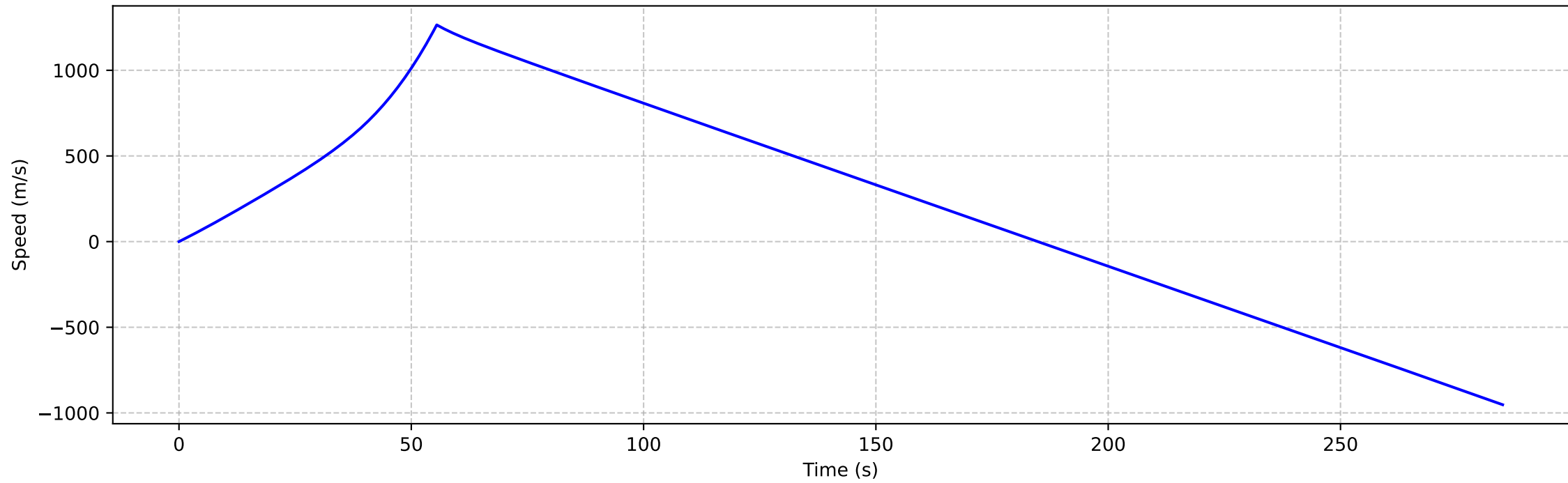
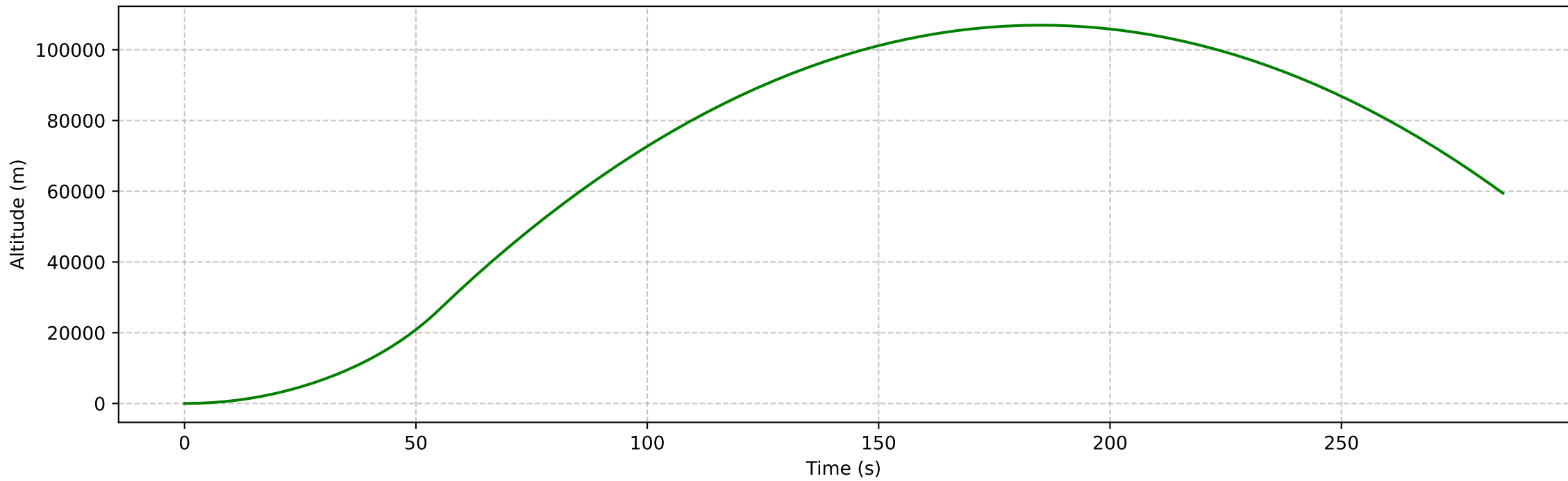


