part 4—CLIMB

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Page numbers in bold face type denote illustrations.

SCOPE.

All enroute climb performance data for the EC-121R aircraft are included in this part. Climb performance data presented is based on maximum rates of climb which can be obtained for the speed schedules shown with standard power available and the configurations noted. A deviation of 5 knots from the prescribed airspeeds will not result in an appreciable decrease in the rate of climb if a steady airspeed is maintained.

CLIMB POWER SETTINGS.

Evaluation of climb power settings to be used is generally based on considerations of engine wear and reliability factors in addition to resultant performance. The powers available with the R3350-93A engine include METO at 2600 rpm, alternate METO at 2650 rpm, and alternate climb at 2500 rpm. Alternate METO power is available only in low blower and is recommended for use only when emergency conditions or mission requirements warrant its use.

Alternate climb power settings result in less engine wear and less rate of climb, but better overall performance may be obtained under some conditions due to reduced fuel flow during the climb and availability in high blower. The point at which one setting becomes superior to another is generally a function of gross weight during climb, cruise altitude desired, and the cruise speed schedule to be used. The constant power schedule of 2050 average bhp per engine up to the high blower critical altitude has the advantage of simplicity. Constant BMEP can be maintained by shifting blowers as the low blower critical altitude is reached. Therefore, Alternate Climb power is generally best when operating at high or overload weights. Limit alternate climb power may be used rather than constant 2050 BHP per engine. This will result in slightly increased climb performance as the full-throttle altitudes are approached. Maximum cruise power requires the least fuel flow but results in the least rate of climb. This setting may be advantageous at light weights where a change in cruising altitude is desired during a flight, or where simulating performance at a heavier gross weight.

METO POWER CLIMB PERFORMANCE.

Graphical climb performance data is shown in figures A4-1 through A4-6 for four-, three-, and two-engine operation. A four-engine climb speed of 170 knots will provide better turbine cooling and is recommended for normal operation; however, use of 155 knots EAS results in a slightly greater rate of climb and higher ceiling.

ALTERNATE METO POWER CLIMB PERFORMANCE.

Low blower climb performance for three-, and two-engine operation with alternate METO power is shown in figures A4-7 through A4-10. This power setting is only recommended for emergency conditions or when mission requirements warrant its use.

ALTERNATE CLIMB POWER PERFORMANCE.

Figures A4-11 and A4-12 present climb performance data for the alternate climb power setting. The material applies to operation at 170 knots EAS.

SERVICE AND CRUISE CEILING.

Service ceiling is the altitude at which a rate of climb of 100 fpm can be obtained. Cruise ceiling is the altitude at which a rate of climb of 300 fpm can be obtained. The respective altitudes can be determined from the appropriate climb chart at the intersection of gross weight and rate of climb lines.

Should an engine fail at an altitude greater than can be held on three engines, enter a three-engine composite cruise control chart (figure A5-6 for low blower or A5-7 for high blower) at the operating gross weight, proceed to the desired speed, move up to the desired power setting, and read the density altitude. (Refer to Part 5.)

ALLOWANCES FOR FLIGHT PLANNING.

No allowances have been included in the climb performance charts for fuel used during warmup, taxi and takeoff, time to reach climb speed after takeoff, time to shift blowers, or for time required to accelerate to cruise speed at the end of the climb.

TEMPERATURE COMPENSATION.

To refine data shown on the rate-of-climb charts, a correction can be applied for higher-than-standard temperatures (hot day). This correction compensates for propeller, engine, and aircraft efficiencies which did not follow the standard temperature lapse rate. These corrections may also be applied to the climb performance charts, although the resulting differences may not be large enough to be read. Cold day corrections are not included.

Application of this correction is as follows:

- Gross Weight—120,000 lb
- Pressure Altitude—11,000 ft
- Temperature—11°C
- Resulting Density Altitude—13,000 ft
- Std Temp at 13,000 ft——10.8°C
- Δ Temperature—21.8°C

Using figure A4-1

- Δ Gross Weight—2398 lb
- R/C at 122,398 lb—915 fpm (120,000 + 2398)

SAMPLE PROBLEM.

The following sample is provided to illustrate use of the climb performance data (figure A4-2):

Conditions.

- Takeoff gross weight—130,000 lb
- Climb to 16,000 feet density altitude from sea level with METO power

Enter the chart at 16,000 feet and move horizontally to the takeoff gross weight in each of the fans (distance, time, and fuel used) and read the following:

Distance—54 nautical air miles

Time to climb—17 minutes

Climb fuel used—1875 pounds

Warmup, taxi, takeoff fuel used—700 pounds

Total fuel used—1875 + 700 or 2575 pounds.

FOUR ENGINE OPERATION
METO POWER RATE OF CLIMB
2600 RPM

MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 LB/US GAL

NOTES:

1. Recommended climb speed: 170 knots EAS
2. Engine speed: 2600 rpm
   Mixture control: Auto Rich
   Spark: Retard
   Shift to high blower at 10,000 ft
   Set inboard engines at limit BMEP, unless limit MAP is obtained first.
3. Cowl flap positions: 30% open low blower, 40% open high blower.
4. Oil radiator flap positions: 35% open low blower, 40% open high blower.
5. Wing flaps and landing gear retracted.
6. Primary and secondary scoops closed
7. Cabin superchargers operating

