Name: _____

A typical aircraft has 4 basic components of forces acting on it namely: LIFT (generated by aircraft wing), DRAG (generated by the entire aircraft), WEIGHT and THRUST (provided by the engine), as illustrated in Figure 1.

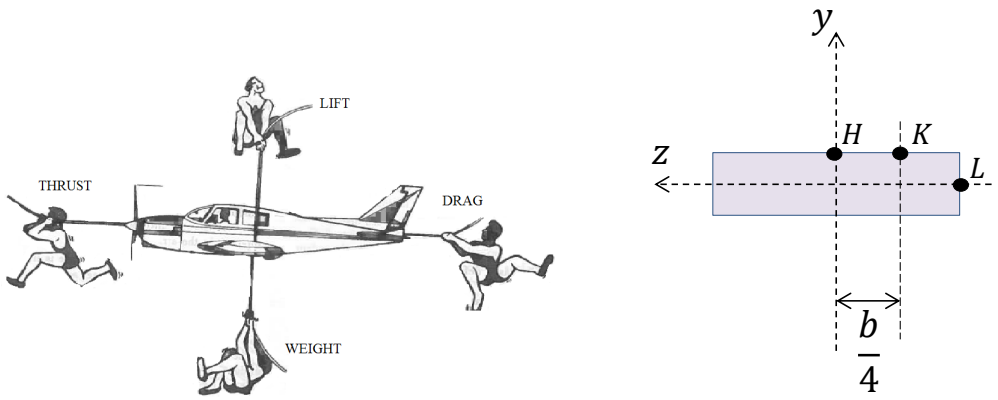

Figure 1: Typical forces acting in aircraft and cross-section area of the wing.

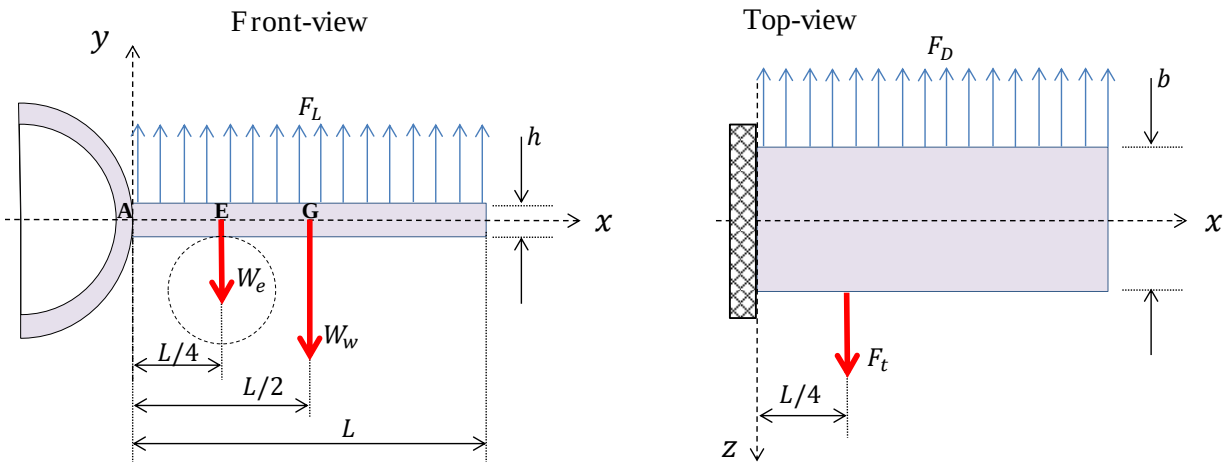

Figure 2: Load distribution in McDonnell Douglas wing

Figure 2 shows the load distribution in a McDonnell Douglas wing. We model the elliptical cross section of the wing as a rectangular cross section (see Figure 1). We also assume that the cross section is uniform in the x-direction (no tapering). The wings are orthogonal to the fuselage axis (also known as 0^o sweep back), the wingspan is $L = 932$ in, the aspect ratio is $L/b = 7.5$ and the wing thickness is $h = 28$ in. The aircraft is equipped with GE-CF6 engine (depicted in dashed line in Fig. 2), which has weight $W_e = 8,111$ lb and acts at point E. The thrust provided by the engine is given by $F_t = 40,000$ lb. The drag force is uniformly distributed and given by $F_D = 37.5$ lb/in. The weight of the wing $W_w = 53,175$ lb acts on point G. The lift to drag ratio is 17.5 for this wing. Assume that the connection between the wing and fuselage can be modeled as a cantilever beam. Determine the state of stress at point L and represent these stresses in a stress element.