part 7-DESCENT, LANDING, AND GO-AROUND

TABLE OF CONTENTS

Page numbers in bold face type denote illustrations.

EMERGENCY DESCENTS.

Figure A7-1 shows the time, based on contractor's flight tests at 110,000 pounds gross weight, to descend from a nominal altitude of 20,000 feet pressure altitude. Time to descend between any two altitudes can be determined on an incremental basis. The data are representative for operation in low blower at 2600 rpm with the throttles closed, cowl and oil radiator flaps full open, automatic pilot disengaged, and auxiliary control boost on. Descent data with gear down are for 165 knots with 60 percent wing-flap extension and for 155 knots with 100 percent wing-flap extension. The descent with flaps and gear retracted is for 293 knots EAS below 10,400 feet pressure altitude, with lower airspeeds being used above that altitude to maintain 0.54 Mach number. Although the chart shows that a clean configuration allows the minimum time to descend, the terminal speed is quite high. If an immediate landing is to be made, minimum time to descend and land may be made with gear and flaps full down since no deceleration period is required at the terminal altitude.

NORMAL LANDING DISTANCES.

Gross weight and pilot flight and braking technique are the major variables affecting landing distances. Figure A7-2 shows normal landing ground roll distances and the corresponding air distance from a height of 50 feet. These data may be said to represent aircraft performance which can be obtained without undue effort on the part of the flight crew or strain on the aircraft. Values given are 1-2/3 times the average obtained during a series of minimum distance landing tests.

MAXIMUM LANDING PERFORMANCE.

Figures A7-3, -4, and -5 show ground distances for hard stops with 100-, 60-percent, and wing flaps up. Duplication of the performance given requires hard wheel braking without skidding and close adherence to the touchdown speeds shown. Distances to clear a 50-foot obstacle, land, and stop are approximately 140 percent of the landing ground roll distances when minimum forward thrust is used for the approach. These ground roll distances cannot be reduced appreciably without use of reverse thrust or slower touchdown speeds.

STOPPING DISTANCE.

EFFECT OF RUNWAY SURFACE CONDITIONS.

Stopping distance depends upon a tire-to-runway coefficient of friction which will vary with the condition of the runway surface. The condition of the runway surface will be reported as a Runway Condition Reading (RCR). The RCR is a measure of the coefficient of friction between the tire and the runway surface, as determined by the inspection decelerometer. All charts involving stopping distance are based on dry concrete or asphalt friction coefficients corresponding to an RCR of 23. Slippery runway surfaces will increase stopping distances; increased distances are accounted for by auxiliary scales as a function of RCR.

Many airfields will continue to report braking action in accordance with ICAO documents. This is the "good," "medium," "poor" categorization of braking action on unusual runway surface condition. In order to relate this categorization to an RCR or when RCR values are not available, the following relationship will be used:

Runway Condition	ICAO Report	RCR
Dry	Good	23
Wet	Medium	12
Icy	Poor	05

Also reported will be Runway Surface Covering (RSC) which will be average runway surface covering given in depth and type, such as slush, water, or snow.

LANDING SPEED SCHEDULE FOR MINIMUM GROUND ROLL
— POWER-ON APPROACH —
GEAR DOWN — 100% WING FLAPS

LANDING WEIGHT (LB)	KNOTS—IAS AT 50-FT HEIGHT		KNOTS—IAS AT TOUCHDOWN	
	NO. 2 STATIC	NO. 1 STATIC	NO. 2 STATIC	NO. 1 STATIC
80,000	79	81	72	74
85,000	82	83	74	76
90,000	84	86	76	78
95,000	86	88	78	80
100,000	89	91	80	82
105,000	91	93	82	84
110,000	93	95	84	86
113,000	94	97	85	88
115,000	95	98	86	88
120,000	107	100	88	90
122,000	107	101	89	91
125,000	109	102	90	92
130,000	110	104	91	94
135,000	112	106	93	96
137,500	113	107	94	97

RUNWAY CONDITION READING (RCR).

RCR is a measure of the tire-to-runway friction coefficient. RCR is reported as a whole number varying from 4 to 26 and is used to determine the stopping capability for the particular runway surface condition.

RUNWAY SURFACE COVERING (RSC).

