

99 NASA-CR-2005-213584 Vol1 Average Fan Performance

Reynolds: RNI=0.100 f=0.950 RNI=1.000 f=1.000

Mass Flow

29.03100000 0.00000000 0.034482758 0.068965517 0.103448279
0.137931034 0.172413796 0.206896558 0.241379306 0.275862068
0.310344815 0.344827592 0.379310340 0.413793117 0.448275864
0.482758611 0.517241359 0.551724136 0.586206913 0.620689631
0.655172408 0.689655185 0.724137902 0.758620679 0.793103456
0.827586234 0.862068951 0.896551728 0.931034505 0.965517223
1.000000000
0.010000000 0.837990999 0.831705928 0.822474718 0.812065125
0.802020192 0.792424262 0.781313121 0.770707071 0.760213256
0.747979820 0.736363649 0.723989904 0.711503923 0.697474718
0.684343457 0.670454562 0.658080816 0.645959616 0.633333325
0.620707095 0.607828259 0.595202029 0.583080828 0.570875406
0.559343457 0.547474742 0.535353541 0.522979796 0.510858595
0.498989910
0.025000000 2.094949484 2.075982094 2.054096460 2.029292822
2.005836248 1.978338957 1.951964140 1.925028086 1.894725084
1.865544319 1.835802436 1.803815961 1.773512959 1.742648721
1.708978653 1.678787827 1.648484826 1.616161585 1.582154870
1.552525282 1.521212101 1.487878799 1.456453443 1.426150441
1.398989916 1.368686914 1.337373734 1.307070732 1.276767731
1.246464610
0.050000001 4.186868668 4.151515007 4.107323170 4.055555344
4.005050659 3.954545498 3.904040337 3.848484755 3.791666746
3.732323170 3.672979832 3.611111164 3.551767588 3.488636255
3.422979832 3.354798079 3.292929411 3.227272749 3.161616087
3.103535414 3.039141417 2.976010084 2.914141417 2.852272749
2.797979832 2.731060505 2.671717167 2.611111164 2.555555582
2.494949579
0.075000003 6.289843082 6.231481552 6.163860798 6.093153954
6.022446632 5.937373638 5.861111164 5.771043777 5.681818008
5.596969604 5.496071815 5.409652233 5.315375805 5.223232269
5.128283024 5.032323360 4.928282738 4.835353374 4.744444370
4.671155930 4.576879978 4.482604027 4.380471230 4.286195278
4.199775696 4.105499268 4.019079685 3.924803495 3.838383913
3.744107723
0.100000001 8.393939018 8.309763908 8.222222328 8.121212006
8.023569107 7.936027050 7.814815044 7.693602562 7.565656662
7.447811604 7.343434334 7.212121010 7.090909004 6.969696999
6.848484993 6.707070827 6.585858822 6.468013287 6.333333492
6.198653221 6.070706844 5.949494839 5.821548939 5.700336933
5.582491398 5.461279392 5.340067387 5.225589275 5.101010323
4.979797840

0.150000006 12.59595966 12.46212101 12.32323265 12.19191933
12.03367043 11.87542057 11.71380424 11.52861977 11.36026955
11.17845154 11.00000000 10.82491589 10.62963009 10.45454502
10.25589180 10.07407379 9.89225578 9.71043777 9.51851845
9.33333302 9.14478111 8.952020645 8.757575989 8.598484993
8.421717644 8.232323647 8.055555344 7.878787994 7.689393997
7.500000000
0.200000003 16.79393959 16.62424278 16.44444466 16.25589180
16.05454636 15.83838367 15.61616135 15.37598228 15.15959549
14.92727280 14.67878819 14.43636322 14.19753075 13.96184063
13.71043777 13.45903492 13.20763206 12.97194195 12.72053909
12.45342350 12.21773243 11.96632957 11.73063946 11.47923660
11.24354649 10.99214363 10.74074078 10.50505066 10.26936054
10.03367043
0.300000012 25.13407707 24.91336823 24.65937042 24.37995148
24.08126640 23.76803207 23.44377899 23.11107063 22.77171326
22.42693520 22.07755852 21.72413063 21.36704445 21.00664330
20.64329147 20.27743149 19.90961075 19.54050827 19.17091179
18.80169106 18.43374825 18.06794167 17.70498848 17.34535408
16.98910522 16.63576126 16.28409958 15.93196678 15.57604408
15.21160507
0.400000006 32.03423309 31.75140381 31.42536545 31.08754158
30.76150322 30.43939400 30.10942841 29.76767731 29.40628433
29.04489326 28.69528580 28.31649780 27.94612885 27.54882240
27.17171669 26.77441025 26.39730644 26.04040337 25.67003441
25.31986618 24.96634102 24.59932709 24.26262665 23.90572357
23.54769897 23.19304085 22.84736252 22.47474670 22.12457848
21.76992226
0.480399996 37.74416733 37.40650558 37.05896378 36.70192337
36.33693314 35.96543503 35.58872604 35.20769119 34.82404709
34.43893814 34.05316544 33.66745377 33.28248596 32.89912033
32.51792908 32.13913727 31.76304054 31.38988304 31.02009392
30.65440178 30.29218292 29.93342209 29.57810402 29.22643280
28.87870407 28.53429413 28.19283867 27.85416794 27.51833344
27.18430138
0.539600015 41.53419876 41.18251801 40.83990860 40.50365829
40.17023087 39.83673859 39.50089264 39.16081619 38.81428909
38.46149063 38.10225296 37.73668671 37.36513138 36.98807144
36.60592270 36.21980667 35.83121872 35.44109726 35.05037308
34.65999222 34.27108765 33.88462448 33.50095367 33.12041473
32.74321365 32.36966705 31.99978256 31.63216209 31.26593781
30.90019608
0.588100016 45.84591293 45.54995346 45.25166702 44.94972992
44.64305115 44.33066559 44.01174164 43.68556213 43.35118484
43.00738907 42.65486908 42.29347610 41.92315292 41.54397202

