AIRPLANE PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY

Climb Gradient	The ratio of the change in height during a portion of a climb to the horizontal distance traversed in the same time interval.
Demonstrated Crosswind Velocity	The velocity of the crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during certification tests. The value shown is not limiting.
GPH	U.S. Gallons per hour.
MEA	Minimum Enroute IFR Altitude.
Route Segment	A part of a route. Each end of that part is identified by: (1) A geographical location; or (2) A point at which a definite radio fix can be established.

WEIGHT AND BALANCE TERMINOLOGY

Airplane Center of Gravity (CG)	The point at which an airplane would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the airplane.
Arm	The horizontal distance from the reference datum to the center of gravity (C.G.) of an item.

Basic Empty Weight	The weight of an empty airplane including full engine oil and unusable fuel. This equals empty weight plus the weight of unusable fuel, and the weight of all the engine oil required to fill the lines and tanks. Basic empty weight is the basic configuration from which loading data is determined.
CG Arm	The arm is obtained by adding the airplane's individual moments and dividing the sum by the total weight.
CG Limits	The extreme center of gravity locations within which the airplane must be operated at a given weight.
Empty Weight	The weight of an empty airplane before any oil or fuel has been added. This includes all permanently installed equipment, fixed ballast, full hydraulic fluid, full chemical toilet fluid, and all other operating fluids full, except that the engines, tanks, and lines do not contain any engine oil or fuel.
Engine Oil	Total system oil including undrainable.
Jack Points	Points on the airplane identified by the manufacturer as suitable for supporting the airplane for weighing or other purposes.
Leveling Points	Those points which are used during the weighing process to level the airplane.
Maximum Landing Weight	Maximum weight approved for the landing touchdown.
Maximum Ramp Weight	Maximum weight approved for ground maneuvering (includes weight of start, taxi, and runup fuel).

Maximum Take-off Weight	Maximum weight approved for the start of the take-off run.
Maximum Zero Fuel Weight	Maximum weight exclusive of usable fuel.
Moment	The product of the weight of an item multiplied by its arm (moment divided by a constant is used to simplify balance calculations by reducing the number of digits).
Payload	Weight of occupants, cargo, and baggage.
Reference Datum	An imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Station	A location along the airplane fuselage usually given in terms of distance from the reference datum.
Tare	The weight of chocks, blocks, stands, etc., used on the scales when weighing an airplane.
Unusable Fuel	Fuel that is not available for flight planning.
Usable Fuel	Fuel available for flight planning.
Useful Load	Difference between Ramp Weight, and Basic Empty Weight.

Serials E-2165 and After and those serials complying with Raytheon Service Bulletin No. 2024:

Operating Range (Green Arc) ..... 3.0 to 27.4 gph
Maximum (Red Radial) ..... 27.4 gph

MISCELLANEOUS INSTRUMENT MARKINGS

INSTRUMENT PRESSURE

Operating Range (Green Arc) .....4.3 to 5.9 in. Hg

FUEL QUANTITY

Yellow Arc..... E to 3/8 full

WEIGHT LIMITS

Maximum Ramp Weight..... 3663 lbs
Maximum Take-off Weight ..... 3650 lbs
Maximum Landing Weight ..... 3650 lbs
Maximum Zero Fuel Weight .....No Structural Limitation
Maximum Weights in Baggage Compartments:
Between Spars ..... 200 lbs
Rear Spar to Sta. 170 ..... 400 lbs
Aft Compartment (Sta. 170 to Sta. 190) ..... 70 lbs
Floor Structure Load Limits:
Between Spars ..... 50 lbs per sq ft
Rear Spar to Sta. 170 ..... 100 lbs per sq ft
Maximum combined weight of aft seat occupants is 250 lbs unless otherwise placarded.

CENTER OF GRAVITY LIMITS (Landing Gear Extended)

FORWARD LIMITS

74.0 inches aft of datum at 3100 lbs or less, with straight line variation to 81.0 inches at 3650 lbs.