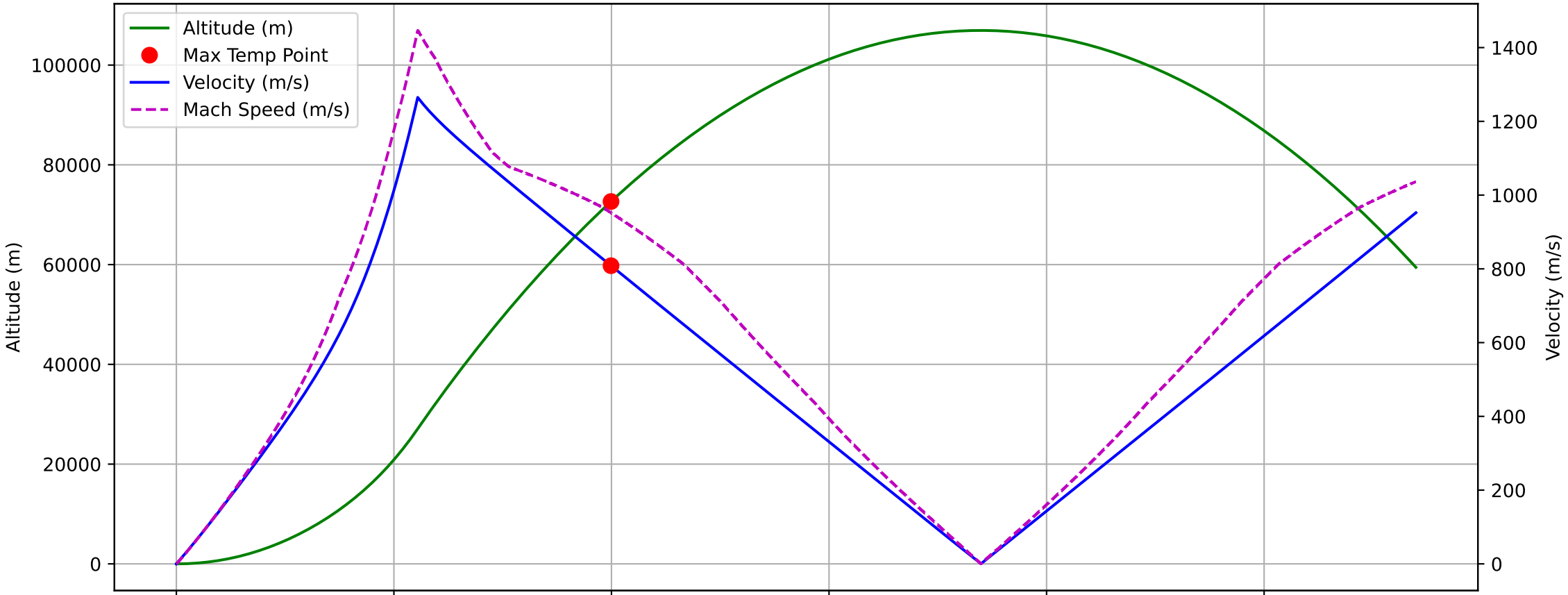