41.15608215 40.75952148 40.35350418 39.93994904 39.51946259
39.09266281 38.66023254 38.22278976 37.78085327 37.33593369
36.88921356 36.44163513 35.99418259 35.54819489 35.10544586
34.66532516
0.631900012 50.19073105 49.94612122 49.69059753 49.42673492
49.15705490 48.88272095 48.60385132 48.31975937 48.02918625
47.73018646 47.41979980 47.09716797 46.76076508 46.40937042
46.04211807 45.65854263 45.25854111 44.84187317 44.40820313
43.96117020 43.50252151 43.03420258 42.55831528 42.07703400
41.59272003 41.10835266 40.62611008 40.14755630 39.67390823
39.20439529
0.673399985 54.29607773 54.11860275 53.94638443 53.77277756
53.59130478 53.39685440 53.18554306 52.95460510 52.70226288
52.42763138 52.13042068 51.80899811 51.46685410 51.10582733
50.72781372 50.33486938 49.92915344 49.51282883 49.08800507
48.65656662 48.22036362 47.78173447 47.34189224 46.90177155
46.46196365 46.02272415 45.58392715 45.14478683 44.70391464
44.26072311
0.712599993 58.15859604 58.05349350 57.94581604 57.83227921
57.70981216 57.57564545 57.42733002 57.26272202 57.08002472
56.87776566 56.65480042 56.41027069 56.14273834 55.85172653
55.53882980 55.20464706 54.85007095 54.47627258 54.08468246
53.67694855 53.25495529 52.82067490 52.37585449 51.92402267
51.46831131 51.01154709 50.55667496 50.10673904 49.66489029
49.23171997
0.752099991 62.31474304 62.27659988 62.24713135 62.21960068
62.18695068 62.14317322 62.08325958 62.00316620 61.89976501
61.77080154 61.61482239 61.43111038 61.21961975 60.98085785
60.71517563 60.42354202 60.10943985 59.77504349 59.42267609
59.05473328 58.67359543 58.28157425 57.88082123 57.47330475
57.06067657 56.64417648 56.22487259 55.80329132 55.37921906
54.95255280
0.795799971 67.64887238 67.64701843 67.64997864 67.65505219
67.65873718 67.65747833 67.64767456 67.62584686 67.58866119
67.53303528 67.45620728 67.35578156 67.22975922 67.07662201
66.89528656 66.68515778 66.44611359 66.17834473 65.88099670
65.55699158 65.20811462 64.83627319 64.44358826 64.03235626
63.60497284 63.16386795 62.71141434 62.24989319 61.78140640
61.30831146
0.816999972 70.42424011 70.42424011 70.42424011 70.42424011
70.42424011 70.42424011 70.42424011 70.42424011 70.42361450
70.40142822 70.34331512 70.26403046 70.16857147 70.05451202
69.92280579 69.75467682 69.54417419 69.30488586 69.03921509
68.74518585 68.44965363 68.13405609 67.76887512 67.37168884
66.94145203 66.49484253 66.03226471 65.55953979 65.06365967

64.54082489

0.837199986 73.37374115 73.37374115 73.37374115 73.37374115
73.37374115 73.37374115 73.37374115 73.37374115 73.37368011
73.37097168 73.35386658 73.31835175 73.26459503 73.18917847
73.08882904 72.96057892 72.80179596 72.61031342 72.38448334
72.12329102 71.82636261 71.49404907 71.12693787 70.72608185
70.29618835 69.84117126 69.36581421 68.87579346 68.37770844
67.87828827

0.861000001 77.17171478 77.17171478 77.17171478 77.17171478
77.17171478 77.17171478 77.17171478 77.17171478 77.17174530
77.17297363 77.17485046 77.16781616 77.14399719 77.09877014
77.02767944 76.92659760 76.79187012 76.62045288 76.41001892
76.15913391 75.86730194 75.53507233 75.16413116 74.75730896
74.31867218 73.85348511 73.36779785 72.87142181 72.37432861
71.88552094

0.883000016 81.03030396 81.03030396 81.03030396 81.03030396
81.03030396 81.03030396 81.03030396 81.03030396 81.03030396
81.03030396 81.03014374 81.02431488 81.00905609 80.97826385
80.92594910 80.84719849 80.73754120 80.59314728 80.41098785
80.18895721 79.92591858 79.62184143 79.27770233 78.89555359
78.47844696 78.03037262 77.55615997 77.06140900 76.55234528
76.03586578

