**import** **numpy** **as** **np**

**import** **matplotlib.pyplot** **as** **plt**

*# Constants*

MARR = 0.1

useful\_life = 10

fuel\_cost\_per\_gallon = 6.00

miles\_per\_gallon = 7

annual\_mileage = np.linspace(0, 50000, 500)

*# Deflector Costs*

costs = {

"Blow-on-by": {"investment": 2500, "maintenance": 100, "fuel\_savings": 0.0343},

"Wind-shear": {"investment": 7500, "maintenance": 180, "fuel\_savings": 0.0686},

"Air-vantage": {"investment": 15000, "maintenance": 230, "fuel\_savings": 0.1029}

}

*# Function to calculate equivalent annual cost*

**def** annual\_cost(investment, maintenance, fuel\_savings, mileage):

eac = investment \* (MARR \* (1 + MARR) \*\* useful\_life) / ((1 + MARR) \*\* useful\_life - 1)

fuel\_cost\_per\_mile = fuel\_cost\_per\_gallon / miles\_per\_gallon

total\_fuel\_cost = (fuel\_cost\_per\_mile - fuel\_savings) \* mileage

total\_annual\_cost = eac + maintenance + total\_fuel\_cost

**return** total\_annual\_cost

*# Calculate total annual cost for each deflector type*

cost\_blow\_on\_by = annual\_cost(\*\*costs["Blow-on-by"], mileage=annual\_mileage)

cost\_wind\_shear = annual\_cost(\*\*costs["Wind-shear"], mileage=annual\_mileage)

cost\_air\_vantage = annual\_cost(\*\*costs["Air-vantage"], mileage=annual\_mileage)

*# Plotting*

plt.figure(figsize=(10, 6))

plt.plot(annual\_mileage, cost\_blow\_on\_by, label="Blow-on-by")

plt.plot(annual\_mileage, cost\_wind\_shear, label="Wind-shear")

plt.plot(annual\_mileage, cost\_air\_vantage, label="Air-vantage")

*# Add labels and legend*

plt.title('Annual Cost vs Mileage for Different Wind Deflectors')

plt.xlabel('Annual Mileage')

plt.ylabel('Annual Cost ($)')

plt.legend()

plt.grid(**True**)

*# Show plot*

plt.show()