AFT LIMIT

87.7 inches aft of datum at all weights.

REFERENCE DATUM

Datum is 83.1 inches forward of center line through forward jack points.

MEAN AERODYNAMIC CHORD

MAC leading edge is 66.7 inches aft of datum.
MAC length is 65.3 inches.

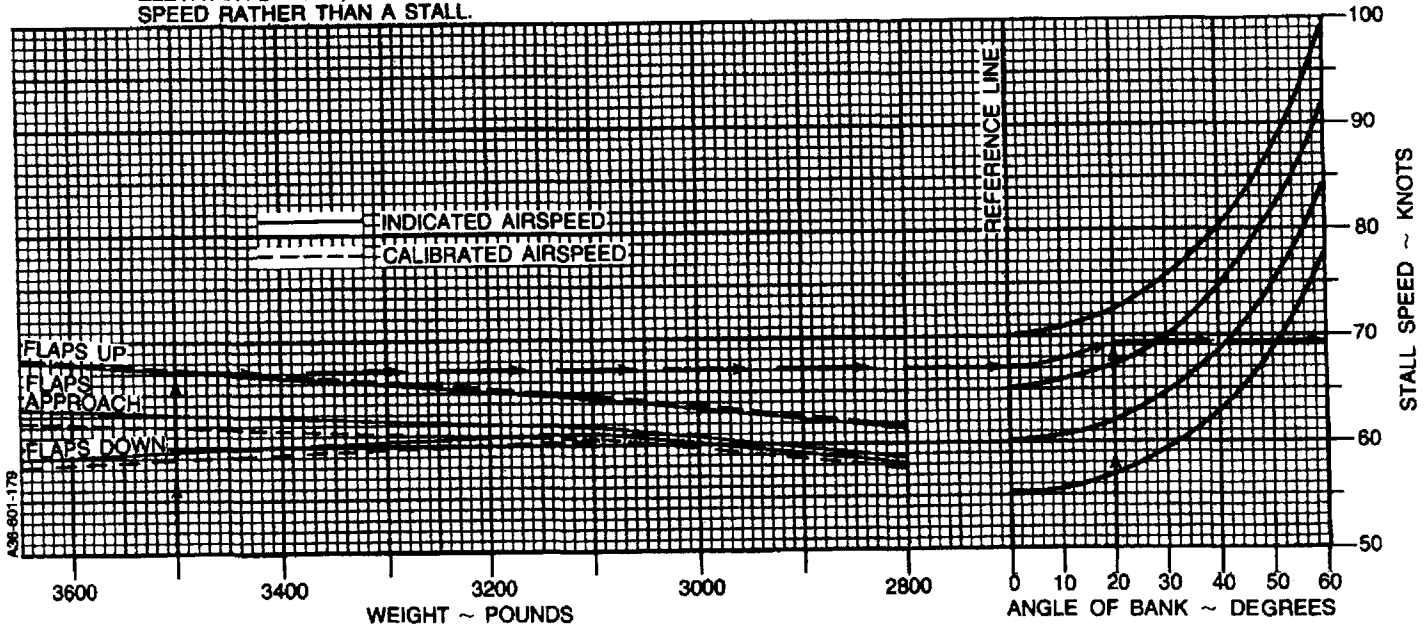
STALL SPEEDS – POWER IDLE

Notes: 1. THE MAXIMUM ALTITUDE LOSS EXPERIENCED WHILE CONDUCTING STALLS IN ACCORDANCE WITH CAR 3.120 WAS 320 FEET.

2. THESE STALL SPEEDS WERE DETERMINED AT THE FORWARD CENTER OF GRAVITY LIMIT FOR EACH WEIGHT. AT SOME LOADINGS THE AIRPLANE IS ELEVATOR LIMITED, RESULTING IN A MINIMUM STEADY SPEED RATHER THAN A STALL.

