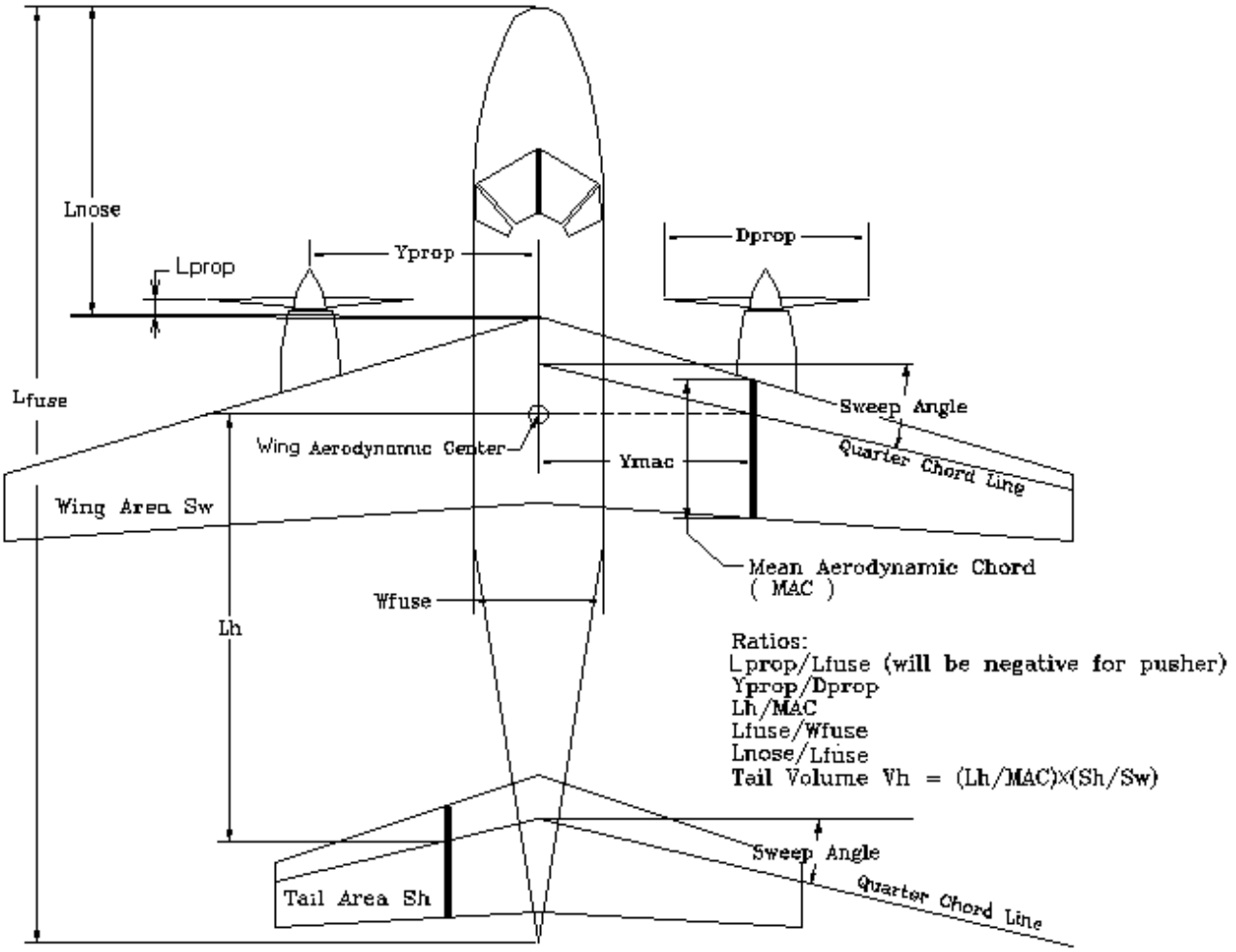
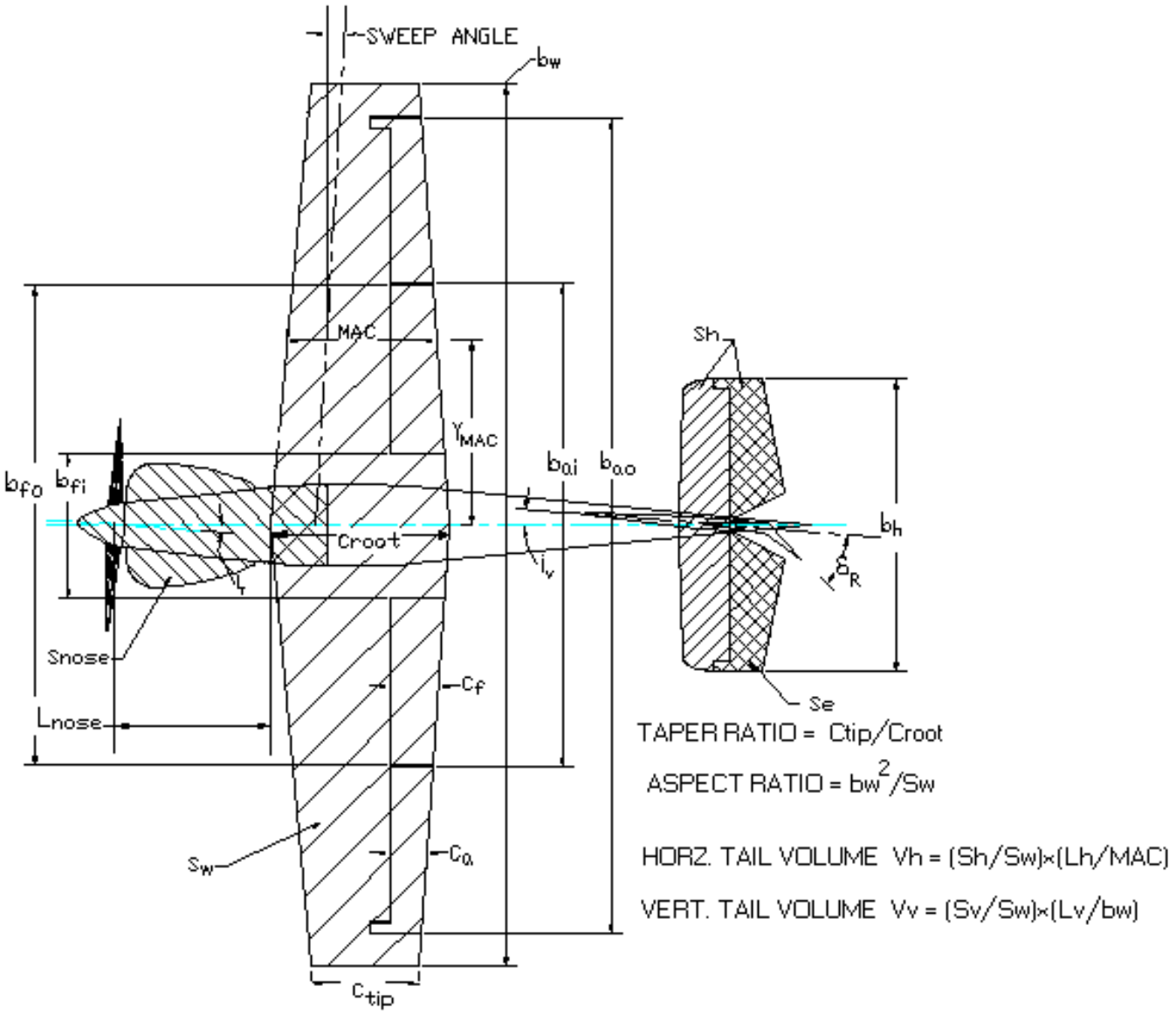
Rodger's AeroDes7 Software Helpful Diagram and Definitions

