

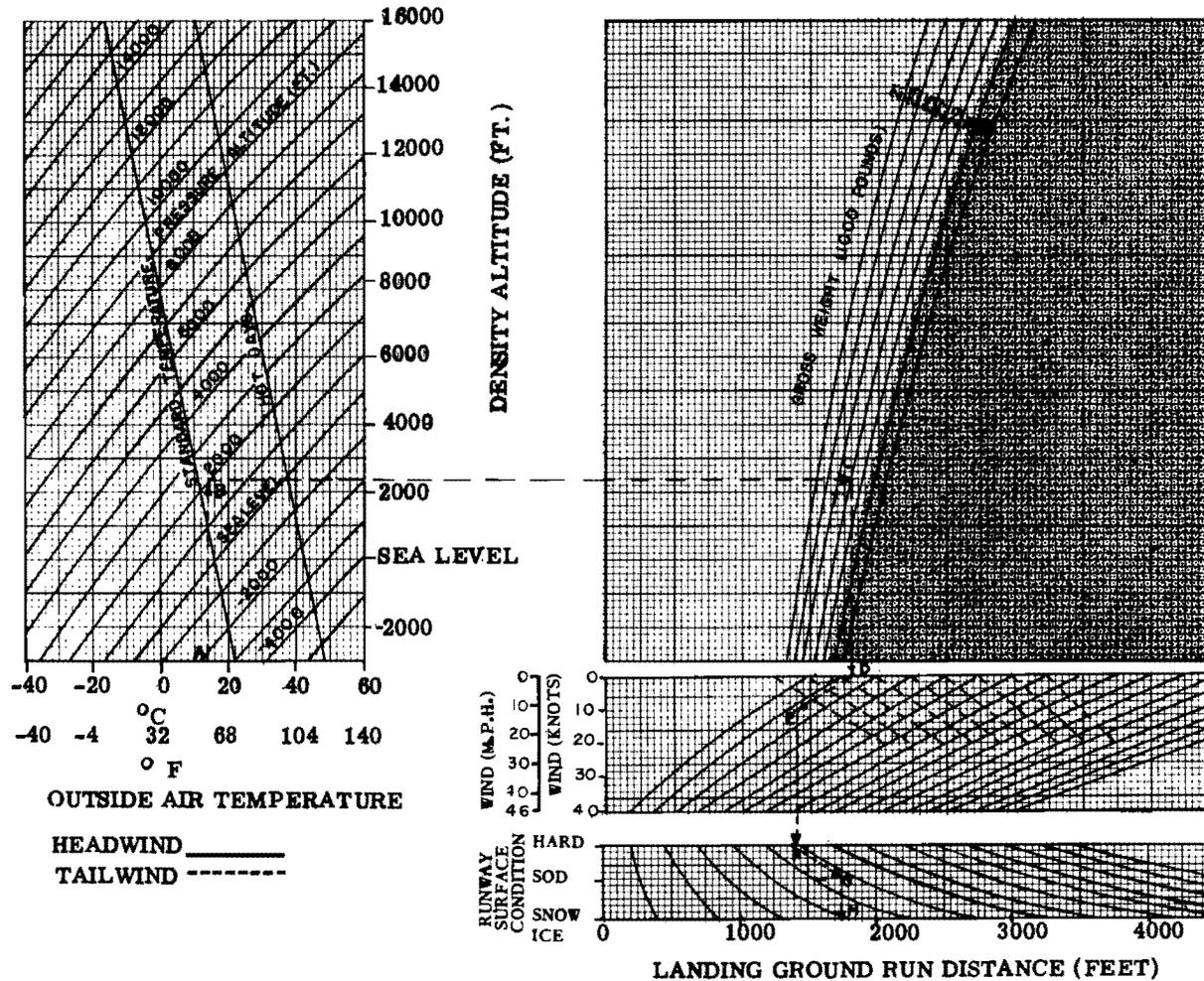
LANDING GROUND RUN

TOUCHDOWN AT $1.1V_s$
WING FLAPS = 45 DEGREES
IDLE POWER

MODEL(S): C-47, C-117
AND R4D

BASED ON: FLIGHT TEST DATA
DATA AS OF: 11 JULY 1957

ENGINE(S): (2) R-1830-90C
(HIGH BLOWER INOPERATIVE)
-90D AND -92



SAMPLE PROBLEM:

- Outside air temperature = 14°C .
- Pressure altitude = 2000 feet.
- Gross weight = 27000 pounds.
- Base line.
- Reported headwind = 20 knots.
- Base line and run distance on hard surface runway = 1400 feet.
- Runway surface condition = sod.
- Ground run distance on sod surface = 1750 feet.

NOTE:

- Speed at 50 foot height = 120 percent of stall speed.
- Speed at touchdown = 110 percent of stall speed.
- Wing flaps = 45 degrees.
- This chart is for landing ground run distance only. Air run from a 50 foot height to touchdown is approximately 85 percent of landing ground run on hard surface for 45 degrees flap. Total landing distance from a 50 foot height is the sum of the air run plus the ground run distance for any prevailing runway surface condition.
- Use 50 percent of reported headwinds and 150 percent of reported tailwinds with the wind correction grid, if wind is measured at a source other than runway. This is a recommended procedure which may be revised at the discretion of the pilot, depending upon the source of measurement of the wind data.

Figure A6-1. Landing Ground Run - Touchdown at $1.1V_s$ - Wing Flaps - 45 Degrees.

