APPENDIX D: SCORING MODAL / NODAL CAPABILITY FOR DISTRIBUTION ACTIVITIES (Transportation or T-factor)

When considering the distribution capabilities of Supply and Storage Activities, the S&S JCSG assigned different military value weights to the "modes of transportation" available to an Activity (air, sea, rail, pipeline and ground). The S&S JCSG assigned greater military value to an Activity's ability to ship via multiple transportation modes. Military value will also differ based on an Activity's distance to its distribution nodes and the nodes' tonnage capacity. The proximity of the closest and/or most frequently used distribution nodes, together with tonnage capacity, are of importance when determining an Activity's military value.

To determine the various military value assignments, Activities will be scored using transportation factors (T-factors). T-factors represent a composite value of all the transportation modes and distribution nodes used by an Activity. There will be four T-factors scored for each Activity:

T1: Measures the density of multiple distribution nodes to each Activity.

T2: Measures the distance in miles from each Activity to its most frequently used distribution nodes.

T3: Measures the throughput capacity, in tons per day, of each Activity's most frequently used distribution nodes.

T4: Measures the capability to increase distribution volume across distribution nodes at each Activity

The S&S JCSG assigned the weights listed below to each mode of transportation. Military judgment and experience within the DOD transportation community aided in the determination of the following five modal weights:

Table D1: Weighting of Transportation Modes

Transportation Mode	Modal Weight
Air	0.30
Sea	0.25
Rail	0.20
Pipeline	0.15
Ground	0.10
TOTAL	1.00

The S&S JCSG, in determining the weights, made the following assumptions:

1. Activities possessing all five modes of transportation on their installation will more likely have the greatest military value.

2. The air mode is critical to the DOD's ability to deploy and sustain forces, move time sensitive items and personnel. Therefore it received the highest weighting.

3. The sea mode delivers 95 percent of DOD overseas cargo. Therefore it received the second highest weighting.

4. The rail mode is capable of transporting greater volumes of cargo than the truck mode and is less hindered by civilian traffic. Therefore it received the third highest weight. Rail may also travel more miles per day (528) than ground (400). Military Traffic Management Command Transportation Engineering Agency Pamphlet 700-2 stipulates an average of 400 miles per day for military convoys and 528 miles per day on average for unit trains, also illustrating that rail is more valuable than truck as more miles can be traversed in one day by rail than by truck.

5. The pipeline mode, when accessible, can deliver large quantities of POL, undisturbed to facilities, therefore it received the fourth highest weight.

6. The ground mode is considered accessible to all Activities. Therefore it has been assigned the least weighted value.

Also considered for the ground mode, Air Mobility Command load planners will save space on military aircraft for cargo that may be delivered in one-half of a day or less (200 miles) from an installation. Installations one-day away (400 miles) will not be committed to a particular aircraft, unless the cargo is valuable. Cargo received from an installation more than one-day away (400+ miles) is usually placed in storage and load planned when aircraft become available.

Description and application of the four T-factors:

T1: Density of Multiple Distribution Nodes

The first T-factor (T1) is used to determine the military value of an Activity's access to multiple distribution nodes (e.g. multiple airports) for four of the five transportation modes (assumed every facility possesses ground mode). The inherent value of this measurement is to portend distribution flexibility.

The S&S JCSG determined that the "normalized" scoring of T-1 should follow a function that represents the "law of diminishing returns." The value of additional nodes for a particular mode follows the following scoring table:

Table D2: Scoring Access to Multiple Nodes (T1)

Number of Nodes within 50 miles	Normalized Score
0 nodes	0.00 score

1 node	0.36 score
2 nodes	0.64 score
3 nodes	0.84 score
4 nodes	0.96 score
>=5 nodes	1.00 score

Example for Illustrational Purposes Only

Activity X can access the following number of nodes within a 50-mile radius: 4 Airports, 3 Seaports, 1 Rail Terminal, and no Pipeline Terminals.

