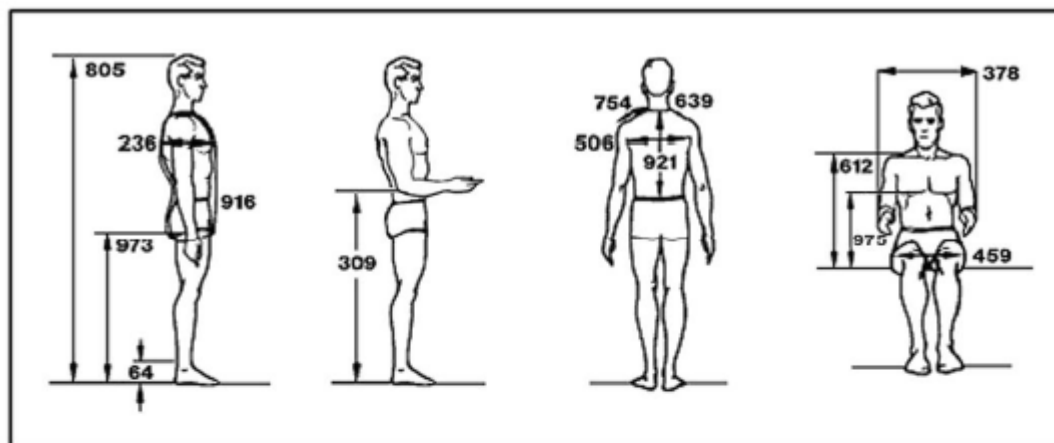
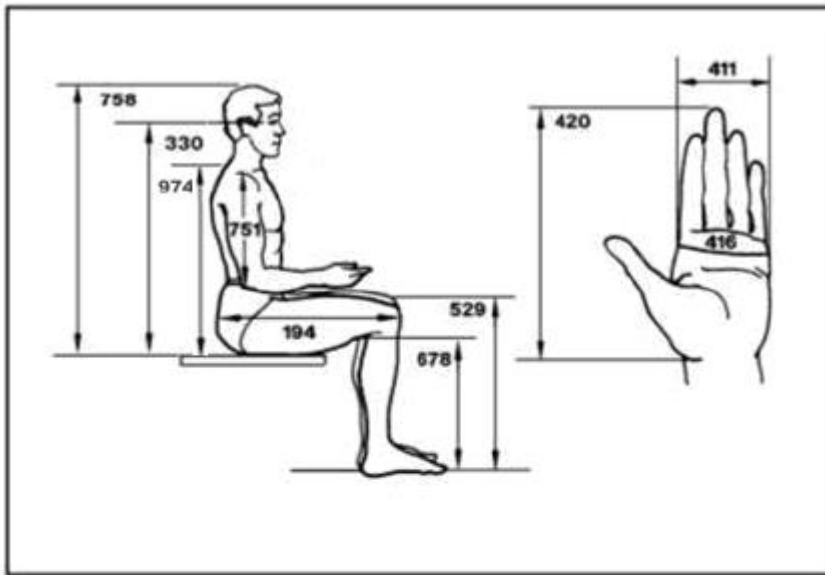