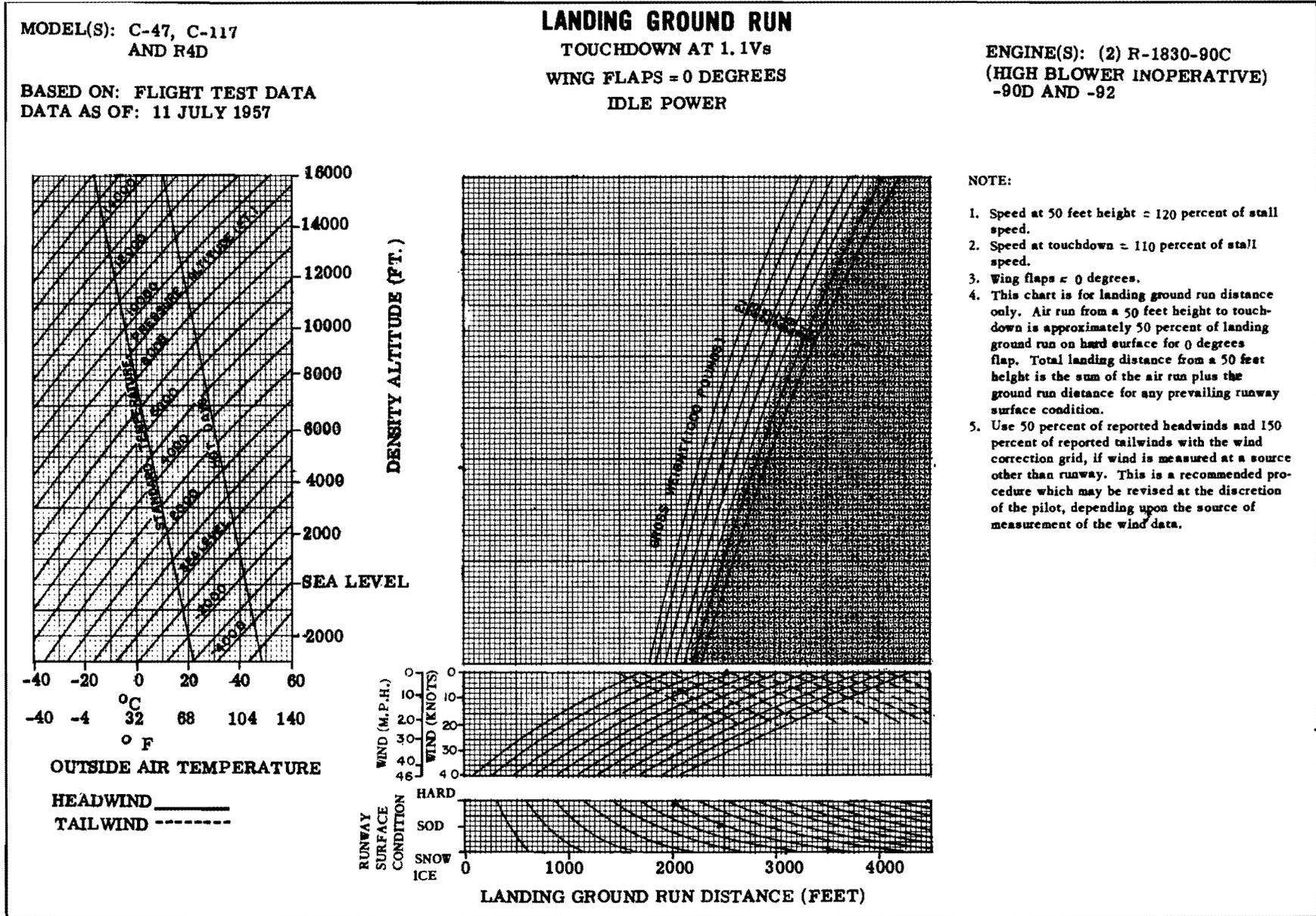
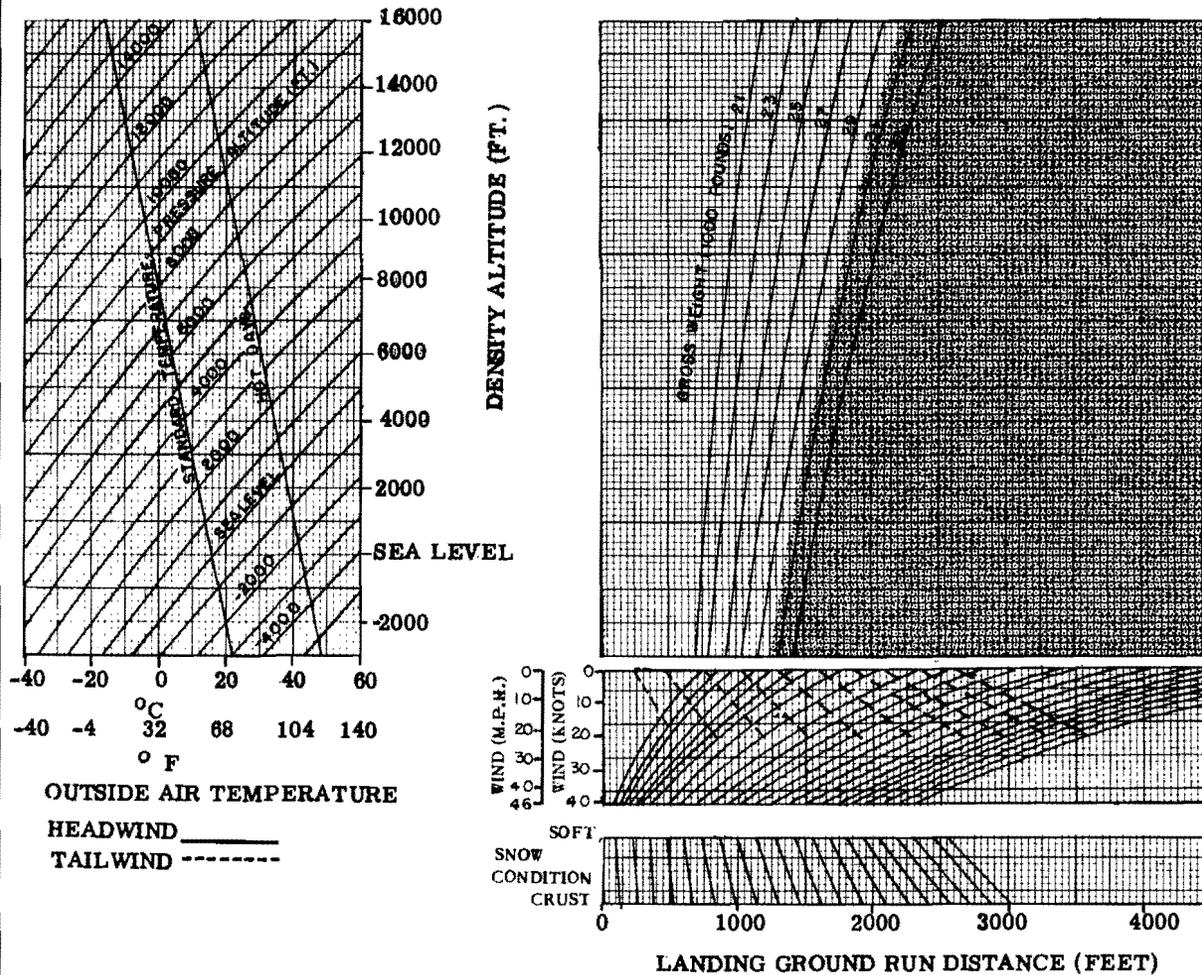


Figure A6-2. Landing Ground Run - Touchdown at 1.1V_s - Wing Flaps - 0 Degrees.