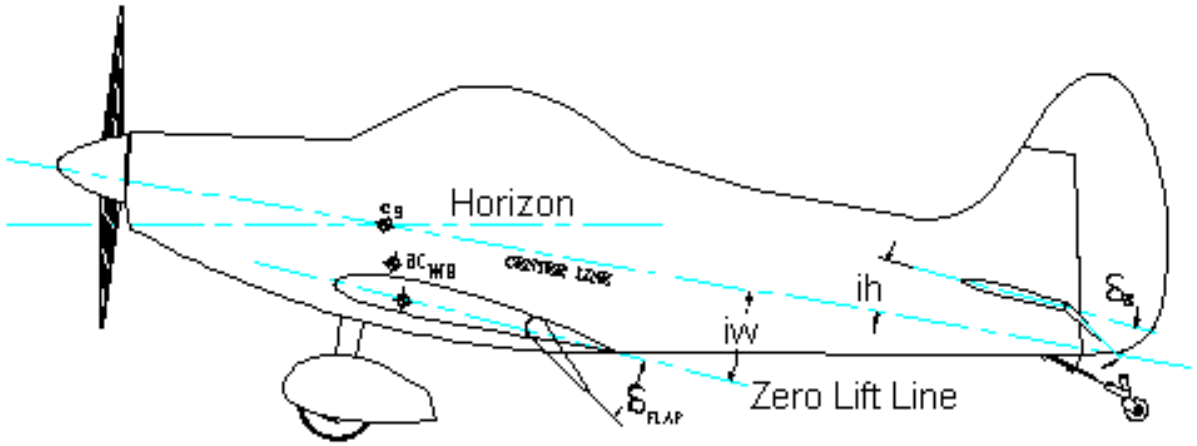
General Diagram used in Top View



General Diagram used in Airframe Data Input

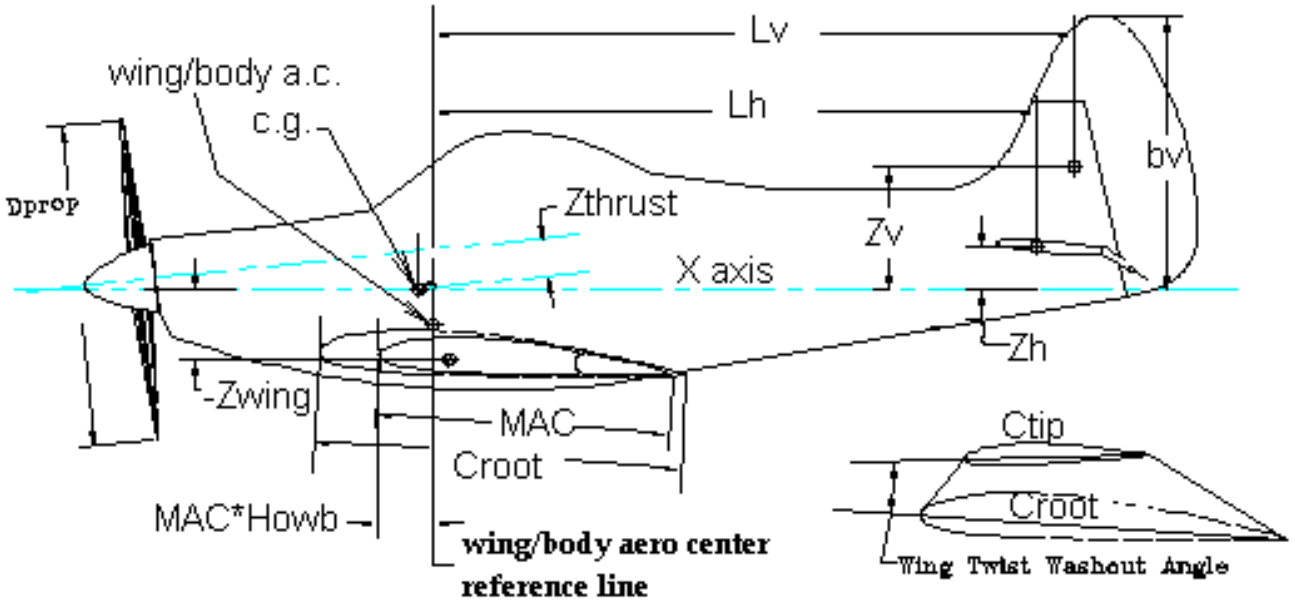