TABLE F1.0-1 - ANTHROPOMETRIC DIMENSIONAL DATA FOR AMERICAN FEMALE AND MALE

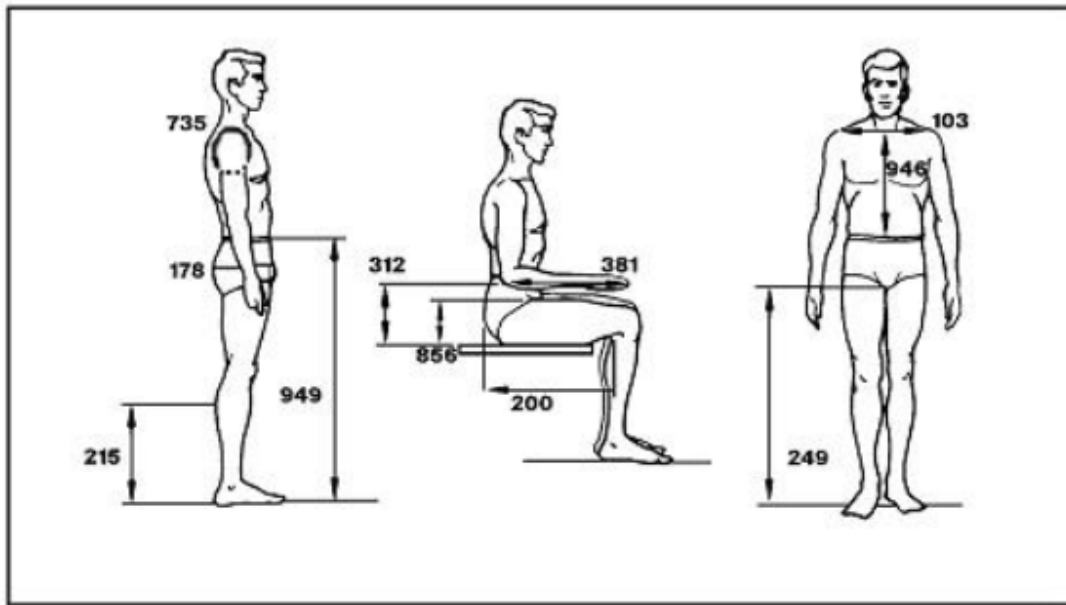


No.	Dimension	Min (cm, (in))	Max (cm, (in))
805	Stature	148.6 (58.5)	194.6 (76.6)
973	Wrist height	70.3 (27.7)	96.3 (37.9)
64	Ankle height	4.8 (1.9)	8.1 (3.2)
309	Elbow height (rest height standing)	89.9 (35.4)	120.7 (47.5)
236	Bust depth (chest depth)	19.1 (7.5)	30.2 (11.9)
916	Vertical trunk circumference	134.9 (53.1)	181.9 (71.6)
612	Mid-shoulder height, sitting	52.6 (20.7)	71.1 (28.0)
459*	Hip breadth, sitting	31.5 (12.4)	46.5 (18.3)
921	Waist back	39.1 (15.4)	55.9 (22.0)
506	Interscye	29.3 (11.5)	48.0 (18.9)
639	Neck circumference	27.8 (10.9)	43.4 (17.1)
754	Shoulder length (side neck-to-acromion horizontal distance)	12.0 (4.7)	18.0 (7.1)
378	Forearm-forearm breadth	38.9 (15.3)	66.0 (26.0)
975	Chest height, sitting	33.8 (13.3)	50.3 (19.8)

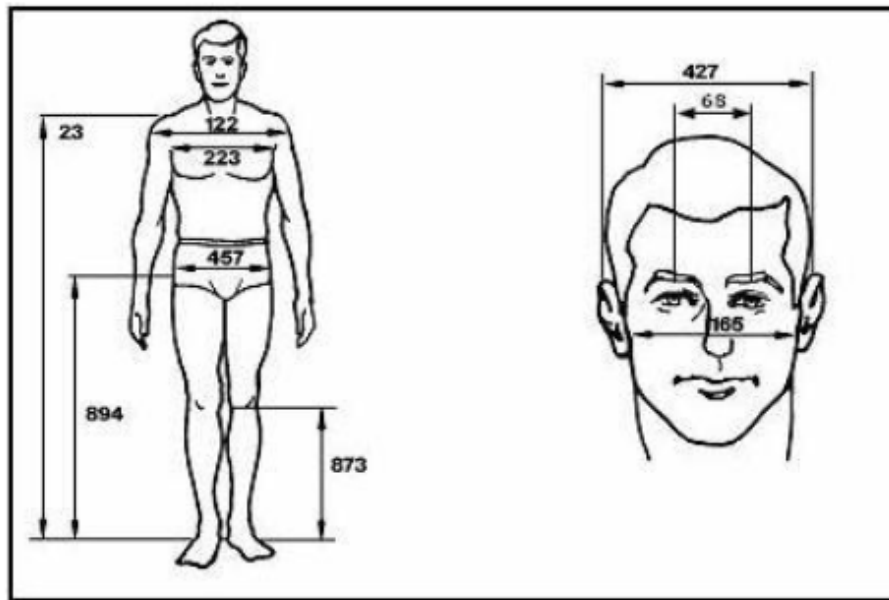
*For seated measurements, the largest female hip breadth is larger than the largest male hip breadth, and the smallest male hip breadth is smaller than the smallest female hip breadth; therefore, male data are used for the Min dimension, and female data are used for the Max dimension.