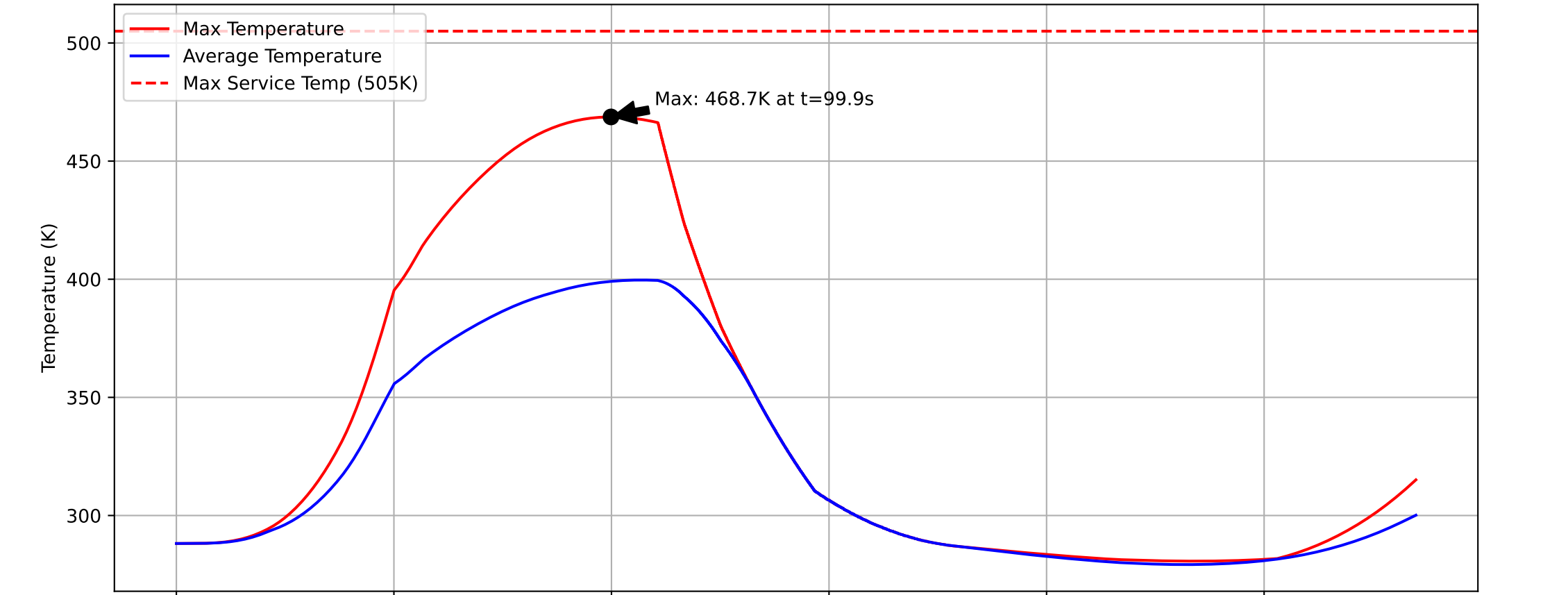
Speed vs Time



