4.0 GROUND MANEUVERING

4.0 GROUND MANEUVERING

4.1 General Information

The 747 main landing gear consists of four main struts, each strut with four wheels. This geometric arrangement of the four main gears results in somewhat different ground maneuvering characteristics from those experienced with typical landing gear aircraft.

Basic factors that influence the geometry of the turn include:

1. Nose wheel steering angle

2. Engine power settings

3. Center of gravity location

4. Airplane weight

4. Pavement surface conditions

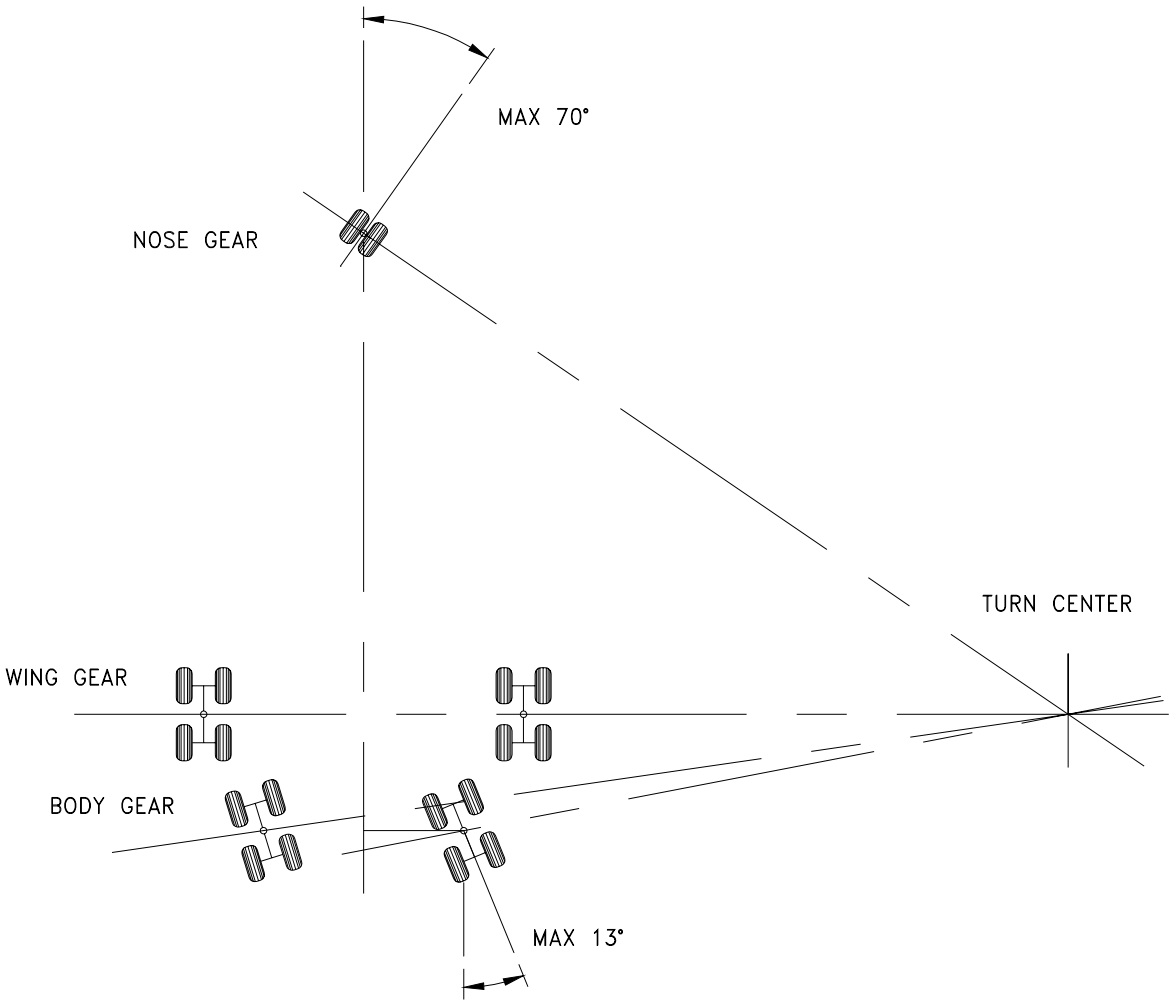
6. Amount of differential braking

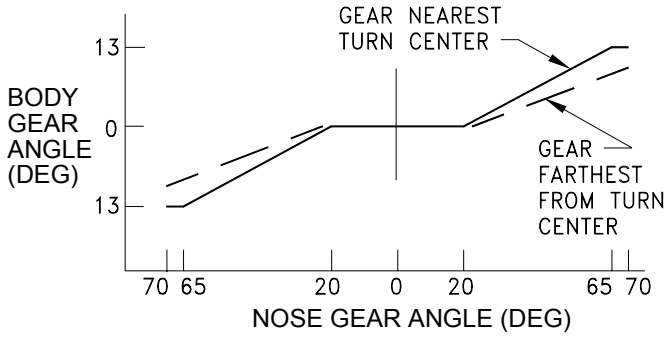
7. Ground speed

8. Main landing gear steering

The steering system of the 747 incorporates steering of the main body landing gear in addition to the nose gear steering. This body gear steering system is hydraulically actuated and is programmed electrically to provide steering ratios proportionate to the nose gear steering angles. During takeoff and landing, the body gear steering system is centered, mechanically locked, and depressurized.

Steering of the main body gear has the following advantages over ground maneuvering without this steering feature; overall improved maneuverability, including improved nose gear tracking; elimination of the need for differential braking during ground turns, with subsequent reduced brake wear; reduced thrust requirements; lower main gear stress levels; and reduced tire scrubbing. The turning radii shown in Section 4.2 are derived from a previous test involving a 747-200. The 747-400 is expected to follow the same maneuvering characteristics.