0.910300016 86.03254700 86.03254700 86.03254700 86.03254700
86.03254700 86.03254700 86.03254700 86.03254700 86.03254700
86.03254700 86.03254700 86.03247070 86.02958679 86.01573944
85.98573303 85.93446350 85.85658264 85.74694061 85.60076141
85.41384125 85.18276978 84.90504456 84.57923126 84.20513916
83.78389740 83.31803131 82.81155396 82.27002716 81.70053101
81.11263275

0.932600021 91.07743835 91.07743835 91.07743835 91.07743835
91.07743835 91.07743835 91.07743835 91.07743835 91.07743835
91.07743835 91.07743835 91.07755280 91.08106232 91.06029510
91.02086639 90.95990753 90.87307739 90.75611115 90.60491943
90.41567230 90.18499756 89.91002655 89.58852386 89.21896362
88.80062866 88.33365631 87.81915283 87.25914001 86.65669250
86.01843262

0.964699984 95.66329956 95.66329956 95.66329956 95.66329956
95.66329956 95.66329956 95.66329956 95.66329956 95.66329956
95.66329956 95.66329956 95.66329956 95.66392517 95.68634796
95.67102051 95.63625336 95.57588959 95.48374939 95.35388947
95.18083191 94.95963287 94.68630981 94.35805511 93.97325134
93.53163147 93.03449249 92.48472595 91.88690186 91.24735260
90.57588196

1.000000000 100.0650940 100.0650940 100.0650940 100.0650940
100.0650940 100.0650940 100.0650940 100.0650940 100.0650940

100.0650940 100.0650940 100.0650940 100.0650940 100.0650940
100.0650940 100.0649796 100.0602493 100.0254593 99.9673233
99.8433762 99.6469498 99.3959961 99.0853195 98.71053314
98.26830292 97.75638580 97.17379761 96.52088165 95.79948425
95.01801300
1.015900016 101.7424240 101.7424240 101.7424240 101.7424240
101.7424240 101.7424240 101.7424240 101.7424240 101.7424240
101.7424240 101.7424240 101.7424240 101.7424240 101.7424240
101.7424240 101.7422791 101.7361984 101.6941223 101.6018906
101.4694519 101.2912521 101.0625076 100.7793884 100.4392548
100.0407562 99.5840378 99.0708084 98.50447083 97.89043427
97.24169159
1.031800032 103.2413025 103.2413025 103.2413025 103.2413025
103.2413025 103.2413025 103.2413025 103.2413025 103.2413025
103.2413025 103.2413025 103.2413025 103.2413025 103.2413025
103.2413025 103.2412491 103.2390747 103.2256317 103.1909485
103.1156693 102.9823761 102.8049469 102.5776215 102.2949142
101.9517670 101.5436401 101.0666580 100.5176315 99.8952560
99.2179489
1.071200013 105.2031403 105.2031403 105.2031403 105.2031403
105.2031403 105.2031403 105.2031403 105.2031403 105.2031403
105.2031403 105.2031403 105.2031403 105.2031403 105.2031403
105.2031403 105.2031479 105.2031174 105.1970520 105.1674194
105.1128922 105.0283890 104.9090042 104.7502365 104.5480957
104.2992172 104.0009995 103.6517105 103.2505875 102.7988968
102.3163452

Efficiency

29.03100000 0.00000000 0.034482758 0.068965517 0.103448279
0.137931034 0.172413796 0.206896558 0.241379306 0.275862068
0.310344815 0.344827592 0.379310340 0.413793117 0.448275864
0.482758611 0.517241359 0.551724136 0.586206913 0.620689631
0.655172408 0.689655185 0.724137902 0.758620679 0.793103456
0.827586234 0.862068951 0.896551728 0.931034505 0.965517223
1.000000000
0.010000000 -0.191695660 0.027873324 0.219883367 0.368091196
0.488357306 0.582834184 0.653604686 0.713877439 0.761571527
0.794833601 0.819138348 0.834162235 0.842541814 0.844414711
0.841137111 0.836454868 0.831400990 0.827090323 0.821003318
0.813979924 0.805551827 0.796187282 0.787759185 0.778719604
0.770780027 0.760766268 0.749049366 0.736392379 0.724341571
0.713938832
0.025000000 -0.193067268 0.041105621 0.230038285 0.383046776
0.499824345 0.586170197 0.652107000 0.706287622 0.755652189
0.792310655 0.816176891 0.832107008 0.842341125 0.845537424