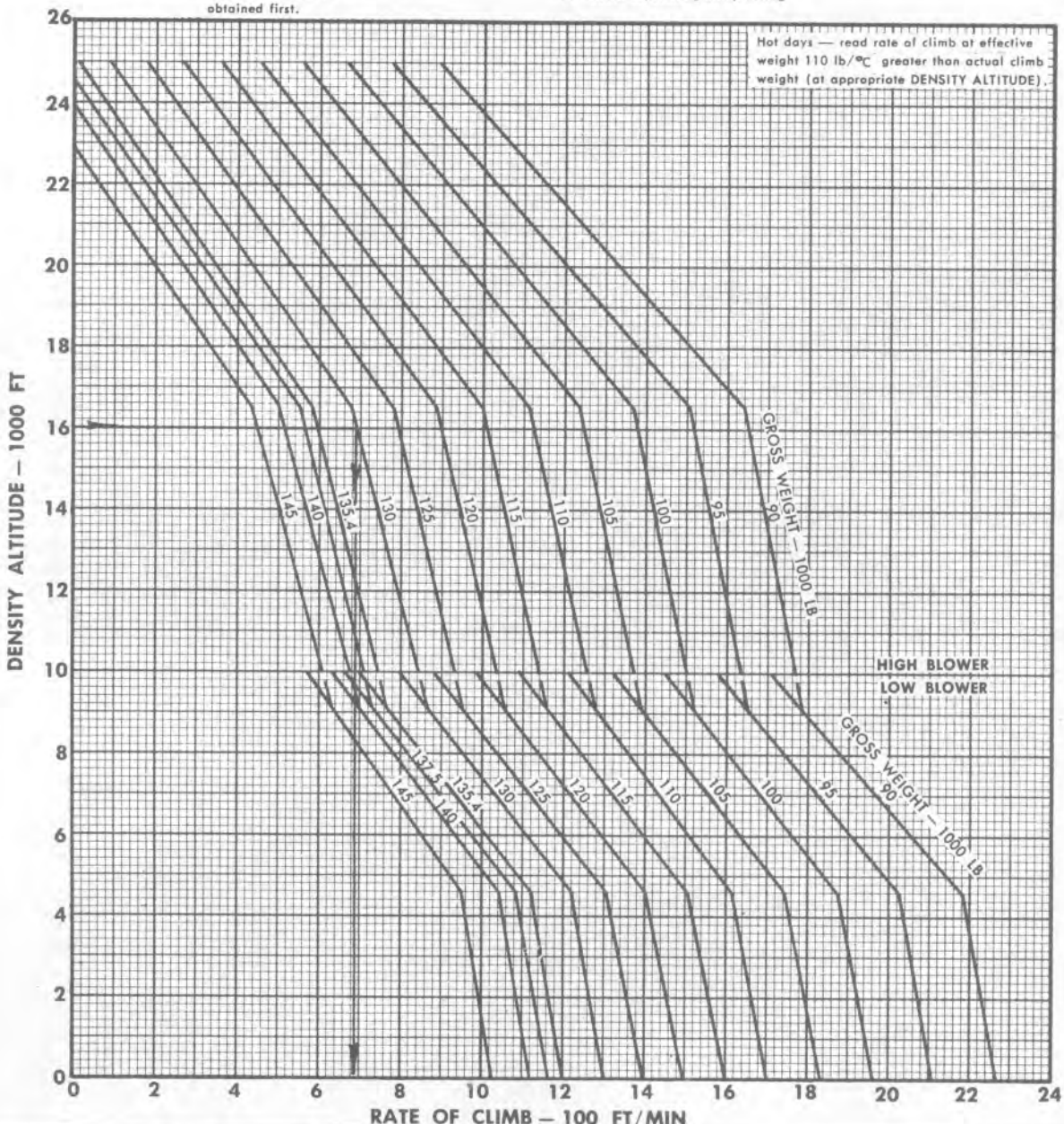


Figure A4-1

FOUR ENGINE CLIMB PERFORMANCE

METO POWER 2600 RPM

MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 LB/US GAL

NOTES:
1. Recommended climb speed: 170 knots EAS
2. Engine speed: 2600 rpm
   Mixture control: Auto Rich
   Spark: Retard
   Shift to high blower at 10,000 ft
   Set inboard engines at limit BMEP, unless limit MAP is obtained first.
3. Cowl flap positions: 30% open low blower, 40% open high blower.
4. Oil radiator flap positions: 35% open low blower, 40% open high blower.
5. Wing flaps and landing gear retracted.
6. Primary and secondary scoops closed
7. Cabin superchargers operating

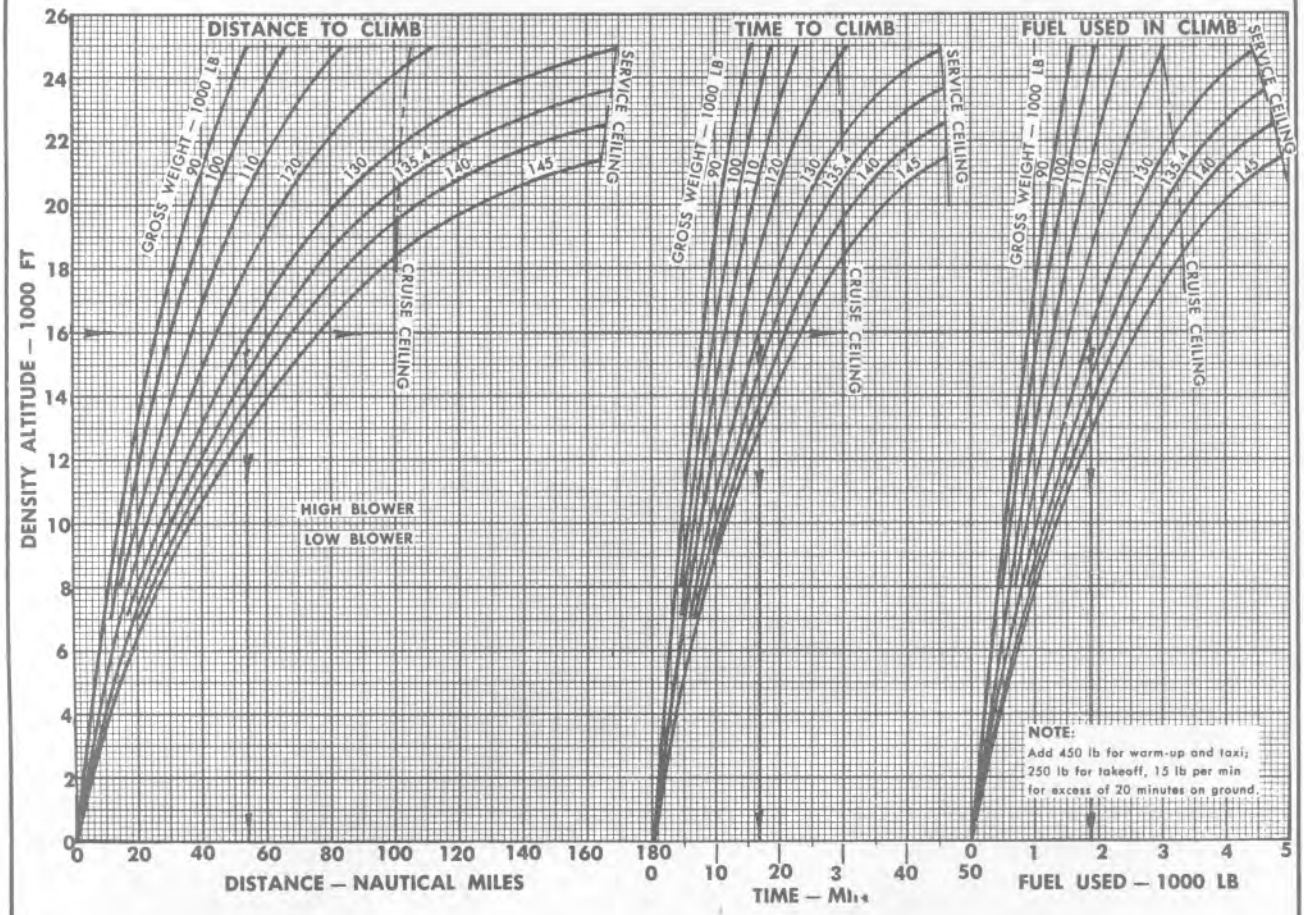


Figure A4-2

THREE ENGINE OPERATION

METO POWER RATE OF CLIMB

2600 RPM

MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 LB/US GAL

NOTE:

1. Cowl flaps 30% open (low blower), 40% open (high blower).
2. Oil radiator flaps 35% open (low blower), 40% open (high blower).
3. Flaps and gear up.
4. Primary and secondary heat exchanger scoops closed.
5. Prop feathered, cowl and oil flaps closed on inoperative engine
6. Cabin superchargers connected
7. Climb speed 161 knots EAS.