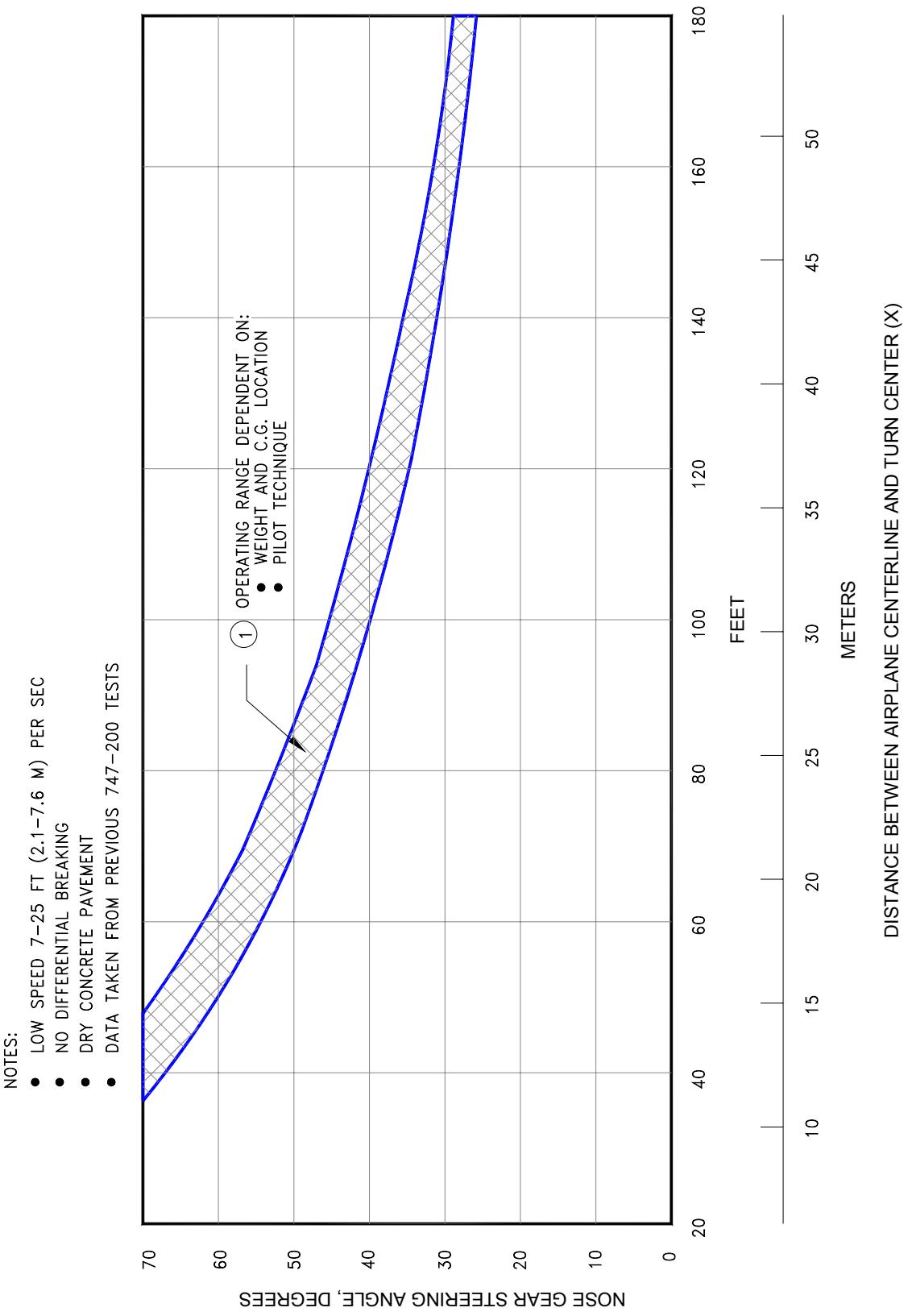


NOSE GEAR	BODY GEAR
0° TO 20°	0°
20° TO 70°	0° TO 13°

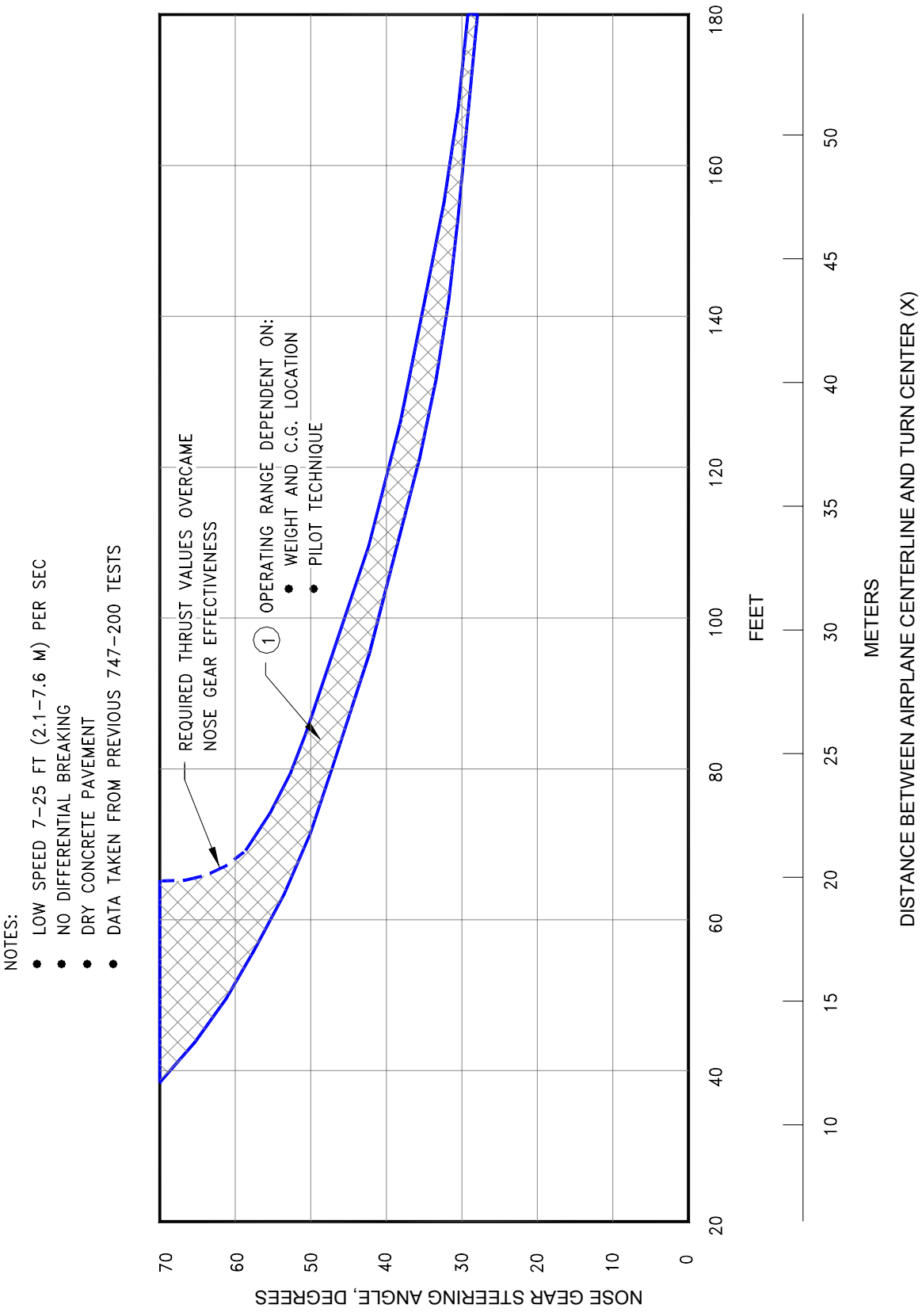
NOSEGEAR/BODY GEAR TURN RATIOS

4.1.1 GENERAL INFORMATION

MODEL 747

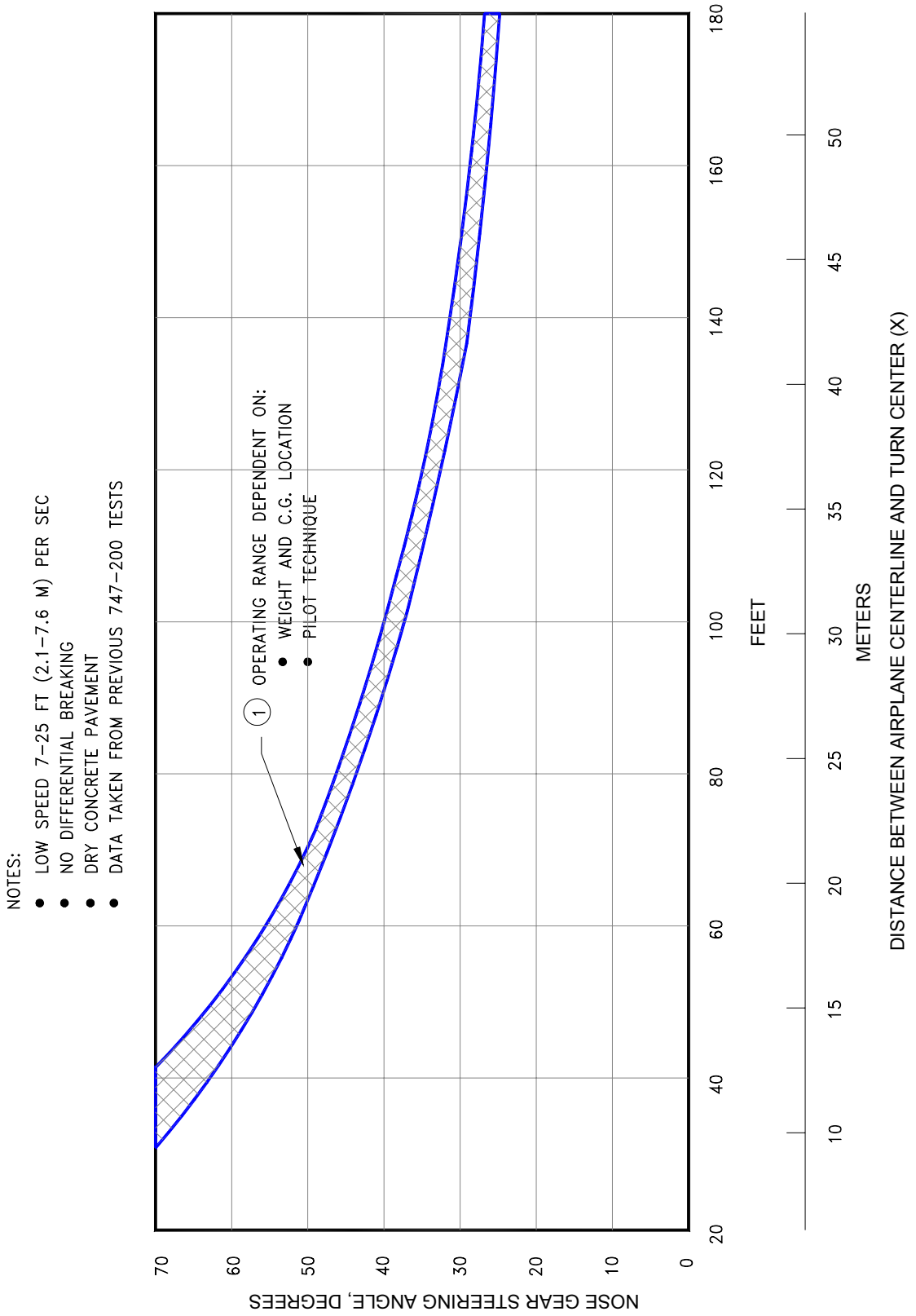


4.2.1 TURNING RADII - WITH BODY GEAR STEERING - SYMMETRICAL THRUST
MODEL 747



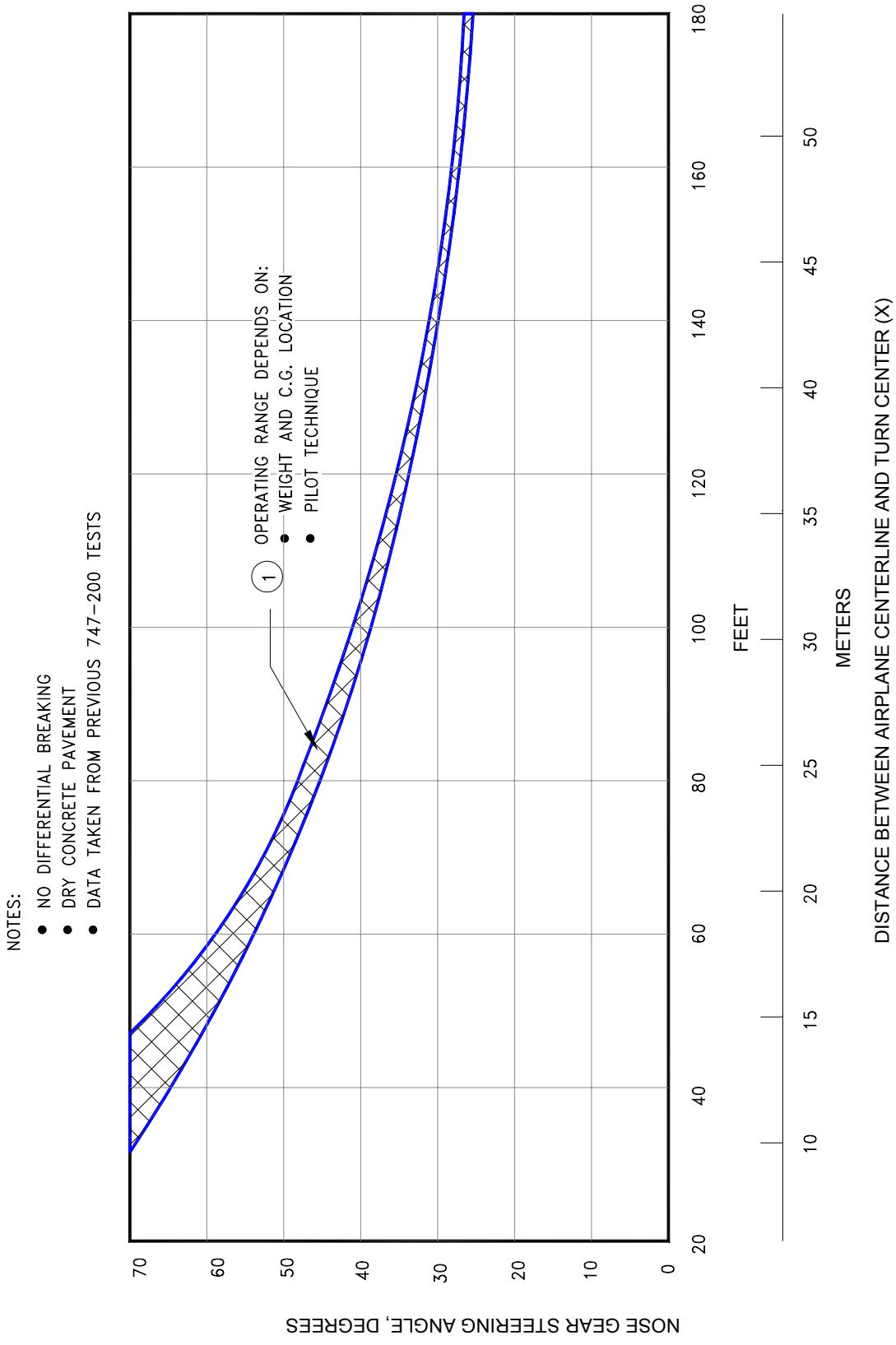
4.2.2 TURNING RADII - BODY GEAR STEERING INOPERATIVE - SYMMETRICAL THRUST

MODEL 747



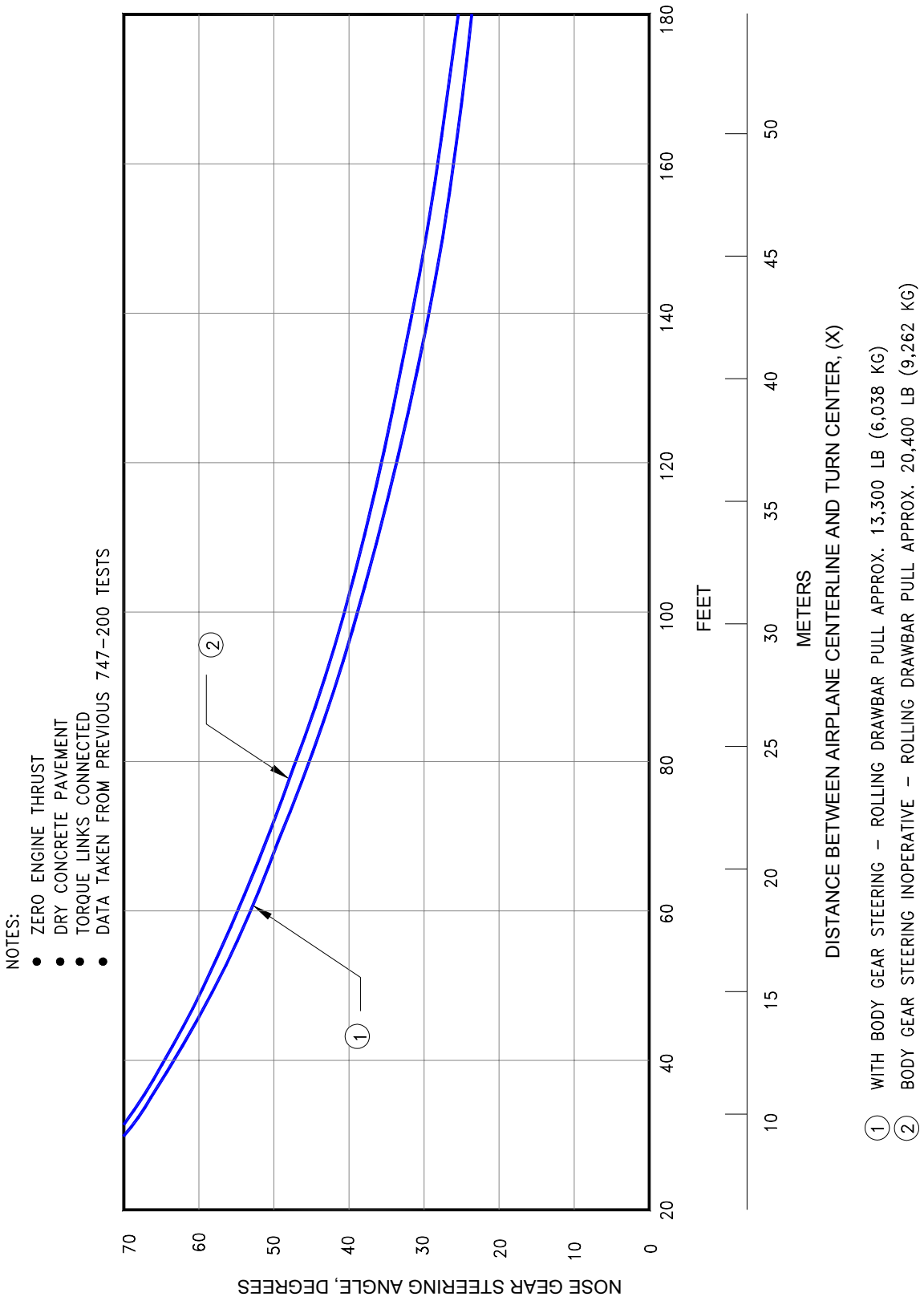
4.2.3 TURNING RADII - WITH BODY GEAR STEERING - UNSYMMETRICAL THRUST

MODEL 747



4.2.4 TURNING RADII - BODY GEAR STEERING INOPERATIVE- SYMMETRICAL THRUST

MODEL 747



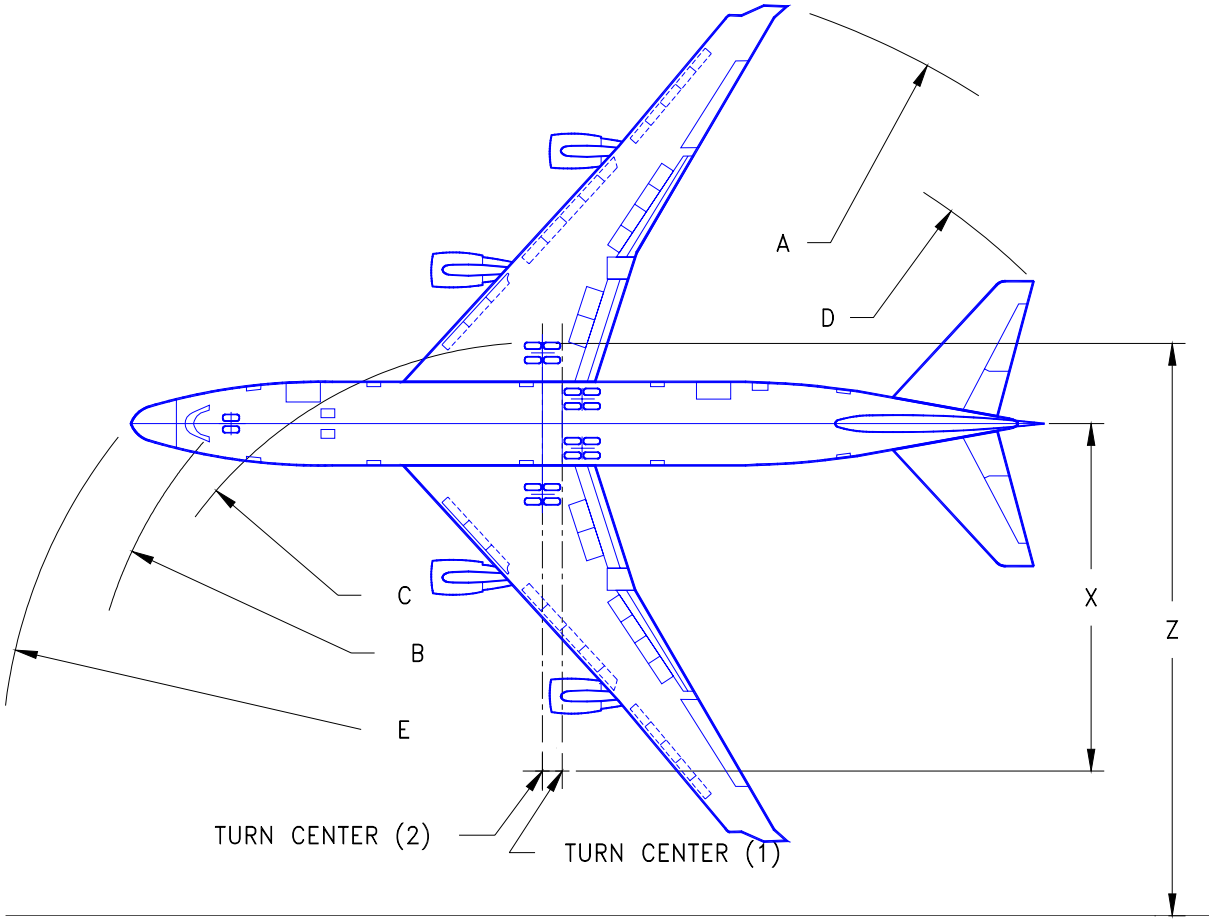
4.2.5 TURNING RADII - TOWED

MODEL 747

NOTES: 1. CONSULT AIRLINE FOR OPERATING PROCEDURES
2. VALUES ARE ROUNDED TO THE NEAREST FOOT

X * (FEET)	RADIUS (FEET)										Z (3) MINIMUM WIDTH FOR 180°TURN	