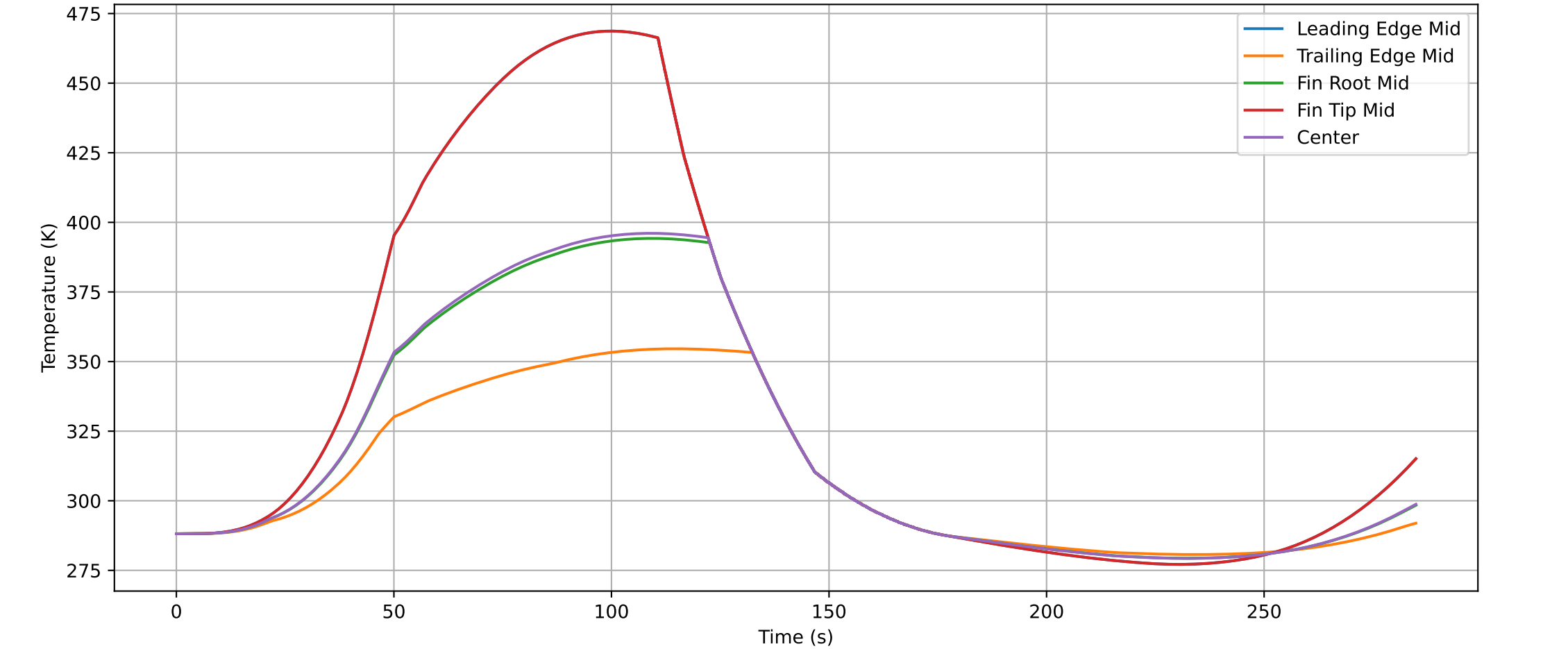
Altitude vs Time



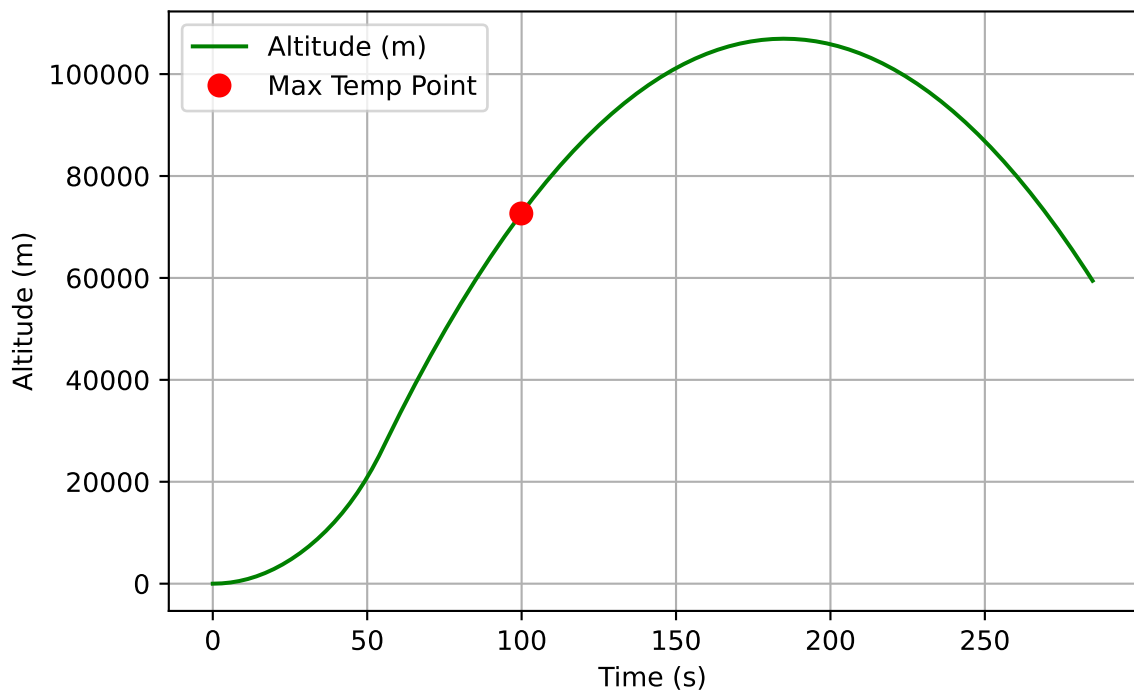
Fin Temperature History - Titanium Ti-6Al-4V