RSC is the average surface covering and is determined in depth of 1/10-inch and type, as listed below:

P	Patchy
WR	Wet Runway
SLR	Slush on Runway
LSR	Loose Snow on Runway
PSR	Packed Snow on Runway
IR	Ice on Runway

A typical report on runway condition could be SLR 05P which would indicate slush on runway with an RCR of 05 and patchy condition.

WIND VELOCITIES.

Wind speed values shown on the curves are assumed to be those actually existing at the runway at the mean height of the airplane (10 feet). Wind speeds reported by a tower some distance from the runway should be adjusted before use. Multiply reported headwinds by 0.5 and tailwinds by 1.5 if the tower anemometer is more than 50 feet high. Allow for gusts if necessary. Convert these values to a component parallel to the runway, using the chart in Part 3 (figure A3-9). During gusty conditions always increase the threshold and landing speed by the full gust increment, but not to exceed 10 knots.

REVERSE THRUST.

Use of reverse thrust in conjunction with wheel braking will appreciably reduce the landing ground roll distances shown. If used, it should be applied as quickly as possible after touchdown, since this type of braking is most effective at the higher speeds.

A calculated reverse thrust stopping distance grid is shown below the landing ground roll. These distances assume simultaneous application of brakes and symmetrical 2-engine reverse thrust at 2500 rpm.

POWER-ON APPROACH.

Power-on approach procedure can be used to reduce touchdown speeds and ground-roll distances from those shown on figure A7-3. Approach speeds at the 50-foot-height point can be reduced somewhat from those for normal approach with minimum forward thrust. Touchdown speeds can be reduced to the stall speed values shown on the following table. However, use of this procedure will not result in the shortest overall distance to clear an obstacle, land, and stop. The angle of the approach flight path is not as steep as that for maximum performance procedure. The speeds are tabulated below for reference. Speeds at 50 feet are 1.1 V_s while touchdown is accomplished at 1.0 V_s.

LANDING GO-AROUND RATES OF CLIMB.

Figure A7-6 shows rates of climb available with maximum power on four engines with the landing gear down and flaps extended 100 percent. The data are directly applicable to standard-day conditions. The speed schedule is that for normal approach, and provides a 30 percent margin over the zero-thrust stall speeds.