	A (4) WING TIP		B (3) NOSE GEAR		C (3) WING GEAR		D TAIL TIP		E NOSE			
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
40	157	159	96	91	61	61	142	146	117	112	156	152
60	176	177	106	102	81	81	154	158	125	120	187	183
80	195	196	119	115	101	101	167	171	136	132	219	216
100	214	215	133	130	121	121	182	185	148	145	254	251
120	233	234	149	146	141	141	197	200	162	159	290	287
140	253	254	166	163	161	161	213	216	178	175	327	324
160	272	273	183	181	181	181	230	233	194	191	364	362

* X = DISTANCE BETWEEN AIRPLANE CENTERLINE AND TURN CENTER
(1) BODY GEAR STEERING INOPERATIVE
(2) WITH BODY GEAR STEERING
(3) MEASURED TO OUTSIDE TIRE FACES
(4) WINGSPAN AT 213 FEET



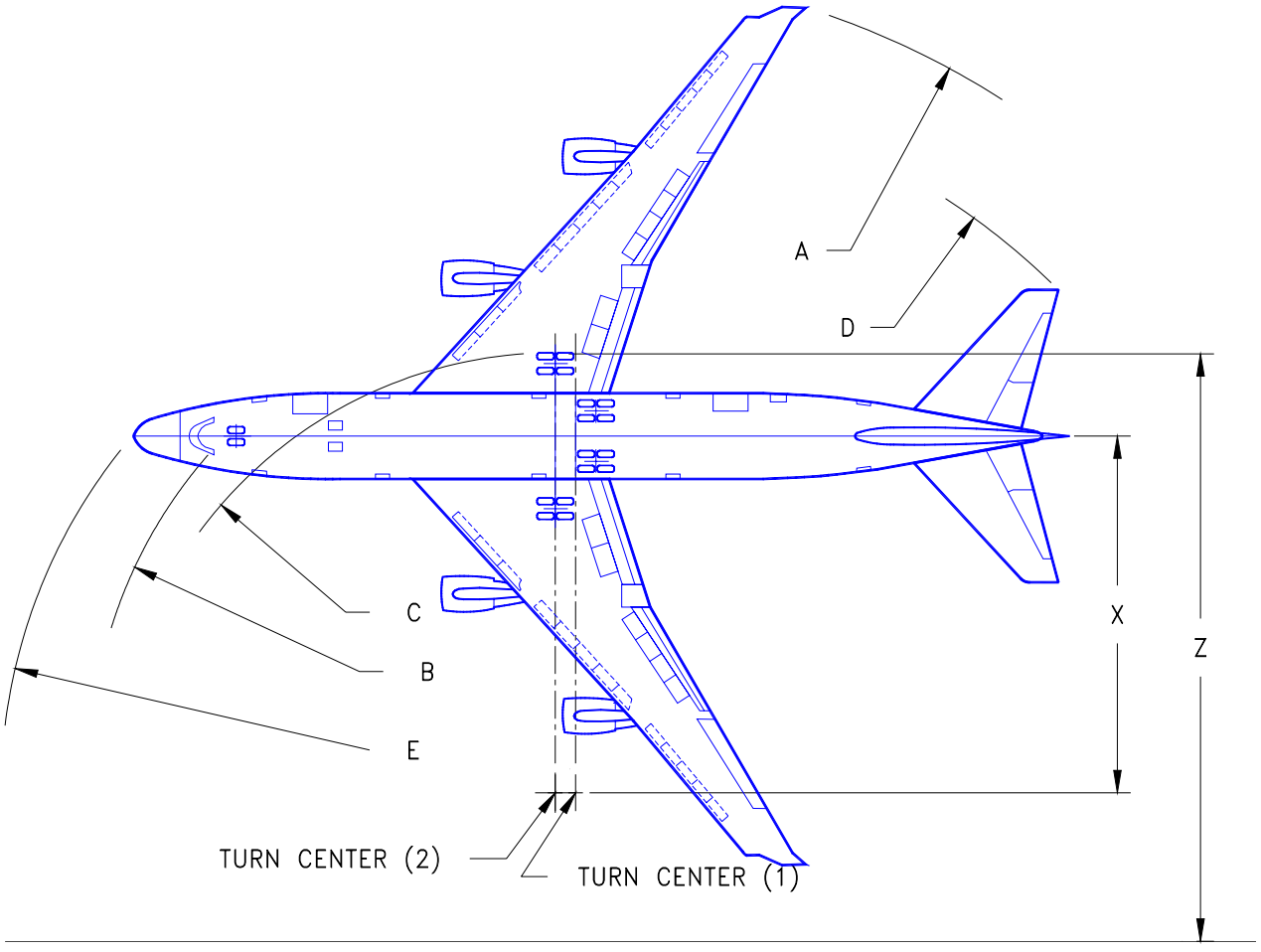
4.3.1 CLEARANCE RADII - ENGLISH UNITS

MODEL 747-400, -400 COMBI, -400 FREIGHTER, -400ER, -400ER FREIGHTER

NOTES: 1. CONSULT AIRLINE FOR OPERATING PROCEDURES
