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        NASA-GLENN CHEMICAL EQUILIBRIUM PROGRAM CEA2, MAY 21, 2004
                    BY  BONNIE MCBRIDE AND SANFORD GORDON
     REFS: NASA RP-1311, PART I, 1994 AND NASA RP-1311, PART II, 1996

 ******************************************************************************



 problem   case=9 o/f=5.55157,
       rocket  equilibrium  frozen  nfz=2  tcest,k=3800
   p,bar=53.31725,65,75,85,95,120,
   sup,ae/at=25,35,45,55,75,
 react
   fuel=H2(L) wt=100.  t,k=20.27
   oxid=O2(L) wt=100.  t,k=90.17
 output
      siunits
 end

 OPTIONS: TP=F  HP=F  SP=F  TV=F  UV=F  SV=F  DETN=F  SHOCK=F  REFL=F  INCD=F
 RKT=T  FROZ=T  EQL=T  IONS=F  SIUNIT=T  DEBUGF=F  SHKDBG=F  DETDBG=F  TRNSPT=F

 TRACE= 0.00E+00  S/R= 0.000000E+00  H/R= 0.000000E+00  U/R= 0.000000E+00

 Pc,BAR =     53.317250    65.000000    75.000000    85.000000    95.000000   120.000000

 Pc/P =

 SUBSONIC AREA RATIOS =

 SUPERSONIC AREA RATIOS =    25.0000    35.0000    45.0000    55.0000    75.0000

 NFZ=  2  Mdot/Ac= 0.000000E+00  Ac/At= 0.000000E+00

    REACTANT          WT.FRAC    (ENERGY/R),K   TEMP,K  DENSITY
        EXPLODED FORMULA
 F: H2(L)            1.000000  -0.108389E+04    20.27  0.0000
          H  2.00000
 O: O2(L)            1.000000  -0.156101E+04    90.17  0.0000
          O  2.00000

  SPECIES BEING CONSIDERED IN THIS SYSTEM
 (CONDENSED PHASE MAY HAVE NAME LISTED SEVERAL TIMES)
  LAST thermo.inp UPDATE:    9/09/04

  g 6/97  *H               g 4/02  HO2              tpis78  *H2
  g 8/89  H2O              g 6/99  H2O2             g 5/97  *O
  g 4/02  *OH              tpis89  *O2              g 8/01  O3
  g11/99  H2O(cr)          g 8/01  H2O(L)           g 8/01  H2O(L)

 O/F =   5.551570

                       EFFECTIVE FUEL     EFFECTIVE OXIDANT        MIXTURE
 ENTHALPY                   h(2)/R             h(1)/R               h0/R
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FileEditor:xEx9.out

(KG-MOL)(K)/KG	-0.53767500E+03	-0.48783267E+02	-0.12340534E+03

KG-FORM.WT./KG	bi(2)	bi(1)	b0i
*H	0.99212255E+00	0.00000000E+00	0.15143279E+00
*O	0.00000000E+00	0.62502344E-01	0.52962288E-01

POINT	ITN	T	H	O
1	9	3383.845	-9.262	-16.577
Pinf/Pt = 1.737750				
2	4	3185.977	-9.430	-16.983
Pinf/Pt = 1.739241				
2	2	3185.673	-9.430	-16.983
3	5	1441.980	-10.683	-26.970
3	2	1468.156	-10.663	-26.627
4	3	1368.363	-10.741	-28.008
4	2	1343.488	-10.761	-28.385
5	3	1231.875	-10.854	-30.275
5	2	1255.346	-10.834	-29.848
6	3	1210.791	-10.872	-30.672
6	2	1187.901	-10.893	-31.120
7	3	1067.484	-11.005	-33.805
7	2	1088.644	-10.984	-33.289

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 773.3 PSIA
CASE = 9

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2(L)	1.0000000	-9012.000	20.270
OXIDANT	O2(L)	1.0000000	-12979.000	90.170

O/F= 5.55157 %FUEL= 15.263517 R,EQ.RATIO= 1.429629 PHI,EQ.RATIO= 1.429629

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7392	260.19	407.24	568.90	742.97	1122.79
P, BAR	53.317	30.655	0.20491	0.13092	0.09372	0.07176	0.04749
T, K	3383.84	3185.67	1468.16	1343.49	1255.35	1187.90	1088.64
RHO, KG/CU M	2.4097 0	1.4864 0	2.2170-2	1.5479-2	1.1859-2	9.5960-3	6.9288-3
H, KJ/KG	-1026.05	-2208.65	-9531.45	-9927.75	-10201.1	-10406.4	-10702.2
U, KJ/KG	-3238.68	-4271.01	-10455.7	-10773.5	-10991.4	-11154.2	-11387.5
G, KJ/KG	-64163.7	-61648.7	-36925.1	-34995.3	-33624.1	-32570.9	-31014.7
S, KJ/(KG)(K)	18.6586	18.6586	18.6586	18.6586	18.6586	18.6586	18.6586
M, (1/n)	12.716	12.843	13.207	13.207	13.207	13.207	13.207
(dLV/dLP)t	-1.02010	-1.01475	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000
(dLV/dLT)p	1.3658	1.2844	1.0001	1.0000	1.0000	1.0000	1.0000
Cp, KJ/(KG)(K)	8.3253	7.4796	3.2234	3.1342	3.0690	3.0179	2.9416
GAMMAs	1.1447	1.1468	1.2428	1.2514	1.2581	1.2636	1.2723
SON VEL,M/SEC	1591.5	1537.9	1071.8	1028.8	997.1	972.1	933.8

