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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    o/f=1,2,3,
       rocket  equilibrium  frozen  nfz=3  tcest,k=3800
   p,bar=70,80,90,100,
   sup,ae/at=15,25,35,45,
 react
   fuel=C2H5OH(L) wt=1  t,k=300
   oxid=H2O2(L) wt=.85  t,k=300
   name=H2O(L) wt=.15  t,k=300
 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 =    70.000000    80.000000    90.000000   100.000000

 Pc/P =

 SUBSONIC AREA RATIOS =

 SUPERSONIC AREA RATIOS =    15.0000    25.0000    35.0000    45.0000

 NFZ=  3  Mdot/Ac= 0.000000E+00  Ac/At= 0.000000E+00

    REACTANT          WT.FRAC   (ENERGY/R),K   TEMP,K  DENSITY
        EXPLODED FORMULA
 F: C2H5OH(L)        0.869565  -0.333515E+05   300.00  0.0000
          C  2.00000  H  6.00000  O  1.00000
 O: H2O2(L)          1.000000  -0.225647E+05   300.00  0.0000
          H  2.00000  O  2.00000
 N: H2O(L)           0.130435  -0.343605E+05   300.00  0.0000
          H  2.00000  O  1.00000

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

  g 7/97  *C               tpis79  *CH              g 4/02  CH2
  g 4/02  CH3              g11/00  CH2OH            g 7/00  CH3O
  g 8/99  CH4              g 7/00  CH3OH           srd 01  CH3OOH
  tpis79  *CO              g 9/99  *CO2             tpis91  COOH
  tpis91  *C2              g 6/01  C2H             g 1/91  C2H2,acetylene
  g 5/01  C2H2,vinylidene  g 4/02  CH2CO,ketene    g 3/02  O(CH)2O
```

srd 01	HO(CO)2OH	g 7/01	C2H3,vinyl	g 6/96	CH3CO,acetyl
g 1/00	C2H4	g 8/88	C2H4O,ethylen-o	g 8/88	CH3CHO,ethanal
g 6/00	CH3COOH	srd 01	OHCH2COOH	g 7/00	C2H5
g 7/00	C2H6	g 8/88	C2H5OH	g 7/00	CH3OCH3
srd 01	CH3O2CH3	g 8/00	C2O	tpis79	*C3
n 4/98	C3H3,1-propynl	n 4/98	C3H3,2-propynl	g 2/00	C3H4,allene
g 1/00	C3H4,propyne	g 5/90	C3H4,cyclo-	g 3/01	C3H5,allyl
g 2/00	C3H6,propylene	g 1/00	C3H6,cyclo-	g 6/01	C3H6O,propylox
g 6/97	C3H6O,acetone	g 1/02	C3H6O,propanal	g 7/01	C3H7,n-propyl
g 9/85	C3H7,i-propyl	g 2/00	C3H8	g 2/00	C3H8O,1propanol
g 2/00	C3H8O,2propanol	g 7/88	C3O2	g tpis	*C4
g 7/01	C4H2,butadiyne	g 8/00	C4H4,1,3-cyclo-	n10/92	C4H6,butadiene
n10/93	C4H6,1butyne	n10/93	C4H6,2butyne	g 8/00	C4H6,cyclo-
n 4/88	C4H8,1-butene	n 4/88	C4H8,cis2-buten	n 4/88	C4H8,tr2-butene
n 4/88	C4H8,isobutene	g 8/00	C4H8,cyclo-	g10/00	(CH3COOH)2
n10/84	C4H9,n-butyl	n10/84	C4H9,i-butyl	g 1/93	C4H9,s-butyl
g 1/93	C4H9,t-butyl	g12/00	C4H10,n-butane	g 8/00	C4H10,isobutane
g 8/00	*C5	g 5/90	C5H6,1,3cyclo-	g 1/93	C5H8,cyclo-
n 4/87	C5H10,1-pentene	g 2/01	C5H10,cyclo-	n10/84	C5H11,pentyl
g 1/93	C5H11,t-pentyl	n10/85	C5H12,n-pentane	n10/85	C5H12,i-pentane
n10/85	CH3C(CH3)2CH3	g 2/93	C6H2	g11/00	C6H5,phenyl
g 8/00	C6H5O,phenoxy	g 8/00	C6H6	g 8/00	C6H5OH,phenol
g 1/93	C6H10,cyclo-	n 4/87	C6H12,1-hexene	g 6/90	C6H12,cyclo-
n10/83	C6H13,n-hexyl	g 6/01	C6H14,n-hexane	g 7/01	C7H7,benzyl
g 1/93	C7H8	g12/00	C7H8O,cresol-mx	n 4/87	C7H14,1-heptene
n10/83	C7H15,n-heptyl	n10/85	C7H16,n-heptane	n10/85	C7H16,2-methylh
n 4/89	C8H8,styrene	n10/86	C8H10,ethylbenz	n 4/87	C8H16,1-octene
n10/83	C8H17,n-octyl	n 4/85	C8H18,n-octane	n 4/85	C8H18,isooctane
n10/83	C9H19,n-nonyl	g 3/01	C10H8,naphthale	n10/83	C10H21,n-decyl
g 8/00	C12H9,o-bipheny	g 8/00	C12H10,biphenyl	g 6/97	*H
g 1/01	HCO	g 6/01	HCCO	g 4/02	HO2
tpis78	*H2	g 5/01	HCHO,formaldehy	g 6/01	HCOOH
g 8/89	H2O	g 6/99	H2O2	g 6/01	(HCOOH)2
g 5/97	*O	g 4/02	*OH	tpis89	*O2
g 8/01	O3	n 4/83	C(gr)	n 4/83	C(gr)
n 4/83	C(gr)	g11/99	H2O(cr)	g 8/01	H2O(L)
g 8/01	H2O(L)				

O/F = 1.000000

	EFFECTIVE FUEL	EFFECTIVE OXIDANT	MIXTURE
ENTHALPY	h(2)/R	h(1)/R	h0/R
(KG-MOL)(K)/KG	-0.87830508E+03	-0.66338234E+03	-0.77084371E+03

KG-FORM.WT./KG	bi(2)	bi(1)	b0i
*C	0.37751016E-01	0.00000000E+00	0.18875508E-01
*H	0.12773351E+00	0.58798142E-01	0.93265827E-01
*O	0.26115739E-01	0.58798142E-01	0.42456941E-01

POINT	ITN	T	C	H	O
1	17	1230.508	-3.162	-7.388	-31.309
Pinf/Pt = 1.760974					
2	4	1149.938	-2.822	-7.590	-32.891
Pinf/Pt = 1.753031					
2	2	1150.536	-2.825	-7.588	-32.878
Pinf/Pt = 1.753086					
2	1	1150.532	-2.825	-7.588	-32.878

3	5	750.131	-1.208	-9.406	-45.743
3	3	765.411	-1.259	-9.305	-45.015
3	2	765.452	-1.260	-9.304	-45.013
4	4	722.460	-1.119	-9.599	-47.134
ADD	C(gr)				
4	1	722.487	-1.125	-9.599	-47.131
4	2	722.763	-1.126	-9.597	-47.116
5	4	696.380	-1.088	-9.789	-48.525
5	2	696.190	-1.088	-9.790	-48.536
6	3	676.676	-1.061	-9.940	-49.646
6	2	676.901	-1.061	-9.938	-49.633

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1015.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 1.00000 %FUEL= 50.000000 R,EQ.RATIO= 1.987518 PHI,EQ.RATIO= 3.852266

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7531	114.35	215.10	324.47	440.40
P, BAR	70.000	39.930	0.61214	0.32543	0.21574	0.15895
T, K	1230.51	1150.53	765.45	722.76	696.19	676.90
RHO, KG/CU M	1.1141 1	6.9140 0	1.8113-1	1.0391-1	7.2348-2	5.5298-2
H, KJ/KG	-6409.19	-6747.31	-8598.76	-8804.35	-8929.99	-9019.44
U, KJ/KG	-7037.48	-7324.83	-8936.71	-9117.53	-9228.19	-9306.87
G, KJ/KG	-21260.7	-20633.6	-17837.3	-17527.7	-17332.6	-17189.2
S, KJ/(KG)(K)	12.0694	12.0694	12.0694	12.0694	12.0694	12.0694
M, (1/n)	16.284	16.564	18.832	19.188	19.412	19.580
MW, MOL WT	16.284	16.564	18.832	19.167	19.230	19.287
(dLV/dLP)t	-1.06957	-1.07641	-1.06450	-1.05909	-1.05539	-1.05268
(dLV/dLT)p	1.7960	1.9327	2.0410	1.9619	1.9129	1.8781
Cp, KJ/(KG)(K)	7.3519	8.4302	9.9433	9.3840	8.9412	8.6409
GAMMAs	1.1827	1.1710	1.1370	1.1346	1.1362	1.1372
SON VEL,M/SEC	862.0	822.3	619.9	596.1	582.1	571.7
MACH NUMBER	0.000	1.000	3.376	3.672	3.857	3.996

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1231.2	1231.2	1231.2	1231.2	1231.2
CF	0.6679	1.6997	1.7777	1.8238	1.8558
Ivac, M/SEC	1524.6	2254.1	2331.8	2378.2	2410.6
Isp, M/SEC	822.3	2092.6	2188.7	2245.4	2284.8

MOLE FRACTIONS

CH4	0.03336	0.04254	0.11683	0.12781	0.12988	0.13171
*CO	0.17459	0.15630	0.03144	0.02032	0.01424	0.01073
*CO2	0.09940	0.11381	0.20719	0.21257	0.20952	0.20659
*H2	0.37469	0.36801	0.29081	0.26988	0.25384	0.24102
H2O	0.31795	0.31934	0.35372	0.36833	0.38318	0.39494
C(gr)	0.00000	0.00000	0.00000	0.00109	0.00934	0.01501

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz
C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane	C9H19,n-nonyl
C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl	*H
HCO	HCCO	HO2	HCHO,formaldehy	HCOOH
H2O2	(HCOOH)2	*O	*OH	*O2
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 3

Pin = 1015.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000

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NAME H2O(L) 0.1304348 -285690.685 300.000

O/F= 1.00000 %FUEL= 50.000000 R,EQ.RATIO= 1.987518 PHI,EQ.RATIO= 3.852266