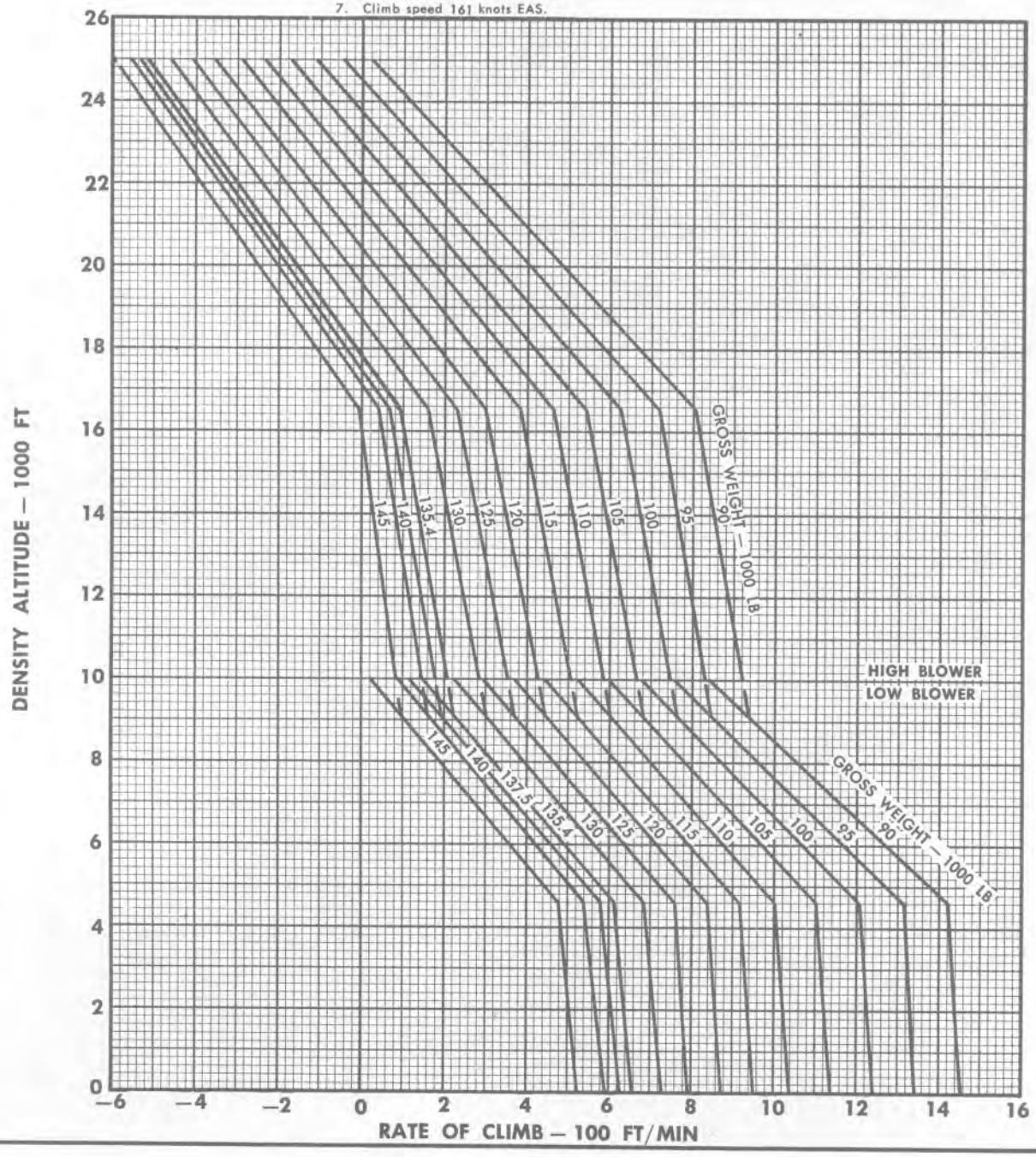


Figure A4-3

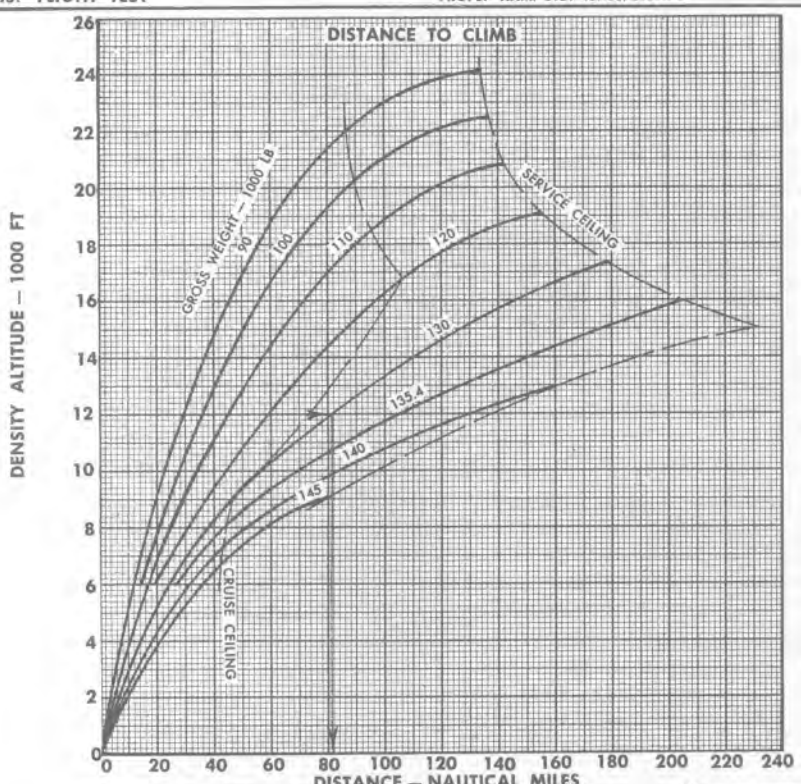
THREE ENGINE CLIMB PERFORMANCE

METO POWER 2600 RPM

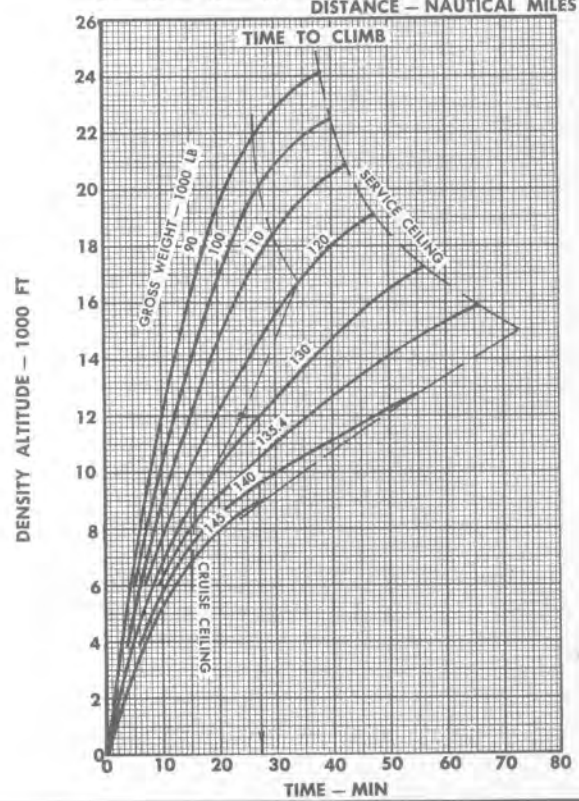
MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST

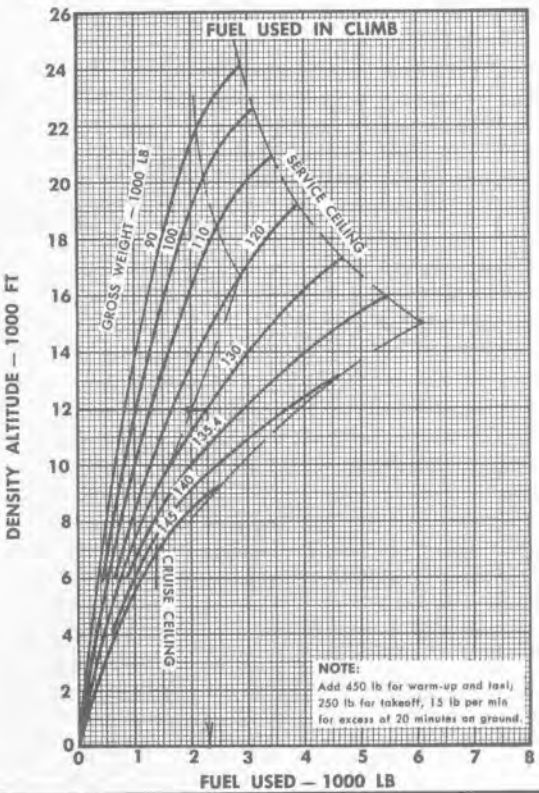
ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 LB/US GAL



NOTES:
1. Recommended climb speed: 161 knots EAS
2. Engine speed: 2600 rpm
   Mixture control: Auto Rich
   Spark: Retard
   Set inboard engines at limit BMEP, unless limit MAP is obtained first.
   All flaps closed and prop feathered on inoperative engine.
3. Cowl flap positions: 30% open low blower 40% open high blower.
4. Oil radiator flap positions: 35% open low blower, 40% open high blower.
5. Wing flaps and landing gear retracted.
6. Primary and secondary scoops closed.
7. Cabin superchargers operating.