Mode	Mode Weight (MW)	Field Response	Normalized Score (use Table D2) (NS)	Sub-total (MW) * (NS)
Air	0.30	4	0.96	0.288
Sea	0.25	3	0.84	0.210
Rail	0.20	1	0.36	0.072
Pipeline	0.15	0	0.00	0.000
T1: factor for Activity X				0.570

Activity Y can access the following number of nodes within a 50-mile radius: 3 Airports, no Seaports, 2 Rail Terminals, and 1 Pipeline Terminal.

Mode	Mode Weight	Field Response	Normalized Score (use Table D2)	Sub-total
Air	0.30	3	0.84	0.252
Sea	0.25	0	0.00	0.000
Rail	0.20	2	0.64	0.128
Pipeline	0.15	1	0.36	0.05
T1: factor for Activity Y				0.434

Activity Z can access the following number of nodes within a 50-mile radius: no Airports, 2 Seaports, no Rail Terminals, and 1 Pipeline Terminal.

Mode	Mode Weight	Field Response	Normalized Score (use Table D2)	Sub-total
Air	0.30	0	0.00	0.000
Sea	0.25	2	0.64	0.160
Rail	0.20	0	0.00	0.000
Pipeline	0.15	1	0.36	0.054
T1: factor for Activity Z				0.214

T2: Distance in Miles to Distribution Nodes

The second T-factor (T2) is used to determine the military value of an Activity's distance to each of its most frequently used distribution nodes (all five modal nodes) starting at the Activity's main gate. The importance of this measurement is to value the proximity of each modal node.

The S&S JCSG determined that the "normalized" scoring of T2 will follow a non-linear function. The normalized scores, derived by an S-function, may be found on the last page of Appendix D in Table D3. This table is represented graphically in Figure D1. The score is based on miles to the node from the Activity's main gate (on base equals "zero" miles).

Example for Illustrational Purposes Only

The distance of Activity X's most frequently used distribution nodes to the activity's main gate: Airport - 25 miles; Seaport - 200 miles; Rail Terminal - 8 miles; and Pipeline Terminal – 56 miles.

Mode	Mode Weight (MW)	Field Response (miles)	Normalized (use Table D3) (NS)	Sub-total (MW) * (NS)
Air	0.30	25	0.79	0.237
Sea	0.25	200	0.07	0.018
Rail	0.20	8	0.89	0.178
Pipeline	0.15	56	0.35	0.053
T2: factor for Activity X				0.486

The distance of Activity Y's most frequently used distribution nodes to the activity's main gate: Airport - 18 miles; Seaport – on base; Rail Terminal - 15 miles; and Pipeline Terminal - 36 miles.

Mode	Mode Weight	Field Response (miles)	Normalized Score (use Table D3)	Sub-total
Air	0.30	18	0.84	0.252
Sea	0.25	0	1.00	0.250
Rail	0.20	15	0.86	0.172
Pipeline	0.15	36	0.67	0.101
T2: factor for Activity Y				0.775

The distance of Activity Z's most frequently used distribution nodes to the activity's main gate: Airport – on base; Seaport - 6 miles; Rail Terminal – 19; and Pipeline Terminal - 60 miles.

Mode	Mode Weight	Field Response (miles)	Normalized Score (use Table D3)	Sub-total
Air	0.30	0	1.00	0.300
Sea	0.25	6	0.89	0.223
Rail	0.20	19	0.84	0.168
Pipeline	0.15	60	0.29	0.044
T2: factor for Activity Z				0.735

T3: Throughput Capacity, in Tons Per Day, of Most Frequently Used Distribution Nodes

The third T-factor (T3) is used to determine the military value of an Activity's tonnage capacity at its most frequently used distribution nodes (all five modal nodes). The importance of this measurement is to value the throughput capacity of each modal node.