2. VALUES ARE ROUNDED TO THE NEAREST 0.1 METER

X * (METERS)	RADIUS (METERS)										Z (3) MINIMUM WIDTH FOR 180°TURN (METERS)	
	A (4) WING TIP		B (3) NOSE GEAR		C (3) WING GEAR		D TAIL TIP		E NOSE			
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
15	50.4	50.9	30.5	29.2	21.3	21.3	44.9	46.1	36.6	35.2	51.8	50.5
20	55.1	55.6	33.3	32.1	26.3	26.3	48.0	49.1	38.9	37.6	59.6	58.4
25	59.9	60.3	36.6	35.5	31.3	31.3	51.3	52.4	41.7	40.5	67.9	66.8
30	64.7	65.1	40.2	39.3	36.3	36.3	55.0	56.0	44.9	43.7	76.5	75.6
35	69.5	69.9	44.2	43.3	41.3	41.3	58.8	59.8	48.3	47.3	85.5	84.6
40	74.4	74.8	48.3	47.5	46.3	46.3	62.8	63.7	52.1	51.1	94.6	93.8
45	79.3	79.6	52.6	51.8	51.3	51.3	66.9	67.8	56.0	55.1	103.9	103.1

* X = DISTANCE BETWEEN AIRPLANE CENTERLINE AND TURN CENTER
(1) BODY GEAR STEERING INOPERATIVE
(2) WITH BODY GEAR STEERING
(3) MEASURED TO OUTSIDE TIRE FACES
(4) WINGSPAN AT 64.9 METERS