EXAMPLE:

WEIGHT	3500 LBS
FLAPS	UP
BANK ANGLE	20°
STALL SPEED	69.4 KTS INDICATED

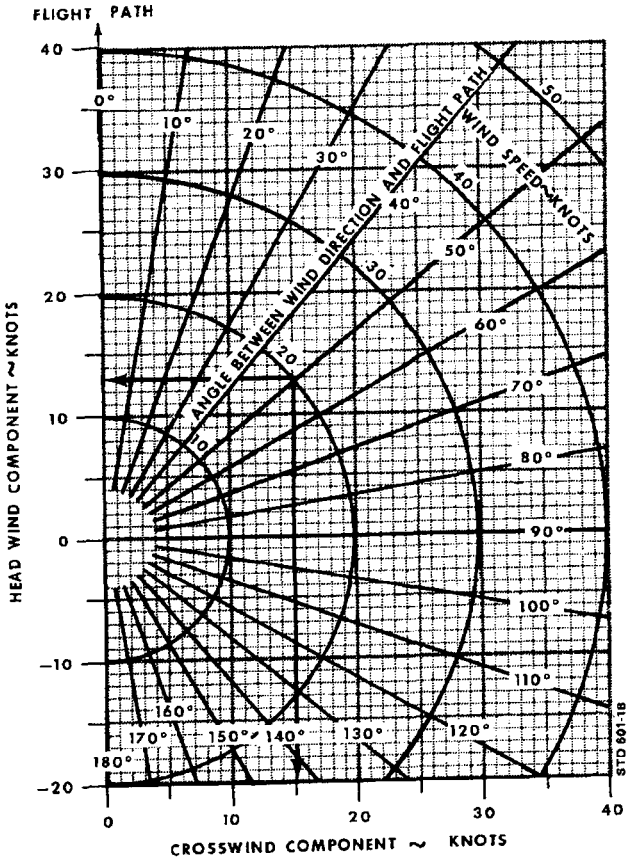


WIND COMPONENTS

Demonstrated Crosswind is 17 kts

EXAMPLE:

WIND SPEED	20 KTS
ANGLE BETWEEN WIND DIRECTION AND FLIGHT PATH	50°
HEADWIND COMPONENT	13 KTS
CROSSWIND COMPONENT	15 KTS



TAKE-OFF DISTANCE – FLAPS UP

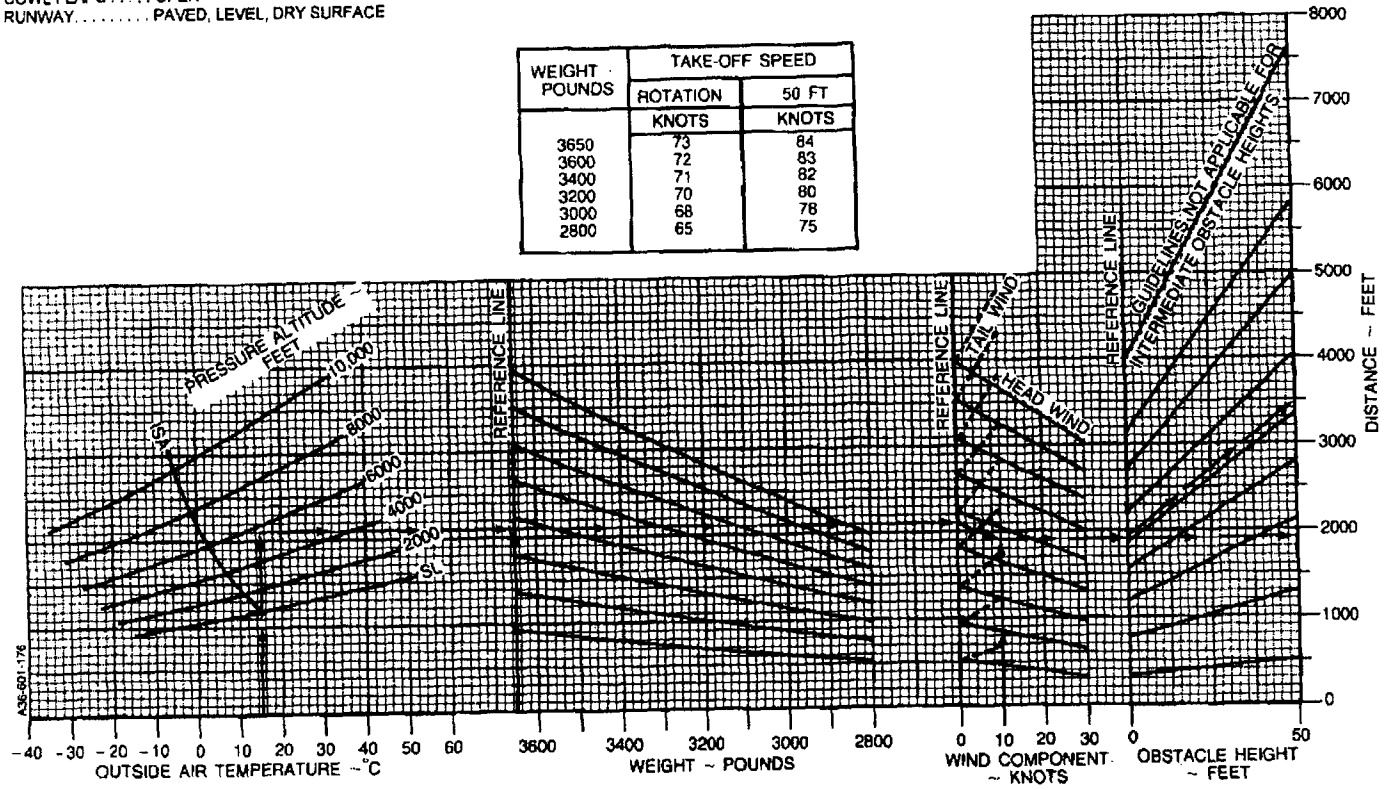
ASSOCIATED CONDITIONS:

POWER . . . . . TAKE-OFF POWER SET BEFORE BRAKE RELEASE
MIXTURE . . . . . FULL RICH (E-1946, E-2104, E-2111 THRU E-3144, NOT IN COMPLIANCE WITH RAYTHEON AIRCRAFT S.B. 28-3052) AS REQUIRED BY FIELD ELEVATION (E-3145 AND AFTER, AND PRIOR AIRPLANES IN COMPLIANCE WITH RAYTHEON AIRCRAFT S.B. 28-3052)
FLAPS . . . . . UP
LANDING GEAR . . . RETRACT AFTER POSITIVE CLIMB ESTABLISHED
COWL FLAPS . . . . . OPEN
RUNWAY . . . . . PAVED, LEVEL, DRY SURFACE

EXAMPLE:

OAT	15°C
PRESSURE ALTITUDE	5653 FT
TAKE-OFF WEIGHT	3650 LBS
HEAD WIND COMPONENT	10 KTS
GROUND ROLL	1900 FT
TOTAL DISTANCE OVER 50-FT OBSTACLE	3475 FT
TAKE-OFF SPEED AT	
ROTATION	73 KTS
50-FT	84 KTS

WEIGHT POUNDS	TAKE-OFF SPEED	
	ROTATION	50 FT
	KNOTS	KNOTS
3650	73	84
3600	72	83
3400	71	82
3200	70	80
3000	68	78
2800	65	75