No.	Dimension	Min (cm [in])	Max (cm [in])
758	Sitting height	77.7 (30.6)	101.3 (39.9)
330	Eye height, sitting	66.5 (26.2)	88.9 (35.0)
529	Knee height, sitting	45.5 (17.9)	63.5 (25.0)
678	Popliteal height	33.0 (13.0)	50.0 (19.7)
751	Shoulder-elbow length	29.6 (11.6)	41.9 (16.5)
194	Buttock-knee length	52.1 (20.5)	69.9 (27.5)
420	Hand length	15.8 (6.2)	22.1 (8.7)
411	Hand breadth	7.1 (2.8)	10.2 (4.0)
416	Hand circumference	16.8 (6.6)	24.1 (9.5)
974	Cervicale height, sitting	56.6 (22.3)	76.2 (30.0)

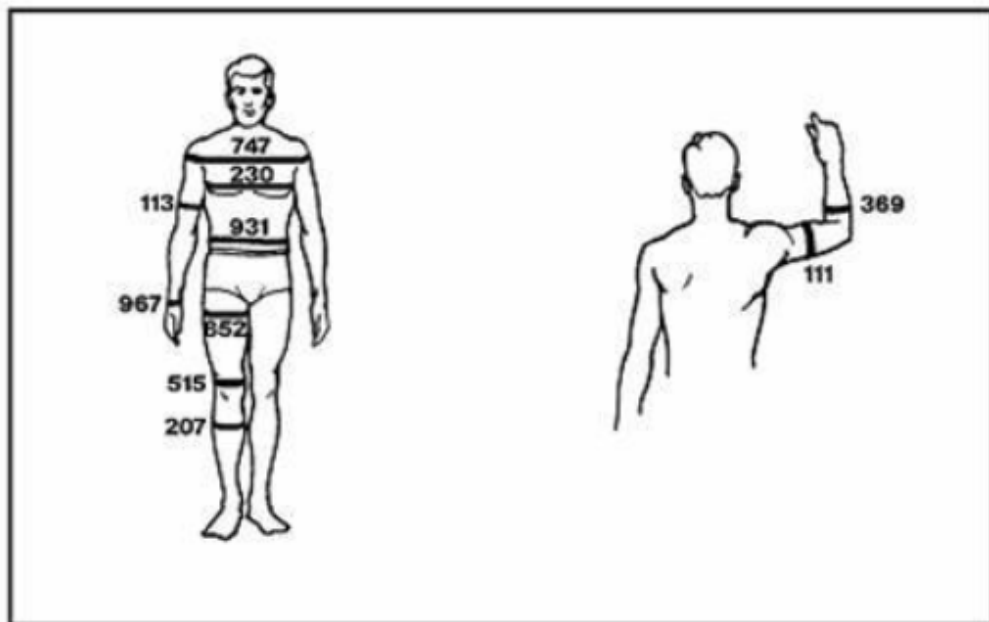


No.	Dimension	Min (cm [in])	Max (cm [in])
949	Waist height	86.6 (34.1)	119.6 (47.1)
249	Crotch height	66.5 (26.2)	95.8 (37.7)
215	Calf height	25.9 (10.2)	41.4 (16.3)
103	Biacromial breadth	32.3 (12.7)	44.5 (17.5)
946	Waist front	34.1 (13.4)	48.8 (19.2)
735	Scye circumference	31.9 (12.6)	52.1 (20.5)
178	Buttock circumference	84.1 (33.1)	114.8 (45.2)
312	Elbow rest height	16.2 (6.4)	30.0 (11.8)
856	Thigh clearance	13.0 (5.1)	20.1 (7.9)
381	Forearm hand length	38.7 (15.2)	54.6 (21.5)
200	Buttock-popliteal length	42.2 (16.6)	57.2 (22.5)

