

be very careful to turn a heavy airship slowly when at low altitudes. On the other hand, he can very materially assist the altitude pilot in holding a light airship down by making abrupt turns.

35. Altitude.—*a. Methods.*—(1) Altitude control of airships is effected by two means, static and dynamic. The former method is discussed in TM 1-325.

(2) Static means of control must always be augmented by dynamic means. Even though an airship takes off in perfect equilibrium it will not remain so. Changes occur in the static lift due to changes in meteorological conditions and loading is being varied constantly by consumption of fuel. To balance inequalities between loading and lift, dynamic means must be used.

b. Trim of airship.—(1) In the study of stability, to simplify the discussion the subject of trim of the airship was omitted. A thorough knowledge of trim is however essential to intelligent control of the airship.

(2) Under action of the static righting moment, the center of gravity of the airship will lie directly below the center of buoyancy. If the line joining these two points is at right angles to the longitudinal axis, this axis is horizontal, and the airship is said to be trimmed in neutral. If, on the other hand, due to the manner of loading or to location of the air in the ballonets of a pressure airship, the longitudinal axis is inclined to the horizontal when the center of gravity is directly below the center of buoyancy, the airship is said to be trimmed nose heavy or tail heavy, as the case may be. The application of trim to dynamic control of airships is discussed in paragraph 37.

c. Climbing and descending.—(1) Change in altitude is accomplished dynamically by use of elevators in conjunction with thrust of propellers. To simplify the following discussion the airship is assumed to be flying with neutral trim and in static equilibrium. If it is desired to climb, the altitude pilot raises the elevators which causes an action in the vertical plane similar to that described in paragraph 34 for turning in a horizontal plane. However, in this case, the elevators must be held in the raised position to prevent the static righting moment bringing the longitudinal axis back to the horizontal.

(2) It should be especially noted that when the elevator is raised the tail of the airship actually descends. For this reason extreme caution should be used in use of the elevator when the airship is near the ground.

36. Reverse.—*a.* There is one curious paradox in control of airships at very low speeds. If the speed falls below a certain definite