MACH NUMBER	0.000	1.000	3.848	4.101	4.296	4.456	4.711

PERFORMANCE PARAMETERS

Ae/At	1.0000	25.000	35.000	45.000	55.000	75.000
CSTAR, M/SEC	2332.3	2332.3	2332.3	2332.3	2332.3	2332.3
CF	0.6594	1.7684	1.8091	1.8367	1.8571	1.8861
Ivac, M/SEC	2878.9	4348.5	4419.9	4468.2	4504.0	4554.9
Isp, M/SEC	1537.9	4124.4	4219.4	4283.7	4331.4	4399.1

MOLE FRACTIONS

*H	0.03350	0.02652	0.00001	0.00000	0.00000	0.00000	0.00000
HO2	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000
*H2	0.29479	0.29432	0.30051	0.30052	0.30052	0.30052	0.30052
H2O	0.63456	0.65280	0.69948	0.69948	0.69948	0.69948	0.69948
H2O2	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
*O	0.00207	0.00120	0.00000	0.00000	0.00000	0.00000	0.00000
*OH	0.03334	0.02409	0.00000	0.00000	0.00000	0.00000	0.00000
*O2	0.00172	0.00104	0.00000	0.00000	0.00000	0.00000	0.00000

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

PRODUCTS WHICH WERE CONSIDERED BUT WHOSE MOLE FRACTIONS
WERE LESS THAN 5.000000E-06 FOR ALL ASSIGNED CONDITIONS

O3 H2O(cr) H2O(L)

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION
AFTER POINT 2

Pin = 773.3 PSIA
CASE = 9

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2(L)	1.0000000	-9012.000	20.270
OXIDANT	O2(L)	1.0000000	-12979.000	90.170

O/F= 5.55157 %FUEL= 15.263517 R,EQ.RATIO= 1.429629 PHI,EQ.RATIO= 1.429629

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7392	294.17	463.40	650.68	853.37	1298.27
P, BAR	53.317	30.655	0.18124	0.11506	0.08194	0.06248	0.04107
T, K	3383.84	3185.67	1236.07	1121.67	1041.32	980.24	891.06
RHO, KG/CU M	2.4097 0	1.4864 0	2.2649-2	1.5845-2	1.2155-2	9.8454-3	7.1192-3
H, KJ/KG	-1026.05	-2208.65	-9175.50	-9522.11	-9759.68	-9937.09	-10191.1
U, KJ/KG	-3238.68	-4271.01	-9975.71	-10248.3	-10433.8	-10571.7	-10768.0
G, KJ/KG	-64163.7	-61648.7	-32238.9	-30450.9	-29189.3	-28226.9	-26816.9
S, KJ/(KG)(K)	18.6586	18.6586	18.6586	18.6586	18.6586	18.6586	18.6586

M, (1/n)	12.716	12.843	12.843	12.843	12.843	12.843	12.843
Cp, KJ/(KG)(K)	8.3253	7.4796	3.0723	2.9870	2.9267	2.8814	2.8156
GAMMAs	1.1447	1.1468	1.2670	1.2767	1.2840	1.2898	1.2986
SON VEL,M/SEC	1591.5	1537.9	1006.9	962.9	930.4	904.7	865.5
MACH NUMBER	0.000	1.000	4.010	4.281	4.492	4.666	4.947

PERFORMANCE PARAMETERS

Ae/At	1.0000	25.000	35.000	45.000	55.000	75.000
CSTAR, M/SEC	2332.3	2332.3	2332.3	2332.3	2332.3	2332.3
CF	0.6594	1.7310	1.7674	1.7919	1.8100	1.8357
Ivac, M/SEC	2878.9	4235.4	4298.3	4340.7	4371.9	4416.1
Isp, M/SEC	1537.9	4037.2	4122.1	4179.4	4221.6	4281.4

MOLE FRACTIONS

*H	0.02652	HO2	0.00001	*H2	0.29432
H2O	0.65280	*O	0.00120	*OH	0.02409
*O2	0.00104				

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

PRODUCTS WHICH WERE CONSIDERED BUT WHOSE MOLE FRACTIONS
WERE LESS THAN 5.000000E-06 FOR ALL ASSIGNED CONDITIONS

O3	H2O(cr)	H2O(L)

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS

POINT	ITN	T	H	O
1	3	3402.909	-9.173	-16.535
Pinf/Pt = 1.738671				
2	4	3200.565	-9.339	-16.946
Pinf/Pt = 1.740289				
2	2	3200.229	-9.339	-16.947
3	5	1439.394	-10.582	-27.004
3	2	1464.797	-10.563	-26.670
4	3	1364.453	-10.641	-28.066
4	2	1340.325	-10.660	-28.434
5	3	1229.556	-10.753	-30.318
5	2	1252.327	-10.734	-29.902
6	3	1207.193	-10.773	-30.742
6	2	1184.994	-10.792	-31.179
7	3	1065.384	-10.904	-33.857
7	2	1085.907	-10.884	-33.354

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 942.7 PSIA
CASE = 9

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2(L)	1.0000000	-9012.000	20.270
OXIDANT	O2(L)	1.0000000	-12979.000	90.170