CLIMB

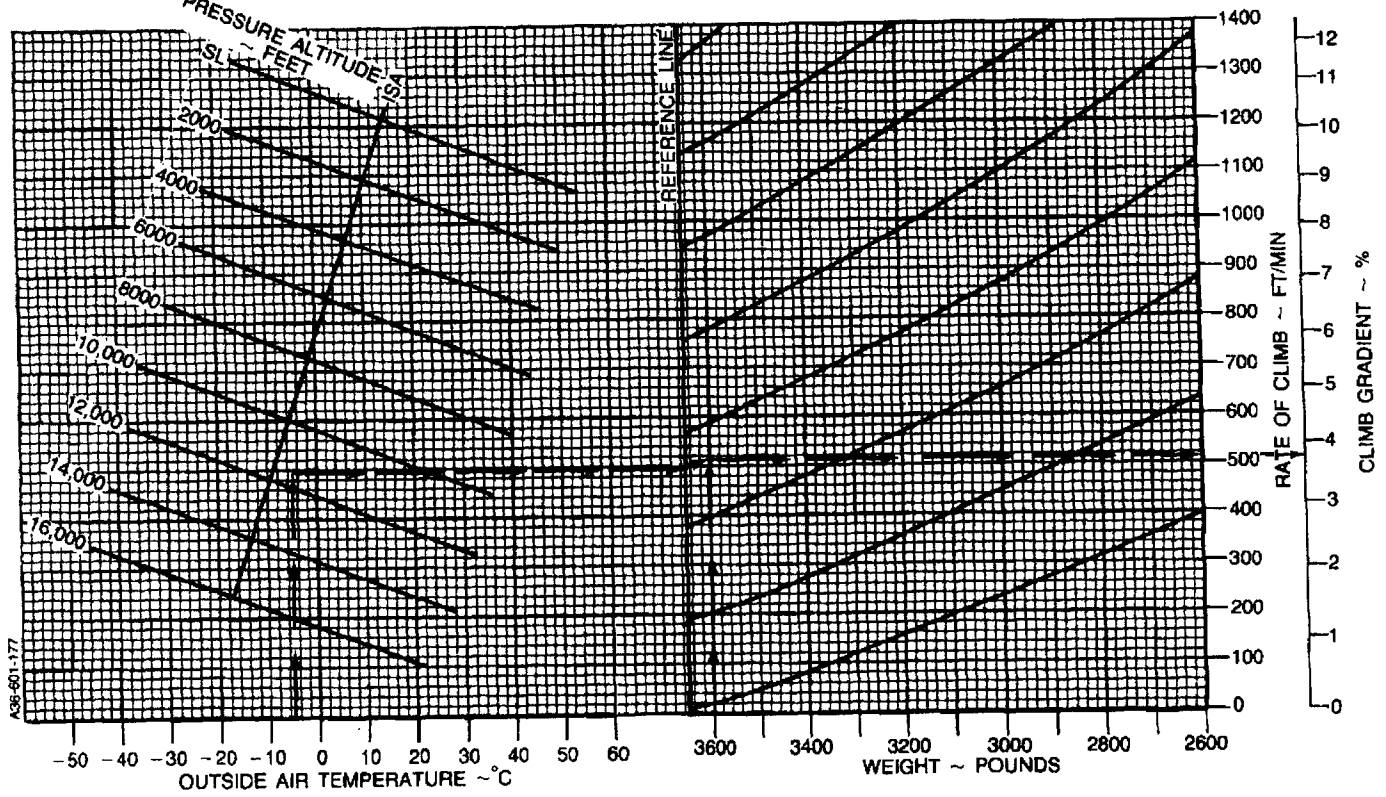
CLIMB SPEED: 100 KNOTS ALL WEIGHTS

ASSOCIATED CONDITIONS:

POWER..... FULL THROTTLE, 2700 RPM
MIXTURE..... FULL RICH (E-1946, E-2104, E-2111 THRU E-3144, NOT IN COMPLIANCE WITH RAYTHEON AIRCRAFT S.B. 28-3052)
AS REQUIRED BY ALTITUDE (E-3145 AND AFTER, AND PRIOR AIRPLANES IN COMPLIANCE WITH RAYTHEON AIRCRAFT S.B. 28-3052)
FLAPS..... UP
LANDING GEAR... UP
COWL FLAPS..... AS REQUIRED

EXAMPLE:

OAT	−5°C
PRESSURE ALTITUDE	11,500 FT
WEIGHT	3600 LBS
RATE OF CLIMB	515 FT/MIN
CLIMB GRADIENT	3.8%



Propeller rpm is controlled by a governor which regulates hydraulic oil pressure to the hub. A control lever (blue knob) on the pedestal allows the pilot to select the governor's rpm range.

