

TAKEOFF

TAKEOFF SPEEDS

Takeoff performance in the JAA approved EMB-145 AFM and ETOAS (First Principles) software is presented in two formats for airplanes equipped with A or A1/1 engines:

- a) Balanced Field Length (fixed V1/VR ratio):
 - Flaps 9°, ALT T/O-1 thrust, dry runway - AFM.
 - Flaps 9°, T/O-1 thrust, dry and wet runways - AFM.
- b) Unbalanced Field Length (variable V1/VR ratio):
 - Flaps 9°, ALT T/O-1 thrust, dry and wet runways - ETOAS (First Principles).
 - Flaps 9°, T/O-1 thrust, dry, wet and contaminated runways - ETOAS (First Principles).
 - Flaps 9°, T/O-1 thrust, contaminated runways - AFM.
 - Flaps 18°, ALT T/O-1 thrust, dry and wet runways - ETOAS (First Principles).
 - Flaps 18°, T/O-1 thrust, dry, wet and contaminated runways - ETOAS (First Principles).
 - Flaps 18°, T/O-1 thrust, dry and wet runways - AFM.

TAKEOFF SPEEDS FOR BALANCED PERFORMANCE

Takeoff speeds V1, VR and V2 for Balanced Performance are read from the tables using the procedure below:

- a) Enter the appropriate table with Airport Pressure Altitude and move right as far as the appropriate Static Air Temperature Range.
- b) Enter the table with Airplane Brake Release Gross Weight and move right as far as the appropriate temperature column. Read V1, VR and V2. If necessary, interpolate between two weights to obtain the corrected speed.

TAKEOFF SPEEDS FOR UNBALANCED PERFORMANCE

Takeoff speeds V1, VR and V2 for Unbalanced Performance are read from the tables using the procedure below:

- a) Enter the appropriate table with Airport Pressure Altitude and move right as far as the appropriate Static Air Temperature Range.
- b) Enter the table with Airplane Brake Release Gross Weight and move right as far as the appropriate temperature column. Read VR and V2. If necessary, interpolate between two weights to obtain the corrected speed.
- c) For determining V1, enter the appropriate takeoff analysis with the Static Air Temperature and wind and read V1 for the Maximum Takeoff Weight. Use the lower between this V1 and VR obtained in step b as the V1 for the actual Takeoff Weight.

AIRPLANE OPERATIONS MANUAL



V1/VR/V2 SPEEDS

EMB-145 - AE3007A and A1/1 ENGINES - JAA CERTIFICATION T/O-1 MODE - FLAPS 9° - DRY RUNWAY

PRESSURE ALTITUDE (ft)	STATIC AIR TEMPERATURE (° C)				
SL →	-40 to 34	35 to 38	39 to 42	43 to 46	47 to 50
1000 →	-40 to 30	31 to 34	35 to 39	40 to 43	44 to 48
2000 →	-40 to 26	27 to 31	32 to 36	37 to 40	41 to 45
3000 →		-40 to 28	29 to 32	33 to 38	39 to 43
4000 →		-40 to 24	25 to 29	30 to 35	36 to 41
5000 →			-40 to 27	28 to 33	34 to 40
6000 →			-40 to 22	23 to 28	29 to 34
7000 →			-40 to 17	18 to 23	24 to 29
8000 →				-40 to 19	20 to 25
	↓	↓	↓	↓	↓
WEIGHT (Kg)	V1 VR V2	V1 VR V2	V1 VR V2	V1 VR V2	V1 VR V2
12000	119 123 130	116 119 126	113 115 121	109 111 116	106 107 112
12500	119 123 129	116 119 125	112 115 120	109 111 116	106 107 111
13000	119 123 129	116 119 124	112 114 120	109 110 115	105 109 113
13500	119 122 128	115 118 124	112 114 119	108 111 115	106 112 115
14000	119 122 127	115 118 123	112 114 119	108 114 117	110 115 117
14500	119 122 127	115 118 122	111 116 119	111 116 119	113 117 119
15000	118 121 126	115 118 122	113 118 121	114 119 121	116 120 121
15500	118 121 126	115 120 123	116 120 123	117 121 123	119 122 123
16000	118 121 125	117 122 125	119 123 125	120 123 125	122 124 125
16500	122 124 128	122 124 128	122 125 127	123 126 127	124 126 127
17000	123 126 129	124 127 129	125 127 129	126 128 129	127 128 129
17500	125 128 131	126 129 131	127 129 131	128 130 131	129 130 131
18000	128 130 133	129 131 133	130 131 133	130 132 133	131 133 133
18500	130 132 135	131 133 135	132 134 135	133 134 135	133 135 135
19000	132 135 137	133 135 137	134 136 137	135 136 137	136 137 137
19500	135 137 138	135 137 138	136 138 138	137 138 138	138 138 138
20000	137 139 140	137 139 140	138 139 140	139 140 140	140 140 140
20500	139 141 142	139 141 142	140 141 142	141 142 142	142 142 142
21000	141 142 144	142 143 144	142 143 144	143 144 144	144 144 144