O/F= 5.55157 %FUEL= 15.263517 R,EQ.RATIO= 1.429629 PHI,EQ.RATIO= 1.429629

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7403	261.31	408.99	571.33	746.15	1127.62
P, BAR	65.000	37.350	0.24874	0.15893	0.11377	0.08711	0.05764
T, K	3402.91	3200.23	1464.80	1340.33	1252.33	1184.99	1085.91
RHO, KG/CU M	2.9267 0	1.8056 0	2.6974-2	1.8835-2	1.4431-2	1.1677-2	8.4320-3
H, KJ/KG	-1026.05	-2213.94	-9542.30	-9937.66	-10210.4	-10415.2	-10710.2
U, KJ/KG	-3246.96	-4282.46	-10464.5	-10781.5	-10998.8	-11161.2	-11393.8
G, KJ/KG	-64079.0	-61511.4	-36683.7	-34772.7	-33414.9	-32372.1	-30831.1
S, KJ/(KG)(K)	18.5291	18.5291	18.5291	18.5291	18.5291	18.5291	18.5291
M, (1/n)	12.740	12.863	13.207	13.207	13.207	13.207	13.207
(dLV/dLP)t	-1.01907	-1.01389	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000
(dLV/dLT)p	1.3454	1.2668	1.0001	1.0000	1.0000	1.0000	1.0000
Cp, KJ/(KG)(K)	8.0569	7.2431	3.2207	3.1318	3.0667	3.0157	2.9395
GAMMAs	1.1462	1.1485	1.2430	1.2516	1.2583	1.2638	1.2725
SON VEL,M/SEC	1595.5	1541.4	1070.6	1027.7	996.0	971.0	932.7
MACH NUMBER	0.000	1.000	3.855	4.108	4.303	4.463	4.718

PERFORMANCE PARAMETERS

Ae/At	1.00000	25.000	35.000	45.000	55.000	75.000
CSTAR, M/SEC	2335.5	2335.5	2335.5	2335.5	2335.5	2335.5
CF	0.6600	1.7671	1.8076	1.8351	1.8554	1.8844
Ivac, M/SEC	2883.4	4350.5	4421.6	4469.8	4505.5	4556.3
Isp, M/SEC	1541.4	4127.0	4221.8	4285.9	4333.4	4400.9

MOLE FRACTIONS

*H	0.03178	0.02501	0.00001	0.00000	0.00000	0.00000	0.00000
HO2	0.00002	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000
*H2	0.29509	0.29466	0.30051	0.30052	0.30052	0.30052	0.30052
H2O	0.63755	0.65530	0.69948	0.69948	0.69948	0.69948	0.69948
H2O2	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
*O	0.00188	0.00108	0.00000	0.00000	0.00000	0.00000	0.00000
*OH	0.03210	0.02300	0.00000	0.00000	0.00000	0.00000	0.00000
*O2	0.00157	0.00094	0.00000	0.00000	0.00000	0.00000	0.00000

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

PRODUCTS WHICH WERE CONSIDERED BUT WHOSE MOLE FRACTIONS
WERE LESS THAN 5.000000E-06 FOR ALL ASSIGNED CONDITIONS

O3 H2O(cr) H2O(L)

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION
AFTER POINT 2

Pin = 942.7 PSIA
CASE = 9

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2(L)	1.0000000	-9012.000	20.270
OXIDANT	O2(L)	1.0000000	-12979.000	90.170

O/F= 5.55157 %FUEL= 15.263517 R,EQ.RATIO= 1.429629 PHI,EQ.RATIO= 1.429629

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7403	293.18	461.66	648.04	849.72	1292.25
P, BAR	65.000	37.350	0.22171	0.14080	0.10030	0.07650	0.05030
T, K	3402.91	3200.23	1246.18	1131.34	1050.64	989.27	899.63
RHO, KG/CU M	2.9267 0	1.8056 0	2.7524-2	1.9254-2	1.4770-2	1.1963-2	8.6502-3
H, KJ/KG	-1026.05	-2213.94	-9205.51	-9554.18	-9793.25	-9971.84	-10227.6
U, KJ/KG	-3246.96	-4282.46	-10011.0	-10285.4	-10472.4	-10611.3	-10809.1
G, KJ/KG	-64079.0	-61511.4	-32296.2	-30516.9	-29260.7	-28302.1	-26896.9
S, KJ/(KG)(K)	18.5291	18.5291	18.5291	18.5291	18.5291	18.5291	18.5291
M, (1/n)	12.740	12.863	12.863	12.863	12.863	12.863	12.863
Cp, KJ/(KG)(K)	8.0569	7.2431	3.0786	2.9931	2.9324	2.8869	2.8205
GAMMAs	1.1462	1.1485	1.2657	1.2754	1.2827	1.2885	1.2973
SON VEL,M/SEC	1595.5	1541.4	1009.7	965.8	933.3	907.7	868.5
MACH NUMBER	0.000	1.000	4.006	4.276	4.487	4.660	4.939

PERFORMANCE PARAMETERS

Ae/At	1.00000	25.000	35.000	45.000	55.000	75.000
CSTAR, M/SEC	2335.5	2335.5	2335.5	2335.5	2335.5	2335.5
CF	0.6600	1.7318	1.7683	1.7929	1.8111	1.8368
Ivac, M/SEC	2883.4	4243.8	4307.0	4349.6	4381.0	4425.4
Isp, M/SEC	1541.4	4044.6	4129.9	4187.4	4229.8	4289.9

MOLE FRACTIONS

*H	0.02501	HO2	0.00001	*H2	0.29466
H2O	0.65530	*O	0.00108	*OH	0.02300
*O2	0.00094				

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

PRODUCTS WHICH WERE CONSIDERED BUT WHOSE MOLE FRACTIONS
WERE LESS THAN 5.000000E-06 FOR ALL ASSIGNED CONDITIONS

O3	H2O(cr)	H2O(L)