General Diagram used in Airframe Data Input

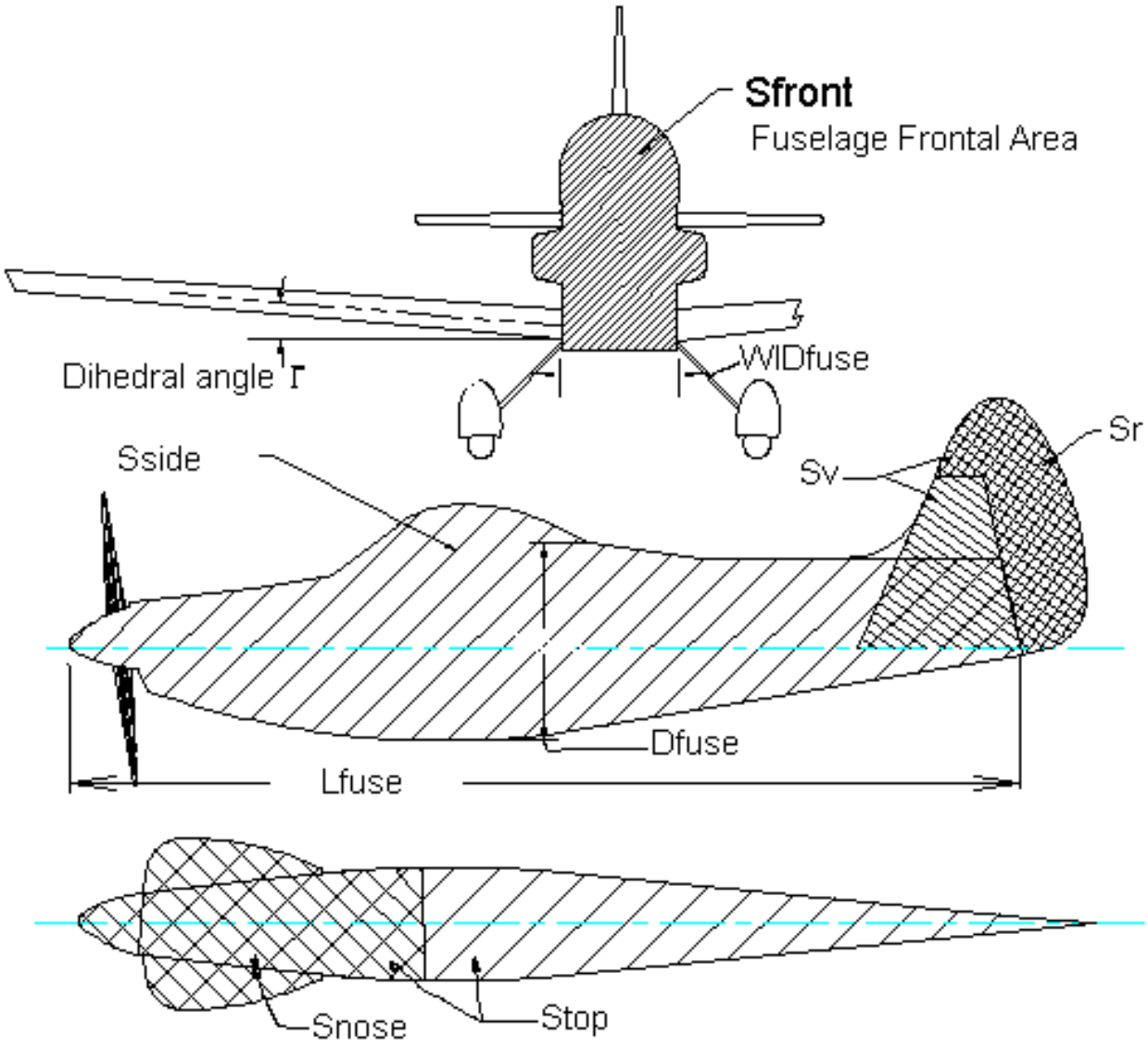


a.c. = aerodynamic center