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7531	114.35	231.51	367.20	517.77
P, BAR	70.000	39.930	0.61214	0.30236	0.19063	0.13520
T, K	1230.51	1150.53	765.45	661.31	599.04	555.55
RHO, KG/CU M	1.1141 1	6.9140 0	1.8113-1	1.0356-1	7.2078-2	5.5119-2
H, KJ/KG	-6409.19	-6747.31	-8598.76	-8820.63	-8948.89	-9036.44
U, KJ/KG	-7037.48	-7324.83	-8936.71	-9112.60	-9213.37	-9281.72
G, KJ/KG	-21260.7	-20633.6	-17837.3	-16802.3	-16179.0	-15741.6
S, KJ/(KG)(K)	12.0694	12.0694	12.0694	12.0694	12.0694	12.0694
M, (1/n)	16.284	16.564	18.832	18.832	18.832	18.832
MW, MOL WT	16.284	16.564	18.832	18.832	18.832	18.832
Cp, KJ/(KG)(K)	7.3519	8.4302	9.9433	2.0867	2.0325	1.9937
GAMMAs	1.1827	1.1710	1.1370	1.2684	1.2775	1.2844
SON VEL,M/SEC	862.0	822.3	619.9	608.5	581.3	561.3
MACH NUMBER	0.000	1.000	3.376	3.609	3.877	4.084

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1231.2	1231.2	1231.2	1231.2	1231.2
CF	0.6679	1.6997	1.7838	1.8306	1.8619
Ivac, M/SEC	1524.6	2254.1	2329.1	2371.1	2399.3
Isp, M/SEC	822.3	2092.6	2196.1	2253.8	2292.3

MOLE FRACTIONS

CH4	0.11683	*CO	0.03144	*CO2	0.20719
*H2	0.29081	H2O	0.35372		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene

FileEditor:xEx9.out

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 C7H15,n-heptyl  C7H16,n-heptane C7H16,2-methylh C8H8,styrene    C8H10,ethylbenz
 C8H16,1-octene  C8H17,n-octyl   C8H18,n-octane  C8H18,isooctane C9H19,n-nonyl
 C10H8,naphthale C10H21,n-decyl  C12H9,o-bipheny C12H10,biphenyl *H
 HCO             HCCO            HO2             HCHO,formaldehy HCOOH
 H2O2            (HCOOH)2        *O              *OH             *O2
 O3              H2O(cr)         H2O(L)

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

POINT	ITN	T	C	H	O
1	3	1239.669	-3.164	-7.338	-31.117
Pinf/Pt = 1.761054					
2	4	1158.358	-2.830	-7.539	-32.688
Pinf/Pt = 1.753276					
2	2	1158.950	-2.833	-7.538	-32.676
Pinf/Pt = 1.753328					
2	1	1158.946	-2.833	-7.538	-32.676
3	5	753.951	-1.223	-9.354	-45.519
3	3	769.306	-1.275	-9.253	-44.795
3	2	769.347	-1.275	-9.253	-44.794
4	4	725.855	-1.134	-9.548	-46.917
4	2	726.127	-1.134	-9.546	-46.903
5	3	699.243	-1.053	-9.742	-48.337
ADD C(gr)					
5	2	699.350	-1.093	-9.740	-48.320
5	2	699.240	-1.092	-9.740	-48.326
6	3	679.589	-1.065	-9.890	-49.434
6	2	679.736	-1.065	-9.889	-49.425

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1160.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 1.00000 %FUEL= 50.000000 R,EQ.RATIO= 1.987518 PHI,EQ.RATIO= 3.852266

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7533	114.56	215.58	325.26	441.53
P, BAR	80.000	45.628	0.69835	0.37110	0.24596	0.18119
T, K	1239.67	1158.95	769.35	726.13	699.24	679.74

RHO, KG/CU M	1.2682 1	7.8703 0	2.0626-1	1.1833-1	8.2390-2	6.2976-2
H, KJ/KG	-6409.19	-6748.72	-8606.42	-8812.50	-8938.37	-9027.94
U, KJ/KG	-7039.98	-7328.46	-8945.00	-9126.12	-9236.90	-9315.65
G, KJ/KG	-21286.9	-20657.6	-17839.6	-17527.0	-17330.2	-17185.7
S, KJ/(KG)(K)	12.0013	12.0013	12.0013	12.0013	12.0013	12.0013
M, (1/n)	16.340	16.621	18.893	19.251	19.475	19.643
MW, MOL WT	16.340	16.621	18.893	19.251	19.328	19.383
(dLV/dLP)t	-1.07120	-1.07747	-1.06390	-1.05791	-1.05468	-1.05194
(dLV/dLT)p	1.8087	1.9391	2.0271	1.9539	1.8979	1.8626
Cp, KJ/(KG)(K)	7.3742	8.4064	9.7842	9.1924	8.7877	8.4855
GAMMAs	1.1828	1.1713	1.1376	1.1383	1.1368	1.1378
SON VEL,M/SEC	863.8	824.1	620.6	597.5	582.5	572.2
MACH NUMBER	0.000	1.000	3.378	3.669	3.861	4.000

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1233.5	1233.5	1233.5	1233.5	1233.5
CF	0.6681	1.6995	1.7774	1.8233	1.8553
Ivac, M/SEC	1527.6	2257.8	2335.5	2381.8	2414.3
Isp, M/SEC	824.1	2096.3	2192.4	2249.1	2288.6

MOLE FRACTIONS

CH4	0.03520	0.04441	0.11881	0.13054	0.13308	0.13487
*CO	0.17412	0.15591	0.03132	0.02030	0.01427	0.01074
*CO2	0.09910	0.11340	0.20647	0.21252	0.20994	0.20699
*H2	0.37015	0.36330	0.28554	0.26465	0.24870	0.23592
H2O	0.32143	0.32296	0.35785	0.37198	0.38647	0.39822
C(gr)	0.00000	0.00000	0.00000	0.00000	0.00755	0.01326

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz

FileEditor:xEx9.out

C8H16,1-octene C8H17,n-octyl C8H18,n-octane C8H18,isooctane C9H19,n-nonyl
C10H8,naphthale C10H21,n-decyl C12H9,o-bipheny C12H10,biphenyl *H
HCO HCCO HO2 HCHO,formaldehy HCOOH
H2O2 (HCOOH)2 *O *OH *O2
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 3

Pin = 1160.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 1.00000 %FUEL= 50.000000 R,EQ.RATIO= 1.987518 PHI,EQ.RATIO= 3.852266

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7533	114.56	231.74	367.40	517.88
P, BAR	80.000	45.628	0.69835	0.34521	0.21775	0.15448
T, K	1239.67	1158.95	769.35	665.12	602.75	559.16
RHO, KG/CU M	1.2682 1	7.8703 0	2.0626-1	1.1793-1	8.2087-2	6.2774-2
H, KJ/KG	-6409.19	-6748.72	-8606.42	-8828.54	-8957.02	-9044.76
U, KJ/KG	-7039.98	-7328.46	-8945.00	-9121.25	-9222.28	-9290.85
G, KJ/KG	-21286.9	-20657.6	-17839.6	-16810.9	-16190.8	-15755.5
S, KJ/(KG)(K)	12.0013	12.0013	12.0013	12.0013	12.0013	12.0013
M, (1/n)	16.340	16.621	18.893	18.893	18.893	18.893
MW, MOL WT	16.340	16.621	18.893	18.893	18.893	18.893
Cp, KJ/(KG)(K)	7.3742	8.4064	9.7842	2.0871	2.0326	1.9935
GAMMAs	1.1828	1.1713	1.1376	1.2672	1.2764	1.2833
SON VEL,M/SEC	863.8	824.1	620.6	609.0	581.9	562.0
MACH NUMBER	0.000	1.000	3.378	3.612	3.879	4.086

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1233.5	1233.5	1233.5	1233.5	1233.5
CF	0.6681	1.6995	1.7833	1.8300	1.8613
Ivac, M/SEC	1527.6	2257.8	2332.8	2374.9	2403.1
Isp, M/SEC	824.1	2096.3	2199.7	2257.4	2295.9

MOLE FRACTIONS

CH4	0.11881	*CO	0.03132	*CO2	0.20647
*H2	0.28554	H2O	0.35785		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz
C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane	C9H19,n-nonyl
C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl	*H
HCO	HCCO	HO2	HCHO,formaldehy	HCOOH
H2O2	(HCOOH)2	*O	*OH	*O2
O3	H2O(cr)	H2O(L)		

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

POINT	ITN	T	C	H	O
1	3	1247.876	-3.167	-7.293	-30.948
Pinf/Pt = 1.761138					
2	4	1165.879	-2.838	-7.495	-32.509
Pinf/Pt = 1.753497					
2	2	1166.465	-2.840	-7.493	-32.497
Pinf/Pt = 1.753548					
2	1	1166.461	-2.840	-7.493	-32.498
3	5	757.326	-1.237	-9.309	-45.322
3	3	772.748	-1.288	-9.208	-44.603
3	2	772.789	-1.288	-9.208	-44.601
4	4	728.848	-1.147	-9.503	-46.726
4	2	729.122	-1.147	-9.501	-46.712
5	4	701.959	-1.065	-9.698	-48.150
ADD C(gr)					
5	2	702.045	-1.096	-9.696	-48.136
5	2	701.921	-1.096	-9.697	-48.143
6	3	682.063	-1.068	-9.846	-49.253
6	2	682.224	-1.069	-9.845	-49.244

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1305.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 1.00000 %FUEL= 50.000000 R,EQ.RATIO= 1.987518 PHI,EQ.RATIO= 3.852266