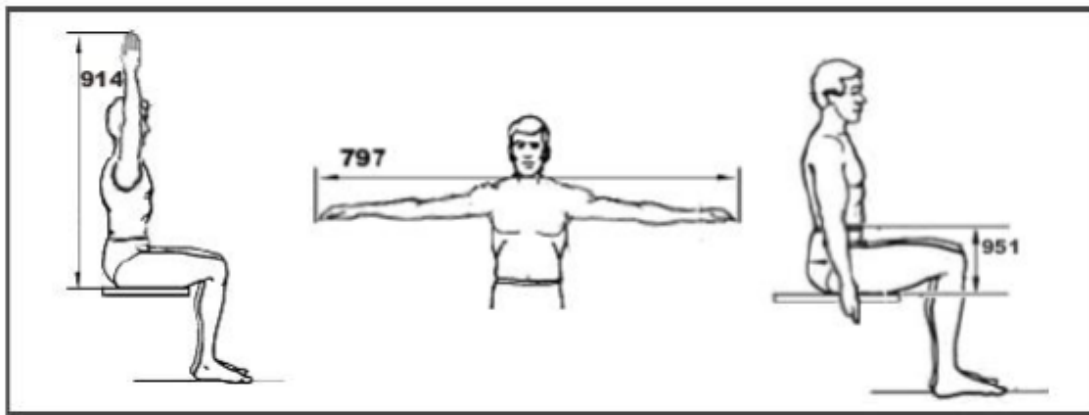


No.	Dimension	Min (cm [in])	Max (cm [in])
23	Acromial (shoulder) height	120.4 (47.4)	161.8 (63.7)
894	Trochanteric height	75.2 (29.6)	105.4 (41.5)
873	Knee Height, Midpatella	39.6 (15.6)	57.9 (22.8)
122	Bideltoid (shoulder) breadth	37.8 (14.9)	56.1 (22.1)
223	Chest breadth	23.5 (9.3)	39.4 (15.5)
457*	Hip breadth	29.8 (11.7)	40.6 (16.0)
165	Bizgomatic (face) breadth	12.0 (4.7)	15.5 (6.1)
427	Head breadth	13.3 (5.2)	16.5 (6.5)
68	Interpupillary Breadth	5.3 (2.1)	7.4 (2.9)

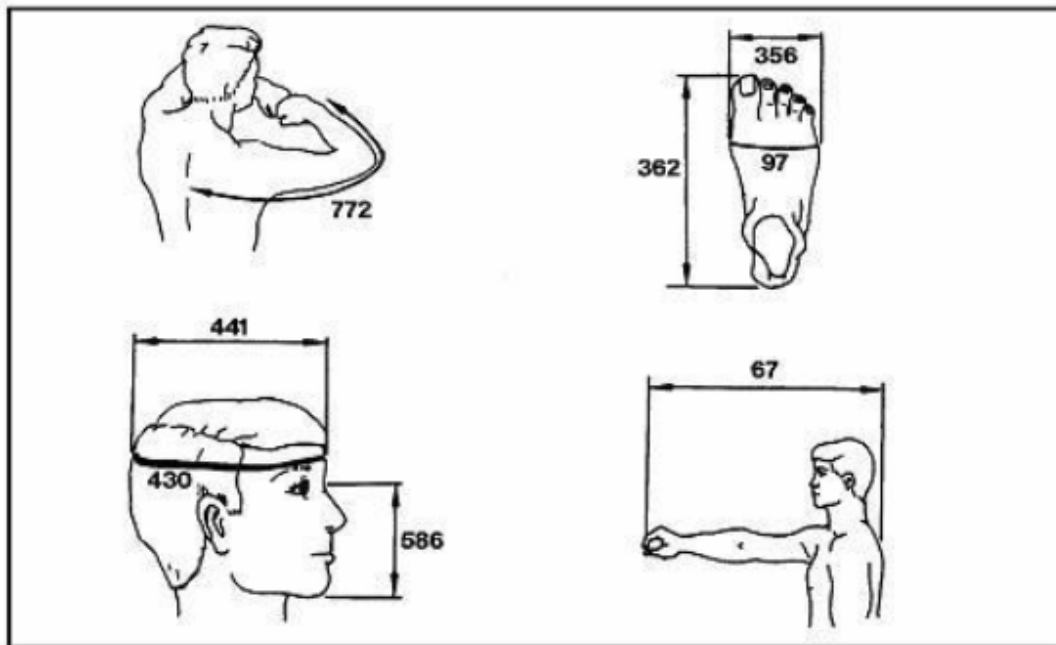
*For standing measurements, the largest female hip breadth is larger than the largest male hip breadth; therefore, female data are used for both the Min dimension and the Max dimension.