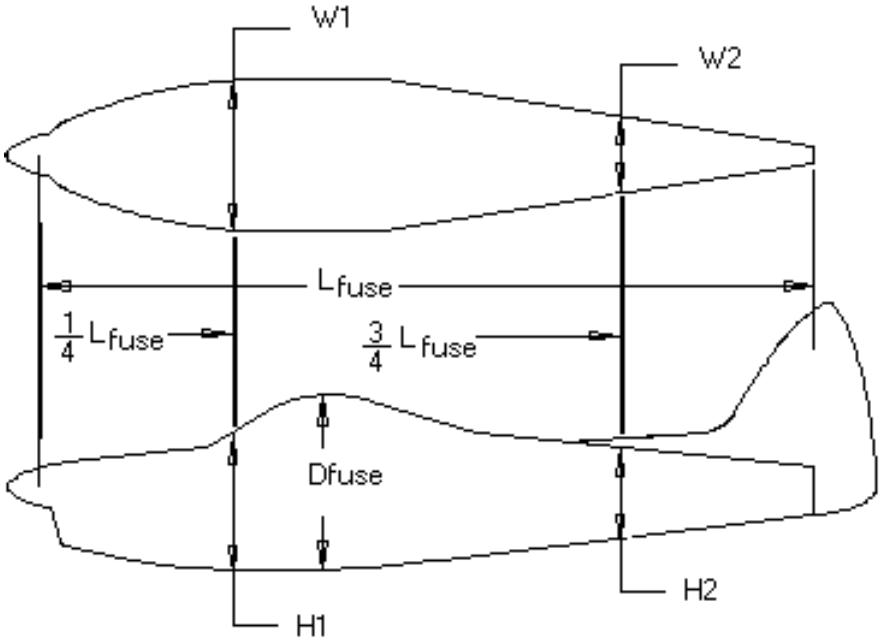
c.g. = center of gravity



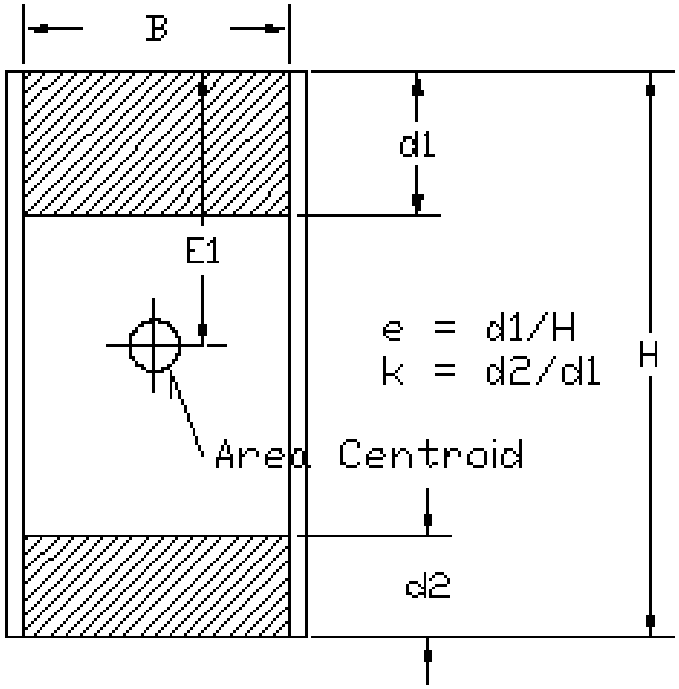
General Diagram used in Airframe Data Input