V1/VR/V2 SPEEDS

EMB-145 - AE3007A and A1/1 ENGINES - JAA CERTIFICATION

ALT T/O-1 MODE - FLAPS 9° - DRY RUNWAY

PRESSURE ALTITUDE (ft)	STATIC AIR TEMPERATURE (° C)				
SL →	-40 to 34	35 to 38	39 to 43	44 to 47	48 to 50
1000 →	-40 to 30	31 to 35	36 to 39	40 to 44	45 to 48
2000 →	-40 to 26	27 to 31	32 to 36	37 to 41	42 to 46
3000 →		-40 to 28	29 to 33	34 to 38	39 to 44
4000 →		-40 to 24	25 to 30	31 to 36	37 to 42
5000 →		-40 to 20	21 to 27	28 to 34	35 to 40
6000 →			-40 to 22	23 to 28	29 to 35
7000 →			-40 to 18	19 to 24	25 to 30
8000 →				-40 to 20	21 to 26
	↓	↓	↓	↓	↓
WEIGHT (kg)	V1 VR V2	V1 VR V2	V1 VR V2	V1 VR V2	V1 VR V2
12000	119 122 129	115 118 124	111 114 119	108 110 115	104 106 110
12500	118 121 128	115 117 123	111 113 119	107 109 114	104 107 111
13000	118 121 127	115 117 122	111 113 118	107 109 114	104 109 113
13500	118 120 126	114 117 122	111 113 118	107 111 115	107 112 115
14000	117 120 126	114 116 121	110 113 117	108 114 117	110 115 117
14500	117 120 125	114 116 121	110 116 119	111 116 119	113 117 119
15000	117 120 125	113 117 121	112 118 121	114 119 121	116 120 121
15500	117 119 124	113 120 123	115 120 123	117 121 123	118 122 123
16000	117 121 125	116 122 125	118 123 125	119 124 125	121 124 125
16500	117 124 127	119 124 127	120 125 127	122 126 127	123 126 127
17000	120 126 129	121 126 129	123 127 129	124 128 129	126 128 129
17500	122 128 131	124 129 131	125 129 131	127 130 131	128 131 131
18000	125 130 133	126 131 133	127 131 133	129 132 133	130 133 133
18500	127 132 135	128 133 135	130 134 135	131 134 135	133 135 135
19000	130 135 137	131 135 137	132 136 137	134 136 137	135 137 137
19500	132 137 138	133 137 138	135 138 138	136 138 138	137 139 138
20000	135 139 140	136 139 140	137 140 140	138 140 140	139 140 140
20500	137 141 142	138 141 142	139 141 142	140 142 142	141 142 142
21000	139 143 144	140 143 144	141 143 144	142 144 144	143 144 144