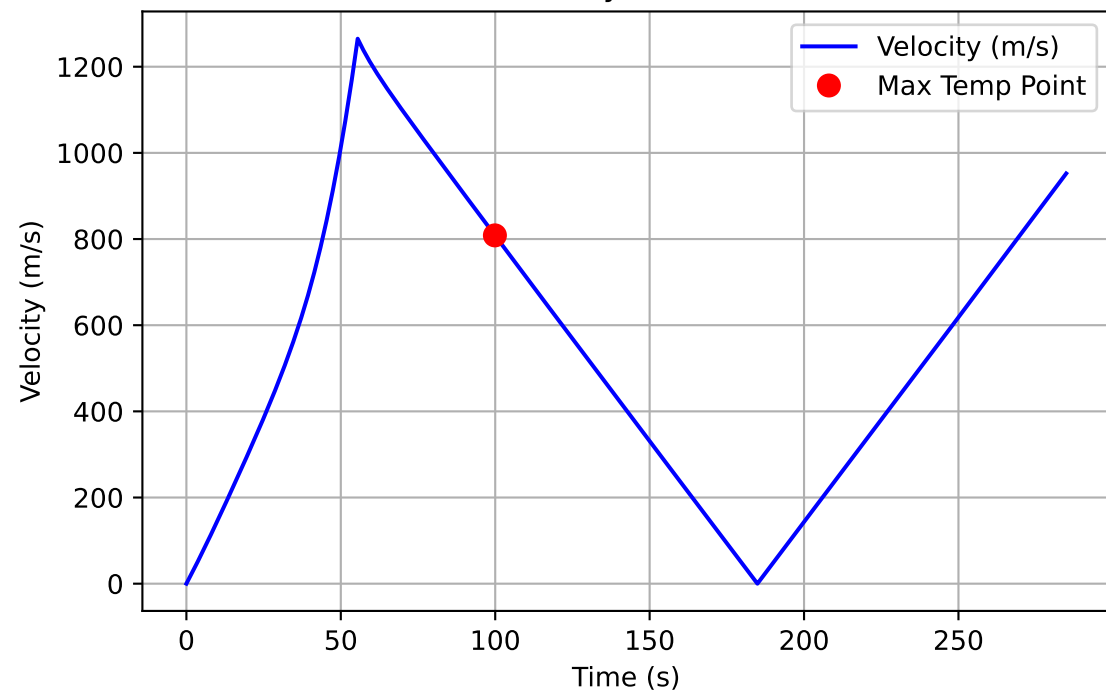
Temperature at Track Points



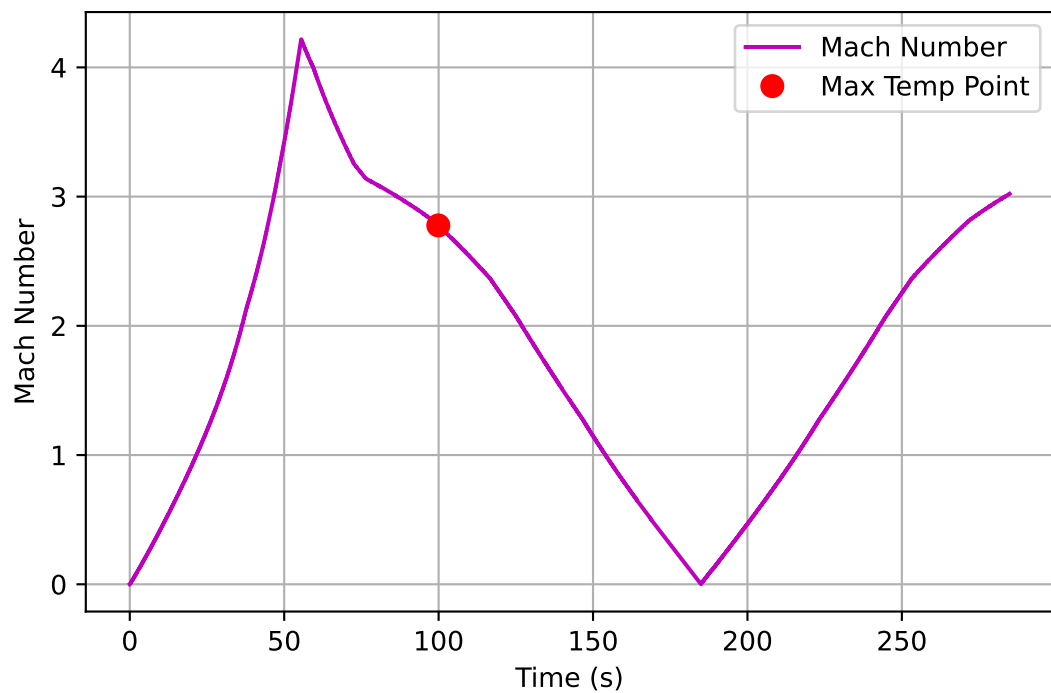
Altitude vs Time



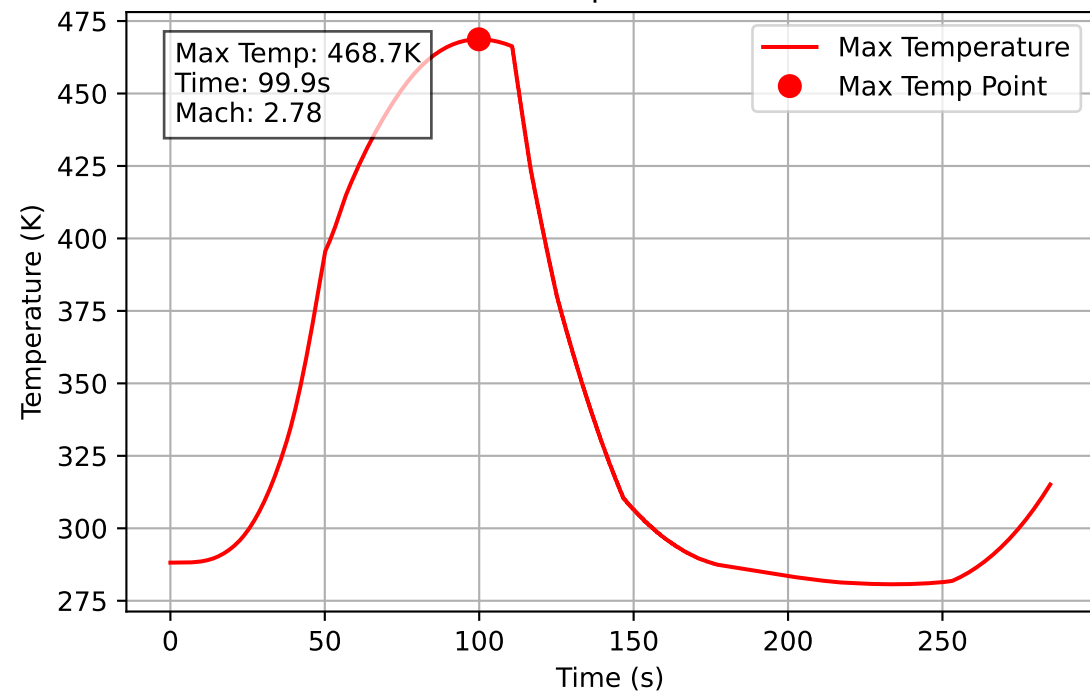
Velocity vs Time



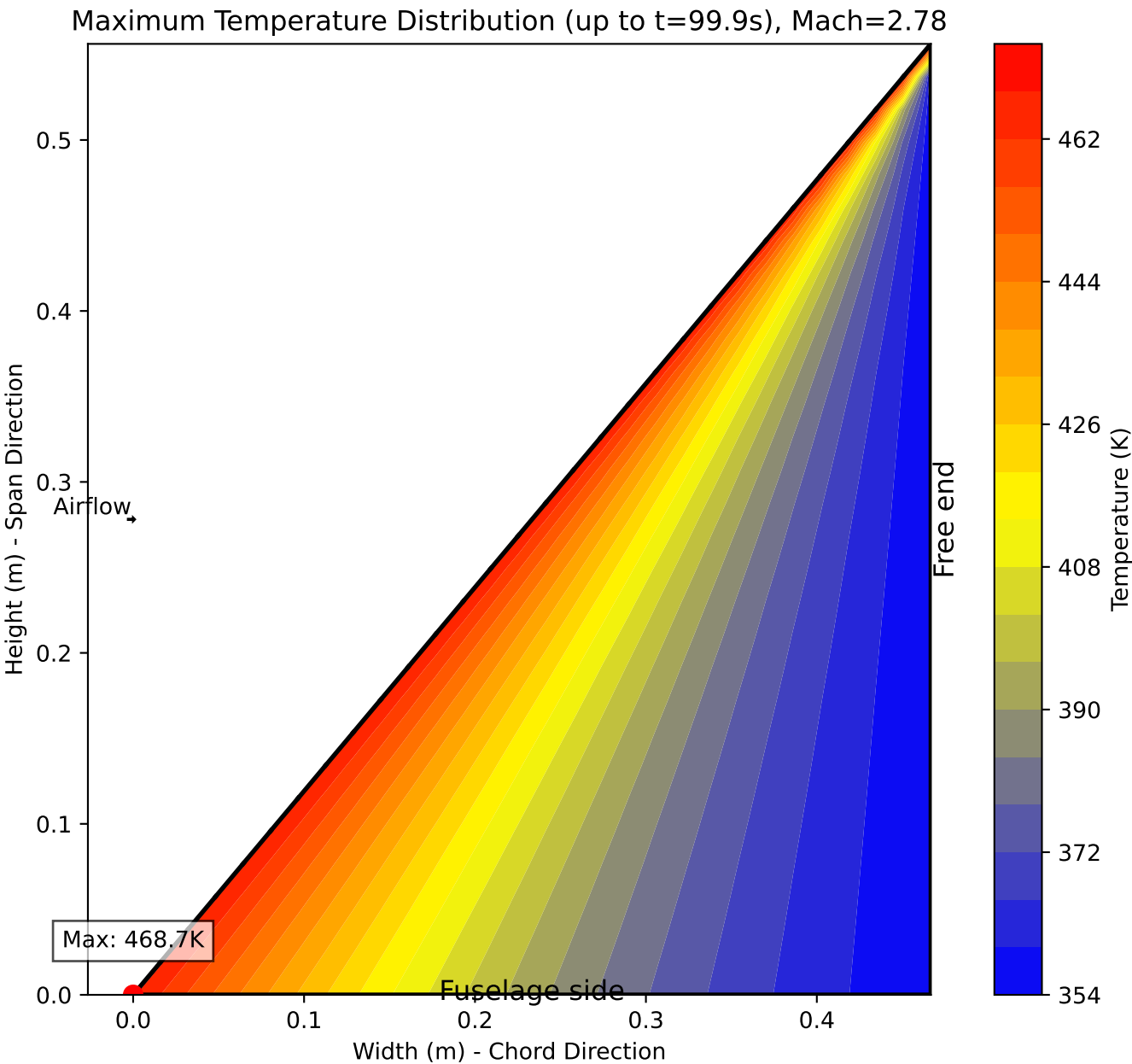
Mach Number vs Time



Maximum Temperature vs Time



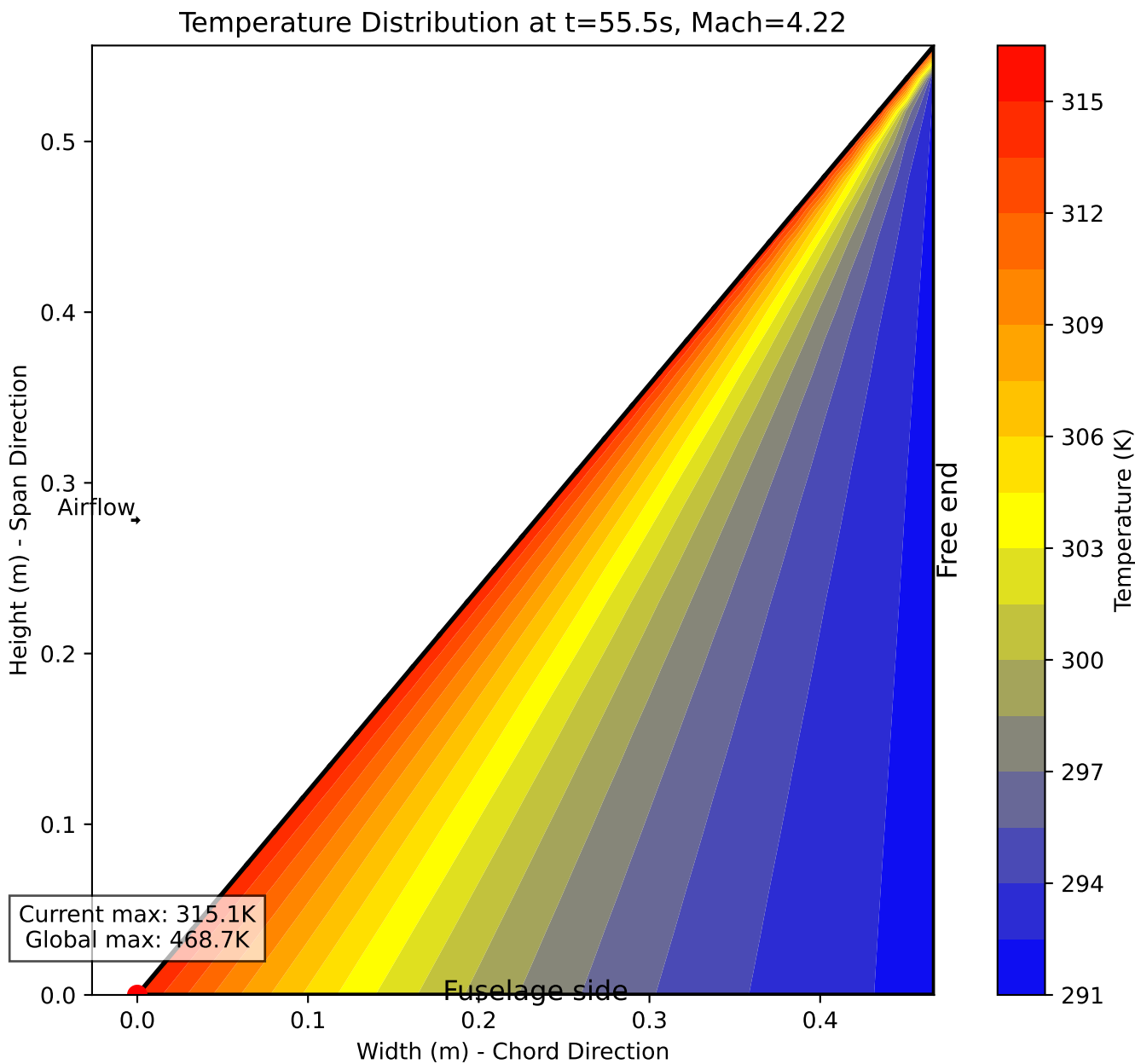