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS

POINT	ITN	T	H	O
1	3	3416.423	-9.108	-16.505
Pinf/Pt = 1.739339				
2	4	3210.819	-9.273	-16.920
Pinf/Pt = 1.741049				
2	2	3210.458	-9.273	-16.921
3	5	1437.594	-10.509	-27.028
3	2	1462.478	-10.490	-26.700
4	3	1361.768	-10.569	-28.106
4	2	1338.142	-10.588	-28.468
5	3	1227.942	-10.681	-30.348
5	2	1250.243	-10.661	-29.940
6	3	1204.723	-10.701	-30.789
6	2	1182.988	-10.720	-31.219
7	3	1063.923	-10.832	-33.894
7	2	1084.019	-10.812	-33.400

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1087.8 PSIA
CASE = 9

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2(L)	1.0000000	-9012.000	20.270
OXIDANT	O2(L)	1.0000000	-12979.000	90.170

O/F= 5.55157 %FUEL= 15.263517 R,EQ.RATIO= 1.429629 PHI,EQ.RATIO= 1.429629

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7410	262.09	410.20	573.02	748.36	1130.98
P, BAR	75.000	43.077	0.28616	0.18284	0.13088	0.10022	0.06631
T, K	3416.42	3210.46	1462.48	1338.14	1250.24	1182.99	1084.02
RHO, KG/CU M	3.3681 0	2.0782 0	3.1081-2	2.1704-2	1.6629-2	1.3457-2	9.7172-3
H, KJ/KG	-1026.05	-2217.68	-9549.78	-9944.50	-10216.8	-10421.2	-10715.8
U, KJ/KG	-3252.81	-4290.53	-10470.5	-10786.9	-11003.9	-11166.0	-11398.2
G, KJ/KG	-64010.6	-61405.1	-36511.7	-34614.2	-33266.0	-32230.6	-30700.5
S, KJ/(KG)(K)	18.4358	18.4358	18.4358	18.4358	18.4358	18.4358	18.4358
M, (1/n)	12.757	12.878	13.207	13.207	13.207	13.207	13.207
(dLV/dLP)t	-1.01834	-1.01329	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000
(dLV/dLT)p	1.3310	1.2546	1.0001	1.0000	1.0000	1.0000	1.0000
Cp, KJ/(KG)(K)	7.8703	7.0795	3.2189	3.1302	3.0651	3.0141	2.9381
GAMMAs	1.1473	1.1498	1.2432	1.2518	1.2585	1.2640	1.2727

SON VEL,M/SEC	1598.4	1543.8	1069.9	1026.9	995.3	970.2	932.0
MACH NUMBER	0.000	1.000	3.859	4.113	4.308	4.468	4.724

PERFORMANCE PARAMETERS

Ae/At	1.0000	25.000	35.000	45.000	55.000	75.000
CSTAR, M/SEC	2337.7	2337.7	2337.7	2337.7	2337.7	2337.7
CF	0.6604	1.7662	1.8066	1.8340	1.8543	1.8831
Ivac, M/SEC	2886.5	4351.8	4422.8	4470.9	4506.6	4557.2
Isp, M/SEC	1543.8	4128.9	4223.4	4287.4	4334.8	4402.2

MOLE FRACTIONS

*H	0.03057	0.02395	0.00001	0.00000	0.00000	0.00000	0.00000
HO2	0.00002	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000
*H2	0.29530	0.29490	0.30051	0.30052	0.30052	0.30052	0.30052
H2O	0.63969	0.65707	0.69948	0.69948	0.69948	0.69948	0.69948
H2O2	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
*O	0.00176	0.00100	0.00000	0.00000	0.00000	0.00000	0.00000
*OH	0.03119	0.02221	0.00000	0.00000	0.00000	0.00000	0.00000
*O2	0.00147	0.00087	0.00000	0.00000	0.00000	0.00000	0.00000

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

PRODUCTS WHICH WERE CONSIDERED BUT WHOSE MOLE FRACTIONS
WERE LESS THAN 5.000000E-06 FOR ALL ASSIGNED CONDITIONS

O3 H2O(cr) H2O(L)

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION
AFTER POINT 2

Pin = 1087.8 PSIA
CASE = 9

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2(L)	1.0000000	-9012.000	20.270
OXIDANT	O2(L)	1.0000000	-12979.000	90.170

O/F= 5.55157 %FUEL= 15.263517 R,EQ.RATIO= 1.429629 PHI,EQ.RATIO= 1.429629

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7410	292.49	460.44	646.20	847.16	1288.03
P, BAR	75.000	43.077	0.25642	0.16289	0.11606	0.08853	0.05823
T, K	3416.42	3210.46	1253.31	1138.15	1057.22	995.64	905.68
RHO, KG/CU M	3.3681 0	2.0782 0	3.1688-2	2.2166-2	1.7003-2	1.3772-2	9.9577-3
H, KJ/KG	-1026.05	-2217.68	-9226.56	-9576.68	-9816.80	-9996.21	-10253.2
U, KJ/KG	-3252.81	-4290.53	-10035.8	-10311.5	-10499.4	-10639.1	-10838.0
G, KJ/KG	-64010.6	-61405.1	-32332.2	-30559.4	-29307.5	-28351.6	-26950.2