AIRPLANE OPERATIONS MANUAL



V1/VR/V2 SPEEDS

EMB-145 - AE3007A and A1/1 ENGINES - JAA CERTIFICATION
T/O-1 MODE - FLAPS 9° - WET RUNWAY
RUDDER 15 (POST MOD S.B. 145-27-0015)

PRESSURE ALTITUDE (ft)	STATIC AIR TEMPERATURE (° C)				
SL →	-40 to 34	35 to 40	41 to 45	46 to 50	
1000 →	-40 to 31	32 to 36	37 to 42	43 to 47	48 to 48
2000 →	-40 to 27	28 to 33	34 to 39	40 to 45	46 to 46
3000 →		-40 to 30	31 to 36	37 to 42	43 to 44
4000 →		-40 to 26	27 to 33	34 to 40	41 to 42
5000 →		-40 to 23	24 to 31	32 to 39	40 to 40
6000 →			-40 to 25	26 to 33	34 to 38
7000 →			-40 to 21	22 to 28	29 to 36
8000 →			-40 to 17	18 to 24	25 to 32
	↓	↓	↓	↓	↓
WEIGHT (kg)	V1 VR V2	V1 VR V2	V1 VR V2	V1 VR V2	V1 VR V2
12000	101 123 130	97 118 124	94 113 118	90 108 113	87 105 109
12500	101 123 129	97 118 123	93 113 118	90 108 112	90 107 111
13000	100 122 128	97 117 123	93 112 117	90 109 113	93 110 113
13500	100 122 128	96 117 122	93 112 117	94 112 115	97 113 115
14000	100 121 127	96 117 122	95 114 117	98 115 117	101 116 117
14500	100 121 126	96 116 121	98 116 119	101 117 119	104 118 119
15000	99 121 126	98 118 121	101 118 121	104 119 121	108 120 121
15500	99 121 125	101 120 123	104 121 123	107 122 123	110 122 123
16000	101 121 125	104 122 125	107 123 125	110 124 125	113 125 125
16500	105 124 128	107 125 128	110 125 127	112 126 127	115 127 127
17000	107 126 129	110 127 129	112 127 129	115 128 129	118 129 129
17500	110 128 131	112 129 131	115 130 131	118 130 131	121 131 131
18000	113 130 133	115 131 133	118 132 133	121 132 133	123 133 133
18500	115 132 135	118 133 135	121 134 135	123 134 135	126 135 135
19000	118 135 137	121 135 137	123 136 137	126 136 137	129 137 137
19500	121 137 138	124 137 138	126 138 138	128 138 138	131 139 138
20000	124 139 140	126 139 140	129 140 140	131 140 140	133 141 140
20500	127 141 142	129 141 142	131 142 142	133 142 142	135 143 142
21000	129 142 144	131 143 144	133 143 144	135 144 144	137 145 144

V1/VR/V2 SPEEDS

EMB-145 - AE3007A and A1/1 ENGINES - JAA CERTIFICATION

T/O-1 MODE - FLAPS 9° - WET RUNWAY

RUDDER 10 (PRE MOD S.B. 145-27-0015)