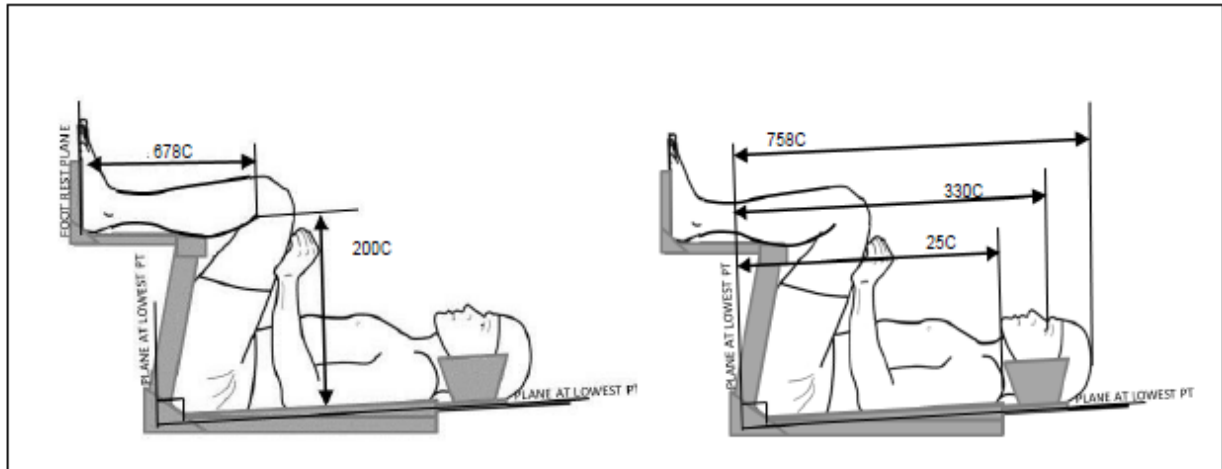
No.	Dimension	Min (cm [in])	Max (cm [in])
747	Shoulder circumference	90.4 (35.6)	133.9 (52.7)
230	Chest circumference	75.7 (29.8)	118.6 (46.7)
931	Waist circumference	61.2 (24.1)	110.5 (43.5)
852	Thigh circumference	47.8 (18.8)	71.9 (28.3)
515	Knee circumference	30.7 (12.1)	44.5 (17.5)
207	Calf circumference	29.5 (11.6)	44.5 (17.5)
967	Wrist circumference	13.5 (5.3)	19.8 (7.8)
111	Biceps circumference, flexed	22.9 (9.0)	40.4 (15.9)
369	Forearm circumference, flexed	21.6 (8.5)	35.3 (13.9)



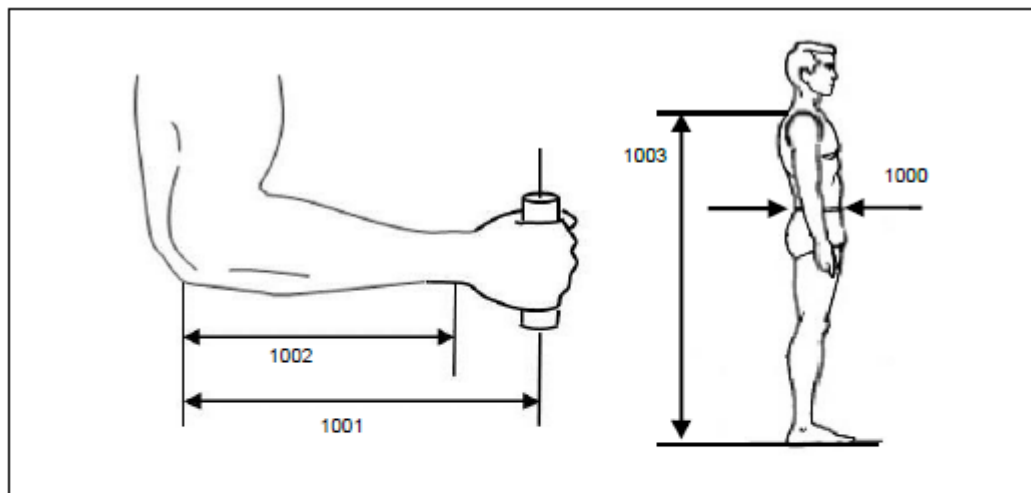
No.	Dimension	Min (cm [in])	Max (cm [in])
951	Waist height, sitting	19.3 (7.6)	27.2 (10.7)
797	Span, sitting	147.8 (58.2)	204.7 (80.6)
914	Vertical index fingertip reach, sitting	118.9 (46.8)	158.2 (62.3)