SNOW LANDING GROUND RUN SKIS DOWN

TOUCHDOWN AT $1.1 V_s$
 WING FLAPS = 45 DEGREES
 IDLE POWER

BASED ON: FLIGHT TEST DATA MODEL(S): C-47, C-117
 DATA AS OF: 11 JULY 1957 AND R4D



NOTE:

1. Speed at 50 feet height = 120 percent of stall speed.
2. Speed at touchdown = 110 percent of stall speed.
3. Wing flaps = 45 degrees.
4. This chart is for landing ground run distance only. Air run from a 50 feet height to touchdown is approximately 75 percent of landing ground run on hard surface for 45 degrees flap. Total landing distance from a 50 feet height is the sum of the air run plus the ground run distance for any prevailing runway surface condition.
5. Use 50 percent of reported headwinds and 150 percent of reported tailwinds with the wind correction grid, if wind is measured at a source other than runway. This is a recommended procedure which may be revised at the discretion of the pilot, depending upon the source of measurement of the wind data.

ENGINE(S): (2) R-1830-90C
 (HIGH BLOWER INOPERATIVE)
 -90D AND -92

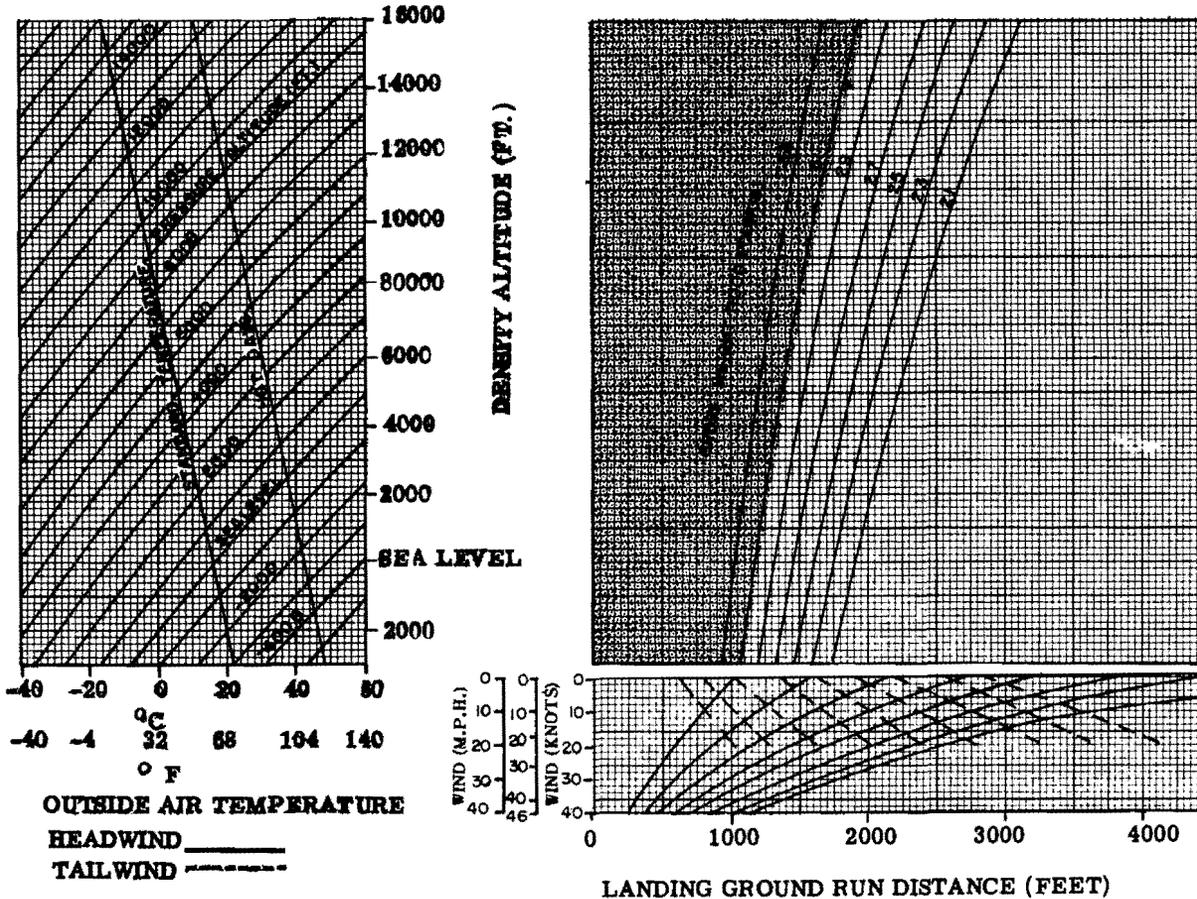
Figure A6-3. Snow Landing Ground Run - Skis Down - Touchdown at $1.1V_s$ - Wing Flaps - 45 Degrees.

PACKED SNOW LANDING GROUND RUN (WITH SKIS)

TOUCHDOWN AT 1.1V_s

WING FLAPS 45 DEGREES

BASED ON: FLIGHT TEST DATA MODEL(S): C-47, C-117 IDLE POWER
DATA AS OF: 11 JULY 1957 AND R4D



NOTE.