0.843545139 0.838729084 0.834515035 0.830300987 0.823076904
0.815644145 0.806822717 0.797792554 0.787990034 0.778683245
0.769268155 0.758697510 0.748010218 0.737591982 0.726735711
0.715521991
0.050000001 -0.185265958 0.055451080 0.227409765 0.374958426
0.497381687 0.578854203 0.649339557 0.706592560 0.755992591
0.787651360 0.814214051 0.832006693 0.840992570 0.845585287
0.845819414 0.842775941 0.837859511 0.830836117 0.823344469
0.816436827 0.805768013 0.796482563 0.786450624 0.777078211
0.767986834 0.757482708 0.747287154 0.735511243 0.726403594
0.713664055
0.075000003 -0.188395709 0.045078829 0.245868266 0.386101991
0.505619526 0.592746139 0.659866214 0.719063520 0.763210714
0.790301025 0.815384626 0.831438124 0.841471553 0.844650984
0.845941365 0.845484972 0.840468228 0.833444834 0.825567842
0.817391276 0.807357848 0.798821032 0.788294315 0.779264212
0.770234108 0.759636819 0.750167251 0.739130437 0.727090299
0.714046836
0.100000001 -0.193646327 0.047454640 0.234588206 0.389016926
0.501035452 0.597658873 0.668572783 0.720802665 0.762006700
0.787759185 0.809297681 0.828026772 0.837391317 0.842073560
0.844748318 0.845819414 0.842541814 0.836923063 0.828494966
0.817725778 0.808829427 0.799464881 0.789632082 0.780267537
0.769230783 0.757792652 0.747491658 0.736166298 0.722662807
0.709136248
0.150000006 -0.195585087 0.048347879 0.240253285 0.388164103
0.505577743 0.599859357 0.670582354 0.729097009 0.763962865
0.791160822 0.815822542 0.832229018 0.840468228 0.843478262
0.845499992 0.845679939 0.843415976 0.837458193 0.831438124
0.821404696 0.813377917 0.803344488 0.792328954 0.783052802
0.774635315 0.762207329 0.752456725 0.740596116 0.727944732
0.716033638
0.200000003 -0.201176882 0.046515003 0.240317941 0.392591059
0.511574924 0.602081835 0.670592010 0.727884591 0.765138626
0.791847825 0.812541783 0.827215731 0.836998343 0.844147146
0.846780956 0.845466733 0.842642128 0.837374568 0.829849482
0.821234882 0.812541783 0.801404655 0.791237473 0.781070232
0.771170557 0.760735810 0.750904500 0.740705073 0.729966581
0.718265951
0.300000012 -0.193926483 0.044036582 0.235100508 0.385754794
0.501168430 0.590786636 0.661289990 0.719840109 0.764724672
0.797290981 0.819397986 0.833745837 0.841471553 0.845265329
0.846956551 0.846839368 0.844172060 0.839955568 0.834080279
0.826421380 0.818528414 0.809665561 0.800133765 0.791304350
0.780267537 0.769230783 0.757190645 0.745326936 0.733714044

0.721087158
0.400000006 0.449163884 0.531939805 0.603010058 0.656856179
0.702341199 0.739632130 0.771237433 0.795045733 0.816753983
0.832318425 0.842274249 0.849498332 0.852976561 0.854046822
0.852508366 0.850033462 0.847090304 0.843879580 0.840026915
0.835585296 0.831013262 0.824632108 0.818782985 0.812663436
0.805052459 0.797512352 0.789297640 0.779855549 0.771341741
0.762237787
0.480399996 0.610880375 0.659499466 0.704097033 0.740647733
0.769104779 0.791250348 0.807480931 0.823914468 0.836501539
0.845906138 0.852654457 0.857189178 0.859887660 0.861098766
0.861090779 0.860053360 0.858159304 0.855552733 0.852380753
0.848805785 0.844824970 0.840497613 0.835874617 0.831023991
0.826014638 0.820818067 0.815431535 0.809869587 0.804165006
0.798248172
0.539600015 0.627173483 0.669656575 0.706051409 0.738535941
0.764287770 0.787602961 0.805708528 0.821485162 0.836751759
0.846815765 0.853589773 0.859347165 0.862393796 0.865339994
0.867296338 0.867307186 0.865050197 0.863209188 0.859009504
0.855209053 0.850875914 0.845132768 0.840548635 0.834280908
0.828994572 0.821576416 0.815176606 0.809304178 0.802140832
0.794391274
0.588100016 0.647993326 0.693457425 0.732918739 0.762286782
0.785814047 0.806727946 0.823393166 0.835902870 0.845861614
0.853394032 0.860076010 0.865907788 0.870802045 0.874086559
0.876414955 0.877036452 0.875968158 0.873394191 0.869899988
0.866061926 0.860299945 0.855047822 0.849118650 0.842796147
0.835165977 0.827312708 0.818594396 0.809500575 0.801522672
0.794620216
0.631900012 0.624851763 0.670017302 0.711980104 0.743891716
0.771544695 0.794168770 0.813436568 0.830080330 0.842622995
0.853523135 0.863515913 0.871745110 0.877499759 0.881636441
0.884659588 0.884756327 0.885189474 0.882548034 0.878933787
0.873833358 0.868747890 0.864421904 0.858659983 0.853421807
0.847500205 0.841020465 0.832357347 0.823454678 0.815829039
0.808127820
0.673399985 0.645257890 0.686425865 0.723806322 0.755002737
0.780618727 0.802537739 0.822371066 0.838917613 0.850891292
0.862337530 0.870690465 0.878268361 0.883103490 0.885970175
0.888713241 0.890185356 0.890297115 0.889681935 0.887683451
0.884538054 0.880464673 0.875699759 0.870386124 0.864636302
0.858531594 0.852124512 0.845438182 0.838453054 0.831112862
0.823413193
0.712599993 0.633753836 0.672536194 0.708091378 0.739063203
0.767713785 0.792256534 0.812496841 0.830141127 0.845600724