4.3.2 CLEARANCE RADII - METRIC UNITS

MODEL 747-400, -400 COMBI, -400 FREIGHTER, -400ER, -400ER FREIGHTER

NOTE: CONSULT AIRLINE FOR OPERATING PROCEDURES

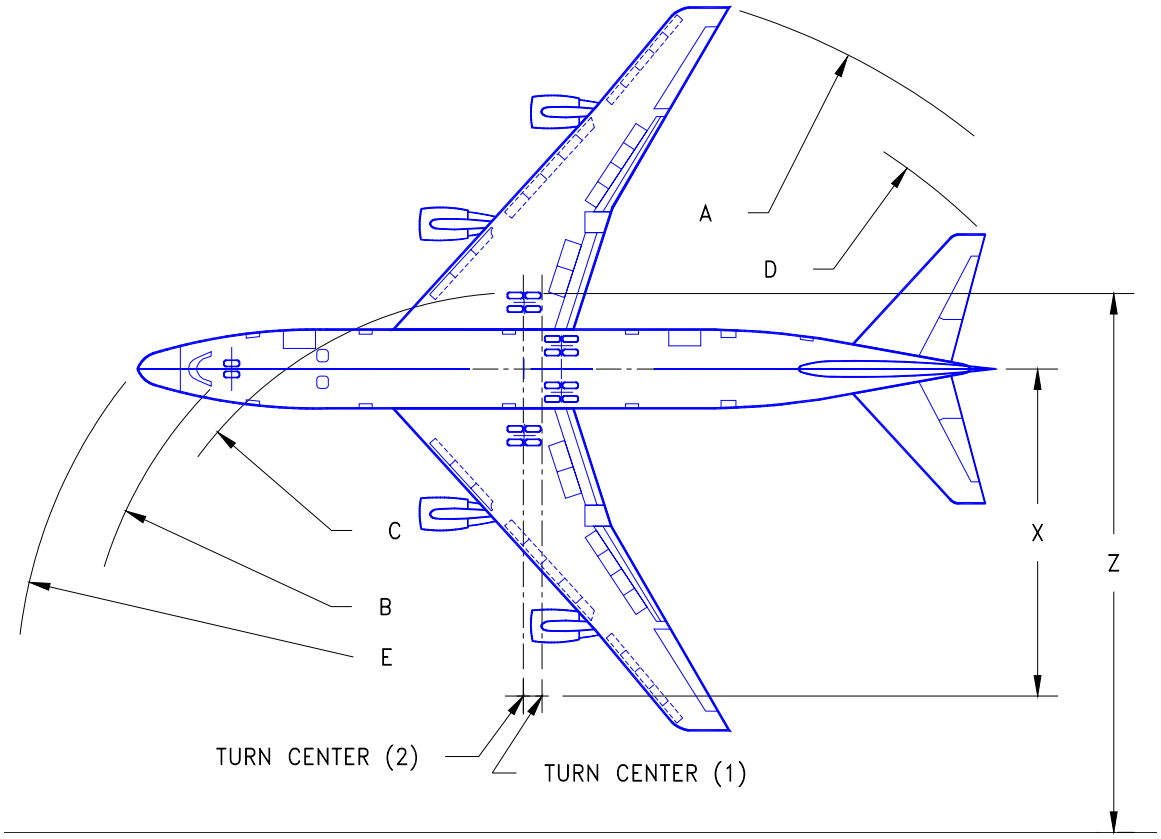
X * (FEET)	RADIUS (FEET)										Z (3) MINIMUM WIDTH FOR 180°TURN	
	A WING TIP		B (3) NOSE GEAR		C (3) WING GEAR		D TAIL TIP		E NOSE			
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
40	148	151	96	91	61	61	142	146	117	112	156	152
60	168	170	106	102	81	81	154	158	125	120	187	183
80	187	188	119	115	101	101	167	171	136	132	219	216
100	206	207	133	130	121	121	182	185	148	145	254	251
120	225	226	149	146	141	141	197	200	162	159	290	287
140	245	246	166	163	161	161	213	216	178	175	327	324
160	264	265	183	181	181	181	230	233	194	191	364	362

* X = DISTANCE BETWEEN AIRPLANE CENTERLINE AND TURN CENTER

(1) BODY GEAR STEERING INOPERATIVE

(2) WITH BODY GEAR STEERING

(3) MEASURED TO OUTSIDE TIRE FACES



4.3.3 CLEARANCE RADII - ENGLISH UNITS

MODEL 747-400 DOMESTIC

NOTE: CONSULT AIRLINE FOR OPERATING PROCEDURES

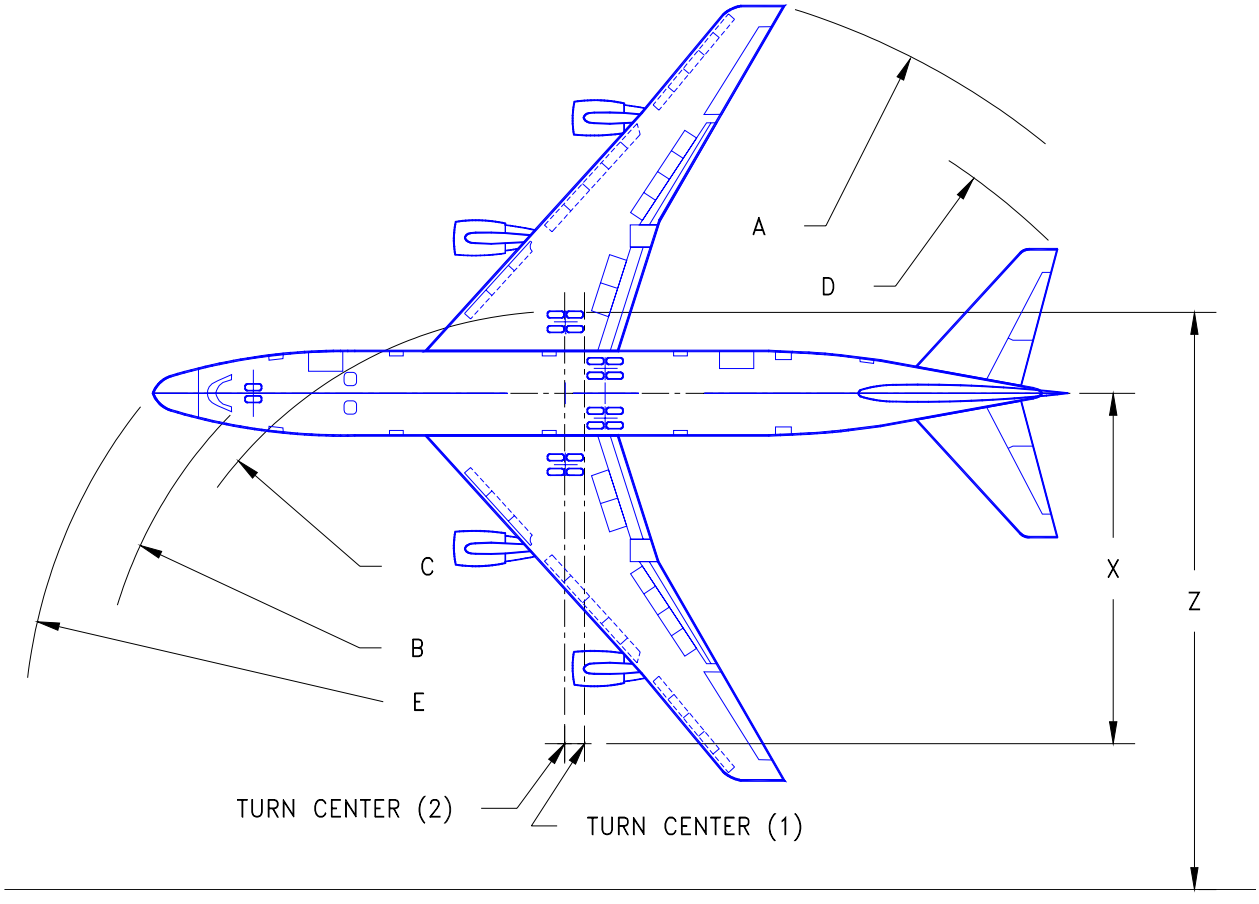
X * (METERS)	RADIUS (METERS)										Z (3) MINIMUM WIDTH FOR 180°TURN (METERS)	
	A WING TIP		B (3) NOSE GEAR		C (3) WING GEAR		D TAIL TIP		E NOSE			
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
15	48.2	48.8	30.5	29.2	21.3	21.3	44.9	46.1	36.6	35.2	51.8	50.5
20	52.7	53.3	33.3	32.1	26.3	26.3	48.0	49.1	38.9	37.6	59.6	58.4
25	57.6	59.7	36.6	35.5	31.3	31.3	51.3	52.4	41.7	40.5	67.9	66.8
30	62.2	62.8	40.2	39.3	36.3	36.3	55.0	56.0	44.9	43.7	76.5	75.6
35	67.1	67.7	44.2	43.3	41.3	41.3	58.8	59.8	48.3	47.3	85.5	84.6
40	71.9	72.2	48.3	47.5	46.3	46.3	62.8	63.7	52.1	51.1	94.6	93.8
45	76.8	77.1	52.6	51.8	51.3	51.3	66.9	67.8	56.0	55.1	103.9	103.1

