Effects of Weight

Most modern aircraft are so designed that if all seats are occupied, all baggage allowed by the baggage compartment structure is carried, and all of the fuel tanks are full, the aircraft will be grossly overloaded. This type of design gives the pilot a great deal of latitude in loading the aircraft for a particular flight. If maximum range is required, occupants or baggage must be left behind, or if the maximum load must be carried, the range, dictated by the amount of fuel on board, must be reduced.

Some of the problems caused by overloading an aircraft are:

- The aircraft will need a higher takeoff speed, which results in a longer takeoff run.
- Both the rate and angle of climb will be reduced.
- The **service ceiling** will be lowered.
- The cruising speed will be reduced.
- The cruising range will be shortened.
- Maneuverability will be decreased.
- A longer landing roll will be required because the landing speed will be higher.
- Excessive loads will be imposed on the structure, especially the landing gear.

The POH or AFM includes tables or charts that give the pilot an indication of the performance expected for any gross weight. An important part of careful preflight planning includes a check of these charts to determine the aircraft is loaded so the proposed flight can be safely made.

Static load: The load imposed on an aircraft structure due to the weight of the aircraft and its contents.

Dynamic load: The actual weight of the aircraft multiplied by the load factor, or the increase in weight caused by acceleration.

Load factor: The ratio of the maximum load an aircraft can sustain to the total weight of the aircraft. Normal category aircraft must have a load factor of at least 3.8, utility category aircraft 4.4, and acrobatic category aircraft, 6.0.

Density altitude: Pressure altitude corrected for nonstandard temperature.

High Density Altitude Airport Operations

Consult the POH or AFM to determine the maximum weight allowed for the aircraft under the conditions of altitude, temperature, wind, and runway conditions.

Your preflight planning must include a careful check of gross weight performance charts to determine the aircraft is loaded properly and the proposed flight can be safely made.

Pilot's Operating Handbook (POH): An FAA-approved document published by the airframe manufacturer that lists the operating conditions for a particular model of aircraft and its engines.

Airplane Flight Manual (AFM): An FAA-approved document, prepared by the holder of a Type Certificate for an airplane or rotorcraft, that specifies the operating limitations and contains the required markings and placards and other information applicable to the regulations under which the aircraft was certificated.