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7535	114.74	215.97	325.97	442.54
P, BAR	90.000	51.325	0.78440	0.41673	0.27610	0.20337
T, K	1247.88	1166.46	772.79	729.12	701.92	682.22
RHO, KG/CU M	1.4218 1	8.8231 0	2.3129-1	1.3270-1	9.2399-2	7.0628-2
H, KJ/KG	-6409.19	-6749.97	-8613.18	-8819.65	-8945.76	-9035.45
U, KJ/KG	-7042.20	-7331.68	-8952.32	-9133.69	-9244.58	-9323.40
G, KJ/KG	-21310.7	-20679.3	-17841.4	-17526.5	-17327.8	-17182.2
S, KJ/(KG)(K)	11.9415	11.9415	11.9415	11.9415	11.9415	11.9415
M, (1/n)	16.391	16.673	18.946	19.304	19.531	19.699
MW, MOL WT	16.391	16.673	18.946	19.304	19.415	19.469
(dLV/dLP)t	-1.07255	-1.07833	-1.06334	-1.05729	-1.05403	-1.05125
(dLV/dLT)p	1.8188	1.9437	2.0145	1.9405	1.8845	1.8486
Cp, KJ/(KG)(K)	7.3857	8.3787	9.6432	9.0511	8.6517	8.3480
GAMMAs	1.1829	1.1717	1.1381	1.1388	1.1373	1.1383
SON VEL,M/SEC	865.3	825.6	621.3	598.0	582.9	572.5
MACH NUMBER	0.000	1.000	3.379	3.672	3.864	4.003

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1235.6	1235.6	1235.6	1235.6	1235.6
CF	0.6682	1.6992	1.7770	1.8229	1.8549
Ivac, M/SEC	1530.2	2261.1	2338.7	2385.0	2417.5
Isp, M/SEC	825.6	2099.5	2195.7	2252.4	2291.8

MOLE FRACTIONS

CH4	0.03685	0.04609	0.12057	0.13230	0.13593	0.13768
*CO	0.17367	0.15554	0.03120	0.02020	0.01428	0.01073
*CO2	0.09884	0.11306	0.20585	0.21188	0.21033	0.20737
*H2	0.36608	0.35911	0.28088	0.25998	0.24415	0.23140
H2O	0.32454	0.32619	0.36150	0.37564	0.38938	0.40111
C(gr)	0.00000	0.00000	0.00000	0.00000	0.00594	0.01170

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz
C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane	C9H19,n-nonyl
C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl	*H
HCO	HCCO	HO2	HCHO,formaldehy	HCOOH
H2O2	(HCOOH)2	*O	*OH	*O2
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 3

Pin = 1305.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 1.00000 %FUEL= 50.000000 R,EQ.RATIO= 1.987518 PHI,EQ.RATIO= 3.852266

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7535	114.74	231.95	367.57	517.98
P, BAR	90.000	51.325	0.78440	0.38801	0.24485	0.17375
T, K	1247.88	1166.46	772.79	668.49	606.03	562.36
RHO, KG/CU M	1.4218 1	8.8231 0	2.3129-1	1.3226-1	9.2065-2	7.0405-2
H, KJ/KG	-6409.19	-6749.97	-8613.18	-8835.51	-8964.19	-9052.09
U, KJ/KG	-7042.20	-7331.68	-8952.32	-9128.87	-9230.14	-9298.88
G, KJ/KG	-21310.7	-20679.3	-17841.4	-16818.3	-16201.1	-15767.5
S, KJ/(KG)(K)	11.9415	11.9415	11.9415	11.9415	11.9415	11.9415

M, (1/n)	16.391	16.673	18.946	18.946	18.946	18.946
MW, MOL WT	16.391	16.673	18.946	18.946	18.946	18.946
Cp, KJ/(KG)(K)	7.3857	8.3787	9.6432	2.0874	2.0327	1.9934
GAMMAs	1.1829	1.1717	1.1381	1.2662	1.2753	1.2823
SON VEL,M/SEC	865.3	825.6	621.3	609.5	582.4	562.5
MACH NUMBER	0.000	1.000	3.379	3.614	3.881	4.087

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1235.6	1235.6	1235.6	1235.6	1235.6
CF	0.6682	1.6992	1.7829	1.8295	1.8608
Ivac, M/SEC	1530.2	2261.1	2336.0	2378.2	2406.4
Isp, M/SEC	825.6	2099.5	2202.9	2260.5	2299.1

MOLE FRACTIONS

CH4	0.12057	*CO	0.03120	*CO2	0.20585
*H2	0.28088	H2O	0.36150		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz
C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane	C9H19,n-nonyl
C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl	*H
HCO	HCCO	HO2	HCHO,formaldehy	HCOOH
H2O2	(HCOOH)2	*O	*OH	*O2
O3	H2O(cr)	H2O(L)		

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

POINT	ITN	T	C	H	O
1	3	1255.316	-3.170	-7.254	-30.796
Pinf/Pt = 1.761222					
2	4	1172.679	-2.845	-7.455	-32.350
Pinf/Pt = 1.753698					
2	2	1173.261	-2.847	-7.453	-32.338
Pinf/Pt = 1.753747					
2	1	1173.257	-2.847	-7.453	-32.338
3	5	760.348	-1.249	-9.268	-45.147
3	3	775.830	-1.300	-9.168	-44.431
3	2	775.871	-1.300	-9.168	-44.429
4	4	731.522	-1.158	-9.463	-46.557
4	2	731.799	-1.159	-9.461	-46.543
5	4	704.381	-1.077	-9.658	-47.983
ADD C(gr)					
5	2	704.447	-1.100	-9.656	-47.973
5	2	704.311	-1.100	-9.657	-47.980
6	3	684.264	-1.071	-9.807	-49.093
6	2	684.438	-1.072	-9.806	-49.084

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1450.4 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 1.00000 %FUEL= 50.000000 R,EQ.RATIO= 1.987518 PHI,EQ.RATIO= 3.852266

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7537	114.90	216.32	326.61	443.45
P, BAR	100.00	57.021	0.87032	0.46227	0.30618	0.22551
T, K	1255.32	1173.26	775.87	731.80	704.31	684.44
RHO, KG/CU M	1.5748 1	9.7728 0	2.5626-1	1.4703-1	1.0238-1	7.8259-2
H, KJ/KG	-6409.19	-6751.09	-8619.24	-8826.04	-8952.38	-9042.16
U, KJ/KG	-7044.18	-7334.56	-8958.86	-9140.45	-9251.44	-9330.31
G, KJ/KG	-21332.6	-20698.9	-17842.9	-17525.8	-17325.3	-17178.8
S, KJ/(KG)(K)	11.8881	11.8881	11.8881	11.8881	11.8881	11.8881
M, (1/n)	16.437	16.719	18.994	19.352	19.581	19.749
MW, MOL WT	16.437	16.719	18.994	19.352	19.494	19.546
(dLV/dLP)t	-1.07369	-1.07905	-1.06283	-1.05671	-1.05343	-1.05062
(dLV/dLT)p	1.8268	1.9470	2.0030	1.9282	1.8722	1.8358
Cp, KJ/(KG)(K)	7.3898	8.3490	9.5168	8.9247	8.5295	8.2247
GAMMAs	1.1831	1.1720	1.1386	1.1393	1.1377	1.1388
SON VEL,M/SEC	866.7	826.9	621.8	598.5	583.3	572.8

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MACH NUMBER	0.000	1.000	3.381	3.673	3.866	4.006

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1237.4	1237.4	1237.4	1237.4	1237.4
CF	0.6683	1.6990	1.7767	1.8226	1.8545
Ivac, M/SEC	1532.5	2263.9	2341.6	2387.9	2420.3
Isp, M/SEC	826.9	2102.4	2198.6	2255.3	2294.8

MOLE FRACTIONS

CH4	0.03836	0.04761	0.12215	0.13387	0.13849	0.14022
*CO	0.17325	0.15518	0.03109	0.02010	0.01428	0.01073
*CO2	0.09862	0.11277	0.20530	0.21131	0.21069	0.20772
*H2	0.36240	0.35531	0.27670	0.25579	0.24007	0.22735
H2O	0.32735	0.32911	0.36477	0.37892	0.39198	0.40371
C(gr)	0.00000	0.00000	0.00000	0.00000	0.00449	0.01028

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz
C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane	C9H19,n-nonyl
C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl	*H
HCO	HCCO	HO2	HCHO,formaldehy	HCOOH
H2O2	(HCOOH)2	*O	*OH	*O2
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 3

Pin = 1450.4 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 1.00000 %FUEL= 50.000000 R,EQ.RATIO= 1.987518 PHI,EQ.RATIO= 3.852266

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7537	114.90	232.14	367.73	518.07
P, BAR	100.00	57.021	0.87032	0.43078	0.27194	0.19303
T, K	1255.32	1173.26	775.87	671.51	608.97	565.23
RHO, KG/CU M	1.5748 1	9.7728 0	2.5626-1	1.4655-1	1.0201-1	7.8015-2
H, KJ/KG	-6409.19	-6751.09	-8619.24	-8841.74	-8970.59	-9058.65
U, KJ/KG	-7044.18	-7334.56	-8958.86	-9135.69	-9237.16	-9306.07
G, KJ/KG	-21332.6	-20698.9	-17842.9	-16824.7	-16210.2	-15778.2
S, KJ/(KG)(K)	11.8881	11.8881	11.8881	11.8881	11.8881	11.8881