1. Speed at 50 feet height = 120 percent of stall speed.
2. Speed at touchdown = 110 percent of stall speed.
3. Wing flaps = 45 degrees.
4. This chart is for landing ground run distance only. Air run from a 50 feet height to touchdown is approximately 75 percent of landing ground run on hard surface for 45 degrees flap. Total landing distance from a 50 feet height is the sum of the air run plus the ground run distance for any prevailing runway surface condition.
5. Use 50 percent of reported headwinds and 150 percent of reported tailwinds with the wind correction grid, if wind is measured at a source other than runway. This is a recommended procedure which may be revised at the discretion of the pilot, depending upon the source of measurement of the wind data.

ENGINE(S): (2) R-1830-90C
(HIGH BLOWER INOPERATIVE)
-90D AND -92

CAUTION

This landing data is based on the following conditions:

1. Touch down with landing gear down, skis fully extended.
2. Retract skis and apply brakes at normal braking conditions.

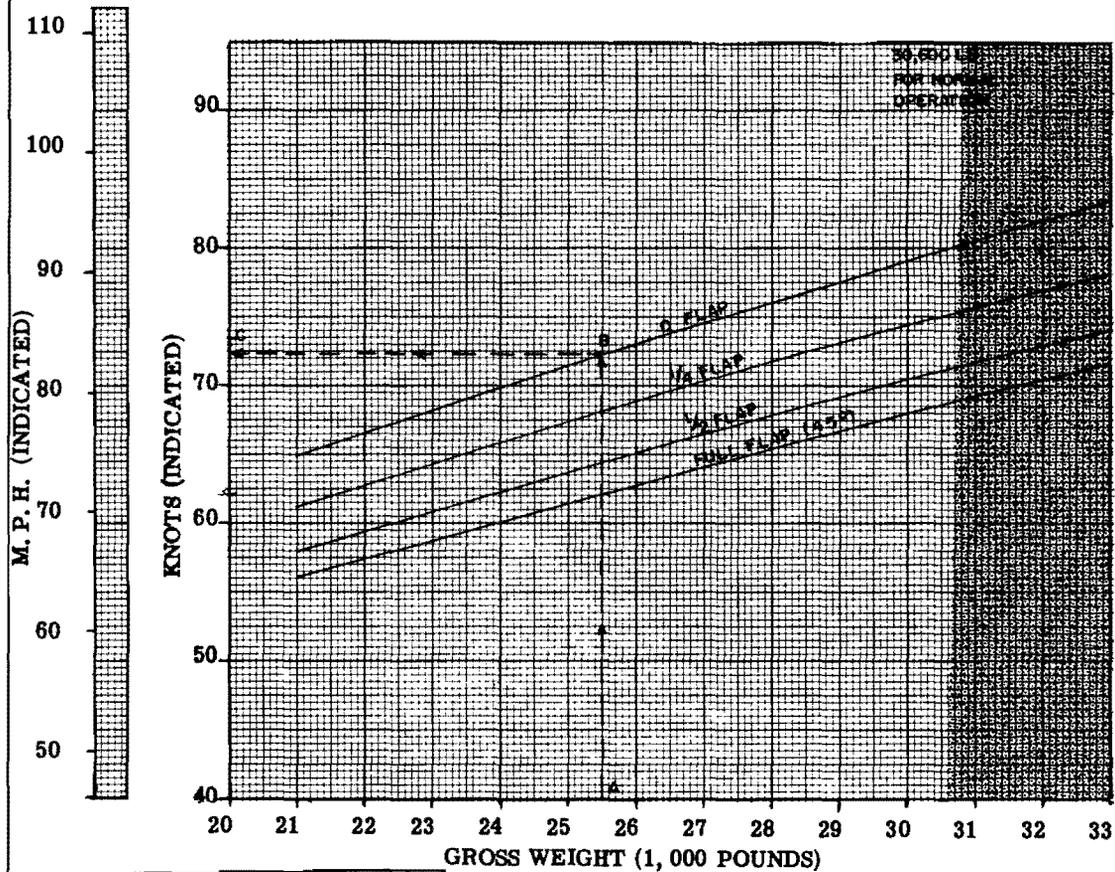
Figure A6-4. Packed Snow Landing Ground Run - Skis Down - Touchdown at 1.1V_s - Wing Flaps - 45 Degrees.

CHARACTERISTIC LANDING SPEEDS TOUCHDOWN AT 1.1V_s

MODELS: C-47, C-117,
AND R4D

ENGINE(S): (2) R-1830-90C
(HIGH JBLOWER INOPERATIVE)
- 90D and -92

BASED ON: FLIGHT TEST DATA
DATA AS OF: 1 DECEMBER 1949



CONVERSION TABLE

TO GET FROM TOUCHDOWN SPEED
1.1V_s TO:

	MULTIPLY BY
THRESHOLD (1.2V _{stall})	1.09
FINAL APPROACH (1.3V _{stall})	1.182
BEFORE TURNING FINAL (1.4V _{stall})	1.272

NOTE:

1. SPEED OVER A 50 FEET HEIGHT IS 1.2V_s.
2. SPEEDS GIVEN ARE AIRSPEED INDICATOR READINGS.
3. A FIVE KNOT CORRECTION FOR POSITION ERROR HAS BEEN SUBTRACTED.
4. NO INSTRUMENT ERROR IS INCLUDED.

SAMPLE PROBLEM:

GIVEN:

1. GROSS WEIGHT = 25,500 POUNDS (POINT A).
2. WING FLAP SETTING = ZERO (POINT B).

FIND:

1. TOUCHDOWN SPEED = 72.2 KNOTS (POINT C).

Figure A6-5. Characteristic Landing Speeds - Touchdown at 1.1V_s.