FOUR ENGINE OPERATION

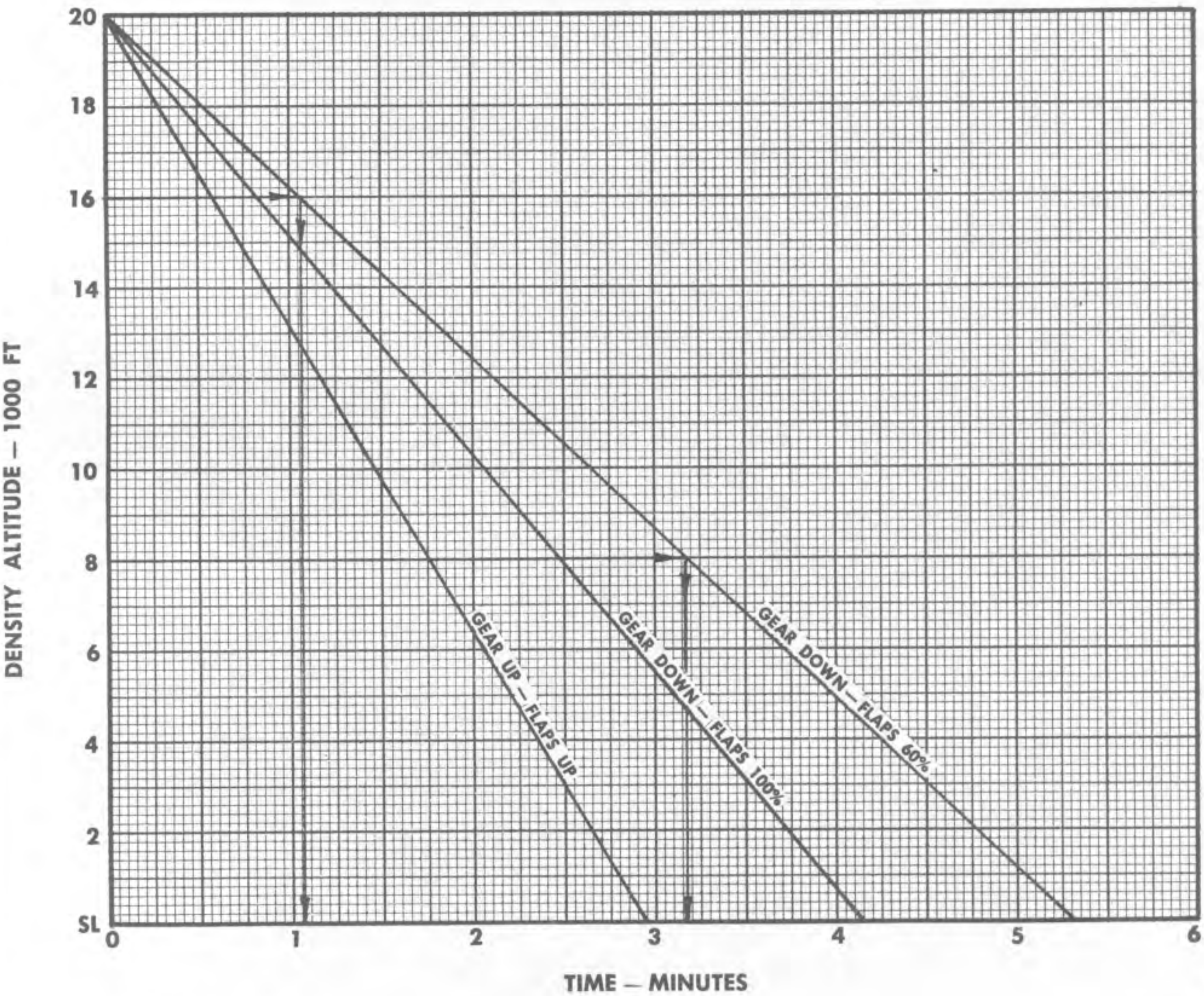
EMERGENCY DESCENTS AT VARIOUS SPEEDS

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

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

NOTES:
1. Auto pilot disengaged
2. Throttle closed
3. 2600 rpm
4. Low blower
5. Cowl flaps 100% (open)
6. Oil cooler flaps 100% (open)
7. Aux control boost ON

CONFIGURATION	IAS
GEAR DOWN — FLAPS 60%	165 KNOTS
GEAR DOWN — FLAPS 100%	155 KNOTS
GEAR UP — FLAPS UP	MACH .54 TO 10,000 FT 293 KNOTS 10,400 FT TO SL