S, KJ/(KG)(K)	18.4358	18.4358	18.4358	18.4358	18.4358	18.4358	18.4358
M, (1/n)	12.757	12.878	12.878	12.878	12.878	12.878	12.878
Cp, KJ/(KG)(K)	7.8703	7.0795	3.0831	2.9974	2.9365	2.8908	2.8239
GAMMAs	1.1473	1.1498	1.2649	1.2745	1.2818	1.2876	1.2964
SON VEL,M/SEC	1598.4	1543.8	1011.7	967.8	935.4	909.8	870.7
MACH NUMBER	0.000	1.000	4.003	4.273	4.483	4.656	4.934

PERFORMANCE PARAMETERS

Ae/At	1.0000	25.000	35.000	45.000	55.000	75.000
CSTAR, M/SEC	2337.7	2337.7	2337.7	2337.7	2337.7	2337.7
CF	0.6604	1.7324	1.7690	1.7936	1.8119	1.8376
Ivac, M/SEC	2886.5	4249.6	4313.1	4355.8	4387.4	4432.0
Isp, M/SEC	1543.8	4049.8	4135.4	4193.0	4235.6	4295.9

MOLE FRACTIONS

*H	0.02395	HO2	0.00001	*H2	0.29490
H2O	0.65707	*O	0.00100	*OH	0.02221
*O2	0.00087				

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

PRODUCTS WHICH WERE CONSIDERED BUT WHOSE MOLE FRACTIONS
WERE LESS THAN 5.000000E-06 FOR ALL ASSIGNED CONDITIONS

O3 H2O(cr) H2O(L)

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS

POINT	ITN	T	H	O
1	3	3428.058	-9.052	-16.479
Pinf/Pt = 1.739924				
2	4	3219.587	-9.215	-16.898
Pinf/Pt = 1.741713				
2	2	3219.204	-9.215	-16.899
3	5	1436.066	-10.446	-27.049
3	2	1460.522	-10.427	-26.725
4	3	1359.514	-10.506	-28.140
4	2	1336.301	-10.525	-28.497
5	3	1226.573	-10.617	-30.373
5	2	1248.486	-10.598	-29.971
6	3	1202.649	-10.638	-30.830
6	2	1181.296	-10.657	-31.253
7	3	1062.683	-10.768	-33.925
7	2	1082.426	-10.749	-33.438

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THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1232.8 PSIA
CASE = 9

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2(L)	1.0000000	-9012.000	20.270
OXIDANT	O2(L)	1.0000000	-12979.000	90.170

O/F= 5.55157 %FUEL= 15.263517 R,EQ.RATIO= 1.429629 PHI,EQ.RATIO= 1.429629

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7417	262.75	411.22	574.46	750.24	1133.83
P, BAR	85.000	48.803	0.32350	0.20670	0.14797	0.11330	0.07497
T, K	3428.06	3219.20	1460.52	1336.30	1248.49	1181.30	1082.43
RHO, KG/CU M	3.8086 0	2.3502 0	3.5184-2	2.4570-2	1.8826-2	1.5235-2	1.1001-2
H, KJ/KG	-1026.05	-2220.91	-9556.09	-9950.27	-10222.2	-10426.3	-10720.5
U, KJ/KG	-3257.82	-4297.43	-10475.6	-10791.5	-11008.2	-11170.0	-11401.9
G, KJ/KG	-63945.6	-61307.1	-36362.9	-34477.1	-33137.2	-32108.2	-30587.6
S, KJ/(KG)(K)	18.3543	18.3543	18.3543	18.3543	18.3543	18.3543	18.3543
M, (1/n)	12.771	12.890	13.207	13.207	13.207	13.207	13.207
(dLV/dLP)t	-1.01771	-1.01277	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000
(dLV/dLT)p	1.3188	1.2441	1.0001	1.0000	1.0000	1.0000	1.0000
Cp, KJ/(KG)(K)	7.7120	6.9413	3.2174	3.1288	3.0638	3.0128	2.9368
GAMMAs	1.1482	1.1508	1.2433	1.2519	1.2586	1.2642	1.2728
SON VEL,M/SEC	1600.8	1545.9	1069.2	1026.2	994.6	969.6	931.3
MACH NUMBER	0.000	1.000	3.863	4.117	4.312	4.472	4.728

PERFORMANCE PARAMETERS

Ae/At	1.0000	25.000	35.000	45.000	55.000	75.000
CSTAR, M/SEC	2339.6	2339.6	2339.6	2339.6	2339.6	2339.6
CF	0.6607	1.7654	1.8058	1.8331	1.8533	1.8821
Ivac, M/SEC	2889.1	4353.0	4423.9	4471.9	4507.5	4558.0
Isp, M/SEC	1545.9	4130.4	4224.7	4288.6	4336.0	4403.3

MOLE FRACTIONS

*H	0.02952	0.02304	0.00001	0.00000	0.00000	0.00000	0.00000
HO2	0.00002	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000
*H2	0.29548	0.29510	0.30051	0.30052	0.30052	0.30052	0.30052
H2O	0.64155	0.65859	0.69948	0.69948	0.69948	0.69948	0.69948
H2O2	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
*O	0.00165	0.00093	0.00000	0.00000	0.00000	0.00000	0.00000
*OH	0.03039	0.02153	0.00000	0.00000	0.00000	0.00000	0.00000
*O2	0.00138	0.00081	0.00000	0.00000	0.00000	0.00000	0.00000

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

PRODUCTS WHICH WERE CONSIDERED BUT WHOSE MOLE FRACTIONS
WERE LESS THAN 5.000000E-06 FOR ALL ASSIGNED CONDITIONS

O3 H2O(cr) H2O(L)