NOTE:
Add 450 lb for warm-up and taxi; 250 lb for takeoff, 15 lb per min for excess of 20 minutes on ground.

Figure A4-4

TWO ENGINE OPERATION
METO POWER RATE OF CLIMB
2600 RPM

MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 LB/US GAL

NOTE:

1. Cowl flaps 30% open (low blower), 40% open (high blower).
2. Oil radiator flaps 35% open (low blower), 40% open (high blower).
3. Flaps and gear up.
4. Primary and secondary heat exchanger scoops closed.
5. Prop feathered, cowl and oil flaps closed on inoperative engines
6. Cabin superchargers disconnected.
7. Climb speed 152 knots EAS.

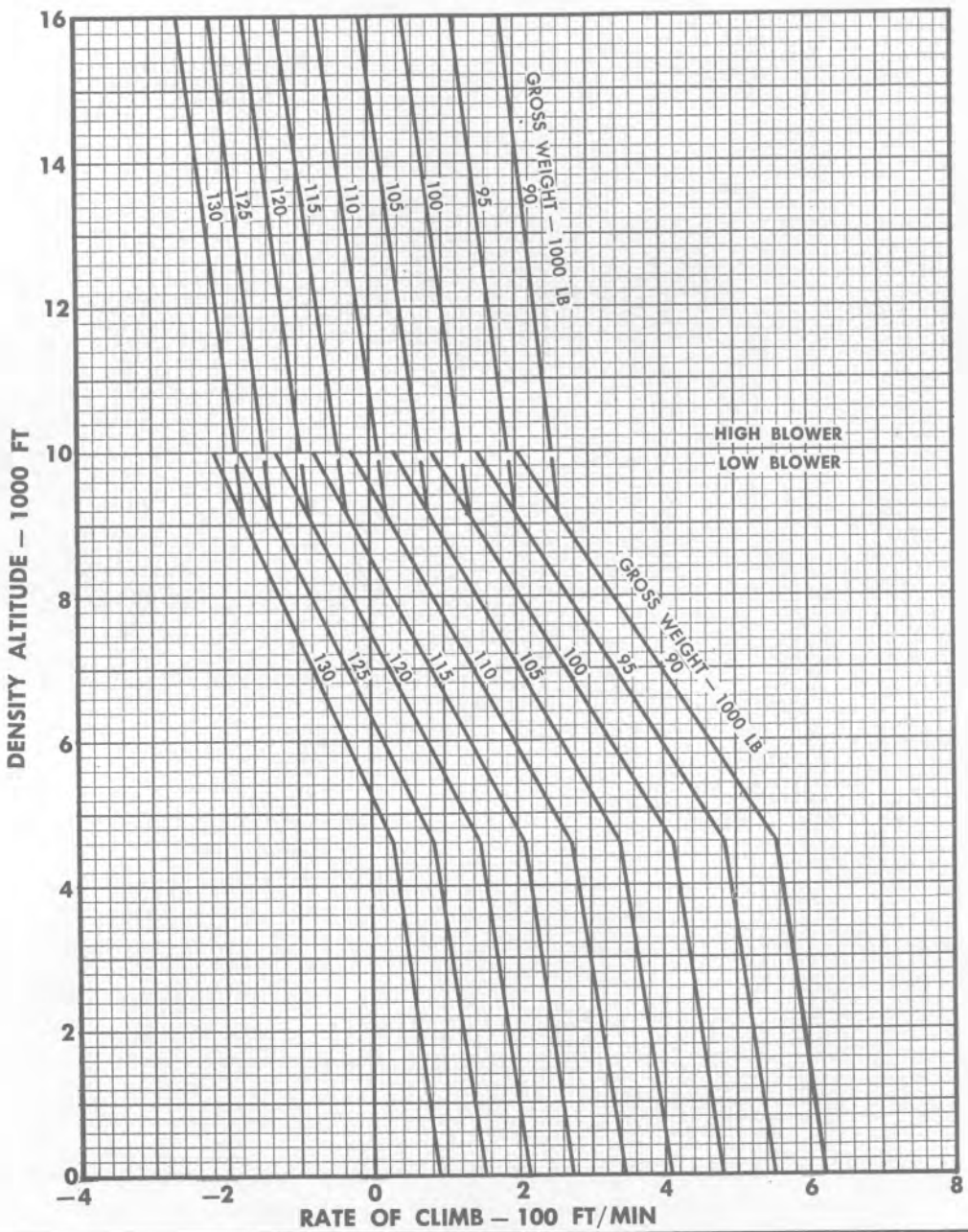


Figure A4-5

TWO ENGINE CLIMB PERFORMANCE

METO POWER

2600 RPM

MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 LB/US GAL

NOTES:

1. Recommended climb speed: 152 knots EAS
2. Engine speed: 2600 rpm
   Mixture control: Auto Rich
   Spark: Retard
   Shift to high blower at 10,000 ft
   All Flaps closed and Propeller feathered on inoperative engines.
3. Cowl flap positions: 30% open low blower, 40% open high blower.
4. Oil radiator flap positions: 35% open low blower, 40% open high blower.
5. Wing flaps and landing gear retracted.
6. Primary and secondary scoops closed
7. Cabin superchargers disconnected.