3.17 — 1.06 = 2.11 MIN

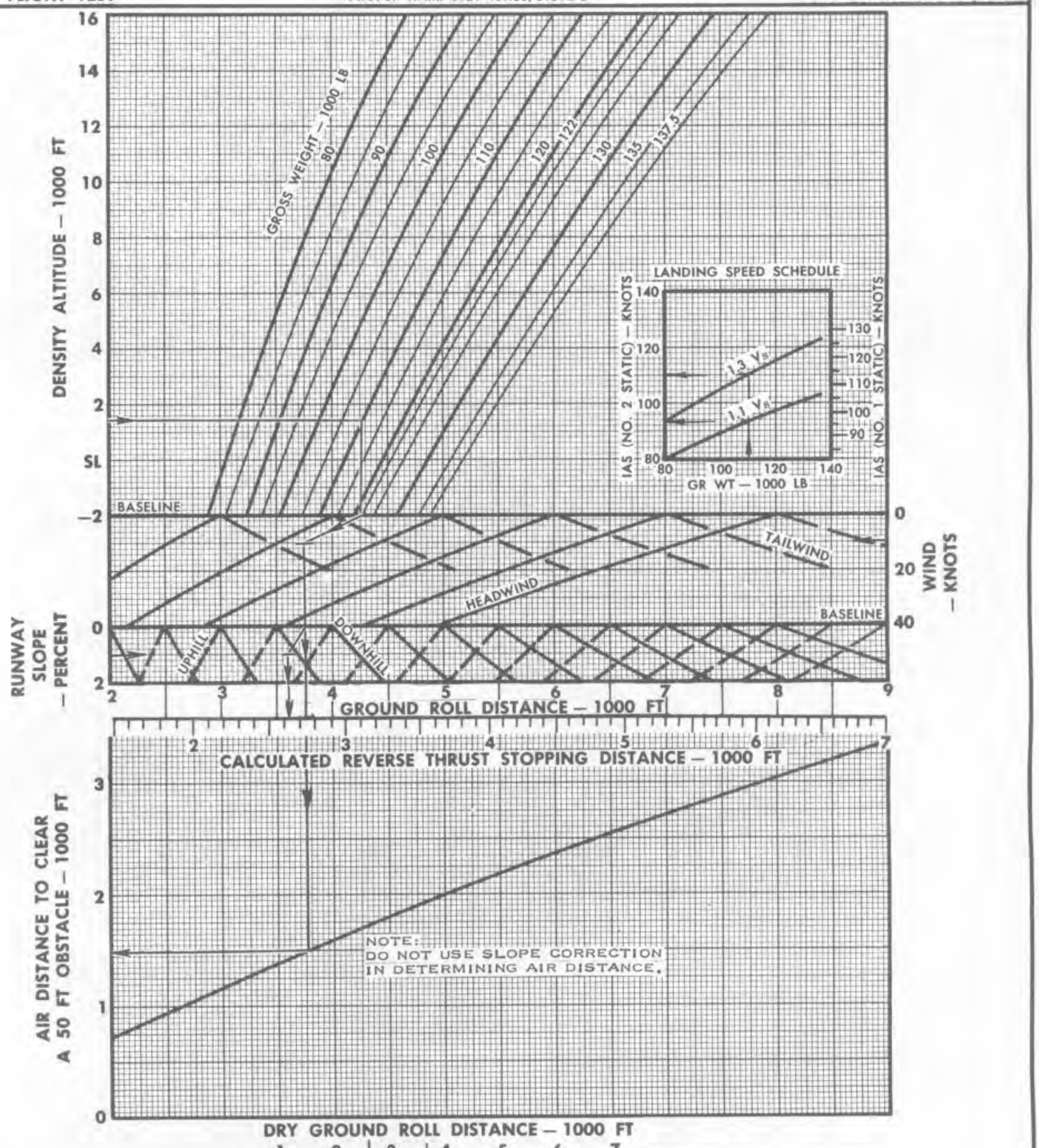
Figure A7-1

NORMAL LANDING FIELD LENGTHS
MODERATE BRAKING
WING FLAPS — 100%

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

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-0

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



CONDITIONS:

1. Engines idling. Moderate wheel braking action assumed and no reverse thrust.
2. Reverse thrust stopping distance assume symmetrical 2-engine reverse thrust at 2500 rpm with simultaneous brake application.
3. Multiply computed headwind component by 0.5 and computed tailwind component by 1.5 to obtain effective runway wind component.
4. If no RCR is available, use 12 for wet runways and 5 for icy runways.

Figure A7-2

LANDING GROUND ROLL
HARD BRAKING
WING FLAPS – 100%

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

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-0

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

CONDITIONS:

1. Engines idling. Hard wheel braking without skidding assumed and no reverse thrust.
2. Reverse thrust stopping distance assume symmetrical 2-engine reverse thrust at 2500 rpm with simultaneous brake application.
3. Air distance to clear 50 ft obstacle with power-off approach is approximately 40% of corresponding ground roll distance without reverse thrust.
4. Multiply computed headwind component by 0.5 and computed tailwind by 1.5 to obtain effective runway wind component.
5. If no RCR is available, use 12 for wet runways and 5 for icy runways.