* X = DISTANCE BETWEEN AIRPLANE CENTERLINE AND TURN CENTER

(1) BODY GEAR STEERING INOPERATIVE

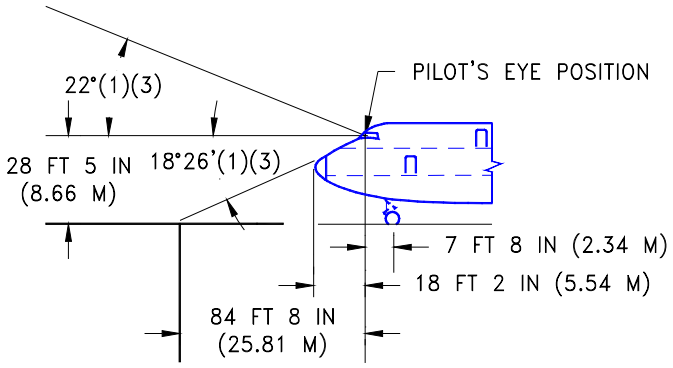
(2) WITH BODY GEAR STEERING

(3) MEASURED TO OUTSIDE TIRE FACES



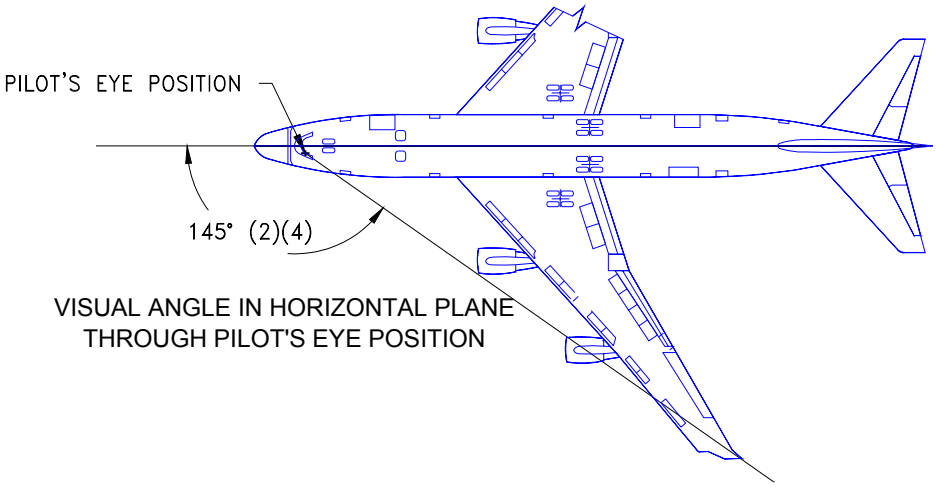
4.3.4 CLEARANCE RADII - METRIC UNITS

MODEL 747-400 DOMESTIC

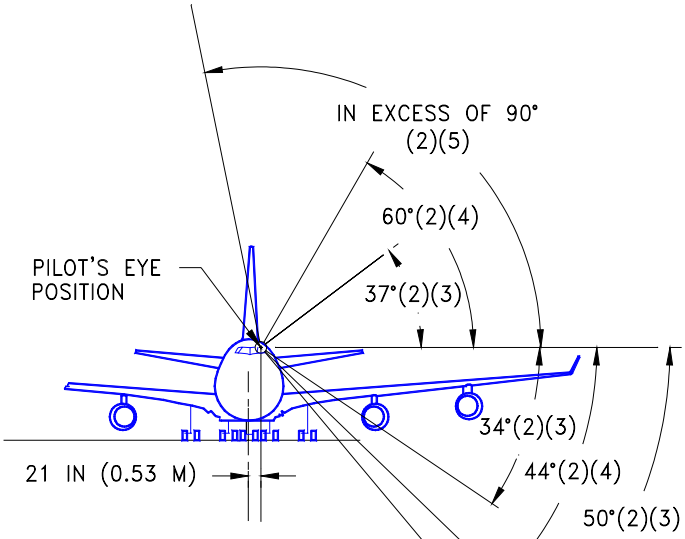


NOT TO BE USED FOR LANDING APPROACH VISIBILITY

VISUAL ANGLES IN VERTICAL PLANE THROUGH PILOT'S EYE POSITION



VISUAL ANGLE IN HORIZONTAL PLANE THROUGH PILOT'S EYE POSITION



VISUAL ANGLES IN PLANE PERPENDICULAR TO LONGITUDINAL AXIS THROUGH PILOT'S EYE POSITION

NOTES:

(1) VISUAL ANGLES THROUGH WINDSHIELD

(2) VISUAL ANGES THROUGH SIDE WINDOW

(3) VISUAL ANGLES FROM NORMAL POSITION

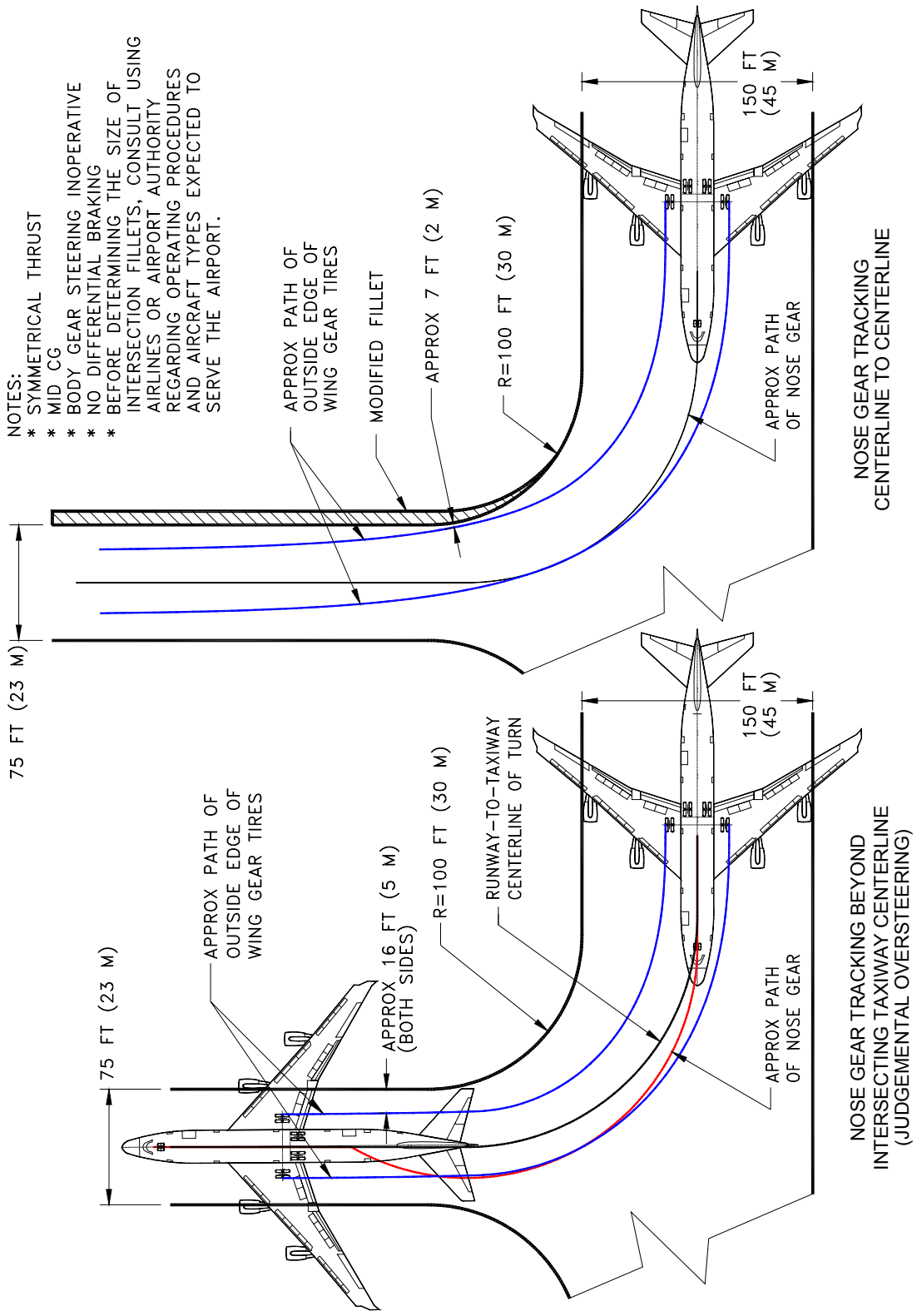
(4) VISUAL ANGLES FROM ALERT POSITION, HEAD MOVED OUTBOARD 5 IN (0.13 M)