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION
AFTER POINT 2

Pin = 1232.8 PSIA
CASE = 9

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2(L)	1.0000000	-9012.000	20.270
OXIDANT	O2(L)	1.0000000	-12979.000	90.170

O/F= 5.55157 %FUEL= 15.263517 R,EQ.RATIO= 1.429629 PHI,EQ.RATIO= 1.429629

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7417	291.90	459.41	644.64	844.99	1284.45
P, BAR	85.000	48.803	0.29120	0.18502	0.13186	0.10059	0.06618
T, K	3428.06	3219.20	1259.41	1144.00	1062.86	1001.11	910.88
RHO, KG/CU M	3.8086 0	2.3502 0	3.5845-2	2.5073-2	1.9233-2	1.5578-2	1.1263-2
H, KJ/KG	-1026.05	-2220.91	-9244.53	-9595.88	-9836.91	-10017.0	-10275.1
U, KJ/KG	-3257.82	-4297.43	-10056.9	-10333.8	-10522.5	-10662.8	-10862.7
G, KJ/KG	-63945.6	-61307.1	-32360.1	-30593.1	-29344.9	-28391.6	-26993.6
S, KJ/(KG)(K)	18.3543	18.3543	18.3543	18.3543	18.3543	18.3543	18.3543
M, (1/n)	12.771	12.890	12.890	12.890	12.890	12.890	12.890
Cp, KJ/(KG)(K)	7.7120	6.9413	3.0870	3.0011	2.9400	2.8942	2.8269
GAMMAs	1.1482	1.1508	1.2642	1.2738	1.2811	1.2868	1.2956
SON VEL,M/SEC	1600.8	1545.9	1013.4	969.5	937.2	911.6	872.5
MACH NUMBER	0.000	1.000	4.001	4.270	4.479	4.652	4.929

PERFORMANCE PARAMETERS

Ae/At	1.0000	25.000	35.000	45.000	55.000	75.000
CSTAR, M/SEC	2339.6	2339.6	2339.6	2339.6	2339.6	2339.6
CF	0.6607	1.7329	1.7695	1.7943	1.8125	1.8383
Ivac, M/SEC	2889.1	4254.6	4318.2	4361.1	4392.8	4437.6
Isp, M/SEC	1545.9	4054.3	4140.0	4197.8	4240.5	4300.9

MOLE FRACTIONS

*H	0.02304	HO2	0.00001	*H2	0.29510
H2O	0.65859	*O	0.00093	*OH	0.02153
*O2	0.00081				

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

PRODUCTS WHICH WERE CONSIDERED BUT WHOSE MOLE FRACTIONS
WERE LESS THAN 5.000000E-06 FOR ALL ASSIGNED CONDITIONS

O3 H2O(cr) H2O(L)

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS

POINT	ITN	T	H	O
1	3	3438.247	-9.001	-16.457
Pinf/Pt = 1.740446				
2	4	3227.217	-9.163	-16.879
Pinf/Pt = 1.742304				
2	2	3226.815	-9.164	-16.880
3	5	1434.743	-10.389	-27.067
3	2	1458.840	-10.371	-26.747
4	3	1357.584	-10.450	-28.169
4	2	1334.718	-10.469	-28.522
5	3	1225.387	-10.561	-30.396
5	2	1246.975	-10.542	-29.999
6	3	1200.873	-10.582	-30.864
6	2	1179.842	-10.601	-31.282
7	3	1061.610	-10.712	-33.952
7	2	1081.057	-10.693	-33.471

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1377.9 PSIA
CASE = 9

REACTANT		WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2(L)	1.0000000	-9012.000	20.270
OXIDANT	O2(L)	1.0000000	-12979.000	90.170

O/F= 5.55157 %FUEL= 15.263517 R,EQ.RATIO= 1.429629 PHI,EQ.RATIO= 1.429629

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7423	263.32	412.11	575.70	751.86	1136.29
P, BAR	95.000	54.526	0.36078	0.23052	0.16502	0.12635	0.08361
T, K	3438.25	3226.82	1458.84	1334.72	1246.98	1179.84	1081.06
RHO, KG/CU M	4.2484 0	2.6218 0	3.9283-2	2.7434-2	2.1021-2	1.7011-2	1.2285-2
H, KJ/KG	-1026.05	-2223.74	-9561.51	-9955.22	-10226.8	-10430.7	-10724.5
U, KJ/KG	-3262.20	-4303.46	-10479.9	-10795.5	-11011.8	-11173.5	-11405.0
G, KJ/KG	-63883.7	-61216.1	-36231.9	-34356.4	-33023.9	-32000.5	-30488.2
S, KJ/(KG)(K)	18.2819	18.2819	18.2819	18.2819	18.2819	18.2819	18.2819
M, (1/n)	12.784	12.901	13.207	13.207	13.207	13.207	13.207
(dLV/dLP)t	-1.01716	-1.01232	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000
(dLV/dLT)p	1.3081	1.2351	1.0001	1.0000	1.0000	1.0000	1.0000
Cp, KJ/(KG)(K)	7.5752	6.8224	3.2160	3.1276	3.0626	3.0117	2.9358

GAMMAs	1.1491	1.1518	1.2435	1.2520	1.2587	1.2643	1.2730
SON VEL,M/SEC	1603.0	1547.7	1068.6	1025.7	994.1	969.0	930.8
MACH NUMBER	0.000	1.000	3.866	4.120	4.315	4.475	4.732