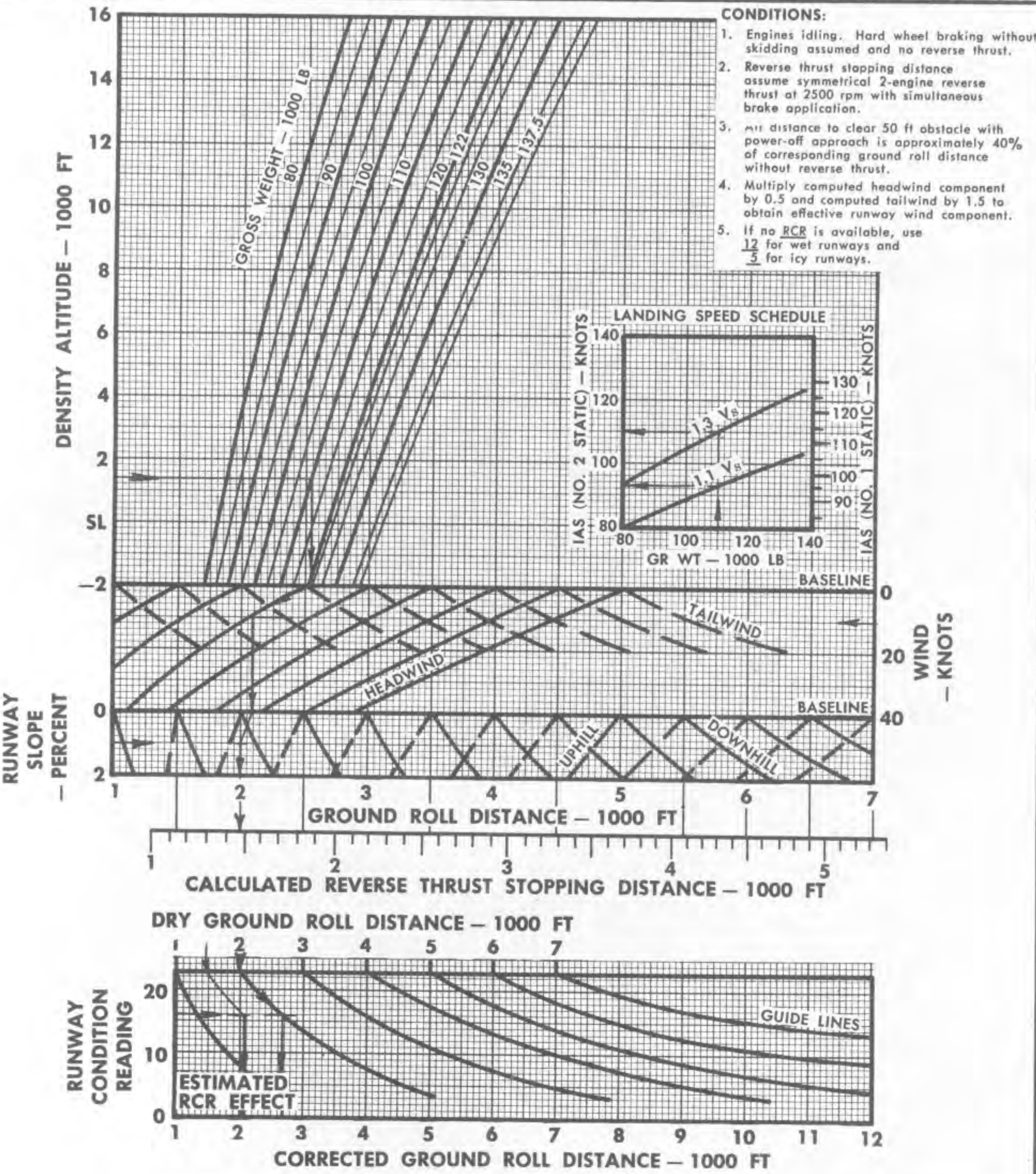


Figure A7-3

LANDING GROUND ROLL
HARD BRAKING
WING FLAPS — 60%

MODEL: EC-121R
DATA AS OF: 31 MARCH 1967
DATA BASIS: CALCULATED

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-0

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

CONDITIONS:

1. Engines idling. Hard wheel braking without skidding assumed and no reverse thrust.
2. Reverse thrust stopping distance assume symmetrical 2-engine reverse thrust at 2500 rpm with simultaneous brake application.
3. Air distance to clear 50 ft obstacle with power-off approach is approximately 40% of corresponding ground roll distance without reverse thrust.
4. Multiply computed headwind component by 0.5 and computed tailwind by 1.5 to obtain effective runway wind component.
5. If no RCR is available, use 12 for wet runways and 5 for icy runways.