No.	Dimension	Min (cm [in])	Max (cm [in])
67	Thumb-tip reach	65.0 (25.6)	90.9 (35.8)
772	Sleeve length	72.4 (28.5)	99.1 (39.0)
441	Head length	17.3 (6.8)	21.6 (8.5)
430	Head circumference	51.3 (20.2)	61.0 (24.0)
586	Menton-sellion (face) length	9.9 (3.9)	14.0 (5.5)
362	Foot length	21.6 (8.5)	30.5 (12.0)
356	Foot breadth	7.9 (3.1)	11.4 (4.5)
97	Ball of foot circumference	19.6 (7.7)	28.2 (11.1)



No.	Dimension
25C	Acromial height, sitting
330C	Eye height, sitting
758C	Sitting height
200C	Buttock-popliteal length
678C	Popliteal height



No.	Dimension	Min (cm [in])	Max (cm [in])
1000	Waist depth	15.0 (5.9)	30.0 (11.8)
1001	Elbow to Center of Grip Length	28.7 (11.3)	40.8 (16.1)
1002	Elbow to wrist length	22.5 (8.9)	33.1 (13.0)
1003	Cervicale height, standing	127.7 (50.3)	169.8 (66.9)

TABLE F1.0-2 - VEHICLE DESIGN CRITICAL ANTHROPOMETRY DIMENSIONS

Design Concern	Critical Dimension	Numerical Code from Table F1.0-1	Minimal Clothing		With ACES-Type Suit, Unpressurized		With ACES-Type Suit, Pressurized	
			Min (cm [in])	Max (cm [in])	Min (cm [in])	Max (cm [in])	Min (cm [in])	Max (cm [in])
Maximum vertical clearance	Stature, standing without bailer bar	805	148.6 (58.5)	194.6 (76.6)	157.7 (62.1)	203.7 (80.2)	158.0 (62.2)	200.2 (78.8)
Vertical seating clearance	Sitting height, with bailer bar	758	77.7 (30.6)	101.3 (39.9)	83.6 (32.9)	112.8 (44.4)	85.9 (33.8)	110.7 (43.6)
Vertical seating clearance with bailer bar down or removed	Sitting height without bailer bar ²	758	NA	NA	82.3 (32.4)	105.9 (41.7)	NA	NA
Vertical seating clearance with bailer bar down or removed	Sitting height without bailer bar in a conformal seat ³	758C	NA	NA	85.5 (33.6)	108.4 (42.7)	86.2 (34)	110.4 (43.5)
Placement of panels to be within line-of-sight	Eye height, sitting	330	66.5 (26.2)	88.9 (35.0)	61.2 (24.1)	87.6 (34.5)	56.9 (22.4)	84.8 (33.4)
Placement of panels to be within line-of-sight	Eye height, sitting in a conformal seat ^{3,4}	330C	NA	NA	63.2 (24.9)	88.0 (34.7)	63.8 (25.1)	85.3 (33.6)
Top of seatback	Acromial height, sitting	N/A	49.5 (19.5)	68.1 (26.8)	48.8 (19.2)	68.8 (27.1)	48.3(19.0)	68.3 (26.9)
Top of seatback	Acromial height, sitting in a conformal seat ³	25C	NA	NA	51.5 (20.3)	71.5 (28.2)	49.5 (19.5)	69.5 (27.3)
Placement of objects that may be over lap (panels, control wheel, etc.)	Thigh clearance, sitting	856	13.0 (5.1)	20.1 (7.9)	15.0 (5.9)	19.8 (7.8)	17.5 (6.9)	21.6(8.5)
Height of panels in front of subject	Knee height, sitting	529	45.5 (17.9)	63.5 (25.0)	47.2 (18.6)	66.3 (26.1)	51.3 (20.2)	69.9 (27.5)
Height of seat pan	Popliteal height, sitting	678	33.0 (13.0)	50.0 (19.7)	31.8 (12.5)	51.1 (20.1)	32.0 (12.6)	49.0 (19.3)
Height of seat pan	Popliteal height, sitting in a conformal seat ^{3,4}	678C	NA	NA	38.0 (14.9)	55.5 (21.9)	34.3 (13.5)	52.5 (20.7)
Downward reach of subject	Wrist height, sitting (with arm to the side)	N/A	39.6 (15.6)	54.6 (21.5)	41.1 (16.2)	62.5 (24.6)	45.0 (17.7)	63.5 (25.0)

