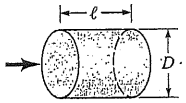
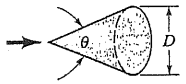
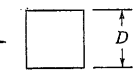
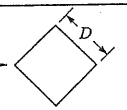
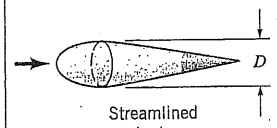
Shape	Reference area A	Drag coefficient C_D	Reynolds number $\text{Re} = \rho UD/\mu$
 Solid hemisphere	$A = \frac{\pi}{4}D^2$	→ 1.17 ← 0.42	$\text{Re} > 10^4$
 Hollow hemisphere	$A = \frac{\pi}{4}D^2$	→ 1.42 ← 0.38	$\text{Re} > 10^4$
 Thin disk	$A = \frac{\pi}{4}D^2$	1.1	$\text{Re} > 10^3$
 Circular rod parallel to flow	$A = \frac{\pi}{4}D^2$	ℓ/D | C_D 0.5 | 1.1 1.0 | 0.93 2.0 | 0.83 4.0 | 0.85	$\text{Re} > 10^5$
 Cone	$A = \frac{\pi}{4}D^2$	θ, degrees | C_D 10 | 0.30 30 | 0.55 60 | 0.80 90 | 1.15	$\text{Re} > 10^4$
 Cube	$A = D^2$	1.05	$\text{Re} > 10^4$
 Cube	$A = D^2$	0.80	$\text{Re} > 10^4$
 Streamlined body	$A = \frac{\pi}{4}D^2$	0.04	$\text{Re} > 10^5$

FIGURE 9.29 Typical drag coefficients for regular three-dimensional objects (Ref. 5).

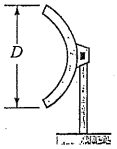
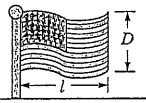
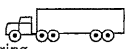
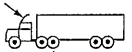
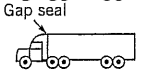
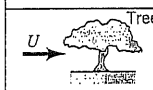
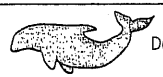
Shape	Reference area	Drag coefficient C_D
 Parachute	Frontal area $A = \frac{\pi}{4}D^2$	1.4
 Porous parabolic dish	Frontal area $A = \frac{\pi}{4}D^2$	Porosity | 0 | 0.2 | 0.5 → | 1.42 | 1.20 | 0.82 ← | 0.95 | 0.90 | 0.80 Porosity = open area/total area
 Average person	Standing Sitting Crouching	$C_DA = 9$ ft^2 $C_DA = 6$ ft^2 $C_DA = 2.5$ ft^2
 Fluttering flag	$A = \ell D$	ℓ/D | C_D 1 | 0.07 2 | 0.12 3 | 0.15
 Empire State Building	Frontal area	1.4
 Six-car passenger train	Frontal area	1.8
Bikes  Upright commuter	$A = 5.5$ ft^2	1.1
 Racing	$A = 3.9$ ft^2	0.88
 Drafting	$A = 3.9$ ft^2	0.50
 Streamlined	$A = 5.0$ ft^2	0.12
Tractor-trailer tucks  Standard	Frontal area	0.96
Fairing  With fairing	Frontal area	0.76
Gap seal  With fairing and gap seal	Frontal area	0.70
 Tree	$U = 10$ m/s $U = 20$ m/s $U = 30$ m/s	Frontal area	0.43 0.26 0.20
 Dolphin	Wetted area	0.0036 at $\text{Re} = 6 \times 10^6$ (flat plate has $C_{Df} = 0.0031$)
 Large birds	Frontal area	0.40

FIGURE 9.30 Typical drag coefficients for objects of interest (Refs. 5, 6, 15, 20).