PROBLEM 9.80

KNOWN: An afterburner is added to the turbojet in Problem 9.77.

FIND: Determine the velocity at the nozzle exit.

SCHEMATIC & GIVEN DATA:

\[ T_4' = 1300 \text{ K} \]

ENGINEERING MODEL: The nozzle expansion is isentropic.

ANALYSIS: For the isentropic process

\[ Pr_5' = \left(\frac{P_5}{P_4} \right) Pr_4' = \left(\frac{26}{1634} \right) 330.9 = 52.452 \]

\[ h_5' = 844.25 \text{ kJ/kg} \]

Thus, the nozzle exit velocity is

\[ V_5 = \sqrt{2 (h_4' - h_5')} \]

\[ = \sqrt{2 \left( 1395.97 - 844.25 \right)} \text{ m/s} \]

Comparing this result with that of Problem 9.77, we see that the use of an afterburner increases the exit velocity, and thus the engine thrust.