M, (1/n)	16.437	16.719	18.994	18.994	18.994	18.994
MW, MOL WT	16.437	16.719	18.994	18.994	18.994	18.994
Cp, KJ/(KG)(K)	7.3898	8.3490	9.5168	2.0878	2.0328	1.9934
GAMMAs	1.1831	1.1720	1.1386	1.2653	1.2744	1.2814
SON VEL,M/SEC	866.7	826.9	621.8	609.9	582.9	563.1
MACH NUMBER	0.000	1.000	3.381	3.617	3.883	4.088

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1237.4	1237.4	1237.4	1237.4	1237.4
CF	0.6683	1.6990	1.7825	1.8291	1.8603
Ivac, M/SEC	1532.5	2263.9	2339.0	2381.1	2409.4
Isp, M/SEC	826.9	2102.4	2205.7	2263.4	2301.9

MOLE FRACTIONS

CH4	0.12215	*CO	0.03109	*CO2	0.20530
*H2	0.27670	H2O	0.36477		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol

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C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz
C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane	C9H19,n-nonyl
C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl	*H
HCO	HCCO	HO2	HCHO,formaldehy	HCOOH
H2O2	(HCOOH)2	*O	*OH	*O2
O3	H2O(cr)	H2O(L)		

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

O/F = 2.000000

	EFFECTIVE FUEL	EFFECTIVE OXIDANT	MIXTURE
ENTHALPY	h(2)/R	h(1)/R	h0/R
(KG-MOL)(K)/KG	-0.87830508E+03	-0.66338234E+03	-0.73502325E+03

KG-FORM.WT./KG	bi(2)	bi(1)	b0i
*C	0.37751016E-01	0.00000000E+00	0.12583672E-01
*H	0.12773351E+00	0.58798142E-01	0.81776598E-01
*O	0.26115739E-01	0.58798142E-01	0.47904008E-01

POINT	ITN	T	C	H	O
1	9	2139.533	-11.239	-8.550	-20.573
Pinf/Pt = 1.775633					
2	3	1937.462	-10.824	-8.662	-21.912
Pinf/Pt = 1.778888					
2	2	1936.843	-10.823	-8.662	-21.917
3	8	872.084	-4.228	-9.580	-40.149
3	3	875.871	-4.276	-9.573	-40.005
4	4	792.659	-3.250	-9.775	-43.464
4	2	791.152	-3.232	-9.780	-43.533
5	4	747.456	-2.772	-9.949	-45.623
5	3	749.136	-2.788	-9.941	-45.539
6	4	723.602	-2.554	-10.064	-46.855
6	2	722.193	-2.542	-10.072	-46.930

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

FileEditor:xEx9.out

Pin = 1015.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 2.00000 %FUEL= 33.333333 R,EQ.RATIO= 1.378917 PHI,EQ.RATIO= 1.926133

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7789	145.07	279.79	425.81	580.10
P, BAR	70.000	39.350	0.48253	0.25019	0.16439	0.12067
T, K	2139.53	1936.84	875.87	791.15	749.14	722.19
RHO, KG/CU M	7.3579 0	4.5695 0	1.2415-1	7.1780-2	5.0229-2	3.8530-2
H, KJ/KG	-6111.36	-6633.00	-9252.15	-9493.75	-9635.57	-9734.56
U, KJ/KG	-7062.72	-7494.15	-9640.82	-9842.31	-9962.85	-10047.7
G, KJ/KG	-32485.2	-30508.3	-20048.9	-19246.2	-18870.1	-18637.0
S, KJ/(KG)(K)	12.3269	12.3269	12.3269	12.3269	12.3269	12.3269
M, (1/n)	18.699	18.701	18.737	18.873	19.032	19.173
MW, MOL WT	18.699	18.701	18.737	18.873	19.032	19.173
(dLV/dLP)t	-1.00008	-1.00003	-1.00363	-1.01477	-1.02369	-1.02903
(dLV/dLT)p	1.0020	1.0007	1.0529	1.2288	1.3777	1.4718
Cp, KJ/(KG)(K)	2.6056	2.5499	2.7505	3.9066	4.9126	5.5546
GAMMAs	1.2067	1.2115	1.2125	1.1842	1.1697	1.1629
SON VEL,M/SEC	1071.4	1021.4	686.5	642.4	618.7	603.5
MACH NUMBER	0.000	1.000	3.651	4.048	4.291	4.461

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1499.8	1499.8	1499.8	1499.8	1499.8
CF	0.6810	1.6711	1.7342	1.7702	1.7949
Ivac, M/SEC	1864.5	2661.4	2734.9	2778.2	2808.3
Isp, M/SEC	1021.4	2506.3	2600.9	2654.9	2691.9

MOLE FRACTIONS

CH4	0.00000	0.00000	0.00095	0.00458	0.00883	0.01261
*CO	0.14798	0.14177	0.04472	0.02880	0.02091	0.01625
*CO2	0.08732	0.09355	0.19011	0.20411	0.20974	0.21241
*H	0.00021	0.00007	0.00000	0.00000	0.00000	0.00000
*H2	0.19137	0.19765	0.29159	0.29547	0.28922	0.28132
H2O	0.57303	0.56693	0.47263	0.46704	0.47129	0.47741
*OH	0.00009	0.00002	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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O

HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz
C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane	C9H19,n-nonyl
C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl	HCO
HCCO	HO2	HCHO,formaldehy	HCOOH	H2O2
(HCOOH)2	*O	*O2	O3	C(gr)
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 3

Pin = 1015.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 2.00000 %FUEL= 33.333333 R,EQ.RATIO= 1.378917 PHI,EQ.RATIO= 1.926133

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7789	145.07	292.66	463.57	653.15
P, BAR	70.000	39.350	0.48253	0.23919	0.15100	0.10717
T, K	2139.53	1936.84	875.87	752.20	678.97	628.21
RHO, KG/CU M	7.3579 0	4.5695 0	1.2415-1	7.1659-2	5.0118-2	3.8445-2
H, KJ/KG	-6111.36	-6633.00	-9252.15	-9505.28	-9651.23	-9750.63
U, KJ/KG	-7062.72	-7494.15	-9640.82	-9839.07	-9952.52	-10029.4
G, KJ/KG	-32485.2	-30508.3	-20048.9	-18777.6	-18020.8	-17494.5
S, KJ/(KG)(K)	12.3269	12.3269	12.3269	12.3269	12.3269	12.3269
M, (1/n)	18.699	18.701	18.737	18.737	18.737	18.737
MW, MOL WT	18.699	18.701	18.737	18.737	18.737	18.737
Cp, KJ/(KG)(K)	2.6056	2.5499	2.7505	2.0132	1.9726	1.9440
GAMMAs	1.2067	1.2115	1.2125	1.2827	1.2902	1.2958
SON VEL,M/SEC	1071.4	1021.4	686.5	654.3	623.5	601.0

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MACH NUMBER	0.000	1.000	3.651	3.982	4.268	4.489

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1499.8	1499.8	1499.8	1499.8	1499.8
CF	0.6810	1.6711	1.7372	1.7741	1.7989
Ivac, M/SEC	1864.5	2661.4	2733.5	2774.0	2801.2
Isp, M/SEC	1021.4	2506.3	2605.3	2660.8	2697.9

MOLE FRACTIONS

CH4	0.00095	*CO	0.04472	*CO2	0.19011
*H2	0.29159	H2O	0.47263		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz
C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane	C9H19,n-nonyl
C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl	HCO
HCCO	HO2	HCHO,formaldehy	HCOOH	H2O2
(HCOOH)2	*O	*O2	O3	C(gr)
H2O(cr)	H2O(L)			

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

POINT	ITN	T	C	H	O
1	2	2139.629	-11.106	-8.483	-20.573

Pinf/Pt = 1.775690

2	3	1937.478	-10.691	-8.595	-21.912

Pinf/Pt = 1.778908

2	2	1936.866	-10.690	-8.595	-21.917
3	8	873.194	-4.124	-9.516	-40.103
3	3	877.063	-4.172	-9.509	-39.956
4	4	795.712	-3.200	-9.714	-43.314
4	2	794.134	-3.183	-9.720	-43.385
5	4	750.954	-2.747	-9.891	-45.429
5	3	752.680	-2.763	-9.883	-45.343
6	4	727.335	-2.539	-10.006	-46.635
6	2	725.869	-2.527	-10.014	-46.712

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1160.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 2.00000 %FUEL= 33.333333 R,EQ.RATIO= 1.378917 PHI,EQ.RATIO= 1.926133

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7789	144.93	279.05	424.43	578.10
P, BAR	80.000	44.971	0.55198	0.28668	0.18849	0.13839
T, K	2139.63	1936.87	877.06	794.13	752.68	725.87
RHO, KG/CU M	8.4087 0	5.2222 0	1.4189-1	8.2040-2	5.7407-2	4.4034-2
H, KJ/KG	-6111.36	-6633.02	-9251.91	-9493.30	-9635.32	-9734.57
U, KJ/KG	-7062.75	-7494.18	-9640.93	-9842.74	-9963.65	-10048.8