PERFORMANCE PARAMETERS

Ae/At	1.0000	25.000	35.000	45.000	55.000	75.000
CSTAR, M/SEC	2341.2	2341.2	2341.2	2341.2	2341.2	2341.2
CF	0.6611	1.7648	1.8050	1.8323	1.8524	1.8812
Ivac, M/SEC	2891.4	4354.0	4424.7	4472.7	4508.2	4558.7
Isp, M/SEC	1547.7	4131.7	4225.9	4289.7	4337.0	4404.2

MOLE FRACTIONS

*H	0.02861	0.02225	0.00001	0.00000	0.00000	0.00000	0.00000
HO2	0.00002	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000
*H2	0.29564	0.29527	0.30051	0.30052	0.30052	0.30052	0.30052
H2O	0.64318	0.65991	0.69948	0.69948	0.69948	0.69948	0.69948
H2O2	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
*O	0.00156	0.00087	0.00000	0.00000	0.00000	0.00000	0.00000
*OH	0.02968	0.02092	0.00000	0.00000	0.00000	0.00000	0.00000
*O2	0.00131	0.00076	0.00000	0.00000	0.00000	0.00000	0.00000

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

PRODUCTS WHICH WERE CONSIDERED BUT WHOSE MOLE FRACTIONS
WERE LESS THAN 5.000000E-06 FOR ALL ASSIGNED CONDITIONS

O3 H2O(cr) H2O(L)

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION
AFTER POINT 2

Pin = 1377.9 PSIA
CASE = 9

REACTANT		WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2(L)	1.0000000	-9012.000	20.270
OXIDANT	O2(L)	1.0000000	-12979.000	90.170

O/F= 5.55157 %FUEL= 15.263517 R,EQ.RATIO= 1.429629 PHI,EQ.RATIO= 1.429629

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7423	291.39	458.51	643.28	843.11	1281.34
P, BAR	95.000	54.526	0.32602	0.20719	0.14768	0.11268	0.07414
T, K	3438.25	3226.82	1264.74	1149.09	1067.78	1005.88	915.42
RHO, KG/CU M	4.2484 0	2.6218 0	3.9996-2	2.7976-2	2.1459-2	1.7381-2	1.2566-2
H, KJ/KG	-1026.05	-2223.74	-9260.15	-9612.58	-9854.39	-10035.1	-10294.1
U, KJ/KG	-3262.20	-4303.46	-10075.3	-10353.2	-10542.6	-10683.4	-10884.1

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G, KJ/KG	-63883.7	-61216.1	-32382.0	-30620.2	-29375.4	-28424.5	-27029.7
S, KJ/(KG)(K)	18.2819	18.2819	18.2819	18.2819	18.2819	18.2819	18.2819
M, (1/n)	12.784	12.901	12.901	12.901	12.901	12.901	12.901
Cp, KJ/(KG)(K)	7.5752	6.8224	3.0903	3.0044	2.9431	2.8970	2.8295
GAMMAs	1.1491	1.1518	1.2635	1.2731	1.2804	1.2861	1.2950
SON VEL,M/SEC	1603.0	1547.7	1014.9	971.0	938.7	913.1	874.1
MACH NUMBER	0.000	1.000	3.999	4.268	4.476	4.649	4.926

PERFORMANCE PARAMETERS

Ae/At	1.0000	25.000	35.000	45.000	55.000	75.000
CSTAR, M/SEC	2341.2	2341.2	2341.2	2341.2	2341.2	2341.2
CF	0.6611	1.7333	1.7700	1.7948	1.8131	1.8389
Ivac, M/SEC	2891.4	4259.0	4322.8	4365.8	4397.5	4442.4
Isp, M/SEC	1547.7	4058.1	4144.0	4202.0	4244.8	4305.4

MOLE FRACTIONS

*H	0.02225	HO2	0.00001	*H2	0.29527
H2O	0.65991	*O	0.00087	*OH	0.02092
*O2	0.00076				

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

PRODUCTS WHICH WERE CONSIDERED BUT WHOSE MOLE FRACTIONS
WERE LESS THAN 5.000000E-06 FOR ALL ASSIGNED CONDITIONS

O3	H2O(cr)	H2O(L)

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS

POINT	ITN	T	H	O
1	3	3459.163	-8.895	-16.412
Pinf/Pt = 1.741542				
2	4	3242.739	-9.055	-16.841
Pinf/Pt = 1.743542				
2	2	3242.297	-9.055	-16.842
3	5	1432.074	-10.271	-27.103
3	2	1455.474	-10.253	-26.791
4	3	1353.745	-10.333	-28.228
4	2	1331.551	-10.351	-28.572
5	3	1222.995	-10.442	-30.440
5	2	1243.953	-10.424	-30.053
6	3	1197.343	-10.465	-30.933
6	2	1176.932	-10.483	-31.342
7	3	1059.444	-10.593	-34.006
7	2	1078.318	-10.575	-33.538

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1740.5 PSIA
CASE = 9

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2(L)	1.0000000	-9012.000	20.270
OXIDANT	O2(L)	1.0000000	-12979.000	90.170