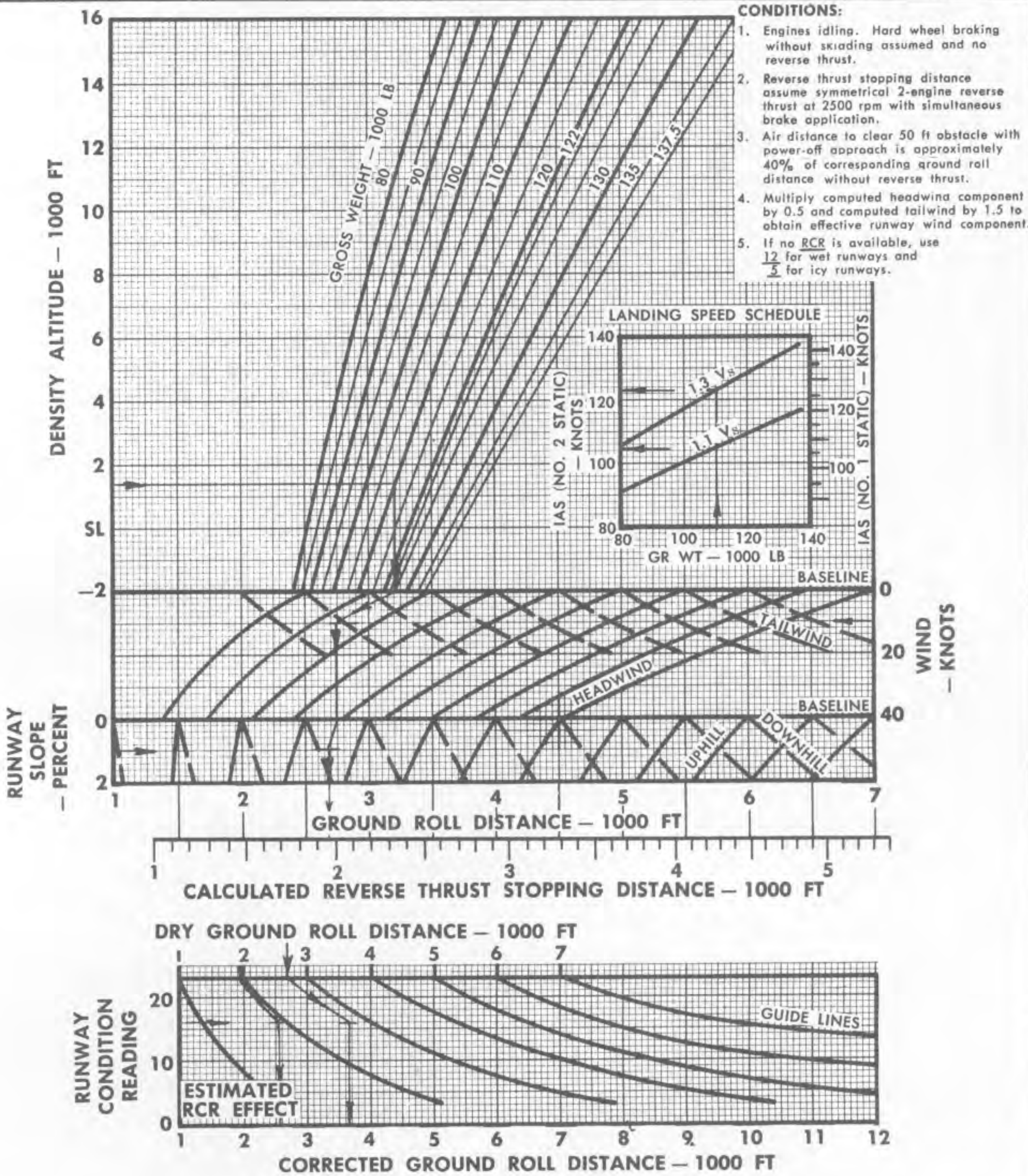


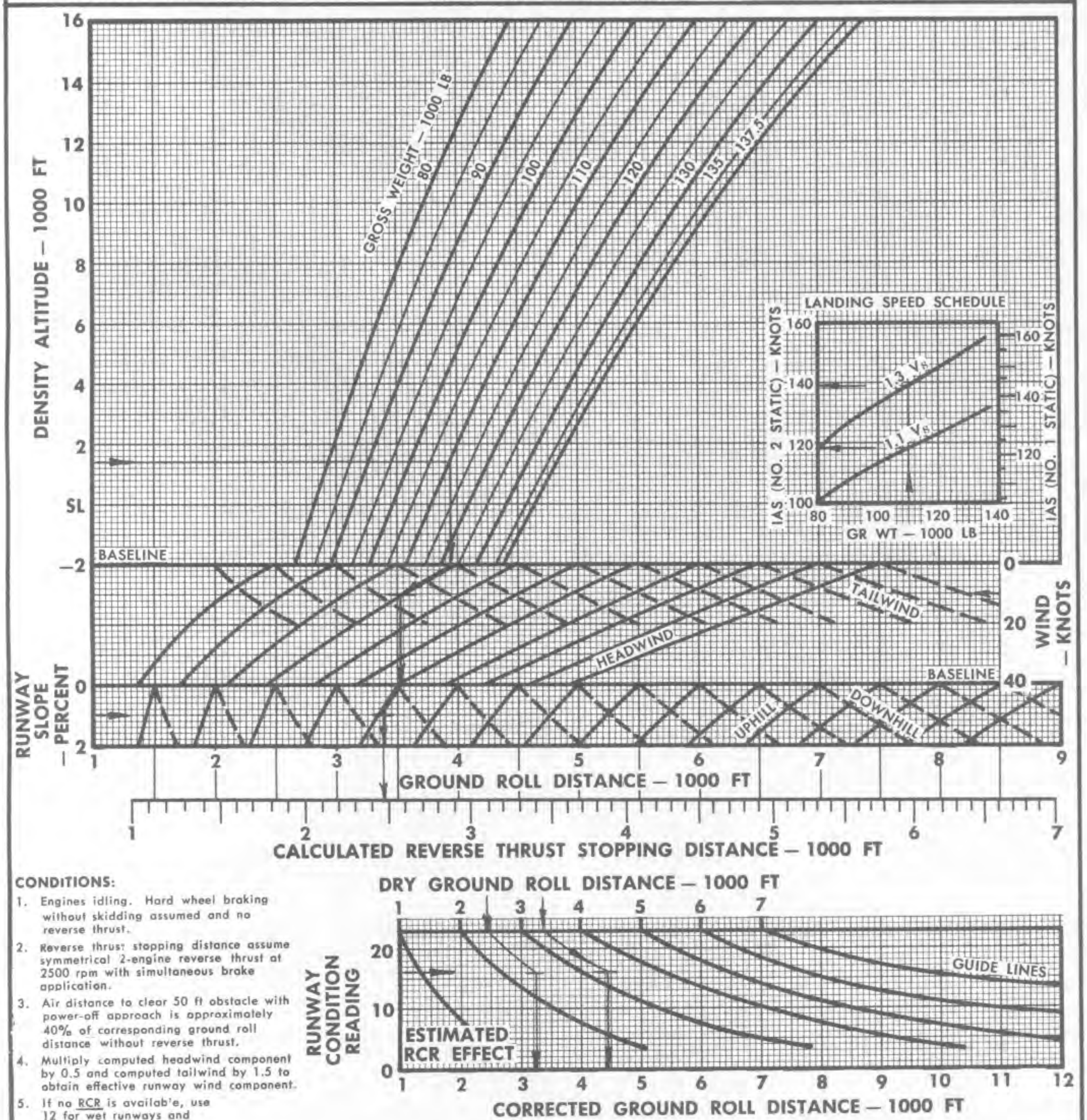
Figure A7-4

LANDING GROUND ROLL
HARD BRAKING
WING FLAPS UP

MODEL: EC-121R
DATA AS OF: 31 MARCH 1967
DATA BASIS: CALCULATED

ENGINE: (4) R3350-93A
PROPS: HAM. STD. 43H60/6959B-0

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



CONDITIONS:

1. Engines idling. Hard wheel braking without skidding assumed and no reverse thrust.
2. Reverse thrust stopping distance assume symmetrical 2-engine reverse thrust at 2500 rpm with simultaneous brake application.
3. Air distance to clear 50 ft obstacle with power-off approach is approximately 40% of corresponding ground roll distance without reverse thrust.
4. Multiply computed headwind component by 0.5 and computed tailwind by 1.5 to obtain effective runway wind component.
5. If no RCR is available, use 12 for wet runways and 5 for icy runways.