G, KJ/KG	-32359.3	-30393.6	-20011.3	-19235.4	-18868.8	-18639.2
S, KJ/(KG)(K)	12.2675	12.2675	12.2675	12.2675	12.2675	12.2675
M, (1/n)	18.699	18.701	18.746	18.895	19.060	19.204
MW, MOL WT	18.699	18.701	18.746	18.895	19.060	19.204
(dLV/dLP)t	-1.00007	-1.00003	-1.00446	-1.01631	-1.02497	-1.03000
(dLV/dLT)p	1.0019	1.0007	1.0651	1.2520	1.3969	1.4859
Cp, KJ/(KG)(K)	2.6040	2.5493	2.8280	4.0570	5.0327	5.6366
GAMMAs	1.2068	1.2116	1.2099	1.1816	1.1684	1.1622
SON VEL,M/SEC	1071.5	1021.4	686.0	642.6	619.4	604.4
MACH NUMBER	0.000	1.000	3.653	4.047	4.286	4.454

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1499.8	1499.8	1499.8	1499.8	1499.8
CF	0.6811	1.6711	1.7341	1.7701	1.7949
Ivac, M/SEC	1864.5	2661.4	2735.1	2778.5	2808.7
Isp, M/SEC	1021.4	2506.2	2600.7	2654.8	2691.9

MOLE FRACTIONS

CH4	0.00000	0.00000	0.00118	0.00519	0.00959	0.01344
*CO	0.14798	0.14177	0.04478	0.02899	0.02114	0.01646
*CO2	0.08732	0.09355	0.18992	0.20359	0.20912	0.21176
*H	0.00019	0.00007	0.00000	0.00000	0.00000	0.00000
*H2	0.19137	0.19765	0.29076	0.29324	0.28646	0.27837
H2O	0.57305	0.56694	0.47335	0.46898	0.47369	0.47998
*OH	0.00008	0.00002	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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz
C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane	C9H19,n-nonyl
C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl	HCO
HCCO	HO2	HCHO,formaldehy	HCOOH	H2O2
(HCOOH)2	*O	*O2	O3	C(gr)
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 3

Pin = 1160.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 2.00000 %FUEL= 33.333333 R,EQ.RATIO= 1.378917 PHI,EQ.RATIO= 1.926133

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7789	144.93	292.36	463.08	652.44
P, BAR	80.000	44.971	0.55198	0.27363	0.17276	0.12262
T, K	2139.63	1936.87	877.06	753.30	680.01	629.20
RHO, KG/CU M	8.4087 0	5.2222 0	1.4189-1	8.1896-2	5.7277-2	4.3936-2
H, KJ/KG	-6111.36	-6633.02	-9251.91	-9505.24	-9651.33	-9750.83
U, KJ/KG	-7062.75	-7494.18	-9640.93	-9839.37	-9952.95	-10029.9
G, KJ/KG	-32359.3	-30393.6	-20011.3	-18746.4	-17993.3	-17469.6
S, KJ/(KG)(K)	12.2675	12.2675	12.2675	12.2675	12.2675	12.2675
M, (1/n)	18.699	18.701	18.746	18.746	18.746	18.746
MW, MOL WT	18.699	18.701	18.746	18.746	18.746	18.746
Cp, KJ/(KG)(K)	2.6040	2.5493	2.8280	2.0134	1.9727	1.9441
GAMMAs	1.2068	1.2116	1.2099	1.2825	1.2901	1.2956
SON VEL,M/SEC	1071.5	1021.4	686.0	654.6	623.8	601.3
MACH NUMBER	0.000	1.000	3.653	3.980	4.266	4.487

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1499.8	1499.8	1499.8	1499.8	1499.8
CF	0.6811	1.6711	1.7372	1.7742	1.7989
Ivac, M/SEC	1864.5	2661.4	2733.6	2774.2	2801.4
Isp, M/SEC	1021.4	2506.2	2605.3	2660.8	2698.0

MOLE FRACTIONS

CH4	0.00118	*CO	0.04478	*CO2	0.18992
*H2	0.29076	H2O	0.47335		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz

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C8H16,1-octene C8H17,n-octyl C8H18,n-octane C8H18,isooctane C9H19,n-nonyl
C10H8,naphthale C10H21,n-decyl C12H9,o-bipheny C12H10,biphenyl HCO
HCCO HO2 HCHO,formaldehy HCOOH H2O2
(HCOOH)2 *O *O2 O3 C(gr)
H2O(cr) H2O(L)

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

POINT	ITN	T	C	H	O
1	2	2139.709	-10.988	-8.424	-20.572
Pinf/Pt = 1.775736					
2	3	1937.491	-10.573	-8.536	-21.912
Pinf/Pt = 1.778925					
2	2	1936.885	-10.572	-8.537	-21.917
3	8	874.344	-4.036	-9.460	-40.055
3	3	878.297	-4.084	-9.452	-39.906
4	4	798.571	-3.160	-9.661	-43.174
4	3	796.901	-3.143	-9.667	-43.249
5	4	754.083	-2.726	-9.840	-45.256
5	3	755.877	-2.742	-9.831	-45.168
6	4	730.697	-2.528	-9.955	-46.439
6	2	729.156	-2.515	-9.963	-46.519

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1305.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 2.00000 %FUEL= 33.333333 R,EQ.RATIO= 1.378917 PHI,EQ.RATIO= 1.926133

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7789	144.79	278.38	423.20	576.33
P, BAR	90.000	50.592	0.62157	0.32329	0.21267	0.15616
T, K	2139.71	1936.88	878.30	796.90	755.88	729.16
RHO, KG/CU M	9.4595 0	5.8749 0	1.5963-1	9.2300-2	6.4585-2	4.9538-2
H, KJ/KG	-6111.36	-6633.04	-9251.66	-9492.92	-9635.14	-9734.64
U, KJ/KG	-7062.78	-7494.20	-9641.04	-9843.18	-9964.42	-10049.9
G, KJ/KG	-32248.2	-30292.4	-19980.2	-19227.2	-18868.3	-18641.4
S, KJ/(KG)(K)	12.2152	12.2152	12.2152	12.2152	12.2152	12.2152

M, (1/n)	18.699	18.701	18.754	18.917	19.086	19.232
MW, MOL WT	18.699	18.701	18.754	18.917	19.086	19.232
(dLV/dLP)t	-1.00007	-1.00002	-1.00531	-1.01767	-1.02607	-1.03082
(dLV/dLT)p	1.0018	1.0006	1.0774	1.2724	1.4131	1.4976
Cp, KJ/(KG)(K)	2.6026	2.5488	2.9061	4.1879	5.1323	5.7026
GAMMAs	1.2068	1.2116	1.2074	1.1796	1.1674	1.1617
SON VEL,M/SEC	1071.5	1021.5	685.7	642.8	620.0	605.2
MACH NUMBER	0.000	1.000	3.655	4.046	4.282	4.448

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1499.8	1499.8	1499.8	1499.8	1499.8
CF	0.6811	1.6710	1.7340	1.7701	1.7949
Ivac, M/SEC	1864.5	2661.5	2735.3	2778.8	2809.0
Isp, M/SEC	1021.5	2506.1	2600.6	2654.7	2691.9

MOLE FRACTIONS

CH4	0.00000	0.00000	0.00142	0.00576	0.01029	0.01419
*CO	0.14798	0.14177	0.04485	0.02917	0.02133	0.01664
*CO2	0.08731	0.09355	0.18973	0.20311	0.20856	0.21119
*H	0.00018	0.00007	0.00000	0.00000	0.00000	0.00000
*H2	0.19137	0.19765	0.28990	0.29117	0.28396	0.27571
H2O	0.57306	0.56694	0.47410	0.47079	0.47586	0.48228
*OH	0.00008	0.00002	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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz
C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane	C9H19,n-nonyl
C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl	HCO
HCCO	HO2	HCHO,formaldehy	HCOOH	H2O2
(HCOOH)2	*O	*O2	O3	C(gr)
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 3

Pin = 1305.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 2.00000 %FUEL= 33.333333 R,EQ.RATIO= 1.378917 PHI,EQ.RATIO= 1.926133

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7789	144.79	292.06	462.57	651.71
P, BAR	90.000	50.592	0.62157	0.30816	0.19456	0.13810
T, K	2139.71	1936.88	878.30	754.44	681.08	630.23
RHO, KG/CU M	9.4595 0	5.8749 0	1.5963-1	9.2133-2	6.4436-2	4.9426-2
H, KJ/KG	-6111.36	-6633.04	-9251.66	-9505.21	-9651.44	-9751.04
U, KJ/KG	-7062.78	-7494.20	-9641.04	-9839.69	-9953.39	-10030.4
G, KJ/KG	-32248.2	-30292.4	-19980.2	-18720.9	-17971.0	-17449.4
S, KJ/(KG)(K)	12.2152	12.2152	12.2152	12.2152	12.2152	12.2152
M, (1/n)	18.699	18.701	18.754	18.754	18.754	18.754
MW, MOL WT	18.699	18.701	18.754	18.754	18.754	18.754
Cp, KJ/(KG)(K)	2.6026	2.5488	2.9061	2.0136	1.9729	1.9442
GAMMAs	1.2068	1.2116	1.2074	1.2823	1.2898	1.2954
SON VEL,M/SEC	1071.5	1021.5	685.7	654.9	624.1	601.6
MACH NUMBER	0.000	1.000	3.655	3.978	4.264	4.485

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1499.8	1499.8	1499.8	1499.8	1499.8