(5) VISUAL ANGLES WITH HEAD MOVED 7 IN (0.18 M) OUTBOARD

* HEAD IS ROTATED ABOUT A POINT 3 IN (0.08 M) AFT OF PILOT'S EYE POSITION

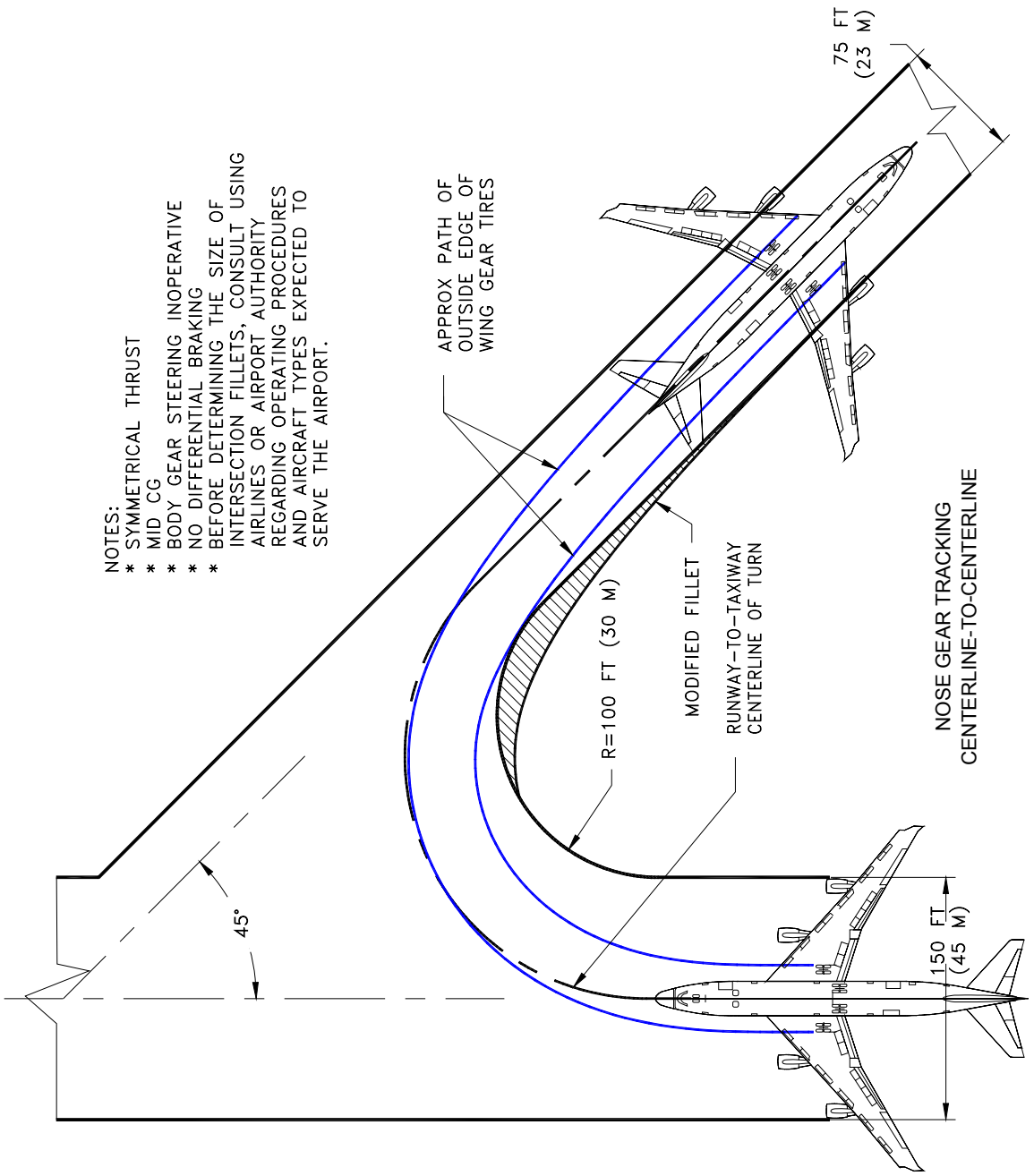
4.4 VISIBILITY FROM COCKPIT IN STATIC POSITION

MODEL 747-400



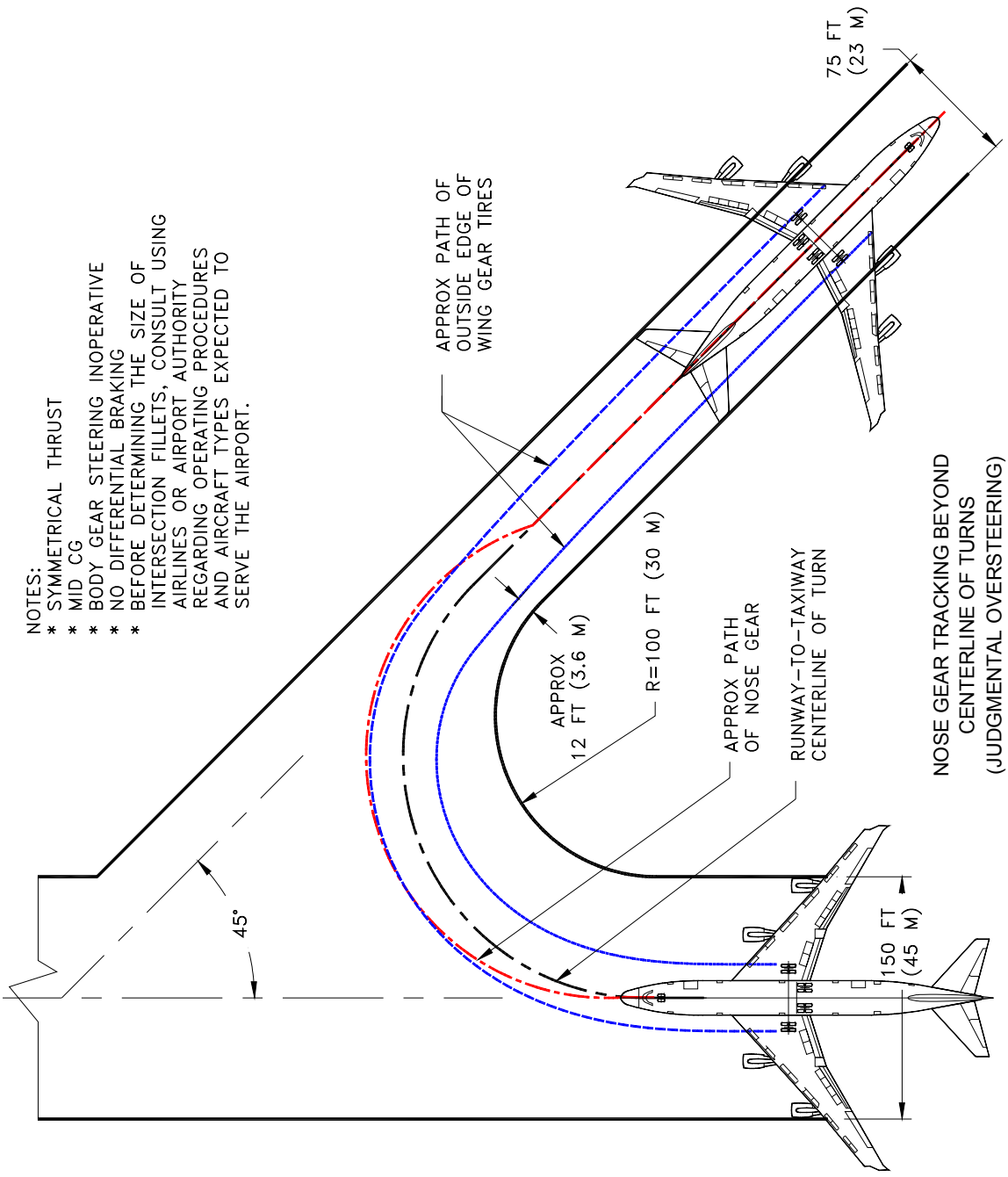
4.5.1 RUNWAY AND TAXIWAY TURN PATHS - RUNWAY-TO-TAXIWAY, 90 DEGREES

MODEL 747-400



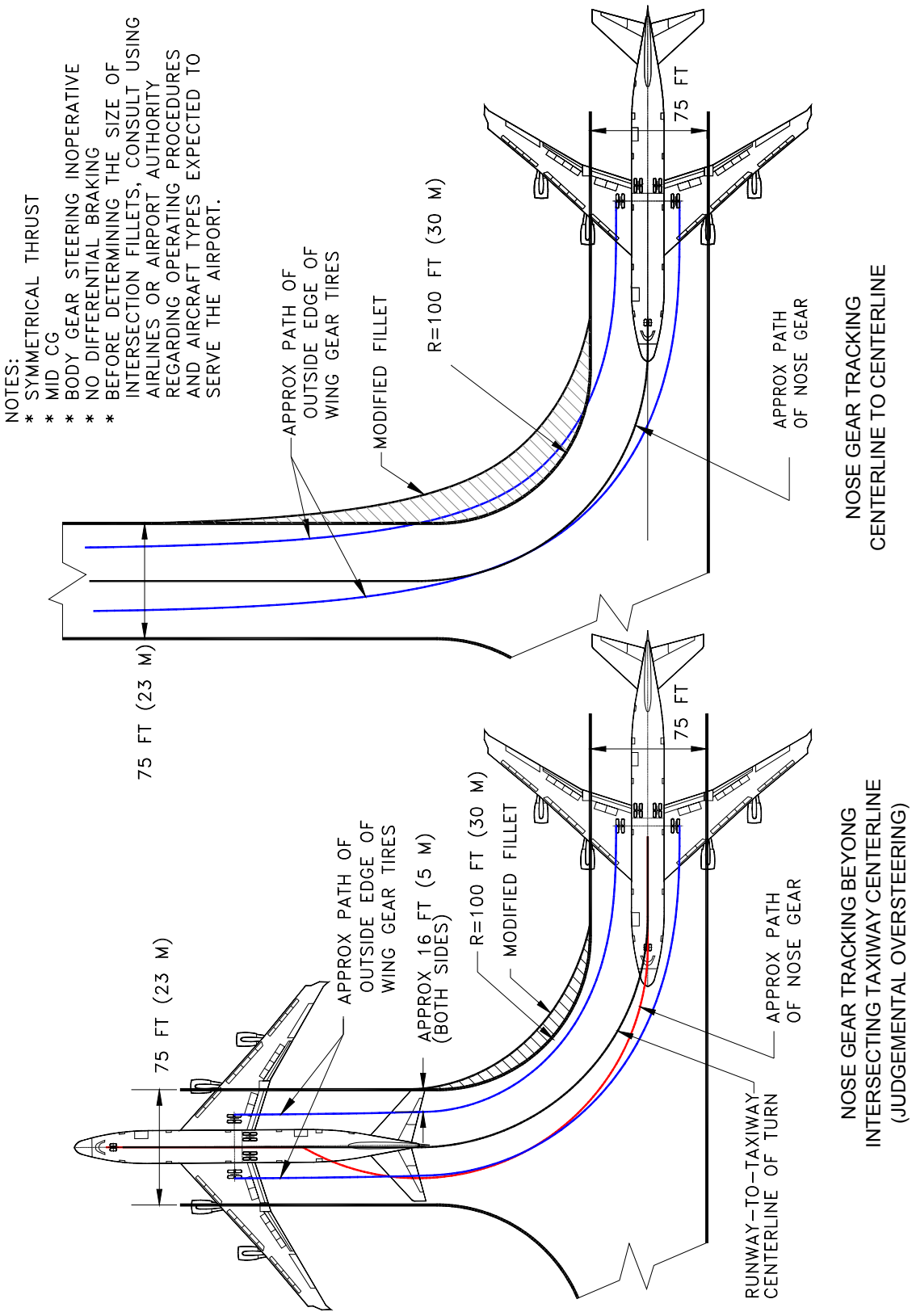
4.5.2 RUNWAY AND TAXIWAY TURN PATHS - RUNWAY-TO-TAXIWAY, MORE THAN 90 DEGREES, NOSE GEAR TRACKS CENTERLINE