Placement of restraint straps	Biacromial breadth	103	32.3 (12.7)	44.5 (17.5)	36.1 (14.2)	45.5 (17.9)	34.8 (13.7)	47.8 (18.8)
Placement of restraint straps	Biacromial breadth in a conformal seat ³	103	NA	NA	31.0 (12.2)	44.9 (17.7)	33.3 (13.1)	49.4 (19.4)
Width of seatback	Bideloid breadth	122	37.8 (14.9)	56.1 (22.1)	53.1 (20.9)	66.3 (26.1)	58.4 (23.0)	70.9 (27.9)
Width of seatback for conformal seat	Bideloid breadth in conformal seat (with bolsters) ^{2,3}	122	NA	NA	38.9 (15.3)	56.7 (22.3)	42.7 (16.8)	62.8 (24.7)
Side clearance envelope, possible seatback width	Forearm-forearm breadth	378	38.9 (15.3)	66.0 (26.0)	69.3 (27.3)	87.6 (34.5)	82.3 (32.4)	100.6 (39.6)
Side clearance envelope, possible seatback width for conformal seat	Forearm-forearm breadth in conformal seat ^{2,3}	378	NA	NA	48.9 (19.3)	76.0 (29.9)	66.5 (26.2)	95.0 (37.4)
Width of seat pan	Hip breadth, sitting ¹	459	31.5 (12.4)	46.5 (18.3)	36.3 (14.3)	54.4 (21.4)	38.9 (15.3)	55.6 (21.9)
Width of seat pan for conformal seat	Hip breadth, sitting in conformal seat ^{1,2,3}	459	NA	NA	32.8 (12.9)	42.8 (16.8)	38.4 (15.1)	45.1 (17.8)
Length of seat pan	Buttock-popliteal length, sitting	200	42.2 (16.6)	57.2 (22.5)	47.2 (18.6)	62.2 (24.5)	50.0 (19.7)	68.6 (27.0)
Length of seat pan	Buttock-popliteal length, sitting in a conformal seat ^{3,4}	200C	NA	NA	45.2 (17.8)	56.1 (22.1)	47.7 (18.8)	58.3 (23.0)
Placement of panels in front of subject	Buttock-knee length, sitting	194	52.1 (20.5)	69.9 (27.5)	59.9 (23.6)	73.9 (29.1)	66.3 (26.1)	82.0 (32.3)
Rudder pedal design, foot clearance	Foot length, sitting	362	21.6 (8.5)	30.5 (12.0)	27.2 (10.7)	38.6 (15.2)	27.2 (10.7)	38.6 (15.2)
Placement of control panels, maximum reach	Thumb tip reach, sitting	67	65.0 (25.6)	90.9 (35.8)	67.3 (26.5)	103.1 (40.6)	52.8 (20.8)	100.6 (39.6)
Placement and adjustability of hand controls; Vehicle reach access	Shoulder to Elbow Length ³	751	29.6 (11.6)	41.9 (16.5)	29.6 (11.6)	41.9 (16.5)	30.8 (12.1)	42.7 (16.8)
Placement and adjustability of hand controls; Vehicle reach access	Elbow to Center of Grip Length ³	1001	28.7 (11.3)	40.8 (16.1)	30.4 (12.0)	41.6 (16.4)	32.7 (12.9)	45.3 (17.8)