PRESSURE ALTITUDE (ft)	STATIC AIR TEMPERATURE (° C)				
SL →	-40 to 33	34 to 36	37 to 39	40 to 43	44 to 46
1000 →	-40 to 29	30 to 33	34 to 36	37 to 40	41 to 43
2000 →		-40 to 29	30 to 33	34 to 37	38 to 40
3000 →		-40 to 26	27 to 29	30 to 33	34 to 38
4000 →			-40 to 26	27 to 30	31 to 35
5000 →			-40 to 22	23 to 28	29 to 33
6000 →				-40 to 23	24 to 28
7000 →				-40 to 18	19 to 23
8000 →					-40 to 19
	↓	↓	↓	↓	↓
WEIGHT (kg)	V1 VR V2	V1 VR V2	V1 VR V2	V1 VR V2	V1 VR V2
12000	118 124 131	115 121 127	111 117 123	108 114 119	105 111 116
12500	117 123 130	114 120 126	111 117 123	108 114 119	105 110 115
13000	117 123 129	114 120 126	111 117 122	107 113 118	104 110 115
13500	116 123 128	113 119 125	110 116 121	107 113 118	104 111 115
14000	116 122 128	113 119 124	110 116 121	107 114 117	104 114 117
14500	116 122 127	113 119 124	110 116 120	107 116 119	104 117 119
15000	115 122 127	112 119 123	109 118 121	107 118 121	104 119 121
15500	115 121 126	112 120 123	109 120 123	106 121 123	103 121 123
16000	115 121 125	112 122 125	109 122 125	106 123 125	103 123 125
16500	115 124 128	112 124 128	109 125 128	106 125 127	106 126 127
17000	114 126 129	111 126 129	108 127 129	107 127 129	109 128 129
17500	114 128 131	111 129 131	108 129 131	109 129 131	112 130 131
18000	114 130 133	111 131 133	110 131 133	112 132 133	115 132 133
18500	114 132 135	111 133 135	113 133 135	115 134 135	117 134 135
19000	114 135 137	114 135 137	116 135 137	118 136 137	120 136 137
19500	115 136 138	117 137 138	119 137 138	121 138 138	123 138 138
20000	118 138 140	120 139 140	122 139 140	124 140 140	126 140 140
20500	121 141 142	123 141 142	125 141 142	127 142 142	128 142 142
21000	124 142 144	126 143 144	128 143 144	130 143 144	131 144 144

AIRPLANE OPERATIONS MANUAL



V1/VR/V2 SPEEDS

EMB-145 - AE3007A and A1/1 ENGINES - JAA CERTIFICATION
T/O-1 MODE - FLAPS 9° - WET RUNWAY
RUDDER 10 (PRE MOD S.B. 145-27-0015)

PRESSURE ALTITUDE (ft)	STATIC AIR TEMPERATURE (° C)				
SL →	47 to 50				
1000 →	44 to 47	48 to 48			
2000 →	41 to 44	45 to 46			
3000 →	39 to 42	43 to 44			
4000 →	36 to 40	41 to 42			
5000 →	34 to 39	40 to 40			
6000 →	29 to 32	33 to 38			
7000 →	24 to 28	29 to 33	34 to 36		
8000 →	20 to 24	25 to 29	30 to 34		
	↓	↓	↓	↓	↓
WEIGHT (kg)	V1 VR V2	V1 VR V2	V1 VR V2	V1 VR V2	V1 VR V2
12000	102 107 112	99 104 109	96 105 109		
12500	102 107 112	99 107 111	96 108 111		
13000	101 109 113	98 110 113	95 111 113		
13500	101 112 115	98 113 115	95 113 115		
14000	101 115 117	98 115 117	97 116 117		
14500	101 117 119	98 118 119	100 118 119		
15000	101 119 121	101 120 121	104 121 121		
15500	102 122 123	104 122 123	107 123 123		
16000	105 124 125	107 125 125	110 125 125		
16500	108 126 127	110 127 127	113 127 127		
17000	111 128 129	113 129 129	116 129 129		
17500	114 130 131	116 131 131	118 131 131		
18000	117 133 133	119 133 133	121 133 133		
18500	120 135 135	122 135 135	124 135 135		
19000	122 137 137	125 137 137	127 137 137		
19500	125 138 138	127 139 138	129 139 138		
20000	128 140 140	130 141 140	132 141 140		
20500	130 142 142	132 143 142	134 143 142		
21000	133 144 144	135 144 144	137 145 144		