Figure A7-5

FOUR ENGINE OPERATION

GO-AROUND RATE OF CLIMB IN LANDING CONFIGURATION

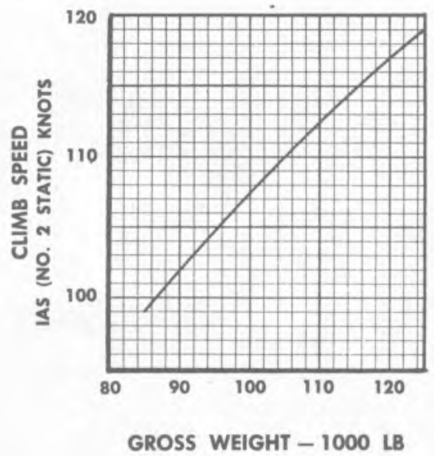
MAXIMUM POWER

GEAR DOWN FLAPS — 100%

MODEL: EC-121R
DATA AS OF: 31 MARCH 1967
DATA BASIS: FLIGHT TESTS

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

CONDITIONS:
1. Maximum power on four (4) engines.
2. Gear down, Flaps 100% extended.
3. Cowl Flaps 30% open on all engines.
4. Oil Radiator Flaps 30% open on all engines.



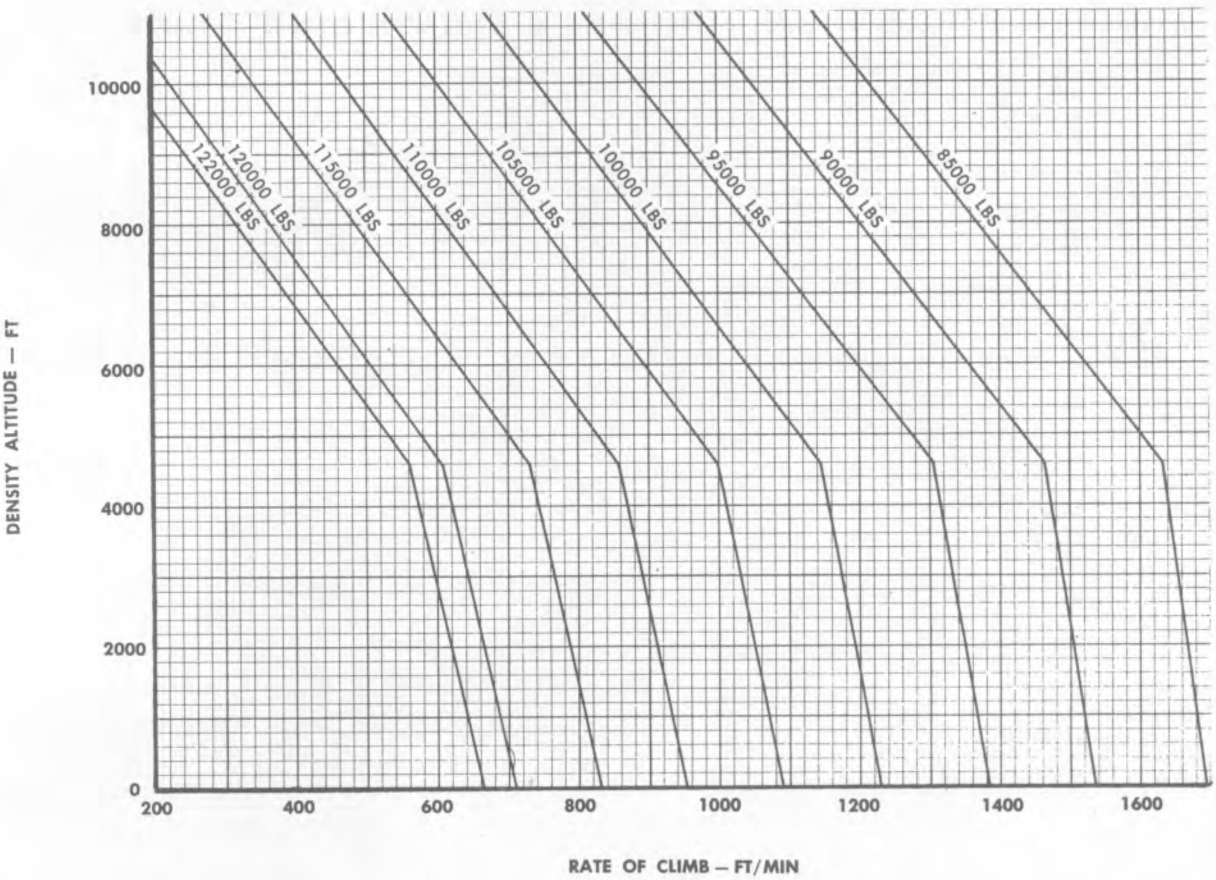


Figure A7-6