MODEL 747-400



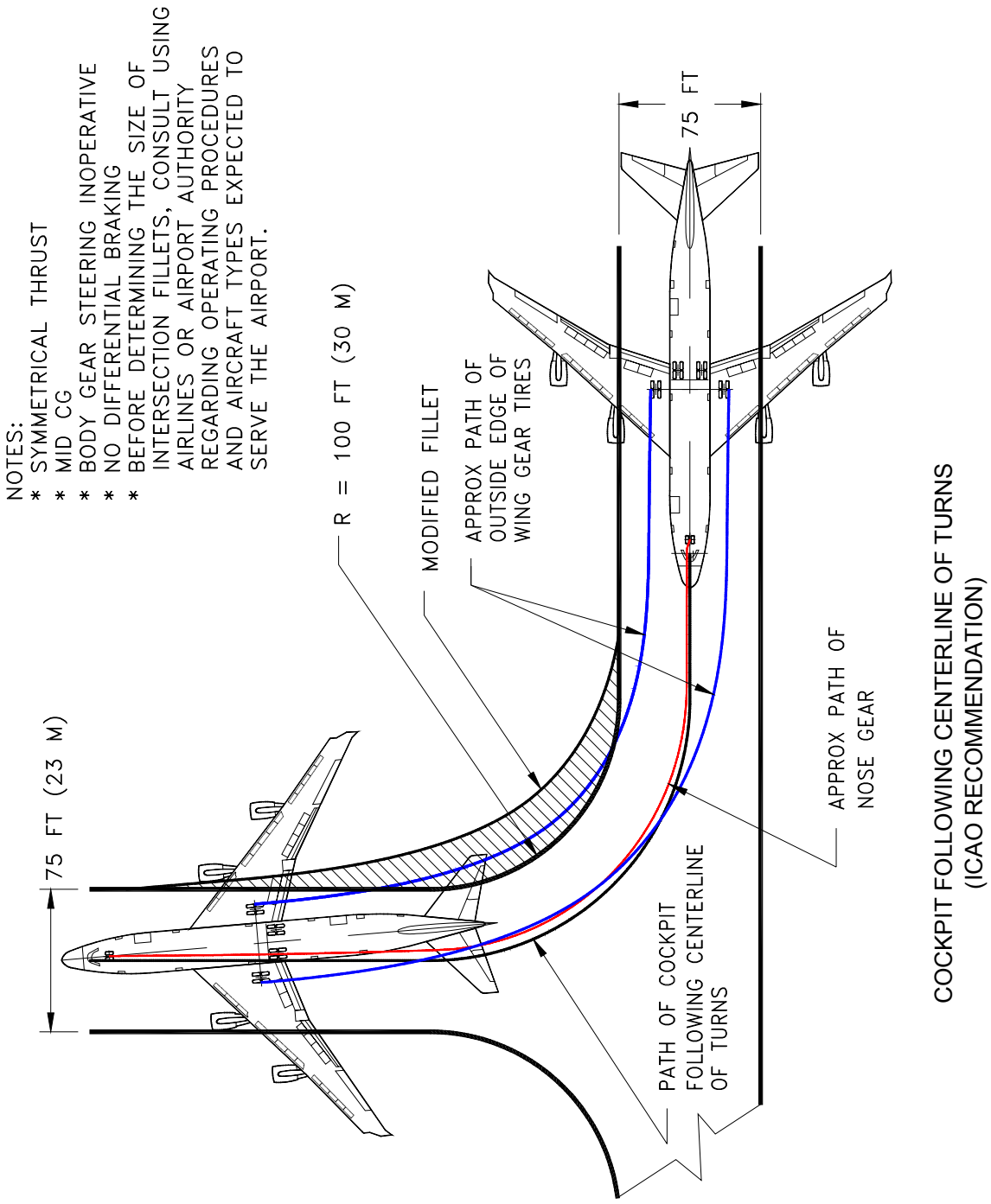
4.5.3 RUNWAY AND TAXIWAY TURN PATHS - RUNWAY-TO-TAXIWAY, MORE THAN 90 DEGREES, JUDGMENTAL OVERSTEERING

MODEL 747-400



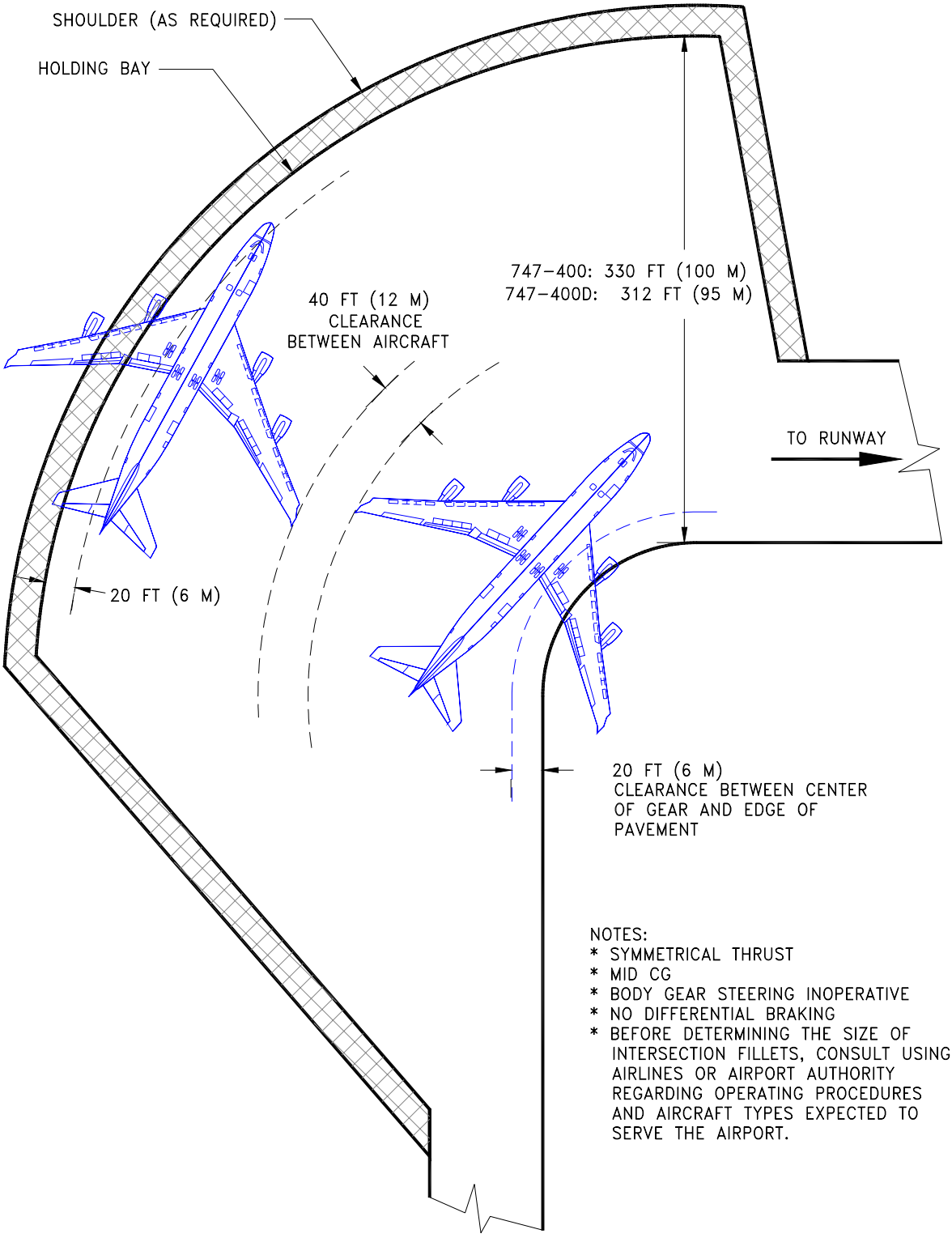
4.5.4 RUNWAY AND TAXIWAY TURN PATHS - TAXIWAY-TO-TAXIWAY, 90 DEGREES

MODEL 747-400



4.5.5 RUNWAY AND TAXIWAY TURN PATHS - TAXIWAY-TO-TAXIWAY, 90 DEGREES, ICAO RECOMMENDATION

MODEL 747-400



4.6 RUNWAY HOLDING BAY

MODEL 747-400

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