The S&S JCSG determined that the "normalized" scoring of T3 follows the "primary method" of normalization discussed in Appendix B for metrics where a higher value equals a higher score. For example, the largest field response (if within 2 standard deviations of the mean), in tons, receives a normalized score of "1.00." The smallest non-zero field response (if within 2 standard deviations of the mean) receives a normalized score of "0.01." The S&S JCSG will then array the remaining responses proportionally.

Example for Illustrational Purposes Only

The tonnage capacity per mode of transportation for five Activities is given below.

Activity	Air Node Throughput in Tons per Day	Water Node Throughput in Tons per Day	Rail Node Throughput in Tons per Day	Pipeline Node Throughput in Tons per Day	Ground Node Throughput in Tons per Day
A	0	0	78	0	183
B	0	0	65.2	0	136.8
C	0	0	13	0	126.2
D	0	0	0	0	77
E	0	0	0	0	16.8

Next, application of the primary normalization method returns the values below for each Activity and mode of transportation.

Activity	Air Node Normalized Score	Water Node Normalized Score	Rail Node Normalized Score	Pipeline Node Normalized Score	Ground Node Normalized Score
A	0.00	0.00	1.00	0.00	1.00
B	0.00	0.00	0.81	0.00	0.72
C	0.00	0.00	0.01	0.00	0.66
D	0.00	0.00	0.00	0.00	0.37
E	0.00	0.00	0.00	0.00	0.01

Finally, the modal weights are applied and the resulting total is re-normalized to create the "T-3 Factor" score.

After Application of Modal Weights							
	0.3	0.25	0.2	0.15	0.1		
Activity	Air Node Normalized Score	Water Node Normalized Score	Rail Node Normalized Score	Pipeline Node Normalized Score	Ground Node Normalized Score	TOTAL	Normalized Score ("T-3 Factor")
A	0.00	0.00	0.20	0.00	0.10	0.30	1.00
B	0.00	0.00	0.16	0.00	0.07	0.23	0.78
C	0.00	0.00	0.00	0.00	0.07	0.07	0.23
D	0.00	0.00	0.00	0.00	0.04	0.04	0.13
E	0.00	0.00	0.00	0.00	0.00	0.00	0.01

T4: Capability to Increase Distribution Volume

The fourth T-factor (T4) is used to determine the military value of an Activity's capability to increase distribution volume across all five modal nodes. Data was collected to calculate each activity's ratio of utilized capacity and maximum capacity by distribution modes.

Activities with a lower ratio of utilized capacity (and thus a higher capability to increase distribution volume) will receive a higher military value score for this metric. The S&S JCSG determined that the "normalized" scoring of T4 follows the "primary method" of normalization discussed in Appendix B for metrics where a lower value equals a higher score.
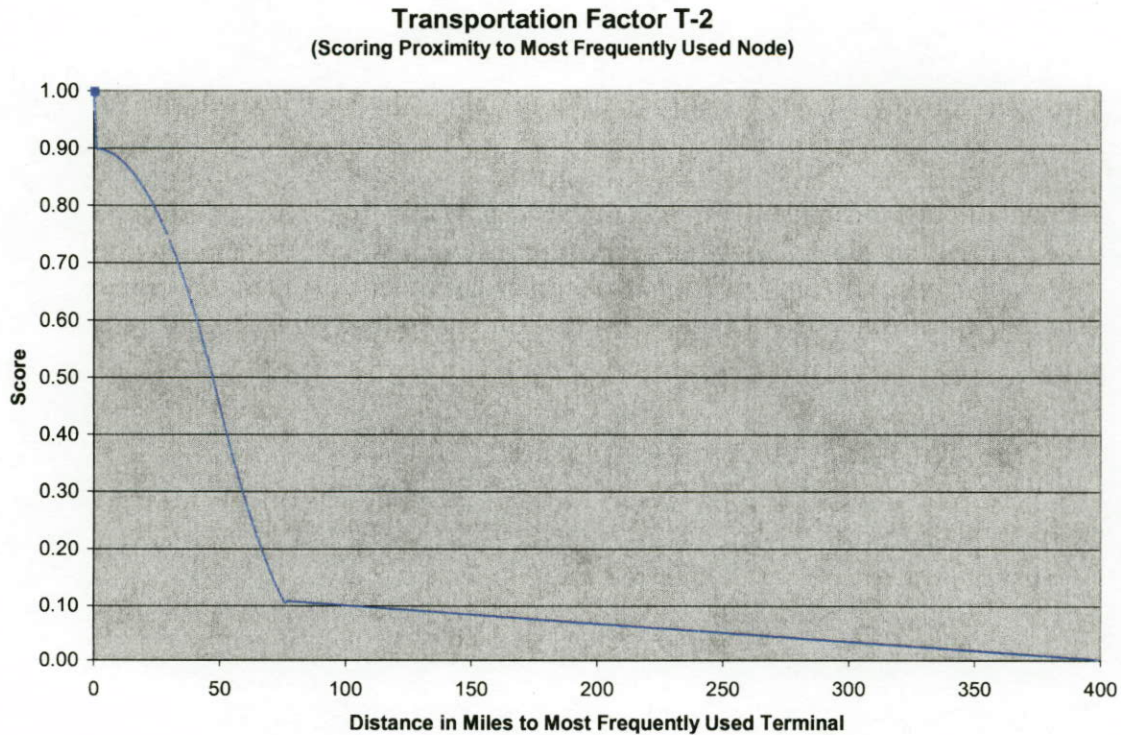
Figure D1: Graphical Depiction of Table D3

