43. (a) The thrust of the rocket is given by $T = Rv_{\mathrm{rel}}$, 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 $R = 480\,\mathrm{kg/s}$ and $v_{\mathrm{rel}} = 3.27 \times 10^3\,\mathrm{m/s}$, so

$$T = (480\,\mathrm{kg/s})(3.27 \times 10^3\,\mathrm{m/s}) = 1.57 \times 10^6\ \mathrm{N}\ .$$

(b) The mass of fuel ejected is given by $M_{\mathrm{fuel}} = R\Delta t$, where Δt is the time interval of the burn. Thus, $M_{\mathrm{fuel}} = (480\,\mathrm{kg/s})(250\,\mathrm{s}) = 1.20 \times 10^5\,\mathrm{kg}$. The mass of the rocket after the burn is $M_f = M_i - M_{\mathrm{fuel}} = 2.55 \times 10^5\,\mathrm{kg} - 1.20 \times 10^5\,\mathrm{kg} = 1.35 \times 10^5\,\mathrm{kg}$.

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

$$v_f = v_{\mathrm{rel}} \ln \frac{M_i}{M_f} = \left(3.27 \times 10^3\right) \ln\left(\frac{2.55 \times 10^5}{1.35 \times 10^5}\right) = 2.08 \times 10^3\ \mathrm{m/s}\ .$$