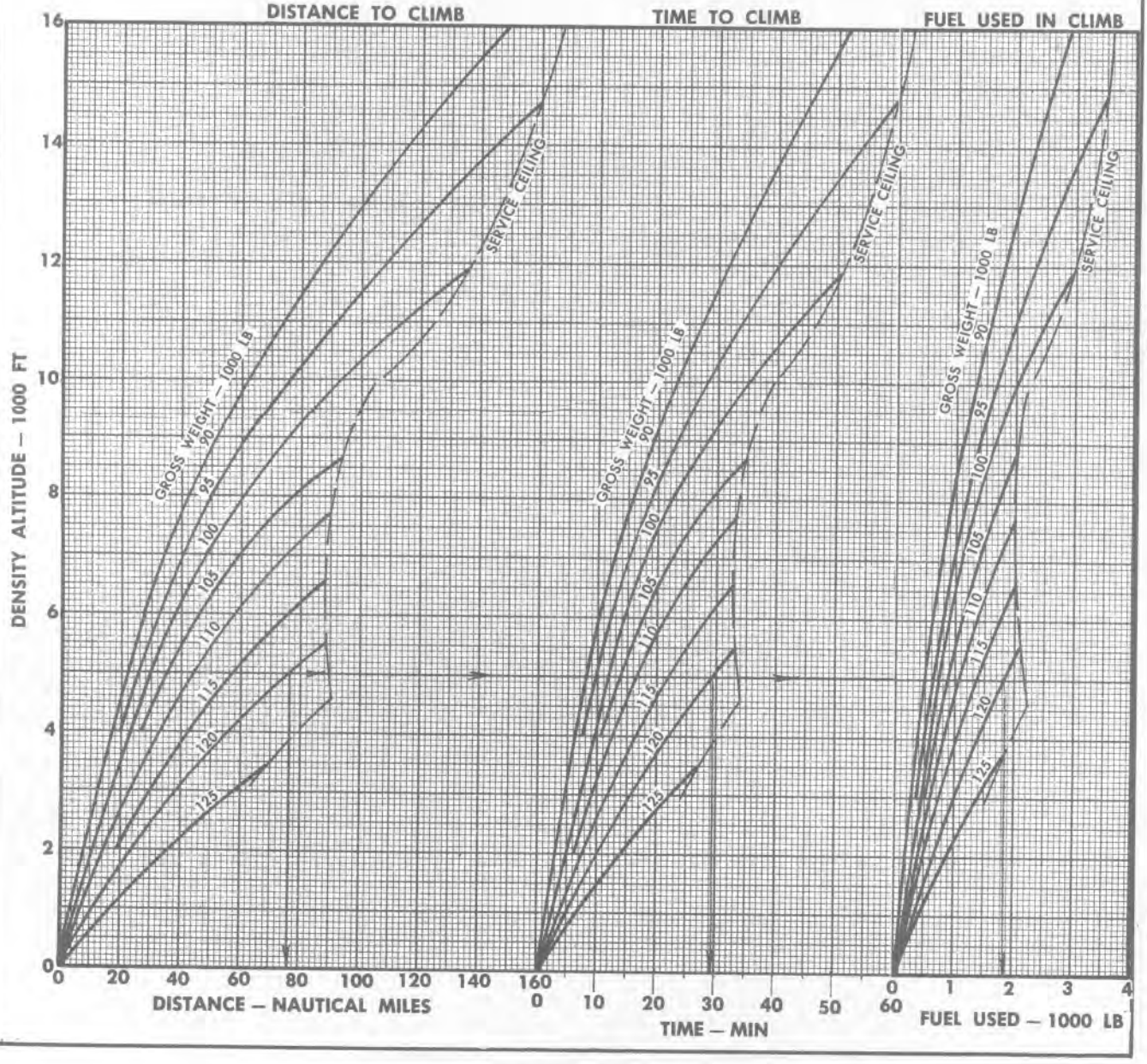


Figure A4-6

THREE ENGINE OPERATION

ALTERNATE METO POWER RATE OF CLIMB

2650 RPM

MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 LB/US GAL

NOTE:

1. Cowl flaps 30% open (low blower)
2. Oil radiator flaps 35% open (low blower)
3. Flaps and gear up.
4. Primary and secondary heat exchanger scoops closed.
5. Prop feathered, cowl and oil flaps closed on inoperative engine
6. Cabin superchargers connected
7. Climb speed 160 knots EAS.

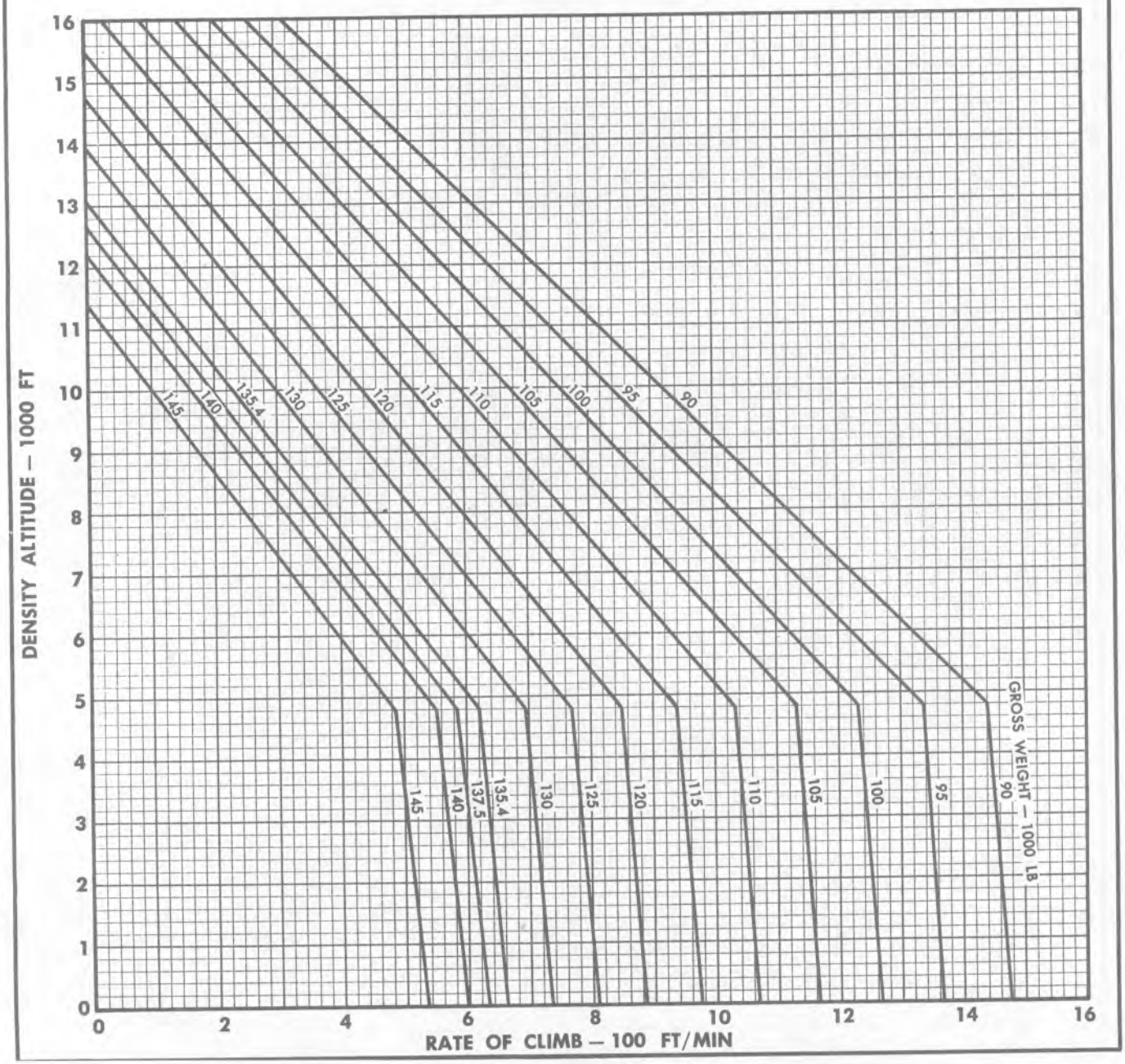


Figure A4-7

THREE ENGINE CLIMB PERFORMANCE

ALTERNATE METO POWER 2650 RPM

MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 LB/US GAL

NOTES:

1. Recommended climb speed: 160 knots EAS
2. Engine speed: 2650 rpm
   Mixture control: Auto Rich
   Spark: Retard
   Set inboard engines at limit BMEP, unless limit MAP is obtained first.
   All flaps closed and prop feathered on inoperative engine.
3. Cowl flap positions: 30% open low blower,
4. Oil radiator flap positions: 35% open low blower,
5. Wing flaps and landing gear retracted.
6. Primary and secondary scoops closed
7. Cabin superchargers operating