Transportation Factor T-2
(Scoring Proximity to Most Frequently Used Node)

Table D3: Scoring Proximity to Most Frequently Used Node (T2)

Miles	Score	Miles	Score	Miles	Score	Miles	Score	Miles	Score	Miles	Score	Miles	Score	Miles	Score
0	1.00	50	0.45	100	0.10	150	0.08	200	0.07	250	0.05	300	0.03	350	0.02
1	0.90	51	0.43	101	0.10	151	0.08	201	0.07	251	0.05	301	0.03	351	0.02
2	0.90	52	0.41	102	0.10	152	0.08	202	0.07	252	0.05	302	0.03	352	0.02
3	0.90	53	0.40	103	0.10	153	0.08	203	0.07	253	0.05	303	0.03	353	0.02
4	0.90	54	0.38	104	0.10	154	0.08	204	0.07	254	0.05	304	0.03	354	0.02
5	0.90	55	0.36	105	0.10	155	0.08	205	0.07	255	0.05	305	0.03	355	0.02
6	0.89	56	0.35	106	0.10	156	0.08	206	0.06	256	0.05	306	0.03	356	0.01
7	0.89	57	0.33	107	0.10	157	0.08	207	0.06	257	0.05	307	0.03	357	0.01
8	0.89	58	0.32	108	0.10	158	0.08	208	0.06	258	0.05	308	0.03	358	0.01
9	0.89	59	0.30	109	0.10	159	0.08	209	0.06	259	0.05	309	0.03	359	0.01
10	0.88	60	0.29	110	0.10	160	0.08	210	0.06	260	0.05	310	0.03	360	0.01
11	0.88	61	0.27	111	0.10	161	0.08	211	0.06	261	0.05	311	0.03	361	0.01
12	0.87	62	0.26	112	0.10	162	0.08	212	0.06	262	0.05	312	0.03	362	0.01
13	0.87	63	0.25	113	0.10	163	0.08	213	0.06	263	0.05	313	0.03	363	0.01
14	0.86	64	0.23	114	0.10	164	0.08	214	0.06	264	0.05	314	0.03	364	0.01
15	0.86	65	0.22	115	0.10	165	0.08	215	0.06	265	0.05	315	0.03	365	0.01
16	0.85	66	0.21	116	0.09	166	0.08	216	0.06	266	0.04	316	0.03	366	0.01
17	0.85	67	0.20	117	0.09	167	0.08	217	0.06	267	0.04	317	0.03	367	0.01
18	0.84	68	0.18	118	0.09	168	0.08	218	0.06	268	0.04	318	0.03	368	0.01
19	0.84	69	0.17	119	0.09	169	0.08	219	0.06	269	0.04	319	0.03	369	0.01
20	0.83	70	0.16	120	0.09	170	0.08	220	0.06	270	0.04	320	0.03	370	0.01
21	0.82	71	0.15	121	0.09	171	0.08	221	0.06	271	0.04	321	0.03	371	0.01
22	0.81	72	0.14	122	0.09	172	0.08	222	0.06	272	0.04	322	0.03	372	0.01