CF	0.6811	1.6710	1.7372	1.7742	1.7990
Ivac, M/SEC	1864.5	2661.5	2733.7	2774.3	2801.6
Isp, M/SEC	1021.5	2506.1	2605.3	2660.9	2698.0

MOLE FRACTIONS

CH4	0.00142	*CO	0.04485	*CO2	0.18973
*H2	0.28990	H2O	0.47410		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH

FileEditor:xEx9.out

CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz
C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane	C9H19,n-nonyl
C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl	HCO
HCCO	HO2	HCHO,formaldehy	HCOOH	H2O2
(HCOOH)2	*O	*O2	O3	C(gr)
H2O(cr)	H2O(L)			

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

POINT	ITN	T	C	H	O
1	2	2139.777	-10.883	-8.371	-20.572
Pinf/Pt = 1.775776					
2	3	1937.503	-10.468	-8.484	-21.912
Pinf/Pt = 1.778940					
2	2	1936.901	-10.467	-8.484	-21.917
3	8	875.517	-3.962	-9.411	-40.007
3	3	879.556	-4.010	-9.402	-39.855
4	4	801.254	-3.128	-9.614	-43.044
4	3	799.479	-3.110	-9.620	-43.122
5	4	756.914	-2.709	-9.794	-45.101
5	3	758.790	-2.725	-9.786	-45.010
6	4	733.758	-2.518	-9.909	-46.262
6	3	732.129	-2.506	-9.917	-46.346

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1450.4 PSIA
CASE =

FileEditor:xEx9.out

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 2.00000 %FUEL= 33.333333 R,EQ.RATIO= 1.378917 PHI,EQ.RATIO= 1.926133

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7789	144.65	277.77	422.10	574.76
P, BAR	100.00	56.213	0.69132	0.36001	0.23691	0.17399
T, K	2139.78	1936.90	879.56	799.48	758.79	732.13
RHO, KG/CU M	1.0510 1	6.5276 0	1.7738-1	1.0256-1	7.1762-2	5.5041-2
H, KJ/KG	-6111.36	-6633.05	-9251.41	-9492.59	-9635.02	-9734.75
U, KJ/KG	-7062.80	-7494.22	-9641.15	-9843.61	-9965.16	-10050.8
G, KJ/KG	-32148.8	-30201.9	-19954.1	-19220.9	-18868.2	-18643.5
S, KJ/(KG)(K)	12.1683	12.1683	12.1683	12.1683	12.1683	12.1683
M, (1/n)	18.699	18.701	18.764	18.937	19.110	19.258
MW, MOL WT	18.699	18.701	18.764	18.937	19.110	19.258
(dLV/dLP)t	-1.00007	-1.00002	-1.00616	-1.01889	-1.02702	-1.03152
(dLV/dLT)p	1.0017	1.0006	1.0897	1.2905	1.4270	1.5075
Cp, KJ/(KG)(K)	2.6015	2.5484	2.9837	4.3028	5.2161	5.7566
GAMMAs	1.2069	1.2116	1.2051	1.1779	1.1666	1.1613
SON VEL,M/SEC	1071.6	1021.5	685.3	643.0	620.6	605.9
MACH NUMBER	0.000	1.000	3.657	4.044	4.278	4.443

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1499.8	1499.8	1499.8	1499.8	1499.8
CF	0.6811	1.6709	1.7339	1.7701	1.7949
Ivac, M/SEC	1864.5	2661.5	2735.5	2779.0	2809.4
Isp, M/SEC	1021.5	2506.0	2600.5	2654.7	2692.0

MOLE FRACTIONS

CH4	0.00000	0.00000	0.00167	0.00629	0.01093	0.01487
*CO	0.14799	0.14177	0.04491	0.02933	0.02150	0.01680
*CO2	0.08731	0.09355	0.18954	0.20267	0.20805	0.21067
*H	0.00017	0.00006	0.00000	0.00000	0.00000	0.00000
*H2	0.19138	0.19765	0.28902	0.28923	0.28167	0.27328
H2O	0.57307	0.56695	0.47486	0.47247	0.47786	0.48439
*OH	0.00007	0.00002	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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3

C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz
C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane	C9H19,n-nonyl
C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl	HCO
HCCO	HO2	HCHO,formaldehy	HCOOH	H2O2
(HCOOH)2	*O	*O2	O3	C(gr)
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 3

Pin = 1450.4 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 2.00000 %FUEL= 33.333333 R,EQ.RATIO= 1.378917 PHI,EQ.RATIO= 1.926133

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7789	144.65	291.75	462.06	650.96
P, BAR	100.00	56.213	0.69132	0.34276	0.21642	0.15362
T, K	2139.78	1936.90	879.56	755.61	682.18	631.28
RHO, KG/CU M	1.0510 1	6.5276 0	1.7738-1	1.0237-1	7.1594-2	5.4917-2
H, KJ/KG	-6111.36	-6633.05	-9251.41	-9505.19	-9651.56	-9751.27
U, KJ/KG	-7062.80	-7494.22	-9641.15	-9840.01	-9953.85	-10031.0
G, KJ/KG	-32148.8	-30201.9	-19954.1	-18699.7	-17952.6	-17432.9
S, KJ/(KG)(K)	12.1683	12.1683	12.1683	12.1683	12.1683	12.1683
M, (1/n)	18.699	18.701	18.764	18.764	18.764	18.764
MW, MOL WT	18.699	18.701	18.764	18.764	18.764	18.764
Cp, KJ/(KG)(K)	2.6015	2.5484	2.9837	2.0138	1.9730	1.9443
GAMMAs	1.2069	1.2116	1.2051	1.2821	1.2896	1.2952
SON VEL,M/SEC	1071.6	1021.5	685.3	655.2	624.4	601.9
MACH NUMBER	0.000	1.000	3.657	3.976	4.262	4.483

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1499.8	1499.8	1499.8	1499.8	1499.8
CF	0.6811	1.6709	1.7371	1.7742	1.7990
Ivac, M/SEC	1864.5	2661.5	2733.8	2774.5	2801.8
Isp, M/SEC	1021.5	2506.0	2605.3	2660.9	2698.1

MOLE FRACTIONS

CH4	0.00167	*CO	0.04491	*CO2	0.18954
*H2	0.28902	H2O	0.47486		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH3OH	CH3OOH	COOH	*C2
C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene	O(CH)2O
HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4	C2H4O,ethylen-o
CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5	C2H6
C2H5OH	CH3OCH3	CH3O2CH3	C2O	*C3
C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne	C3H4,cyclo-
C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox	C3H6O,acetone
C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8	C3H8O,1propanol
C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne	C4H4,1,3-cyclo-
C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-	C4H8,1-butene
C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-	(CH3COOH)2
C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl	C4H10,n-butane
C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-	C5H10,1-pentene
C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane	C5H12,i-pentane
CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy	C6H6
C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-	C6H13,n-hexyl
C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx	C7H14,1-heptene
C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene	C8H10,ethylbenz
C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane	C9H19,n-nonyl
C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl	HCO
HCCO	HO2	HCHO,formaldehy	HCOOH	H2O2
(HCOOH)2	*O	*O2	O3	C(gr)
H2O(cr)	H2O(L)			

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

O/F = 3.000000

ENTHALPY	EFFECTIVE FUEL h(2)/R	EFFECTIVE OXIDANT h(1)/R	MIXTURE h0/R
(KG-MOL)(K)/KG	-0.87830508E+03	-0.66338234E+03	-0.71711302E+03

KG-FORM.WT./KG	bi(2)	bi(1)	b0i
*C	0.37751016E-01	0.00000000E+00	0.94377541E-02

*H	0.12773351E+00	0.58798142E-01	0.76031984E-01
*O	0.26115739E-01	0.58798142E-01	0.50627542E-01

POINT	ITN	T	C	H	O
1	8	2691.999	-15.349	-9.496	-16.731
Pinf/Pt = 1.748906					
2	4	2489.556	-15.280	-9.631	-17.515
Pinf/Pt = 1.755469					
2	2	2488.209	-15.279	-9.632	-17.521
Pinf/Pt = 1.755510					
2	1	2488.201	-15.279	-9.632	-17.521
3	5	1204.050	-11.593	-10.505	-29.692
3	3	1214.926	-11.668	-10.495	-29.476
4	4	1084.355	-10.674	-10.620	-32.361