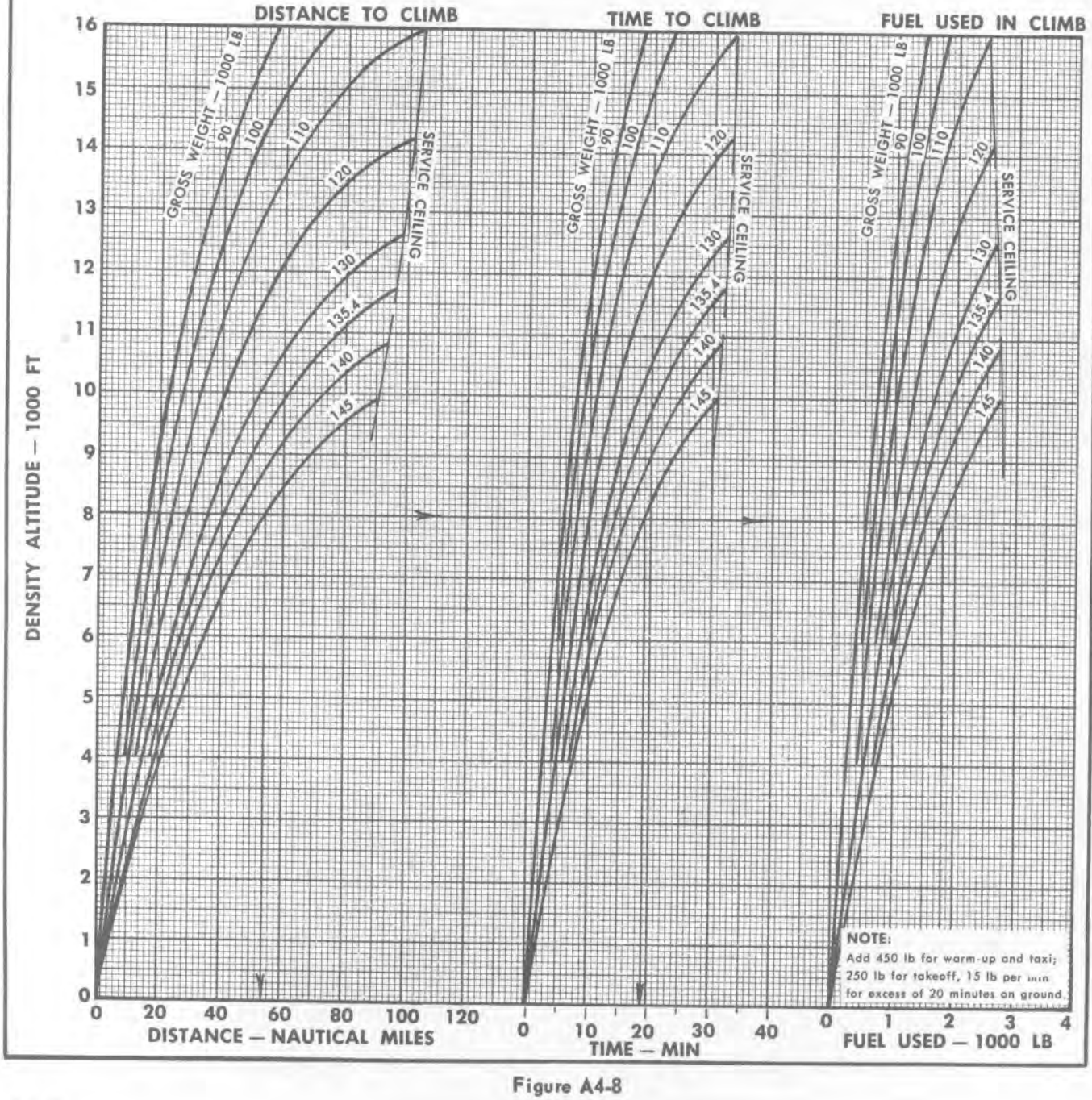


Figure A4-8

TWO ENGINE OPERATION

ALTERNATE METO POWER RATE OF CLIMB

2650 RPM

MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 LB/US GAL

NOTE:

1. Cowl flaps 30% open (low blower)
2. Oil radiator flaps 35% open (low blower)
3. Flaps and gear up.
4. Primary and secondary heat exchanger scoops closed.
5. Prop feathered, cowl and oil flaps closed on inoperative engines
6. Cabin superchargers disconnected.
7. Climb speed 152 knots EAS.

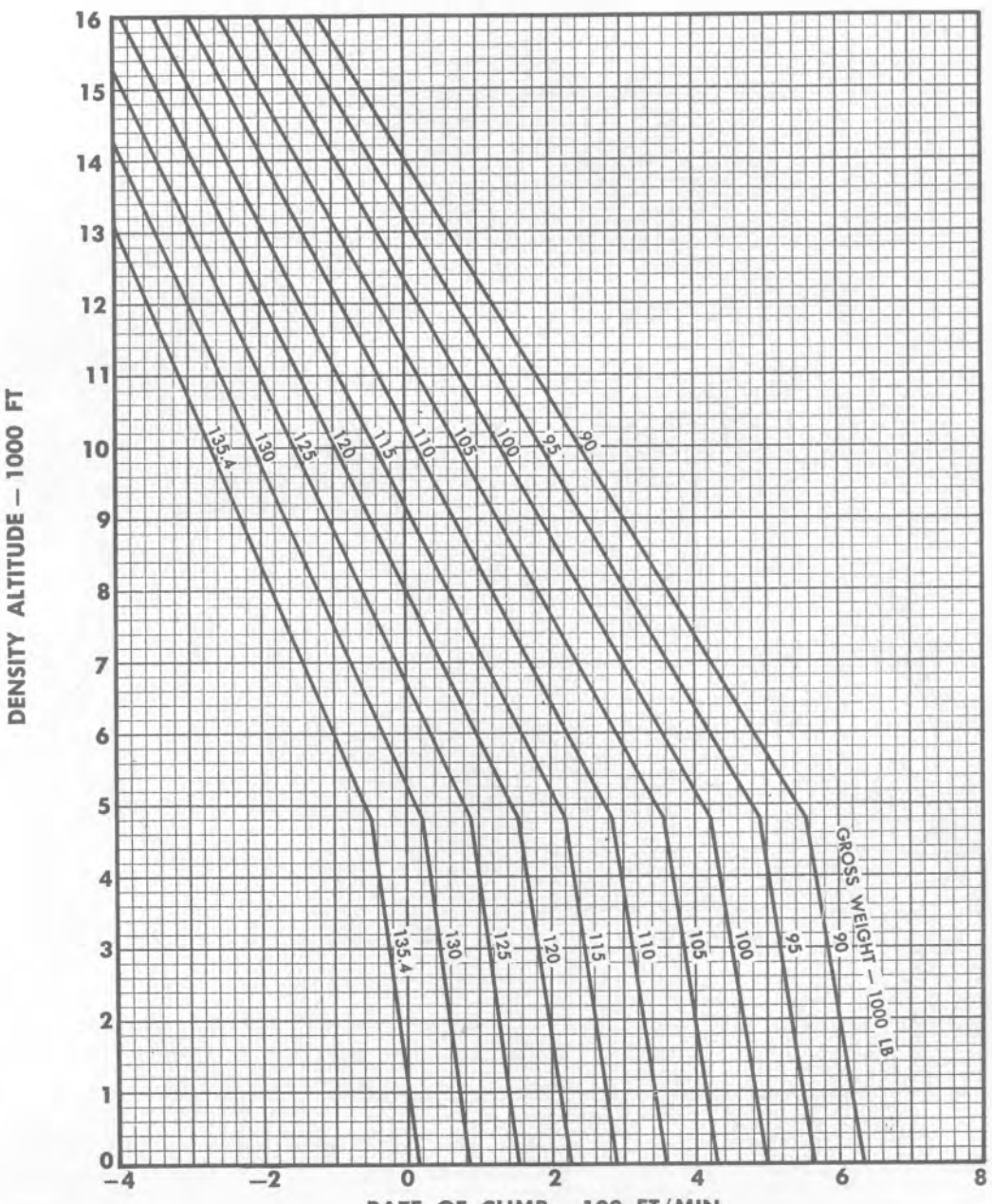


Figure A4-9

TWO ENGINE CLIMB PERFORMANCE
ALTERNATE METO POWER 2650 RPM

MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 LB/US GAL

NOTES:

1. Recommended climb speed: 152 knots EAS
2. Engine speed: 2650 rpm
   Mixture control: Auto Rich
   Spark: Retard
   Set inboard engines at limit BMEP, unless limit MAP is obtained first.
   All flaps closed and prop feathered on inoperative engines.
3. Cowl flap positions: 30% open low blower
4. Oil radiator flap positions: 35% open low blower
5. Wing flaps and landing gear retracted.
6. Primary and secondary scoops closed
7. Cabin superchargers disconnected

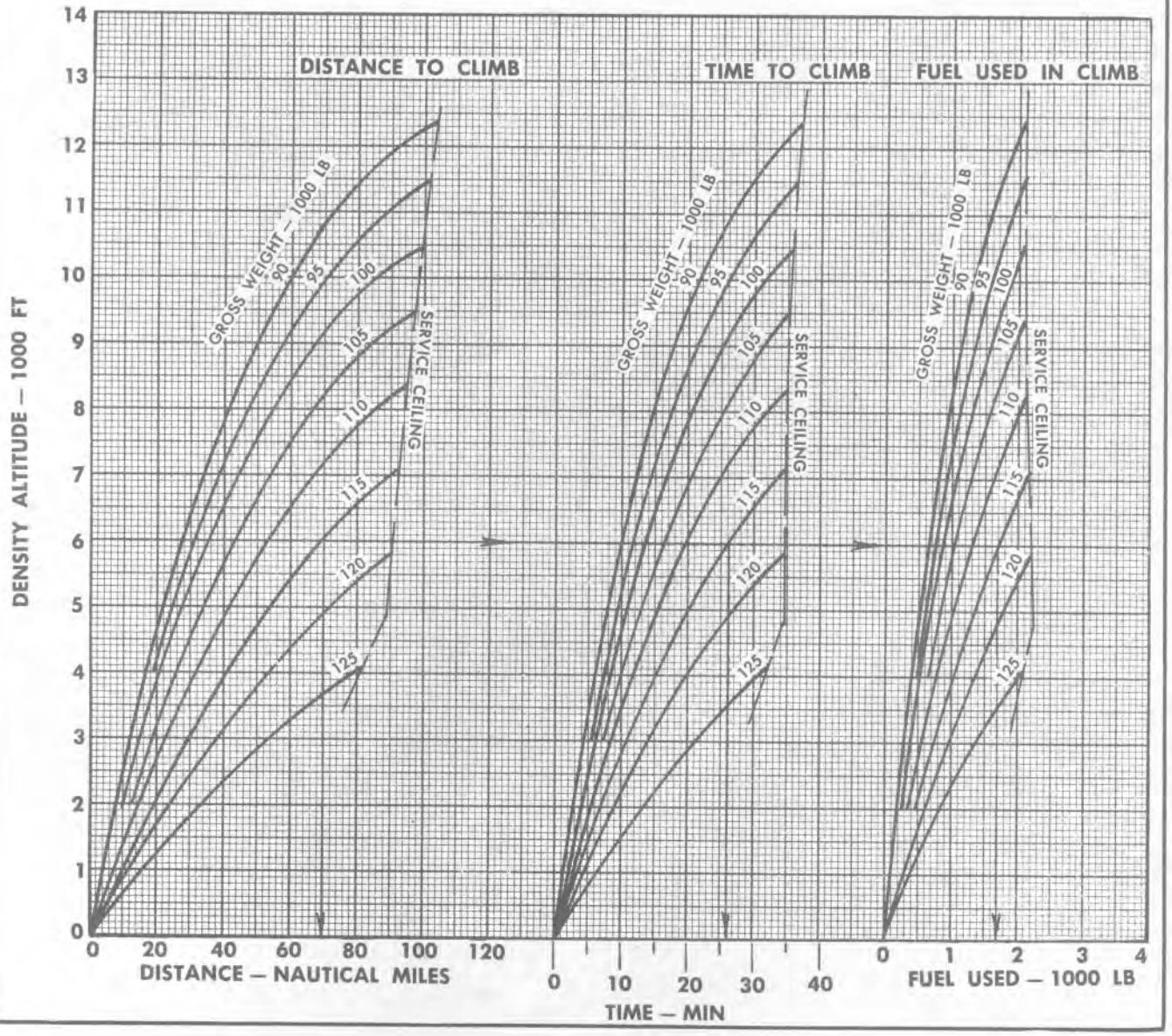


Figure A4-10

FOUR ENGINE OPERATION

ALTERNATE CLIMB POWER RATE OF CLIMB

2500 RPM

HEAT EXCHANGER SCOOPS OPEN

MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 LB/U S GAL

NOTES:

1. Recommended climb speed: 170 knots EAS
2. Engine speed: 2500 rpm
   Mixture control: Auto Rich
   Spark: Retard
   Set inboard engines at limit BMEP, outboard engines 8 BMEP less, unless limit MAP is obtained first.
3. Cowl flap positions:
   30% open (low and high blower)
4. Oil radiator flap positions:
   40% open (low and high blower)
5. Wing flaps and landing gear retracted.
6. Primary and secondary scoops open.
7. Cabin superchargers operating