0.858047128 0.867348790 0.874666870 0.881821036 0.886144638
0.888812304 0.890690506 0.891320705 0.891751051 0.891480923
0.889940023 0.888084531 0.885132074 0.880919993 0.876353145
0.872050464 0.866707325 0.860545337 0.854891181 0.850023866
0.844123542
0.752099991 0.627912700 0.664008141 0.699429750 0.730898261
0.759249449 0.784441292 0.806183100 0.826529980 0.843467653
0.855719805 0.865958452 0.872937560 0.879802763 0.885008276
0.888720691 0.891092777 0.892758667 0.894274592 0.895003855
0.894980788 0.893585503 0.890793860 0.887841225 0.885215342
0.881253064 0.877786636 0.873789668 0.869695723 0.865178823
0.860455692
0.795799971 0.625068367 0.660745263 0.693870723 0.724619508
0.753123581 0.779491305 0.803761959 0.824027121 0.839997530
0.852740109 0.862286925 0.869441450 0.875586987 0.880759001
0.885946214 0.889659107 0.892980993 0.895112514 0.896348715
0.896457613 0.896381974 0.895412683 0.894294322 0.891410649
0.887619197 0.884216249 0.880907059 0.877186835 0.872908711
0.866744399
0.816999972 0.621390402 0.658220172 0.693610251 0.726480544
0.756147623 0.782264113 0.804729998 0.823634267 0.839055002
0.851621211 0.861653149 0.869670153 0.875921488 0.880819857
0.885044336 0.888231158 0.891137719 0.893029451 0.894828558
0.896250665 0.895592928 0.895482004 0.894591391 0.892055571
0.889492095 0.886461079 0.882725358 0.879257143 0.875181675
0.869745612
0.837199986 0.633054733 0.667151749 0.698828220 0.728259683
0.753622055 0.779886901 0.801865101 0.820582926 0.835797727
0.849073112 0.860314608 0.868022144 0.873765290 0.878335655
0.882204115 0.886403263 0.889777124 0.892664492 0.894320190
0.894849122 0.894543231 0.894241333 0.893060446 0.890857279
0.888097346 0.885298610 0.882410467 0.878529191 0.873538554
0.868679225
0.861000001 0.636122942 0.667252123 0.696910858 0.724506438
0.749506891 0.774169803 0.794519842 0.812820494 0.828230321
0.841224849 0.851874709 0.860350490 0.867924035 0.874714434
0.880743027 0.885672390 0.889333367 0.892024875 0.893554509
0.894148588 0.894635141 0.895199060 0.893925965 0.891062379
0.888205945 0.885223448 0.881051600 0.877381802 0.872680545
0.868225813
0.883000016 0.638476908 0.668102264 0.696940243 0.722351789
0.745667815 0.767193675 0.785340190 0.803174675 0.819905579
0.833745778 0.844918430 0.854618490 0.863245368 0.870789409
0.877236664 0.882584989 0.886834323 0.889983118 0.891937435
0.893275499 0.894093335 0.893894076 0.892507195 0.889942110

0.886752963 0.883321822 0.879884899 0.875842750 0.871105433
0.866085112
0.910300016 0.624298573 0.652868807 0.682022035 0.708186567
0.729838312 0.752291739 0.770680845 0.787739575 0.805605590
0.819748282 0.833118021 0.845282733 0.856545627 0.866149604
0.873976648 0.880738735 0.886643469 0.890783489 0.893461108
0.894336104 0.894197166 0.893230140 0.891369700 0.888687372
0.885599136 0.882227302 0.877897978 0.872593582 0.866941452
0.860989928
0.932600021 0.626360893 0.657213092 0.683392406 0.706907392
0.728707790 0.749612272 0.768955946 0.785685420 0.802468479
0.816349328 0.829412997 0.842110157 0.852187395 0.862131596
0.869868100 0.877271175 0.882242382 0.887411237 0.890268266
0.892746627 0.892508030 0.891075730 0.889380813 0.887318432
0.884963572 0.880752623 0.876703978 0.871545494 0.863931298
0.855535746
0.964699984 0.602835298 0.632059336 0.659618437 0.685622633
0.708874941 0.729377985 0.750015616 0.767233491 0.784169853
0.798743784 0.813006341 0.825704575 0.837129414 0.848710179
0.859068096 0.867522597 0.874947309 0.879305482 0.881786823
0.884192228 0.884956837 0.884850919 0.883202672 0.881057441
0.879040301 0.876601636 0.870778859 0.864919901 0.857821703
0.851186931
1.000000000 0.569390774 0.599390328 0.628563881 0.654371142
0.678616464 0.701290965 0.723163545 0.741908729 0.759991646
0.777109742 0.793218493 0.807075143 0.819410622 0.831606984
0.841635883 0.850498855 0.857463241 0.863250852 0.867231131
0.870495558 0.870940447 0.871066928 0.870066106 0.867312968
0.863517642 0.857775748 0.851391137 0.843425691 0.833911777
0.822458148
1.015900016 0.553028464 0.580640614 0.607696295 0.633596480
0.659214377 0.682092309 0.704039335 0.723794222 0.741792738
0.758065760 0.774151623 0.787680209 0.800247848 0.810872376
0.820899904 0.830109000 0.838939309 0.844743550 0.850396872
0.853852093 0.854928613 0.855054259 0.854000747 0.851058364
0.847339869 0.842806816 0.837087750 0.829892218 0.822032571
0.813055336
1.031800032 0.536185861 0.563967824 0.590570211 0.616069436
0.640533388 0.663924515 0.683735728 0.703393877 0.721008182
0.735167444 0.749220908 0.761601746 0.773064852 0.782899022
0.792045236 0.800501108 0.806650698 0.812848747 0.818163812
0.820985317 0.822824180 0.824016571 0.824325800 0.823071480
0.821006596 0.817704439 0.812713265 0.807361901 0.801978052
0.797274470
1.071200013 0.494138569 0.518944025 0.542252302 0.565164387