4	3	1075.002	-10.594	-10.630	-32.594
5	4	981.600	-9.713	-10.733	-35.171
5	3	990.531	-9.804	-10.723	-34.904
6	3	939.539	-9.263	-10.784	-36.498
6	3	930.994	-9.167	-10.794	-36.782

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1015.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 3.00000 %FUEL= 25.000000 R,EQ.RATIO= 1.123726 PHI,EQ.RATIO= 1.284089

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7555	136.17	266.91	414.61	575.60
P, BAR	70.000	39.874	0.51406	0.26226	0.16883	0.12161
T, K	2692.00	2488.20	1214.93	1075.00	990.53	930.99
RHO, KG/CU M	6.5642 0	4.0542 0	1.0724-1	6.1832-2	4.3200-2	3.3107-2
H, KJ/KG	-5962.44	-6539.13	-9625.40	-9929.13	-10108.5	-10232.9
U, KJ/KG	-7028.83	-7522.68	-10104.8	-10353.3	-10499.3	-10600.2
G, KJ/KG	-38361.2	-36485.2	-24247.3	-22867.0	-22029.8	-21437.6
S, KJ/(KG)(K)	12.0352	12.0352	12.0352	12.0352	12.0352	12.0352
M, (1/n)	20.989	21.034	21.073	21.073	21.073	21.073
MW, MOL WT	20.989	21.034	21.073	21.073	21.073	21.073
(dLV/dLP)t	-1.00220	-1.00098	-1.00000	-1.00000	-1.00000	-1.00000
(dLV/dLT)p	1.0535	1.0257	1.0000	1.0000	1.0000	1.0000
Cp, KJ/(KG)(K)	3.0894	2.8057	2.1976	2.1425	2.1039	2.0722
GAMMAs	1.1629	1.1727	1.2188	1.2257	1.2308	1.2352
SON VEL,M/SEC	1113.6	1074.0	764.4	721.0	693.6	673.6
MACH NUMBER	0.000	1.000	3.541	3.906	4.152	4.339

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1607.7	1607.7	1607.7	1607.7	1607.7
CF	0.6680	1.6835	1.7519	1.7911	1.8178
Ivac, M/SEC	1989.8	2883.7	2967.2	3015.3	3048.2
Isp, M/SEC	1074.0	2706.6	2816.6	2879.6	2922.5

MOLE FRACTIONS

*CO	0.07193	0.06911	0.03329	0.02496	0.01960	0.01583
*CO2	0.12616	0.12941	0.16559	0.17392	0.17928	0.18305
*H	0.00165	0.00096	0.00000	0.00000	0.00000	0.00000
*H2	0.06228	0.06364	0.09871	0.10704	0.11240	0.11617
H2O	0.73213	0.73427	0.70241	0.69408	0.68872	0.68495
*O	0.00008	0.00002	0.00000	0.00000	0.00000	0.00000
*OH	0.00538	0.00248	0.00000	0.00000	0.00000	0.00000
*O2	0.00039	0.00010	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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH4	CH3OH	CH3OOH	COOH
*C2	C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene
O(CH)2O	HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4
C2H4O,ethylen-o	CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5
C2H6	C2H5OH	CH3OCH3	CH3O2CH3	C2O
*C3	C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne
C3H4,cyclo-	C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox
C3H6O,acetone	C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8
C3H8O,1propanol	C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne
C4H4,1,3-cyclo-	C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-
C4H8,1-butene	C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-
(CH3COOH)2	C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl
C4H10,n-butane	C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-
C5H10,1-pentene	C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane
C5H12,i-pentane	CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy
C6H6	C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-
C6H13,n-hexyl	C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx
C7H14,1-heptene	C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene
C8H10,ethylbenz	C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane
C9H19,n-nonyl	C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl
HCO	HCCO	HO2	HCHO,formaldehy	HCOOH
H2O2	(HCOOH)2	O3	C(gr)	H2O(cr)
H2O(L)				

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

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THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION
AFTER POINT 3

Pin = 1015.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 3.00000 %FUEL= 25.000000 R,EQ.RATIO= 1.123726 PHI,EQ.RATIO= 1.284089

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7555	136.17	268.93	420.21	586.16
P, BAR	70.000	39.874	0.51406	0.26029	0.16658	0.11942
T, K	2692.00	2488.20	1214.93	1067.24	977.66	914.52
RHO, KG/CU M	6.5642 0	4.0542 0	1.0724-1	6.1814-2	4.3185-2	3.3096-2
H, KJ/KG	-5962.44	-6539.13	-9625.40	-9931.49	-10111.5	-10235.7
U, KJ/KG	-7028.83	-7522.68	-10104.8	-10352.6	-10497.2	-10596.5
G, KJ/KG	-38361.2	-36485.2	-24247.3	-22775.9	-21877.9	-21242.1
S, KJ/(KG)(K)	12.0352	12.0352	12.0352	12.0352	12.0352	12.0352
M, (1/n)	20.989	21.034	21.073	21.073	21.073	21.073
MW, MOL WT	20.989	21.034	21.073	21.073	21.073	21.073
Cp, KJ/(KG)(K)	3.0894	2.8057	2.1976	2.0334	1.9846	1.9492
GAMMAs	1.1629	1.1727	1.2188	1.2407	1.2481	1.2538
SON VEL,M/SEC	1113.6	1074.0	764.4	722.8	693.9	672.6
MACH NUMBER	0.000	1.000	3.541	3.898	4.152	4.346

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1607.7	1607.7	1607.7	1607.7	1607.7
CF	0.6680	1.6835	1.7525	1.7917	1.8184
Ivac, M/SEC	1989.8	2883.7	2966.9	3014.5	3046.9
Isp, M/SEC	1074.0	2706.6	2817.5	2880.6	2923.4

MOLE FRACTIONS

*CO	0.03329	*CO2	0.16559	*H2	0.09871
H2O	0.70241				

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH4	CH3OH	CH3OOH	COOH
*C2	C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene
O(CH)2O	HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4
C2H4O,ethylen-o	CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5
C2H6	C2H5OH	CH3OCH3	CH3O2CH3	C2O
*C3	C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne
C3H4,cyclo-	C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox

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C3H6O,acetone	C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8
C3H8O,1propanol	C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne
C4H4,1,3-cyclo-	C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-
C4H8,1-butene	C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-
(CH3COOH)2	C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl
C4H10,n-butane	C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-
C5H10,1-pentene	C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane
C5H12,i-pentane	CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy
C6H6	C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-
C6H13,n-hexyl	C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx
C7H14,1-heptene	C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene
C8H10,ethylbenz	C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane
C9H19,n-nonyl	C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl
HCO	HCCO	HO2	HCHO,formaldehy	HCOOH
H2O2	(HCOOH)2	O3	C(gr)	H2O(cr)
H2O(L)				

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

POINT	ITN	T	C	H	O
1	3	2694.397	-15.225	-9.432	-16.720
Pinf/Pt = 1.749488					
2	4	2490.513	-15.151	-9.565	-17.510
Pinf/Pt = 1.755866					
2	2	2489.198	-15.150	-9.566	-17.516
3	5	1203.792	-11.458	-10.438	-29.697