23	0.80	73	0.13	123	0.09	173	0.08	223	0.06	273	0.04	323	0.03	373	0.01
24	0.80	74	0.12	124	0.09	174	0.08	224	0.06	274	0.04	324	0.03	374	0.01
25	0.79	75	0.11	125	0.09	175	0.08	225	0.06	275	0.04	325	0.03	375	0.01
26	0.78	76	0.11	126	0.09	176	0.07	226	0.06	276	0.04	326	0.02	376	0.01
27	0.77	77	0.11	127	0.09	177	0.07	227	0.06	277	0.04	327	0.02	377	0.01
28	0.76	78	0.11	128	0.09	178	0.07	228	0.06	278	0.04	328	0.02	378	0.01
29	0.75	79	0.11	129	0.09	179	0.07	229	0.06	279	0.04	329	0.02	379	0.01
30	0.74	80	0.11	130	0.09	180	0.07	230	0.06	280	0.04	330	0.02	380	0.01
31	0.73	81	0.11	131	0.09	181	0.07	231	0.06	281	0.04	331	0.02	381	0.01
32	0.72	82	0.11	132	0.09	182	0.07	232	0.06	282	0.04	332	0.02	382	0.01
33	0.70	83	0.11	133	0.09	183	0.07	233	0.06	283	0.04	333	0.02	383	0.01
34	0.69	84	0.11	134	0.09	184	0.07	234	0.06	284	0.04	334	0.02	384	0.01
35	0.68	85	0.11	135	0.09	185	0.07	235	0.06	285	0.04	335	0.02	385	0.01
36	0.67	86	0.10	136	0.09	186	0.07	236	0.05	286	0.04	336	0.02	386	0.00
37	0.65	87	0.10	137	0.09	187	0.07	237	0.05	287	0.04	337	0.02	387	0.00
38	0.64	88	0.10	138	0.09	188	0.07	238	0.05	288	0.04	338	0.02	388	0.00
39	0.63	89	0.10	139	0.09	189	0.07	239	0.05	289	0.04	339	0.02	389	0.00
40	0.61	90	0.10	140	0.09	190	0.07	240	0.05	290	0.04	340	0.02	390	0.00
41	0.60	91	0.10	141	0.09	191	0.07	241	0.05	291	0.04	341	0.02	391	0.00
42	0.58	92	0.10	142	0.09	192	0.07	242	0.05	292	0.04	342	0.02	392	0.00
43	0.57	93	0.10	143	0.09	193	0.07	243	0.05	293	0.04	343	0.02	393	0.00
44	0.55	94	0.10	144	0.09	194	0.07	244	0.05	294	0.04	344	0.02	394	0.00
45	0.54	95	0.10	145	0.09	195	0.07	245	0.05	295	0.04	345	0.02	395	0.00
46	0.52	96	0.10	146	0.08	196	0.07	246	0.05	296	0.03	346	0.02	396	0.00
47	0.50	97	0.10	147	0.08	197	0.07	247	0.05	297	0.03	347	0.02	397	0.00
48	0.49	98	0.10	148	0.08	198	0.07	248	0.05	298	0.03	348	0.02	398	0.00
49	0.47	99	0.10	149	0.08	199	0.07	249	0.05	299	0.03	349	0.02	399	0.00