POWER OFF STALL SPEEDS 0 FLAPS

MODEL(S): C-47, C-117
AND R4D

BASED ON: FLIGHT TEST DATA
DATA AS OF: 1 DECEMBER 1949

ENGINE(S): (2) R-1830-90C
(HIGH BLOWER INOPERATIVE)
-90D AND -92

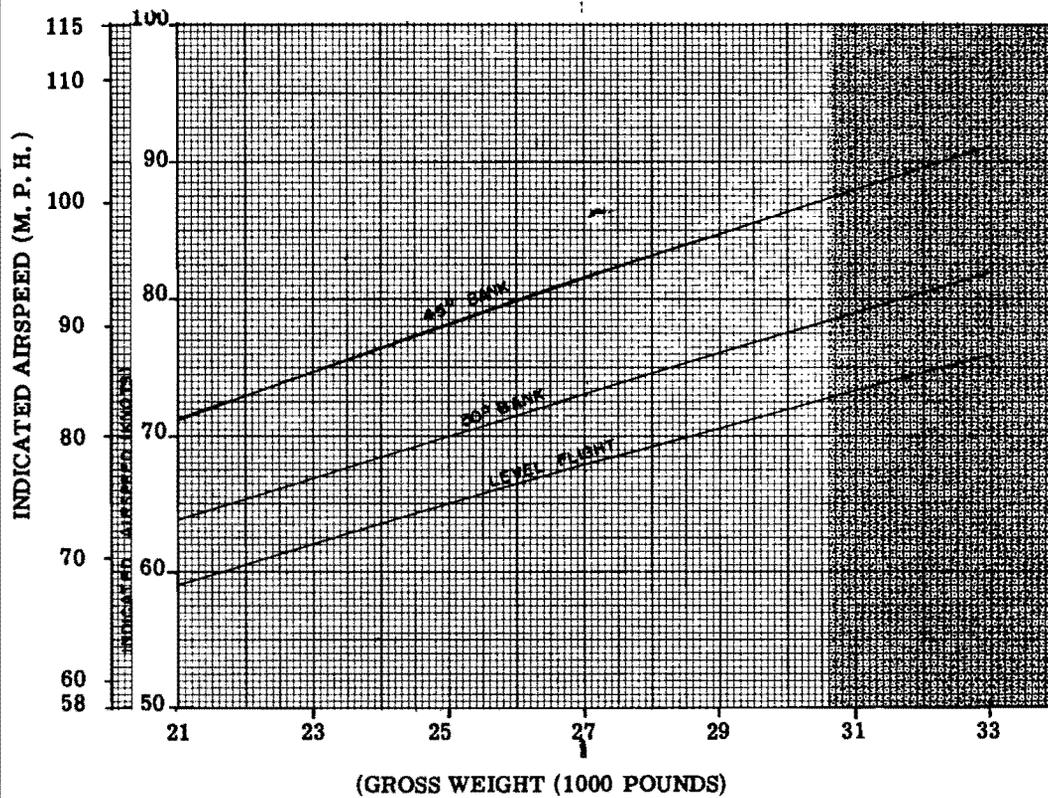


Figure A6-6. Power Off Stall Speeds - 0 Flaps.

POWER OFF STALL SPEEDS 1/4 FLAPS

MODEL(S): C-47,
C-117 AND R4D

BASED ON: FLIGHT TEST DATA
DATA AS OF: 1 DECEMBER 1949

ENGINE(S): (2) R-1830-90C
(HIGH BLOWER INOPERATIVE)
-90D AND -92

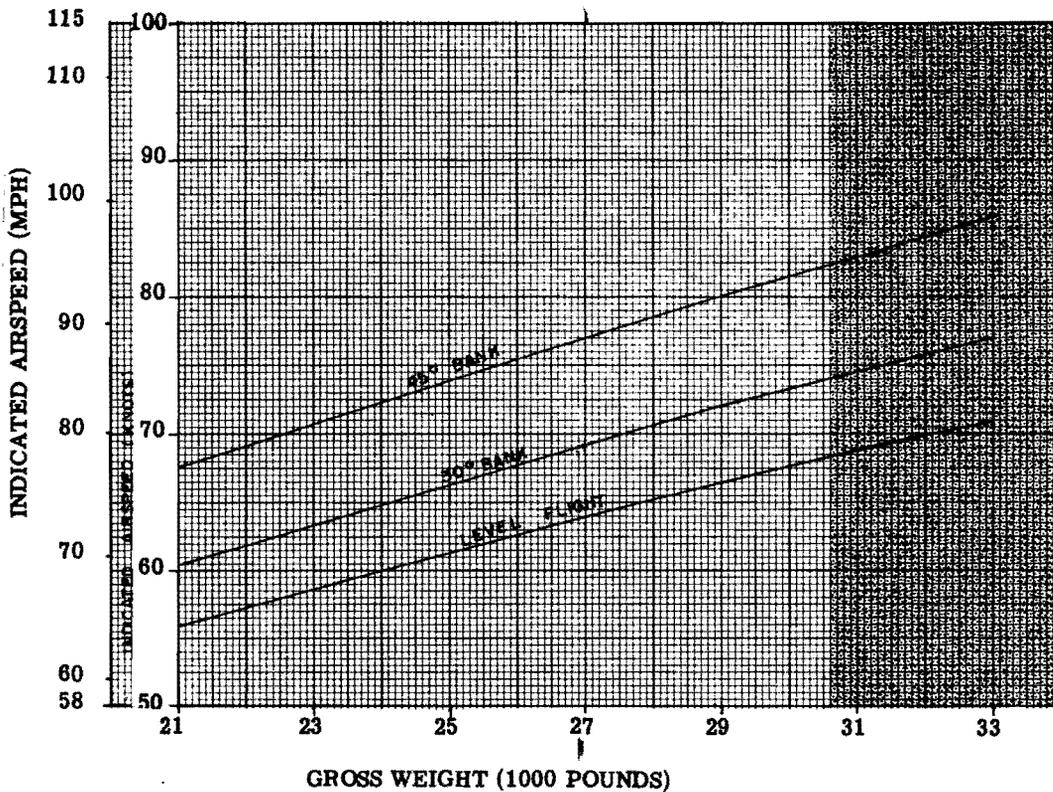


Figure A6-7. Power Off Stall Speeds - 1/4 Flaps.