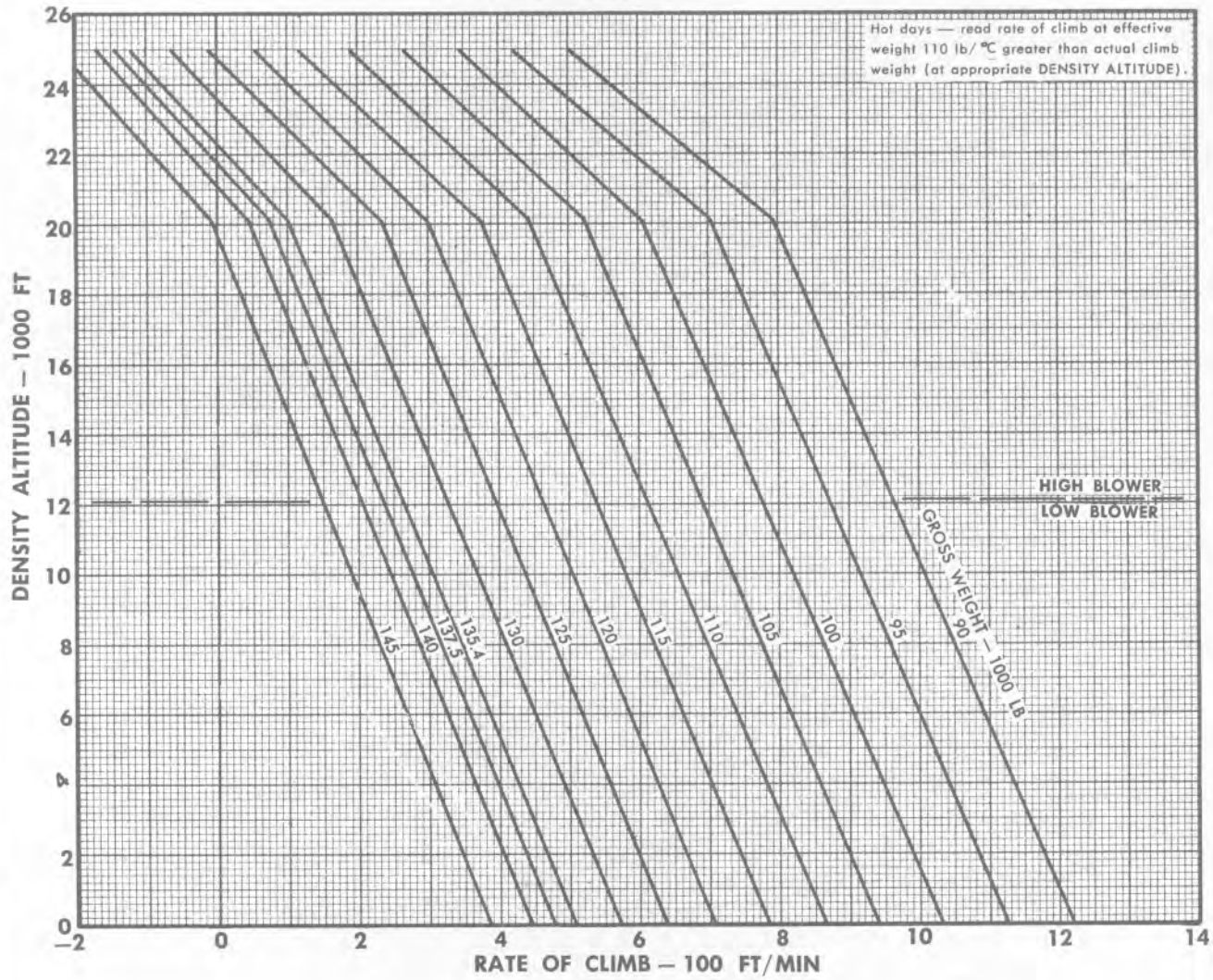


Figure A4-11

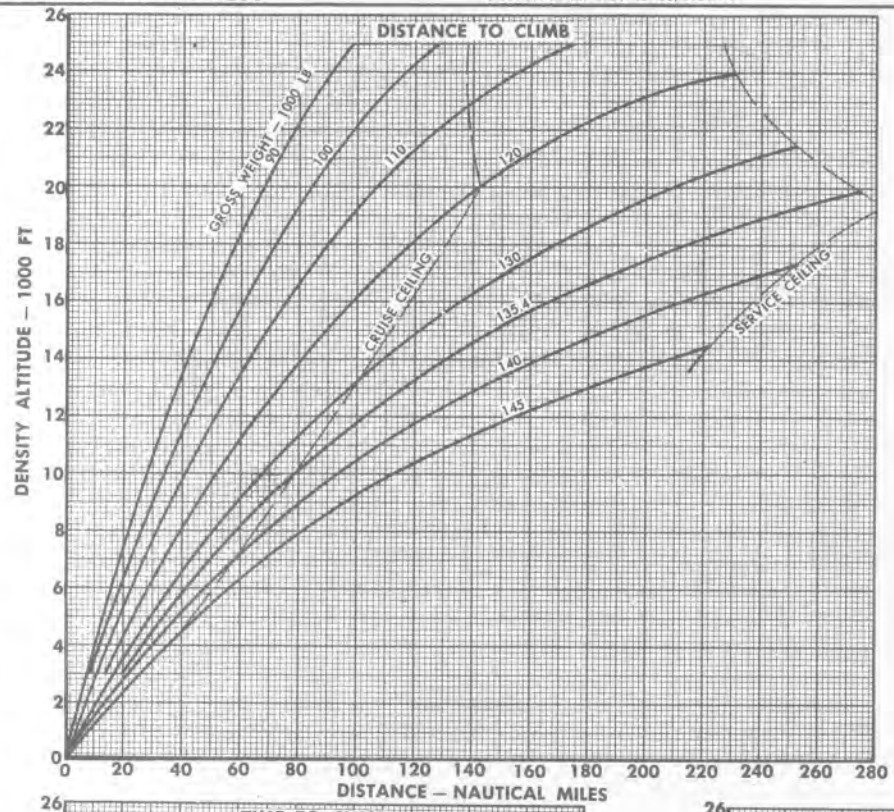
FOUR ENGINE CLIMB PERFORMANCE

ALTERNATE CLIMB POWER
2500 RPM
HEAT EXCHANGER SCOOPS OPEN

MODEL: EC-121R/C-121G
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TEST

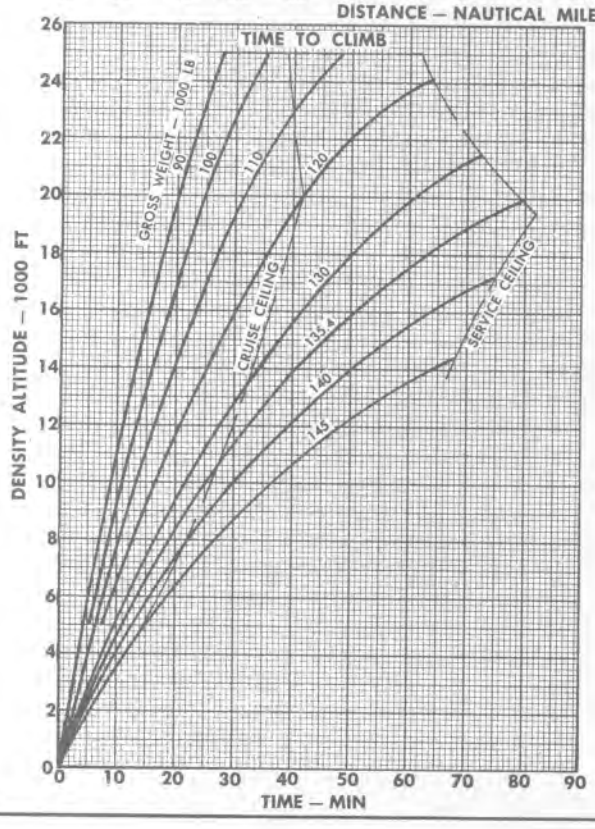
ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-O

FUEL GRADE: 115/145
FUEL DENSITY: 6.0 LB/U S GAL



NOTES:

1. Recommended climb speed: 170 knots EAS
2. Engine speed: 2500 rpm
   Mixture control: Auto Rich
   Spark: Retard
   Set inboard engines at limit BMEP, outboard engines 8 BMEP less, unless limit MAP is obtained first.
3. Cowl flap positions:
   30% open (low and high blower)
4. Oil radiator flap positions:
   40% open (low and high blower)
5. Wing flaps and landing gear retracted.
6. Primary and secondary scoops open.
7. Cabin superchargers operating



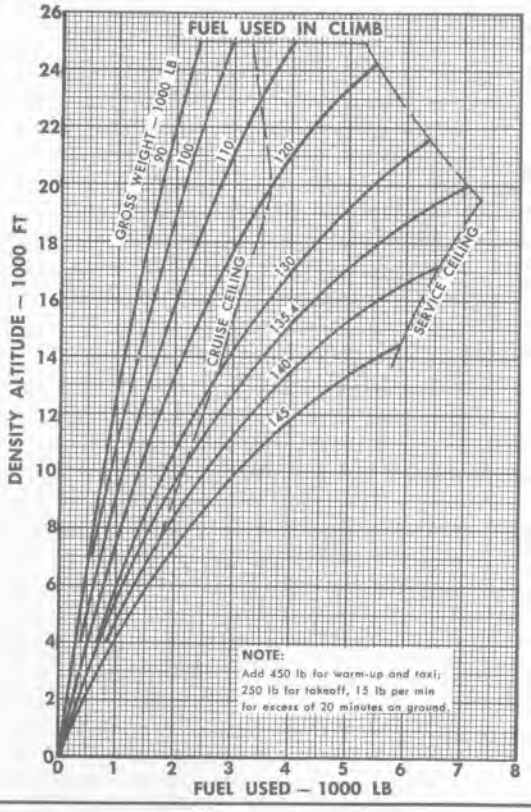


Figure A4-12