O/F= 5.55157 %FUEL= 15.263517 R,EQ.RATIO= 1.429629 PHI,EQ.RATIO= 1.429629

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7435	264.46	413.90	578.19	755.12	1141.24
P, BAR	120.00	68.825	0.45375	0.28993	0.20754	0.15891	0.10515
T, K	3459.16	3242.30	1455.47	1331.55	1243.95	1176.93	1078.32
RHO, KG/CU M	5.3450 0	3.2991 0	4.9520-2	3.4586-2	2.6502-2	2.1448-2	1.5489-2
H, KJ/KG	-1026.05	-2229.55	-9572.35	-9965.13	-10236.1	-10439.5	-10732.5
U, KJ/KG	-3271.14	-4315.73	-10488.6	-10803.4	-11019.2	-11180.4	-11411.4
G, KJ/KG	-63741.1	-61012.8	-35960.3	-34106.3	-32789.1	-31777.4	-30282.6
S, KJ/(KG)(K)	18.1301	18.1301	18.1301	18.1301	18.1301	18.1301	18.1301
M, (1/n)	12.811	12.922	13.207	13.207	13.207	13.207	13.207
(dLV/dLP)t	-1.01603	-1.01141	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000
(dLV/dLT)p	1.2864	1.2168	1.0001	1.0000	1.0000	1.0000	1.0000
Cp, KJ/(KG)(K)	7.2995	6.5841	3.2134	3.1252	3.0603	3.0095	2.9337
GAMMAs	1.1509	1.1538	1.2437	1.2523	1.2590	1.2645	1.2732
SON VEL,M/SEC	1607.4	1551.5	1067.5	1024.6	992.9	967.9	929.7
MACH NUMBER	0.000	1.000	3.873	4.127	4.322	4.483	4.739

PERFORMANCE PARAMETERS

Ae/At	1.0000	25.000	35.000	45.000	55.000	75.000
CSTAR, M/SEC	2344.5	2344.5	2344.5	2344.5	2344.5	2344.5
CF	0.6617	1.7634	1.8035	1.8306	1.8507	1.8793
Ivac, M/SEC	2896.1	4355.9	4426.5	4474.3	4509.7	4560.1
Isp, M/SEC	1551.4	4134.3	4228.3	4291.9	4339.0	4406.0

MOLE FRACTIONS

*H	0.02674	0.02065	0.00001	0.00000	0.00000	0.00000	0.00000
HO2	0.00002	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000
*H2	0.29596	0.29563	0.30051	0.30052	0.30052	0.30052	0.30052
H2O	0.64655	0.66263	0.69948	0.69948	0.69948	0.69948	0.69948
H2O2	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
*O	0.00138	0.00076	0.00000	0.00000	0.00000	0.00000	0.00000
*OH	0.02818	0.01966	0.00000	0.00000	0.00000	0.00000	0.00000
*O2	0.00116	0.00066	0.00000	0.00000	0.00000	0.00000	0.00000

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

PRODUCTS WHICH WERE CONSIDERED BUT WHOSE MOLE FRACTIONS
WERE LESS THAN 5.000000E-06 FOR ALL ASSIGNED CONDITIONS

O3 H2O(cr) H2O(L)

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION
AFTER POINT 2

Pin = 1740.5 PSIA
CASE = 9

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	H2(L)	1.0000000	-9012.000	20.270
OXIDANT	O2(L)	1.0000000	-12979.000	90.170

O/F= 5.55157 %FUEL= 15.263517 R,EQ.RATIO= 1.429629 PHI,EQ.RATIO= 1.429629

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7435	290.35	456.69	640.53	839.29	1275.05
P, BAR	120.00	68.825	0.41329	0.26276	0.18735	0.14298	0.09411
T, K	3459.16	3242.30	1275.60	1159.50	1077.82	1015.63	924.69
RHO, KG/CU M	5.3450 0	3.2991 0	5.0354-2	3.5220-2	2.7014-2	2.1879-2	1.5818-2
H, KJ/KG	-1026.05	-2229.55	-9291.86	-9646.48	-9889.89	-10071.9	-10332.8
U, KJ/KG	-3271.14	-4315.73	-10112.6	-10392.5	-10583.4	-10725.4	-10927.7
G, KJ/KG	-63741.1	-61012.8	-32418.7	-30668.4	-29431.0	-28485.4	-27097.5
S, KJ/(KG)(K)	18.1301	18.1301	18.1301	18.1301	18.1301	18.1301	18.1301
M, (1/n)	12.811	12.922	12.922	12.922	12.922	12.922	12.922
Cp, KJ/(KG)(K)	7.2995	6.5841	3.0972	3.0110	2.9493	2.9028	2.8348
GAMMAs	1.1509	1.1538	1.2622	1.2718	1.2790	1.2848	1.2936
SON VEL,M/SEC	1607.4	1551.5	1017.8	974.1	941.8	916.3	877.3
MACH NUMBER	0.000	1.000	3.995	4.263	4.471	4.642	4.918

PERFORMANCE PARAMETERS

Ae/At	1.0000	25.000	35.000	45.000	55.000	75.000
CSTAR, M/SEC	2344.5	2344.5	2344.5	2344.5	2344.5	2344.5
CF	0.6617	1.7342	1.7711	1.7959	1.8142	1.8402
Ivac, M/SEC	2896.1	4267.8	4331.9	4375.1	4407.1	4452.2
Isp, M/SEC	1551.4	4065.9	4152.2	4210.4	4253.4	4314.3

MOLE FRACTIONS

*H	0.02065	HO2	0.00001	*H2	0.29563
H2O	0.66263	*O	0.00076	*OH	0.01966
*O2	0.00066				

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

PRODUCTS WHICH WERE CONSIDERED BUT WHOSE MOLE FRACTIONS
WERE LESS THAN 5.000000E-06 FOR ALL ASSIGNED CONDITIONS

O3 H2O(cr) H2O(L)

NOTE. WEIGHT FRACTION OF FUEL IN TOTAL FUELS AND OF OXIDANT IN TOTAL OXIDANTS