# Temperature Distribution at Maximum Temperature



Flight Conditions:  
Time: 99.9 s  
Velocity: 808.5 m/s  
Altitude: 72646.8 m  
Mach: 2.78

Material: Titanium Ti-6Al-4V  
Max Service Temp: 505 K  
Peak Fin Temp: 468.7 K  
Safety Margin: 36.3 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: Titanium Ti-6Al-4V  
Max Service Temp: 505 K  
Peak Fin Temp: 468.7 K  
Safety Margin: 36.3 K

# INITIAL CONDITIONS AND PARAMETERS

## FLIGHT SIMULATION

Generated: 2025-11-15 15:02:54

### SIMULATION PARAMETERS

Fin Material: Titanium Ti-6Al-4V  
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)	8.162	2.100	aero
Total Dry Mass	198.295		
Total Propellant	244.080		
Total Mass	442.375		
Mass Ratio	2.231		

### 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:	466.72 mm
Fin Mass (single):	2.040431 kg
Total Fin Mass:	8.161724 kg
Wall Thickness:	4 mm
Fin Set CG Position:	2.1 m

#### MATERIAL PROPERTIES

Thermal Conductivity:	25 W/(m·K)
Density:	3930 kg/m <sup>3</sup>
Specific Heat:	610 J/(kg·K)
Max Service Temperature:	505 K
Yield Strength:	1050 MPa
Thermal Expansion:	6.6e-06 1/K
Emissivity:	0.63