VR/V2 SPEEDS

EMB-145 - AE3007A and A1/1 ENGINES - JAA CERTIFICATION
T/O-1 MODE - FLAPS 18° - DRY, WET OR CONTAMINATED RUNWAY

PRESSURE ALTITUDE (ft)	STATIC AIR TEMPERATURE (°C)				
SL →	-40 to 34	35 to 39	40 to 45	46 to 50	
1000 →	-40 to 31	32 to 36	37 to 41	42 to 47	48 to 48
2000 →	-40 to 27	28 to 33	34 to 38	39 to 44	45 to 46
3000 →		-40 to 29	30 to 35	36 to 41	42 to 44
4000 →		-40 to 26	27 to 32	33 to 39	40 to 42
5000 →		-40 to 22	23 to 30	31 to 38	39 to 40
6000 →			-40 to 24	25 to 32	33 to 38
7000 →			-40 to 20	21 to 27	28 to 35
8000 →			-40 to 16	17 to 23	24 to 30
	↓	↓	↓	↓	↓
WEIGHT (kg)	VR V2	VR V2	VR V2	VR V2	VR V2
12000	104 117	100 112	99 110	98 108	97 105
12500	104 116	102 113	100 111	99 109	98 106
13000	104 116	103 114	102 112	101 110	100 107
13500	105 117	104 115	103 113	102 111	101 109
14000	107 118	106 116	105 114	104 112	103 110
14500	108 119	107 117	106 115	105 113	104 111
15000	109 120	108 118	107 116	107 114	106 112
15500	110 120	109 119	108 117	108 115	107 114
16000	111 121	110 119	110 118	109 117	109 115
16500	112 121	111 120	110 118	110 117	110 117
17000	112 122	112 120	111 119	111 118	112 118
17500	113 122	112 121	112 120	113 120	114 120
18000	114 123	113 122	114 121	115 121	116 121
18500	115 124	115 123	116 123	117 123	118 123
19000	116 125	117 125	118 125	119 125	120 125
19500	118 126	119 126	120 126	121 126	122 126
20000	120 128	121 128	122 128	123 128	124 128
20500	122 129	123 129	124 129	125 129	126 129
21000	124 131	124 131	125 131	127 131	128 131
21500	125 132	126 132	127 132	128 132	129 132
22000	127 134	128 134	129 134	130 134	131 134

AIRPLANE OPERATIONS MANUAL



VR/V2 SPEEDS

EMB-145 - AE3007A and A1/1 ENGINES - JAA CERTIFICATION T/O-1 MODE - FLAPS 9° - DRY, WET OR CONTAMINATED RUNWAY

PRESSURE ALTITUDE (ft)	STATIC AIR TEMPERATURE (°C)				
SL →	-40 to 35	36 to 40	41 to 46	47 to 50	
1000 →	-40 to 31	32 to 37	38 to 43	44 to 48	
2000 →	-40 to 28	29 to 34	35 to 40	41 to 46	
3000 →	-40 to 23	24 to 30	31 to 37	38 to 44	
4000 →		-40 to 27	28 to 34	35 to 42	
5000 →		-40 to 24	25 to 32	33 to 40	
6000 →		-40 to 19	20 to 27	28 to 35	36 to 38
7000 →			-40 to 22	23 to 30	31 to 36
8000 →			-40 to 18	19 to 26	27 to 34
	↓	↓	↓	↓	↓
WEIGHT (kg)	VR V2	VR V2	VR V2	VR V2	VR V2
12000	123 129	118 124	112 118	107 112	105 109
12500	122 129	117 123	112 117	107 111	108 111
13000	122 128	117 122	112 117	109 113	110 113
13500	122 127	116 122	111 116	112 115	113 115
14000	121 127	116 121	114 117	115 117	116 117
14500	121 126	116 120	116 119	117 119	118 119
15000	121 126	118 121	119 121	120 121	120 121
15500	120 125	120 123	121 123	122 123	123 123
16000	122 125	122 125	123 125	124 125	125 125
16500	124 128	125 128	125 127	126 127	127 127
17000	126 129	127 129	128 129	128 129	129 129
17500	128 131	129 131	130 131	130 131	131 131
18000	130 133	131 133	132 133	133 133	133 133
18500	133 135	133 135	134 135	135 135	135 135
19000	135 137	135 137	136 137	137 137	137 137
19500	137 138	137 138	138 138	138 138	139 138
20000	139 140	139 140	140 140	140 140	141 140
20500	141 142	141 142	142 142	142 142	143 142
21000	142 144	143 144	144 144	144 144	145 144