0.587230027 0.608107924 0.626886904 0.644268930 0.660505652
0.674173236 0.686436236 0.697277069 0.706732154 0.716181219
0.724930704 0.732536793 0.739159584 0.745904803 0.751508772
0.756885231 0.760962784 0.763379991 0.765016377 0.765677869
0.765570760 0.764661610 0.762802541 0.760271907 0.757196605
0.753744543

Pressure Ratio

29.03100000 0.000000000 0.034482758 0.068965517 0.103448279
0.137931034 0.172413796 0.206896558 0.241379306 0.275862068
0.310344815 0.344827592 0.379310340 0.413793117 0.448275864
0.482758611 0.517241359 0.551724136 0.586206913 0.620689631
0.655172408 0.689655185 0.724137902 0.758620679 0.793103456
0.827586234 0.862068951 0.896551728 0.931034505 0.965517223
1.000000000
0.010000000 0.999991536 1.000001788 1.000012279 1.000022173
1.000031710 1.000040531 1.000048995 1.000057220 1.000064969
1.000072598 1.000079513 1.000086069 1.000092387 1.000097871
1.000103116 1.000108004 1.000112891 1.000117421 1.000121713
1.000125647 1.000129223 1.000132561 1.000135779 1.000139356
1.000142336 1.000144958 1.000147223 1.000149250 1.000151157
1.000153184
0.025000000 0.999945283 1.000013113 1.000077724 1.000140905
1.000198245 1.000252366 1.000306606 1.000357151 1.000406146
1.000451565 1.000495195 1.000535369 1.000573754 1.000610471
1.000643611 1.000670791 1.000699282 1.000731826 1.000759006
1.000780821 1.000805259 1.000828862 1.000848055 1.000867248
1.000882626 1.000898957 1.000915289 1.000931621 1.000943780
1.000956059
0.050000001 0.999784589 1.000069857 1.000310063 1.000558972
1.000803471 1.001007318 1.001211047 1.001414895 1.001620054
1.001803517 1.001978159 1.002144098 1.002301335 1.002449751
1.002580762 1.002703071 1.002825379 1.002930164 1.003034949
1.003139734 1.003227115 1.003314376 1.003393054 1.003471613
1.003534198 1.003611326 1.003672481 1.003724933 1.003778696
1.003819466
0.075000003 0.999519646 1.000125170 1.000742316 1.001266360
1.001790404 1.002285242 1.002756953 1.003187776 1.003638983
1.004061103 1.004497766 1.004847169 1.005196452 1.005487680
1.005793333 1.006069899 1.006317377 1.006579280 1.006826758
1.006943226 1.007205248 1.007379889 1.007554531 1.007729292
1.007903934 1.008078575 1.008253217 1.008427978 1.008515239
1.008602619
0.100000001 0.999132454 1.000232935 1.001251817 1.002270699
1.003167391 1.004064083 1.004919887 1.005694270 1.006468654

