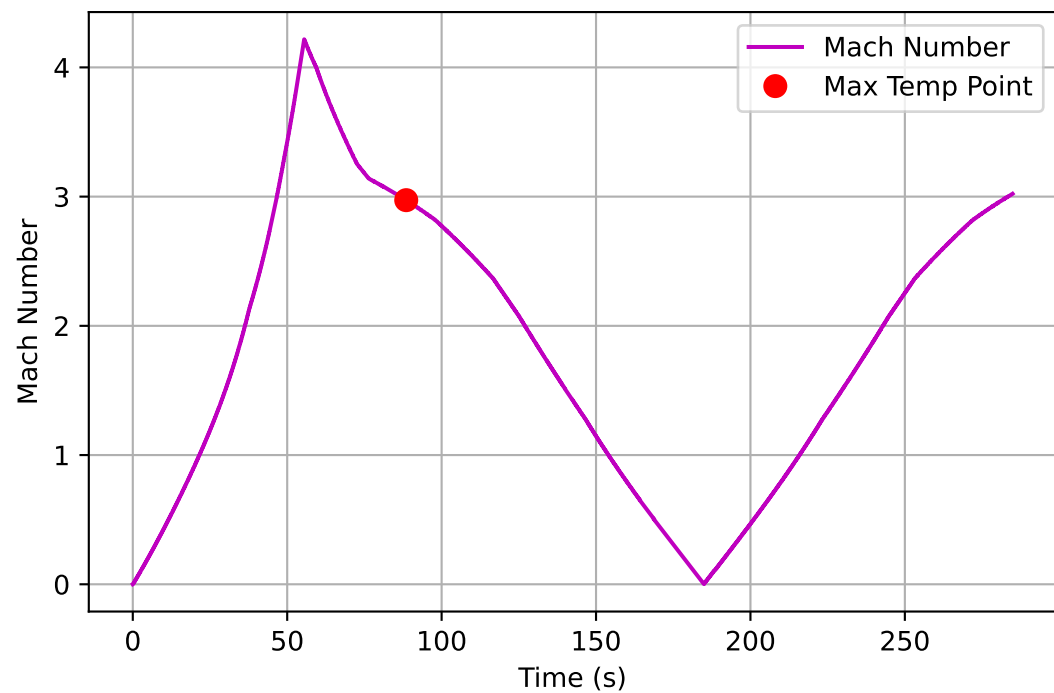
Altitude vs Time



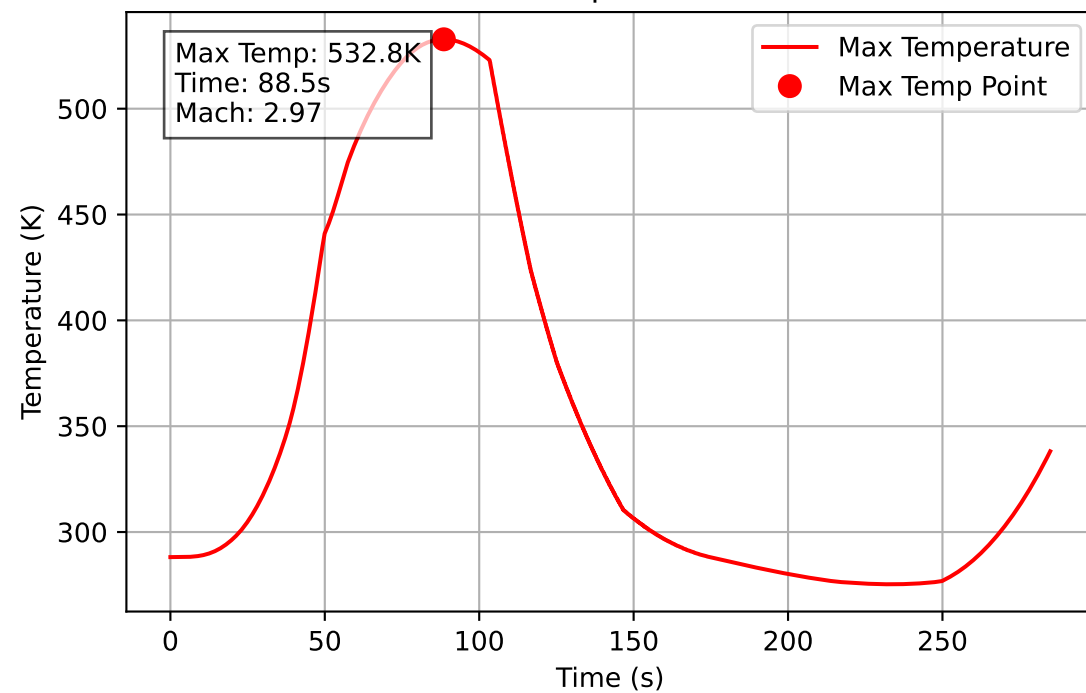
Velocity vs Time



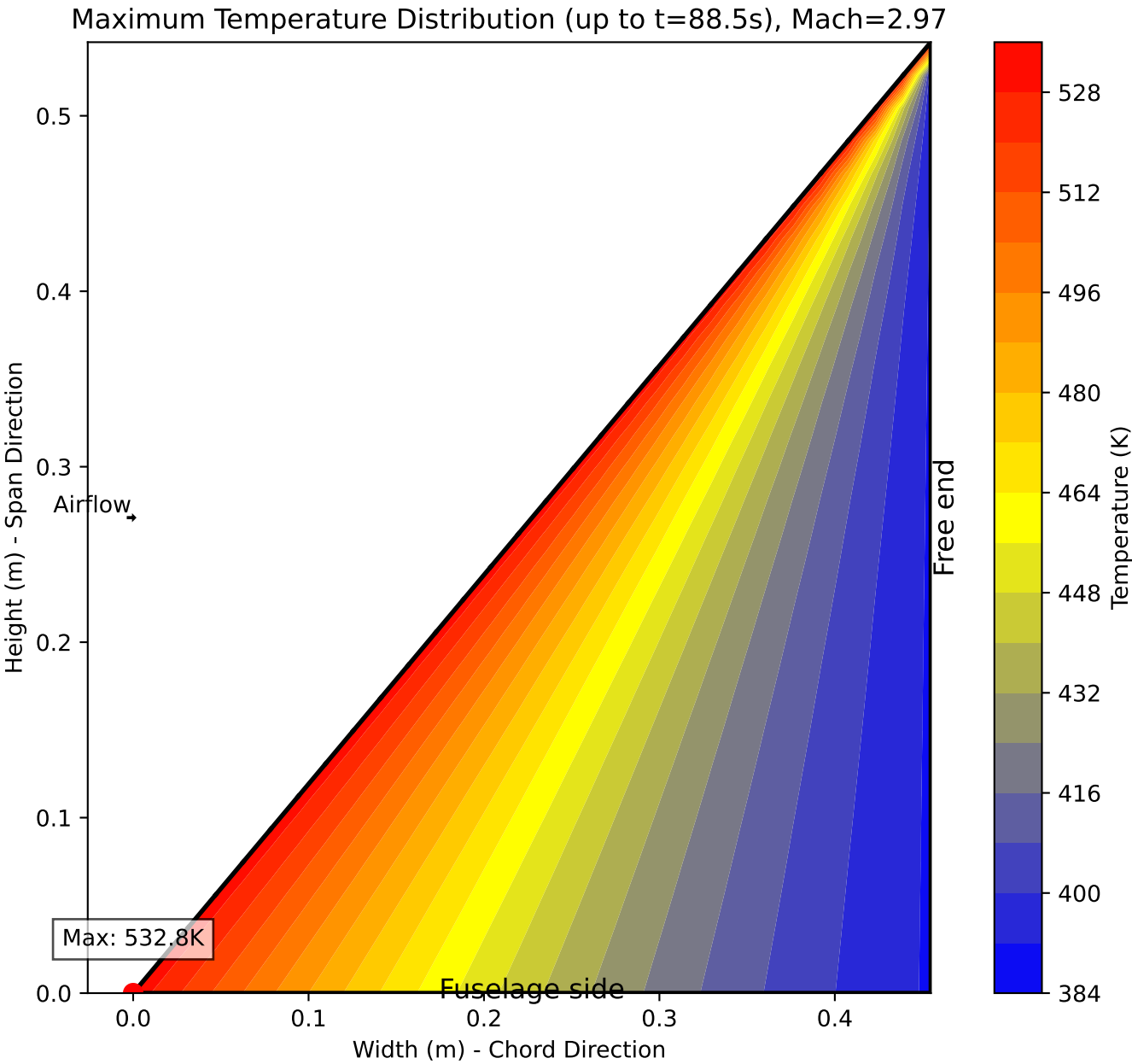
Mach Number vs Time



Maximum Temperature vs Time



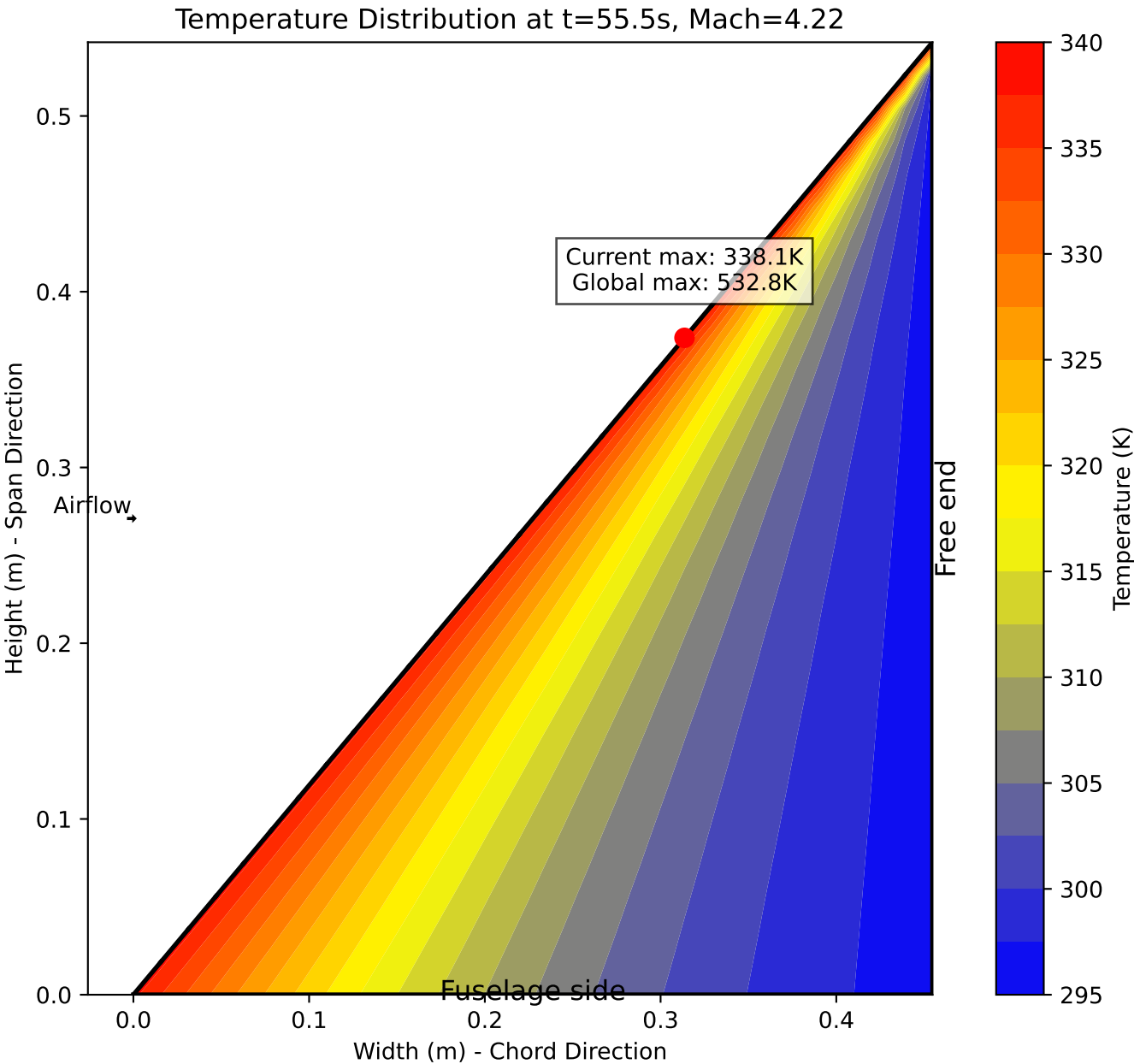
# Temperature Distribution at Maximum Temperature



Flight Conditions:  
Time: 88.5 s  
Velocity: 917.6 m/s  
Altitude: 62843.0 m  
Mach: 2.97

Material: Carbon carbon matrix composite  
Max Service Temp: 2338 K  
Peak Fin Temp: 532.8 K  
Safety Margin: 1805.2 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: Carbon carbon matrix composite  
Max Service Temp: 2338 K  
Peak Fin Temp: 532.8 K  
Safety Margin: 1805.2 K

# INITIAL CONDITIONS AND PARAMETERS

## FLIGHT SIMULATION

Generated: 2025-11-15 00:51:51

### SIMULATION PARAMETERS

Fin Material: Carbon carbon matrix composite  
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)	3.352	2.100	aero
Total Dry Mass	193.485		
Total Propellant	244.080		
Total Mass	437.565		
Mass Ratio	2.261		

### 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: 454.75 mm  
Fin Mass (single): 0.837935 kg  
Total Fin Mass: 3.351739 kg  
Wall Thickness: 4 mm  
Fin Set CG Position: 2.1 m

#### MATERIAL PROPERTIES

Thermal Conductivity: 40 W/(m·K)  
Density: 1700 kg/m<sup>3</sup>  
Specific Heat: 756 J/(kg·K)  
Max Service Temperature: 2338 K  
Yield Strength: 500 MPa  
Thermal Expansion: 4e-06 1/K  
Emissivity: 0.9