VR/V2 SPEEDS

EMB-145 - AE3007A and A1/1 ENGINES - JAA CERTIFICATION ALT T/O-1 MODE - FLAPS 9° - DRY OR WET RUNWAY

PRESSURE ALTITUDE (ft)	STATIC AIR TEMPERATURE (°C)					
SL →	-40 to 32	33 to 37	38 to 42	43 to 47	48 to 50	
1000 →	-40 to 31	32 to 36	37 to 41	42 to 46	47 to 48	
2000 →	-40 to 28	29 to 32	33 to 38	39 to 43	44 to 46	
3000 →		-40 to 29	30 to 35	36 to 40	41 to 44	
4000 →			-40 to 31	32 to 37	38 to 42	
5000 →			-40 to 29	30 to 36	37 to 40	
6000 →			-40 to 24	25 to 30	31 to 38	
7000 →				-40 to 26	27 to 34	35 to 36
8000 →				-40 to 21	22 to 30	31 to 34
	↓	↓	↓	↓	↓	↓
WEIGHT (kg)	VR V2	VR V2	VR V2	VR V2	VR V2	VR V2
12000	123 130	119 126	115 121	111 116	107 111	105 109
12500	123 129	119 125	115 120	111 116	108 112	108 111
13000	122 128	119 124	114 119	110 115	109 113	111 113
13500	122 128	119 124	114 119	112 116	112 115	114 115
14000	121 127	118 123	114 118	114 117	115 117	116 117
14500	121 127	118 123	116 120	117 119	118 119	119 119
15000	121 126	118 122	118 121	119 121	120 121	121 121
15500	121 126	119 124	121 123	122 123	122 123	123 123
16000	121 126	122 125	123 125	124 125	124 125	124 124
16500	124 128	124 127	125 127	126 127	127 127	124 124
17000	126 129	126 129	127 129	128 129	129 129	124 124
17500	128 131	129 131	130 131	130 131	130 130	124 124
18000	130 133	131 133	132 133	132 133	130 130	124 124
18500	132 135	133 135	134 135	133 134	130 130	124 124
19000	134 137	135 137	136 137	134 135	130 130	124 124
19500	136 139	137 139	137 138	134 135	130 130	124 124
20000	138 140	139 140	138 139	134 135	130 130	124 124
20500	140 142	141 142	138 139	134 135	130 130	124 124
21000	142 144	142 143	138 139	134 135	130 130	124 124
21500	143 144	143 143	138 139	134 135	130 130	124 124

FLAP RETRACTION SCHEDULE

Takeoff with Flap 9°:

Flap 9° to UP $V_2 + 15$ KIAS

Takeoff with flap 18°:

Flap 18° to 9° $V_2 + 10$ KIAS

Flap 9° to UP $V_2 + 30$ KIAS

FINAL SEGMENT SPEED

WEIGHT (kg)	V_{FS} (KIAS)
12000	131
12500	134
13000	136
13500	139
14000	141
14500	144
15000	146
15500	149
16000	151
16500	153
17000	155
17500	157
18000	159
18500	161
19000	163
19500	165
20000	167
20500	170
21000	173
21500	175
22000	177

PITCH TRIM SETTING FOR TAKEOFF

CG POSITION (%)	LESS THAN OR EQUAL TO 27.5	27.6 UP TO 32.5	32.6 UP TO 36.5	36.6 UP TO 41.5	ABOVE OR EQUAL TO 41.6
PITCH TRIM UNITS	8	7	6	5	4