1.007202387 1.007802010 1.008529782 1.009112120 1.009694338
1.010276556 1.010788918 1.011278033 1.011767149 1.012174726
1.012541533 1.012867570 1.013187766 1.013560414 1.013845682
1.014171720 1.014416337 1.014660835 1.014905334 1.015080094
1.015225649
0.150000006 0.998078585 1.000524044 1.002853036 1.004992723
1.007103324 1.009141207 1.011033535 1.012853026 1.014599681
1.016200900 1.017802000 1.019257665 1.020640492 1.021950483
1.023187757 1.024352312 1.025443912 1.026535630 1.027481794
1.028427958 1.029228568 1.029868960 1.030684114 1.031266332
1.031965017 1.032430887 1.033129573 1.033595324 1.034061193
1.034526944
0.200000003 0.996506572 1.000887871 1.005021811 1.008952022
1.012707472 1.016273618 1.019636154 1.023034930 1.025953412
1.028908253 1.031659365 1.034308553 1.036462903 1.038755417
1.041048050 1.043340564 1.045305729 1.047270775 1.048908353
1.050545812 1.052183390 1.053493500 1.054476023 1.055786014
1.057096124 1.058078647 1.059388638 1.060371161 1.061353683
1.062008739
0.300000012 0.992218018 1.001928329 1.011196256 1.020040393
1.028480530 1.036535978 1.044224262 1.051560402 1.058556557
1.065222383 1.071565628 1.077592373 1.083308220 1.088718772
1.093830585 1.098651767 1.103192329 1.107464552 1.111482739
1.115263104 1.118823051 1.122180104 1.125350833 1.128348589
1.131181479 1.133850336 1.136344910 1.138641119 1.140696764
1.142447948
0.400000006 1.040502191 1.053020358 1.064956307 1.076601148
1.087663770 1.098435283 1.108915567 1.118813634 1.128420711
1.137445450 1.146179080 1.154264927 1.162183404 1.169403195
1.176390052 1.182911158 1.189432263 1.195720553 1.201542974
1.207365394 1.212990403 1.218078613 1.223202348 1.227860212
1.232139707 1.236331820 1.240262032 1.243668079 1.247074246
1.250218391
0.480399996 1.089364290 1.104647279 1.119401932 1.133620381
1.147309780 1.160479665 1.173141837 1.185305357 1.196992993
1.208223224 1.219011784 1.229374766 1.239329100 1.248895645
1.258092403 1.266931891 1.275428414 1.283595562 1.291450739
1.299017191 1.306293607 1.313289285 1.320013046 1.326478362
1.332700372 1.338675380 1.344404101 1.349890947 1.355144501
1.360149503
0.539600015 1.126177549 1.143648148 1.160743833 1.177453995
1.193750501 1.209604740 1.224989414 1.239877939 1.254234076
1.268054843 1.281331778 1.294061780 1.306245923 1.317889094
1.328996539 1.339587569 1.349691391 1.359329343 1.368524194
1.377301216 1.385690689 1.393721700 1.401411295 1.408776522

1.415831923 1.422594666 1.429075122 1.435249686 1.441105843
1.446628213
0.588100016 1.172338009 1.193362713 1.213914871 1.233975530
1.253525615 1.272544980 1.291013598 1.308910966 1.326211572
1.342883348 1.358925700 1.374325156 1.389069915 1.403151274
1.416563034 1.429297805 1.441330910 1.452696323 1.463402987
1.473461986 1.482887626 1.491694570 1.499896288 1.507532358
1.514636755 1.521239519 1.527373433 1.533082128 1.538422585
1.543390274
0.631900012 1.223461032 1.248392820 1.272773862 1.296619058
1.319950819 1.342777848 1.365094662 1.386882544 1.408110023
1.428729653 1.448668718 1.467889905 1.486340165 1.503970146
1.520735979 1.536602259 1.551542640 1.565528035 1.578528523
1.590615273 1.601820111 1.612184525 1.621759534 1.630602717
1.638781786 1.646386385 1.653488398 1.660145998 1.666409135
1.672270179
0.673399985 1.276016593 1.305252194 1.334253192 1.362928987
1.391168833 1.418864369 1.445913076 1.472221971 1.497709751
1.522309184 1.545964956 1.568592072 1.590220809 1.610854268
1.630503654 1.649191022 1.666948199 1.683813691 1.699831367
1.715044737 1.729501724 1.743269324 1.756386876 1.768888593
1.780800104 1.792137980 1.802907228 1.813091159 1.822652102
1.831576109
0.712599993 1.329234123 1.363004446 1.396534085 1.429760337
1.462612391 1.495013714 1.526884675 1.558143377 1.588708401
1.618500113 1.647442341 1.675463080 1.702474356 1.728409648
1.753257871 1.776987433 1.799578667 1.821024418 1.841330171
1.860514164 1.878607631 1.895651460 1.911685348 1.926813126
1.941135287 1.954749346 1.967764497 1.980299711 1.992485046
2.004364014
0.752099991 1.390580654 1.429447889 1.468387604 1.507303119
1.546063781 1.584532142 1.622567892 1.660032868 1.696794510
1.732730031 1.767729402 1.801697731 1.834557295 1.866247177
1.896706223 1.925894618 1.953854918 1.980602503 2.006166458
2.030587196 2.053913832 2.076201677 2.097507954 2.117890835
2.137403250 2.156087875 2.173984289 2.191114426 2.207473040
2.223057985
0.795799971 1.475516796 1.520613313 1.565796018 1.611027241
1.656240463 1.701352715 1.746264458 1.790863395 1.835025907
1.878620982 1.921513557 1.963567972 2.004651070 2.044637442
2.083410501 2.120867252 2.156919956 2.191493511 2.224478960
2.255903721 2.285766363 2.314078808 2.340869665 2.366184473
2.390081644 2.412630558 2.433907270 2.453991890 2.472964525
2.490923882
0.816999972 1.522466898 1.570687771 1.618908644 1.667129517