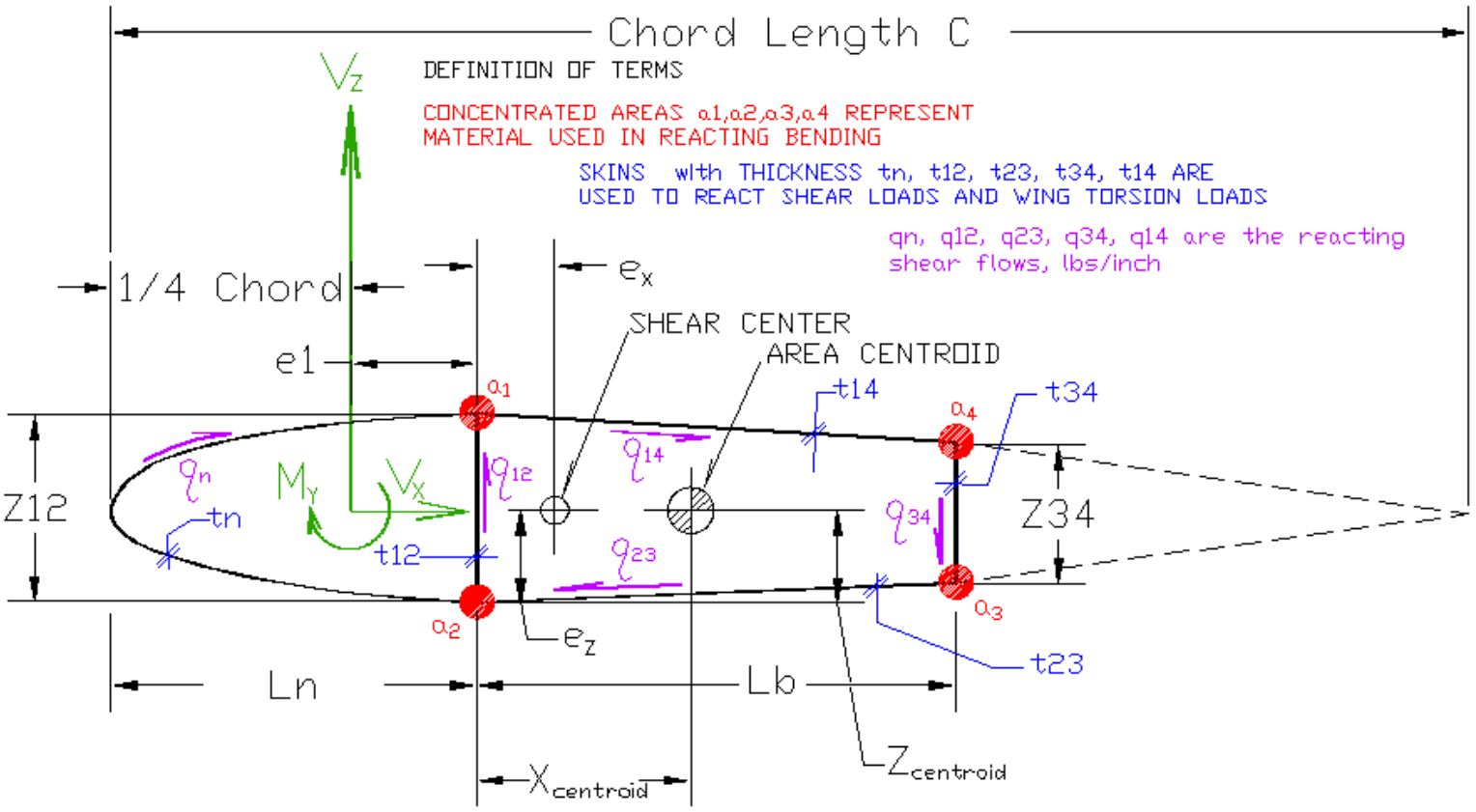
Used in Form 10, Stability and Control



Used in Form 21, Main Spar Analysis



Used in Form 25, Wing Shear Flow



PROGRAM EXPLANATION

This program is intended to aid in the design of conventional, or canard, piston or jet subsonic aircraft. It allows for the quick evaluation of what-if aircraft, so that many trade studies can be accomplished without too much effort. To answer the question of how big, how heavy, from the requirements of how far and how fast. It allows investigations into the interrelationship of taper and twist, and load distributions, to stability and control, engine/prop simulators, critical load cases and wing box stress analysis, and much more.

To start a design from scratch, start with the Conceptual Studies menu. Starting with General Weight and Inertia, select the type aircraft, enter the other data and have the program calculate a statistical average aircraft, including the empty weight fraction We/Wo. Go to the First Estimate Sizing / Trade studies ("rubber engine") where a more detailed performance and sizing calculation is performed. Going to the Detailed Weight Breakdown(fixed engine size) will calculate a new empty weight fraction. You now feed this better estimate of We/Wo back to the First Estimate and re evaluate the performance and size, feed that size to the Detailed Weight, which in turn calculates another updated We/Wo, and this iteration is done until a stable number for empty weight fraction is achieved (usually 2 or 3 iterations only). The Detailed Drag Coefficient Estimate can now yield a good number of CDo of the aircraft, and this can be checked against the assumptions and results from the first estimate calculations. Trade studies can now be approached by changing the requirements of cruise speed, or range, or payload, or material selection, or altitude and power setting, and see the resulting changes in gross weight and engine sizes.

Many design variables are described as ratios, area ratios and length ratios based on the MAC (Mean Aerodynamic Chord). Stabilators can be simulated by making the area of the elevator = horz stab area (its all elevator) and setting the incidence angle ih = 0. In many cases, you may not know exactly what stabilizer areas you require, but referring to them as ratios, they are similar to many aircraft, such as tail volumes, elevator/H stab ratio, rudder/V stab ratio. The program will calculate the appropriate areas based on the geometric ratios.

The Vehicle Analysis section allows you to input the data for a point design, and save them as separate airframe and propulsion files. The data files have extensions of .ar1, and .ar2. A whole range of performance analyses, engine/prop simulations for design-a-prop from scratch studies, Lateral and Longitudinal dynamics, static stability, load distributions over the wing/flap/aileron, V-n diagrams, critical load cases, landing gear analysis, etc..can be performed to obtain the "specify the geometry/weight and see what you get" approach. This in essence lets you analyze also existing designs, to let you calculate values for Vx,Vy, 75% power speeds, etc on antiques or other planes where no references exist. You can also check up on advertised claims on any design, and see if mission range is being quoted, or if drop-me-off-from-a-balloon-at-altitude and burn-every-drop range is quoted.

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