Clearance while traversing and egressing the vehicle	Hip Breadth, Standing ^{1,3}	457	29.8 (11.7)	40.6 (16.0)	32.2 (12.7)	41.0 (16.1)	43.8 (17.2)	52.0 (20.5)
Clearance while traversing and egressing the vehicle	Bust Depth, Standing ³	236	19.1 (7.5)	30.2 (11.9)	21.0 (8.3)	31.7 (12.5)	30.4 (12.0)	43.5 (17.1)
Placement and length of restraint straps	Waist depth ³	1000	15.0 (5.9)	30.0 (11.8)	20.1 (7.9)	33.0 (13.0)	27.8 (10.9)	42.0 (16.5)
Placement and adjustability of hand controls; Vehicle reach access	Hand Length ³	420	15.8 (6.2)	22.1 (8.7)	17.1 (6.7)	23.2 (9.1)	15.8 (6.2)	21.2 (8.4)
Placement and length of restraint straps	Waist height, sitting	951	19.3 (7.6)	27.2 (10.7)	TBD	TBD	TBD	TBD
Placement and adjustability of hand controls; Vehicle reach access	Elbow to wrist length	1002	22.5 (8.9)	33.1 (13.0)	TBD	TBD	TBD	TBD
Posture based clearance while traversing and egressing the vehicle	Cervicale height, standing	1003	127.7 (50.3)	169.8 (66.9)	TBD	TBD	TBD	TBD
Clearance while egressing the seat	Cervicale height, sitting	974	56.6 (22.3)	76.2 (30.0)	TBD	TBD	TBD	TBD
Posture based clearance while traversing and egressing the vehicle	Trochanteric height	894	75.2 (29.6)	105.4 (41.5)	TBD	TBD	TBD	TBD
Posture based clearance while traversing and egressing the vehicle	Ankle height	64	4.8 (1.9)	8.1 (3.2)	TBD	TBD	TBD	TBD
Posture based clearance while traversing and egressing the vehicle	Acromion (shoulder) height	23	120.4 (47.4)	161.8 (63.7)	TBD	TBD	TBD	TBD
Placement and length of restraint straps	Chest height, sitting	975	33.8 (13.3)	50.3 (19.8)	TBD	TBD	TBD	TBD
<p>¹ For seated measurements, the largest female hip breadth is larger than the largest male hip breadth, and the smallest male hip breadth is smaller than the smallest female hip breadth; therefore, male data are used for the Min dimension, and female data are used for the Max dimension.</p> <p>² Additional measurements are provided for specific hardware assumptions. These measurements were taken with a bailer bar either in a down position or removed, in a conformal-style seat that includes features such as a reduced angle between the hip and torso as well as shoulder bolsters. Measurements were taken only in the unpressurized suit condition. Because</p>								

measurements for these hardware configurations are not provided for unsuited or pressurized suited conditions, the standard hardware configuration measurement should always be used for those suit conditions. More details pertaining to measurement assumptions may be found in Memo ZF-08-004: Application of HS2002 Anthropometric Critical Dimensions and Table B1-7 to Occupant Protection and Landing Strategy Tiger Teams.

³ Additional measurements are provided for the design of specific vehicle hardware with a MODACES suited subject. Details of the suit: MODACES with a MAG and associated survival equipment; for both unpressurized and pressurized (4.3 psi) conditions. Details of the conformal-style seat: Seat Back has a 3 degree pitch, conformal fitting seat back and seat pan curvature, multi-adjustable headrest length, one of four fitted shoulder bolster sizes, adjustable seat pan location for crew sitting height, adjustable seat pan length for crew buttock to knee length, and adjustable leg pan length for crew popliteal height. The conformal seat has a reduced hip and knee angle in comparison to the standardized posture.

⁴ Specific measurements are noted as being highly dependent on the combination of conformal seat and suit fit. The buttock to popliteal length in a conformal seat is dependent on both the seat settings used to size the crew for the seat as well as the angle of the hips and knee. The eye height sitting in a conformal seat is dependent essentially on the neck angle of the suited crew, comprising a combination of the cushioning within the helmet and the head rest angle. The popliteal height sitting is based on an adjustable leg pan length to size the crew to the seat appropriately. Crew were ideally sized for the seat and suit for the purposes of data collection, and deviations for comfort and/or a seat redesign will more than likely impact these values.

NOTE: Pressurized suited data is for nominal pressure (for ACES, this is 3.5 psi, MODACES is 4.3 psi).