1.715350389 1.763571262 1.811792135 1.860013008 1.908217430
1.955828547 2.002363205 2.048139811 2.093241930 2.137540102
2.181005716 2.222945213 2.263037205 2.301641941 2.338763952
2.374253035 2.409075022 2.442489862 2.473242998 2.501937628
2.528451920 2.553431749 2.576862812 2.598976851 2.619166613
2.637214184
0.837199986 1.574431658 1.626055717 1.677679777 1.729303718
1.780927777 1.832551837 1.884175897 1.935799837 1.987422228
2.038968801 2.090081215 2.140585184 2.190422058 2.239415407
2.287379265 2.334124565 2.379462719 2.423213482 2.465209246
2.505303383 2.543374777 2.579334259 2.613108158 2.644649029
2.674079895 2.701508284 2.727097988 2.751073599 2.773724318
2.795367241
0.861000001 1.644484758 1.700669289 1.756853819 1.813038468
1.869222999 1.925407529 1.981592178 2.037776709 2.093962193
2.150183439 2.206428051 2.262388706 2.317767382 2.372342110
2.425874710 2.478119373 2.528830051 2.577770233 2.624721050
2.669494152 2.711938620 2.751952171 2.789489985 2.824571133
2.857288599 2.887810707 2.916368008 2.943400145 2.969390392
2.994806767
0.883000016 1.719275475 1.780299067 1.841322660 1.902346134
1.963369727 2.024393320 2.085416794 2.146440506 2.207463980
2.268487453 2.329505920 2.390331268 2.450809717 2.510682344
2.569664240 2.627482653 2.683859348 2.738522291 2.791218042
2.841721296 2.889844418 2.935449839 2.978451729 3.018825054
3.056607008 3.091898918 3.124865055 3.155730963 3.184778929
3.212352276
0.910300016 1.821664214 1.889269590 1.956874967 2.024480343
2.092085600 2.159690857 2.227296352 2.294901609 2.362507105
2.430112362 2.497717619 2.565320253 2.632817984 2.699884415
2.766267538 2.831691742 2.895844936 2.958396196 3.019006968
3.077343464 3.133091688 3.185970068 3.235743761 3.282240868
3.325364113 3.365102291 3.401542664 3.434880733 3.465424061
3.493653774
0.932600021 1.931136012 2.005732059 2.080328226 2.154924393
2.229520559 2.304116726 2.378712654 2.453308821 2.527904987
2.602501154 2.677097321 2.751697779 2.826432228 2.900186300
2.973094463 3.044953108 3.115477085 3.184362173 3.251291275
3.315939903 3.377989531 3.437134266 3.493091822 3.545612812
3.594491959 3.639575481 3.680773735 3.718063116 3.751498699
3.781368971
0.964699984 2.036058187 2.117316484 2.198574781 2.279833078
2.361091375 2.442349434 2.523607731 2.604866028 2.686124325
2.767382622 2.848640919 2.929899216 3.011183262 3.093400955
3.174015522 3.253695965 3.332066774 3.408715725 3.483208895

3.555104971 3.623963833 3.689375401 3.750979662 3.808477402
3.861646891 3.910367727 3.954631090 3.994553089 4.030388355
4.062645435
1.000000000 2.141616106 2.229544640 2.317472935 2.405401468
2.493329763 2.581258297 2.669186592 2.757115126 2.845043421
2.932971954 3.020900249 3.108828783 3.196757078 3.284685612
3.372614145 3.460536957 3.548232317 3.634386063 3.719212055
3.800319433 3.877048731 3.950104475 4.018958569 4.083109856
4.142108917 4.195568085 4.243181705 4.284739971 4.320149422
4.349773407
1.015900016 2.183089018 2.273630142 2.364171267 2.454712391
2.545253515 2.635794401 2.726335526 2.816876650 2.907417774
2.997958899 3.088500023 3.179041147 3.269582272 3.360123396
3.450664520 3.541198492 3.631435156 3.719795465 3.805360317
3.888444185 3.968555450 4.045217991 4.117990494 4.186487675
4.250398636 4.309507370 4.363709927 4.413031101 4.457655907
4.498314857
1.031800032 2.220732689 2.313641787 2.406550646 2.499459743
2.592368603 2.685277700 2.778186560 2.871095657 2.964004517
3.056913376 3.149822474 3.242731333 3.335640430 3.428549290
3.521458387 3.614364624 3.707163334 3.799365282 3.890379667
3.979032993 4.064144611 4.146261692 4.224843025 4.299336433
4.369192123 4.433873653 4.492876053 4.545732498 4.592104912
4.633020878
1.071200013 2.270835400 2.366890907 2.462946415 2.559001923
2.655057192 2.751112700 2.847168207 2.943223715 3.039279222
3.135334492 3.231389999 3.327445507 3.423501015 3.519556522
3.615611792 3.711667776 3.807721615 3.903453827 3.997873068
4.090791225 4.181794643 4.270449638 4.356319904 4.438976288
4.518010616 4.593048573 4.663767815 4.729908466 4.791355610
4.849315643

Surge Line

2.029000000 0.498989910 1.246464610 2.494949579 3.744107723
4.979797840 7.500000000 10.03367043 15.21160507 21.76992226
27.18430138 30.01199341 33.84931564 39.20439529 44.49560928
50.10359955 55.77854919 61.92893982 65.08958435 68.15040588
71.96372986 76.09989166 81.30672455 86.22160339 90.83071136
95.77812195 97.87098694 100.0544968 103.0378571
1.000000000 1.000153184 1.000956059 1.003819466 1.008602619
1.015225649 1.034526944 1.062008739 1.142447948 1.250218391
1.360149503 1.460039258 1.552600622 1.672270179 1.826846480
1.980386257 2.192068815 2.466989756 2.618110895 2.783574581
2.990740299 3.208934069 3.484333992 3.771860600 4.050403595
4.320959091 4.458874702 4.580239773 4.758847237