If oil pressure is lost, the propeller will go to the full high rpm position. This is because propeller low rpm is obtained by governor-boosted engine oil pressure working against the centrifugal twisting moment of the blades.

HARTZELL

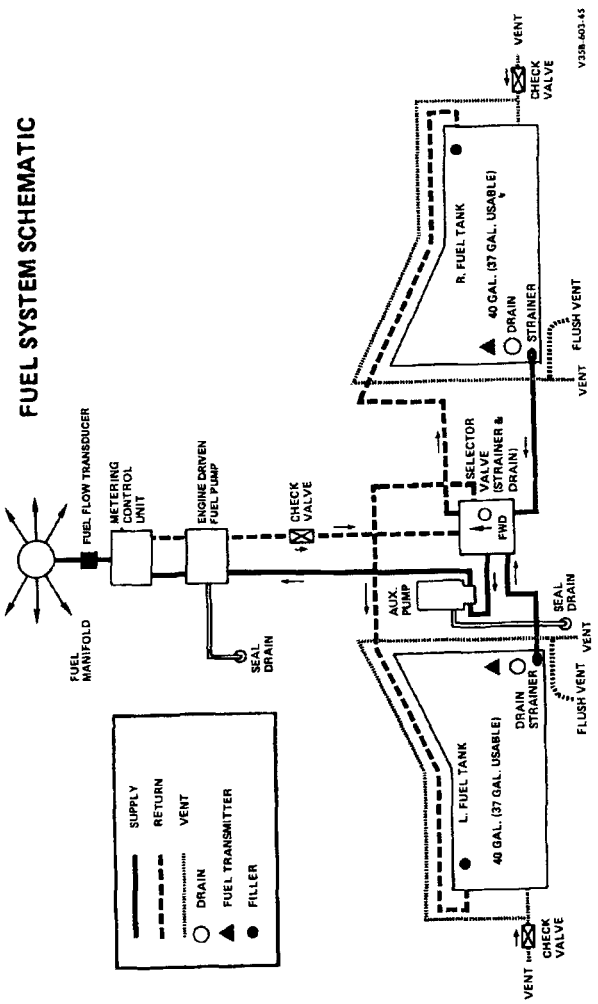
Refer to supplement HPA36-2 for airplanes equipped with a Hartzell propeller.

FUEL SYSTEM

The engine is designed to operate on aviation gasoline grade 100LL (blue) or grade 100 (green). However, the use of grade 100LL (blue) is preferred.

FUEL CELLS

The fuel system consists of a rubber fuel cell located in each wing leading edge. The fuel capacity consists of two 40-gallon cells (37 gallons usable.) A visual measuring tab is attached to each filler neck of each individual cell. The bottom of the tab indicates 27 gallons of usable fuel in the cell, and the detent slot on the tab indicates 32 gallons of usable fuel in the cell. The engine-driven fuel injector pump delivers approximately 10 gallons of excess fuel per hour, which bypasses the fuel control and returns to the cell being used. Three fuel drains are provided, one in each fuel cell sump on the underside of each wing, and one on the fuel selector valve inboard of the left wing root. These points should be drained before the first flight of the day.


FUEL SYSTEM SCHEMATIC
FUEL MANIFOLD
FUEL FLOW TRANSDUCER
METERING CONTROL UNIT
ENGINE DRIVEN FUEL PUMP
CHECK VALVE
SEAL DRAIN
AUX. PUMP
SELECTOR VALVE (STRAINER & DRAIN)
FWD
R. FUEL TANK
40 GAL. (37 GAL. USABLE)
DRAIN
STRAINER
FLUSH VENT
VENT
CHECK VALVE
L. FUEL TANK
SUPPLY
RETURN
VENT
DRAIN
FUEL TRANSMITTER
FILLER