POWER OFF STALL SPEEDS 1/2 FLAPS

MODEL(S): C-47,
C-117, AND R4D

BASED ON: FLIGHT TEST DATA
DATA AS OF: 1 DECEMBER 1949

ENGINE(S); (2) R-1830-90C
(HIGH BLOWER INOPERATIVE)
-90D AND -92

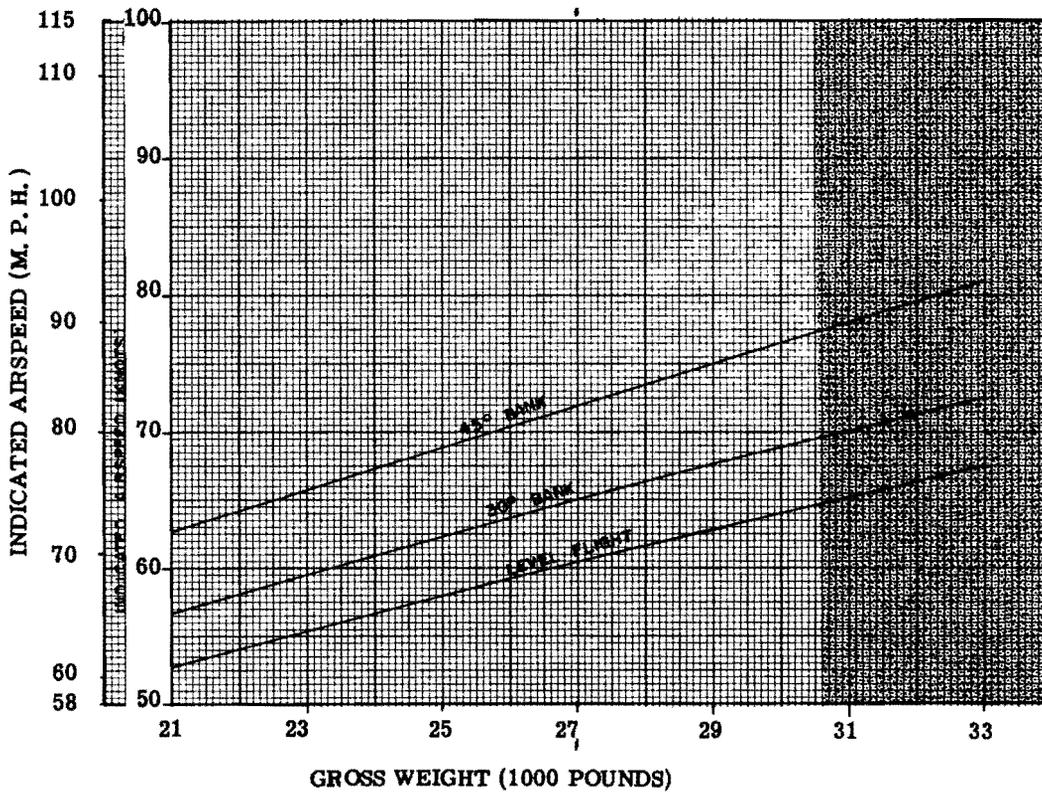


Figure A6-8. Power Off Stall Speeds - 1/2 Flaps.

POWER OFF STALL SPEEDS FULL FLAPS

MODEL(S): C-47,
C-117, and R4D

BASED ON: FLIGHT TEST DATA
DATA AS OF: 1 DECEMBER 1949

ENGINE(S): (2) R-1830-90C
(HIGH BLOWER INOPERATIVE)
-90D AND -92

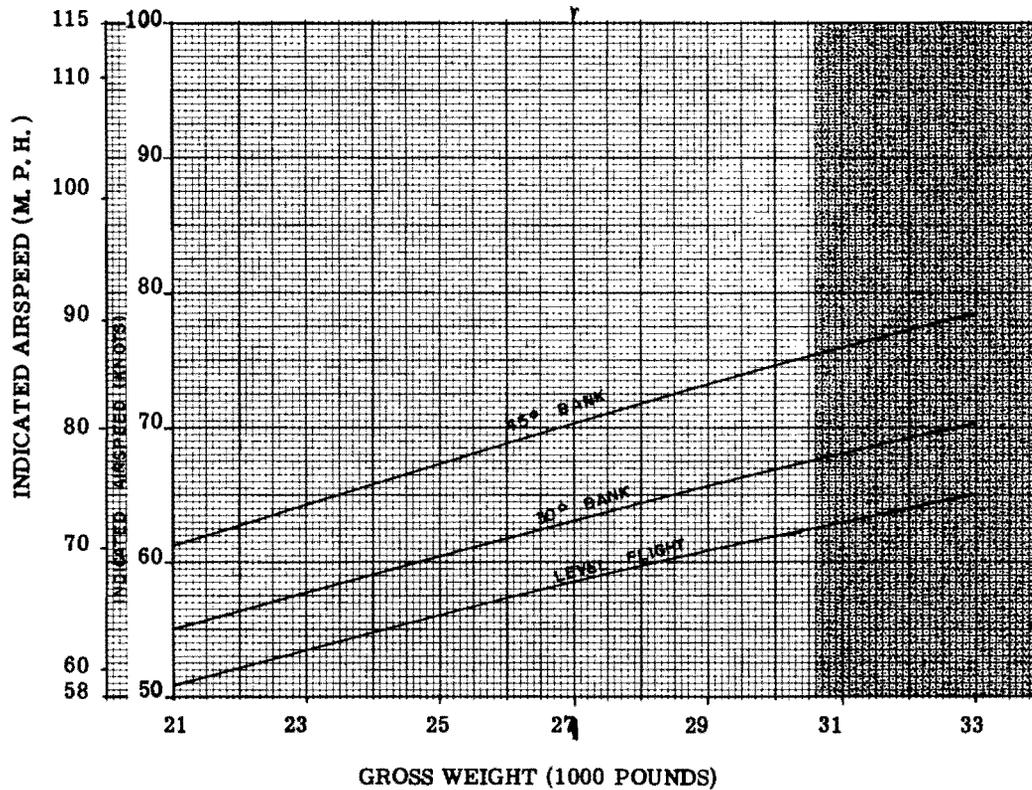


Figure A6-9. Power Off Stall Speeds - Full Flaps.

PART SEVEN

MISSION PLANNING

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TAKE-OFF AND LANDING DATA CARD

A take-off and landing data card is included in T. O. 1C-47-CL-1-1 to provide readily available information for take-off and landing. Prior to each flight, applicable data should be computed and entered on the cards. This information can then be reviewed by the pilot or read aloud by the copilot as a checklist item immediately prior to take-off and landing. A sample is shown on page A7-5.

SOURCES OF INFORMATION

Information for items on the take-off and landing data cards may be found in the following paragraphs.

TAKE-OFF DATA

Refusal Distance---Obtained from the Take-Off Performance--Speed During Ground Run chart (figure A3-9).

