71. (a) The thrust of the rocket is given by $T = Rv_{rel}$ where R is the rate of fuel consumption and v_{rel} is the speed of the exhaust gas relative to the rocket. For this problem R = 480 kg/s and $v_{rel} = 3.27 \times 10^3$ m/s, so

$$T = (480\,\text{kg/s})(3.27\times10^3\ \text{m/s}) = 1.57\times10^6\ \text{N}.$$

(b) The mass of fuel ejected is given by $M_{fuel} = R\Delta t$, where Δt is the time interval of the burn. Thus, M_{fuel} = (480 kg/s)(250 s) = 1.20×10^5 kg. The mass of the rocket after the burn is

$$M_f = M_i - M_{fuel} = (2.55 \times 10^5\ \text{kg}) - (1.20 \times 10^5\ \text{kg}) = 1.35 \times 10^5\ \text{kg}.$$

(c) Since the initial speed is zero, the final speed is given by

$$v_f = v_{rel} \ln\frac{M_i}{M_f} = (3.27\times10^3)\ln\left(\frac{2.55\times10^5}{1.35\times10^5}\right) = 2.08\times10^3\ \text{m/s}.$$