Refusal Speed---Obtained from the Take-Off Performance--Refusal Speed chart (figure A3-11).

Take-Off Speed---Obtain from the Take-Off Performance--Characteristic Take-Off Speed chart (figure A3-14).

LANDING IMMEDIATELY AFTER TAKE-OFF DATA

120 Percent Power-Off Stalling Airspeed---Obtained from the Characteristic Landing Speed chart (figure A6-5).

110 Percent Power-Off Stalling Airspeed---Obtained from the Characteristic Landing Speed chart (figure A6-5).

Take-Off Speed---Obtained from the Take-Off Performance--Characteristics Take-Off Speed chart (figure A3-14).

CONDITIONS DATA

Gross Weight (Actual)---Basic aircraft operating weight, plus fuel, cargo, and crew.

Gross Weight Limited by Single-Engine Climb---Obtained from the Take-Off Gross Weight Limited by Single-Engine Climb Performance chart (figure A3-1).

Pressure Altitude---Obtained from weather briefing or tower operator.

Outside Air Temperature---Obtained from aircraft temperature gage.

Dew Point---Obtained from weather briefing.

Specific Humidity---Obtained from weather briefing.

Density Altitude---Obtained from the Density Altitude Chart (figure A1-4).

Runway Length---Obtained from operations or Flight Information Publications (FLIP) charts.

Runway Slope---Obtained from operations or Flight Information Publications (FLIP) charts.

Wind Component---Obtained from weather briefing.

A7-2

LANDING DATA

Landing Gross Weight---Take-Off weight less fuel consumed.

Wind Component---Obtained from tower operator.
Threshold Airspeed (120 percent of Power-Off Stalling Airspeed)---Obtained from the Characteristic Landing Speeds Chart (figure A6-5).

Touchdown Speed (110 Percent of Power-Off Stalling Airspeed)---Obtained from the Characteristic Landing Speed chart (figure A6-5).

Take-Off Speed---Obtained from the Take-Off Performance--Characteristic Take-Off Speed chart (figure A3-14).

SAMPLE PROBLEM

Sample problems are provided to clarify the use of the performance charts where applied to a typical mission and to emphasize the need for adequate mission planning.

LONG RANGE OPERATION PROBLEM

The following sample problem is a typical search mission for this type aircraft. The mission requires that the aircraft Take-Off - Climb to 10,000 feet density altitude; cruise out for 1 hour at 10,000 feet density altitude; then descend to 1000 feet density altitude; search for 4 hours at 1000 feet density altitude; climb to 7000 feet density altitude; then cruise at 7000 feet density altitude and land at the point of departure. All climbs will be made using climb power settings. Both cruises will be made using recommended long range airspeeds and power settings. The 1000 foot search will be made using the recommended maximum endurance airspeeds and power settings. The mission requires that the aircraft return to the base with sufficient fuel to cruise 30 minutes at sea level, plus an additional 10 percent of Take-Off fuel load.

CONDITIONS

TAKE-OFF CONDITIONS

Pressure Altitude ----Sea Level

Outside Air Temperature----24°C

Specific Humidity----0.015

Headwind at 50-foot Height----20 Knots.

Runway Length Available----4000 Feet

Runway Slope (up hill) ----0.15

Runway Surface Condition----Hard Surface

TAKE-OFF GROSS WEIGHT

Take-Off gross weight limited by single-engine climb performance (see figure A3-1)---30,600 pounds.
Aircraft operating weight, empty, including oil (gross weight less fuel and cargo)----21,000 pounds.

CRUISE CONDITIONS

Headwind -----None

Temperature at 10,000 feet density altitude ---- -5°C Temperature at 7000 feet density altitude ---- 1°C Temperature at 1000 feet pressure altitude ---- 11°C **TAKE-OFF AND ABORT CRITERIA**

Take-Off ground run (see figure A3-2)----- 2050 feet.

Take-Off ground run as corrected by the runway slope correction chart (see figure A3-10)----- 2250 feet.

Take-Off speed (see figure A3-14)----- 80 KIAS.

Refusal speed (see figure A3-11) ----- 72 KIAS.

Refusal distance (see figure A3-9) ----- 1820 feet.

Fuel consumed during warmup and take-off (estimated) ----- 270 pounds.

Distance to clear a 50 foot obstacle ----- (figure A3-2) ----- 4480 feet.

CLIMB TO 10,000 FEET DENSITY ALTITUDE

Climb to 10,000 feet density altitude will be made at climb power settings. The gross weight at start of climb is 30,330 pounds ($30,600 - 270 = 30,330$). The time and distance to climb, and the gross weight at end of climb are determined from figure A4-3 as follows:

Time to climb ----- 41.5 minutes.

Distance to climb ----- 97 nautical miles.

Gross weight at end of climb ----- 29,600 pounds.

Fuel consumed during climb is 730 pounds -----
---($30,330 - 29,600 = 730$).**CRUISE AT 10,000 FEET DENSITY ALTITUDE**

Cruise at 10,000 feet density altitude and descent to 1000 feet pressure altitude will be made at long range power settings. The gross weight at beginning of cruise is 29,600 pounds. Range during cruise and gross weight at end of cruise for a zero wind condition are determined from figure A5-9 as follows:

Range ----- 120 nautical miles.

Gross weight at end of cruise ---- 29, 150 pounds.

Fuel consumed during cruise is 450 pounds -----
---($29,600 - 29,150 = 450$).

The average airspeed is 120 knots.

The recommended power settings and airspeed during cruise for an initial gross weight of 29,600 pounds are determined from figure A5-3 and are as follows:

Calibrated airspeed ----- 130.5 Knots.

Brake horsepower per engine ----- 550.

RPM ----- 1860.

Manifold pressure ----- 28.2 inches Hg.

Fuel flow ----- 470 pounds per hour.

Nautical miles per pound ----- 0.278.

NOTE

The long range power condition charts are based on long range cruising operation; therefore, it is essential that conditions of the 99 percent maximum range power conditions curves be followed. Power settings should be changed at least every hour in order that range and time performance on the long range prediction curves be attainable. The fuel flow data will facilitate the determination of the new gross weight at the time of the power change. At the end of one hour cruise at the initial power setting, the gross weight will be 29,150 pounds ($29,600 - 450 = 29,150$). New power settings can then be read at this new weight.

SEARCH AT 1000 FEET DENSITY ALTITUDE

Search at 1000 feet density altitude with zero degrees wing flaps will be made at the speed and power settings recommended for the maximum endurance. To maintain operation at optimum efficiency, it is necessary to recompute and readjust power settings at least once each hour based on the gross weight change due to fuel consumed. The recommended brake horsepower for the first hour's operation is determined from figure A5-14 as follows:

True airspeed ----- 96 Knots.

Brake horsepower per engine ----- 445.

Fuel consumed during the first hour of cruise is determined to be 385 pounds per hour from figure A5-14.

Power settings for the first hour of cruise at 445 bhp per engine are determined from figures A5-14 as follows:

Manifold pressure ----- 28 inches Hg

RPM ----- 1700.

Fuel consumed (fortwo engines) ---- 385 pounds.

At the beginning of the second hour's cruise the gross weight will be 28,765 pounds ($29150 - 385 = 28,765$). Power settings and fuel consumption for each remaining hour of cruise are computed in the same manner.

After computing power settings and fuel flow for all 4 hours of cruise, the total fuel consumed is determined to be 1495 pounds and the gross weight at end of cruise is 27655 pounds ($29150 - 1495 = 27655$). Range during cruise is estimated to be 380 nautical miles by multiplying time during cruise by average true airspeed during cruise ($4 \times 95 = 380$).

CLIMB TO 7000 FEET DENSITY ALTITUDE.

Climb to 7000 feet density altitude will be made at climb power settings. The gross weight at start of climb is 27,655 pounds. The time and distance to climb, and the gross weight at end of climb are determined from figure A4-3 as follows:

Time to climb ----- 16.8 minutes.
Distance to climb ----- 37.7 nautical miles.
Gross weight at end of climb ----- 27,280 pounds.
Fuel consumed during climb from 1000 feet to 7000 feet is 375 pounds (27,655 - 27,280 = 375).

CRUISE AT 7000 FEET DENSITY ALTITUDE

Cruise at 7000 feet density altitude will be made at long range power settings. The gross weight at beginning of cruise is 27,280 pounds. The range to cruise to point of departure is determined to be 179.3 nautical miles. Time during cruise and gross weight at end of cruise for zero wind conditions are determined by interpolation from figures A5-8 and A5-9 and are as follows:

Time ----- 90 minutes.
Gross weight at end of cruise ----- 26,700 pounds.
Fuel consumed during cruise is 580 pounds.

The recommended power settings and airspeed during cruise for an initial gross weight of 27,280 pounds are determined from figure A5-3 and are as follows:

True airspeed ----- 119 Knots.
Brake horsepower ----- 465.
RPM ----- 1720.
Manifold pressure ----- 27.9 inches Hg.
Fuel flow ----- 400 pounds per hour.
Nautical miles per pound ----- 0.299.

NOTE

The long range power condition charts are based on long range cruising operation; therefore, it is essential that conditions of the 99 percent maximum range power conditions curves be followed. Power settings should be changed at least every hour in order that range and time performance on the long range prediction curves be attainable. The fuel flow data will facilitate the determination of the new gross weight at the time of the power change.

RESERVE FUEL AND CARGO

To determine the amount of cargo that can be carried, the reserve fuel load must be computed. The reserve fuel for this sample problem is 10 percent of the total mission fuel plus sufficient fuel to cruise for 30 minutes at sea level. Fuel required to cruise for 30 minutes at sea level, for gross weight at end of cruise at 7000 feet density altitude is determined from figure A5-3 as follows. Fuel flow per engine is determined to be 180 lb/hr. Therefore, fuel required to cruise 30 minutes is 180 pounds. Ten percent of the total mission fuel plus sufficient fuel to cruise for 30 minutes at sea level is 408 pounds. Therefore, the total reserve fuel is 588 pounds (180 + 408 = 588). Fuel load at take-off can now be determined as follows:

Fuel required for mission --- 3900 pounds (30,600 - 26,700 = 3900).
Reserve fuel ----- 588 pounds.
Total fuel load at take-off ----- 4489 pounds.

Operating weight empty plus fuel load at take-off is 25489 pounds (21000 + 4489 = 25489). Therefore, maximum cargo load is 5111 pounds (30600 - 25489 = 5111).

LANDING IMMEDIATE LANDING

Pressure altitude ----- sea level.
Outside air temperature ----- 24°C.
Headwind at 50-foot height ----- 10 knots.
Runway surface condition ----- hard surface.
Landing gross weight ----- take-off gross weight less fuel consumed.
For warm-up and take-off (270 pounds) --- 30600 - 270 = 30330 pounds.
Threshold speed (figure A6-5) ----- 87 knots.
Touchdown speed (figure A6-5) ----- 80 knots.
Landing ground roll distance with full flaps (figure A6-1) ----- 1675 feet.

DESTINATION LANDING

Pressure altitude --- sea level.
Outside air temperature ----- 30°C.
Headwind at 50-foot height ----- 16 knots.
Runway surface condition ----- hard surface.
Landing gross weight ----- 26700 pounds.
Threshold speed (figure A6-5) ----- 81 knots.
Touchdown speed (figure A6-5) ----- 74 knots.
Landing ground roll distance with full flaps (figure A6-1) ----- 1400 feet.

TAKEOFF AND LANDING DATA CARD

GROSS WEIGHT 30,600 LB.RUNWAY LENGTH 4,000 FT. SLOPE 0.015 UP HILL.PRESSURE ALTITUDE SEA LEVEL.OAT 75 °F 24 °C SPECIFIC HUMIDITY 0.015.

TAKEOFF PERFORMANCE

REFUSAL SPEED 72 KIAS.REFUSAL DISTANCE 1,820 FT.TAKEOFF SPEED 80 KIAS. TAKEOFF DISTANCE 2250 FT.SINGLE ENGINE CLIMB SPEED 101 EAS.

IMMEDIATE/DESTINATION LANDING

THRESHOLD SPEED 75/69 KIAS. TOUCHDOWN SPEED 69/64 KIAS.LANDING DISTANCE 1675/1400 FT.

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