3	3	1214.754	-11.533	-10.428	-29.479
4	4	1084.282	-10.539	-10.553	-32.363
4	3	1074.848	-10.458	-10.563	-32.598
5	4	981.380	-9.576	-10.666	-35.178
5	3	990.386	-9.668	-10.656	-34.908
6	3	939.475	-9.128	-10.717	-36.500
6	3	930.857	-9.032	-10.728	-36.787

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1160.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 3.00000 %FUEL= 25.000000 R,EQ.RATIO= 1.123726 PHI,EQ.RATIO= 1.284089

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7559	136.21	266.98	414.72	575.75
P, BAR	80.000	45.562	0.58734	0.29965	0.19290	0.13895
T, K	2694.40	2489.20	1214.75	1074.85	990.39	930.86
RHO, KG/CU M	7.4971 0	4.6311 0	1.2254-1	7.0657-2	4.9366-2	3.7833-2
H, KJ/KG	-5962.44	-6539.61	-9625.78	-9929.46	-10108.8	-10233.1
U, KJ/KG	-7029.53	-7523.43	-10105.1	-10353.5	-10499.6	-10600.4
G, KJ/KG	-38247.6	-36366.0	-24181.4	-22808.6	-21976.0	-21387.0
S, KJ/(KG)(K)	11.9823	11.9823	11.9823	11.9823	11.9823	11.9823
M, (1/n)	20.994	21.037	21.073	21.073	21.073	21.073
MW, MOL WT	20.994	21.037	21.073	21.073	21.073	21.073
(dLV/dLP)t	-1.00206	-1.00092	-1.00000	-1.00000	-1.00000	-1.00000
(dLV/dLT)p	1.0501	1.0240	1.0000	1.0000	1.0000	1.0000
Cp, KJ/(KG)(K)	3.0568	2.7881	2.1975	2.1424	2.1038	2.0722
GAMMAs	1.1639	1.1734	1.2188	1.2257	1.2308	1.2352
SON VEL,M/SEC	1114.4	1074.4	764.3	721.0	693.5	673.5
MACH NUMBER	0.000	1.000	3.541	3.907	4.152	4.339

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1607.8	1607.8	1607.8	1607.8	1607.8
CF	0.6682	1.6835	1.7519	1.7910	1.8177
Ivac, M/SEC	1990.1	2883.9	2967.3	3015.4	3048.2
Isp, M/SEC	1074.4	2706.8	2816.7	2879.7	2922.6

MOLE FRACTIONS

*CO	0.07188	0.06909	0.03328	0.02495	0.01959	0.01582
*CO2	0.12625	0.12944	0.16560	0.17393	0.17929	0.18306
*H	0.00155	0.00090	0.00000	0.00000	0.00000	0.00000
*H2	0.06218	0.06360	0.09872	0.10705	0.11241	0.11618
H2O	0.73261	0.73451	0.70240	0.69407	0.68871	0.68494
*O	0.00007	0.00002	0.00000	0.00000	0.00000	0.00000
*OH	0.00510	0.00234	0.00000	0.00000	0.00000	0.00000
*O2	0.00035	0.00009	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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH4	CH3OH	CH3OOH	COOH
*C2	C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene
O(CH)2O	HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4
C2H4O,ethylen-o	CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5
C2H6	C2H5OH	CH3OCH3	CH3O2CH3	C2O
*C3	C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne
C3H4,cyclo-	C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox
C3H6O,acetone	C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8
C3H8O,1propanol	C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne
C4H4,1,3-cyclo-	C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-
C4H8,1-butene	C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-

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(CH3COOH)2	C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl
C4H10,n-butane	C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-
C5H10,1-pentene	C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane
C5H12,i-pentane	CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy
C6H6	C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-
C6H13,n-hexyl	C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx
C7H14,1-heptene	C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene
C8H10,ethylbenz	C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane
C9H19,n-nonyl	C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl
HCO	HCCO	HO2	HCHO,formaldehy	HCOOH
H2O2	(HCOOH)2	O3	C(gr)	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 3

Pin = 1160.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 3.00000 %FUEL= 25.000000 R,EQ.RATIO= 1.123726 PHI,EQ.RATIO= 1.284089

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7559	136.21	269.00	420.32	586.32
P, BAR	80.000	45.562	0.58734	0.29739	0.19033	0.13645
T, K	2694.40	2489.20	1214.75	1067.08	977.52	914.38
RHO, KG/CU M	7.4971 0	4.6311 0	1.2254-1	7.0636-2	4.9348-2	3.7820-2
H, KJ/KG	-5962.44	-6539.61	-9625.78	-9931.82	-10111.8	-10235.9
U, KJ/KG	-7029.53	-7523.43	-10105.1	-10352.8	-10497.4	-10596.7
G, KJ/KG	-38247.6	-36366.0	-24181.4	-22717.9	-21824.7	-21192.3
S, KJ/(KG)(K)	11.9823	11.9823	11.9823	11.9823	11.9823	11.9823
M, (1/n)	20.994	21.037	21.073	21.073	21.073	21.073
MW, MOL WT	20.994	21.037	21.073	21.073	21.073	21.073
Cp, KJ/(KG)(K)	3.0568	2.7881	2.1975	2.0333	1.9845	1.9492
GAMMAs	1.1639	1.1734	1.2188	1.2408	1.2482	1.2538
SON VEL,M/SEC	1114.4	1074.4	764.3	722.8	693.8	672.6
MACH NUMBER	0.000	1.000	3.541	3.898	4.152	4.347

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1607.8	1607.8	1607.8	1607.8	1607.8
CF	0.6682	1.6835	1.7524	1.7917	1.8183
Ivac, M/SEC	1990.1	2883.9	2967.0	3014.6	3046.9
Isp, M/SEC	1074.4	2706.8	2817.6	2880.7	2923.5

MOLE FRACTIONS

*CO	0.03328	*CO2	0.16560	*H2	0.09872
H2O	0.70240				

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH4	CH3OH	CH3OOH	COOH
*C2	C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene
O(CH)2O	HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4
C2H4O,ethylen-o	CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5
C2H6	C2H5OH	CH3OCH3	CH3O2CH3	C2O
*C3	C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne
C3H4,cyclo-	C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox
C3H6O,acetone	C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8
C3H8O,1propanol	C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne
C4H4,1,3-cyclo-	C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-
C4H8,1-butene	C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-
(CH3COOH)2	C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl
C4H10,n-butane	C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-
C5H10,1-pentene	C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane
C5H12,i-pentane	CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy
C6H6	C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-
C6H13,n-hexyl	C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx
C7H14,1-heptene	C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene
C8H10,ethylbenz	C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane
C9H19,n-nonyl	C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl
HCO	HCCO	HO2	HCHO,formaldehy	HCOOH
H2O2	(HCOOH)2	O3	C(gr)	H2O(cr)
H2O(L)				

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

POINT	ITN	T	C	H	O
1	3	2696.408	-15.116	-9.375	-16.711
Pinf/Pt = 1.749983					
2	4	2491.306	-15.037	-9.507	-17.506
Pinf/Pt = 1.756197					
2	2	2490.020	-15.036	-9.508	-17.512
3	5	1203.576	-11.338	-10.379	-29.701
3	3	1214.611	-11.414	-10.369	-29.482
4	4	1084.223	-10.420	-10.494	-32.364
4	3	1074.719	-10.339	-10.504	-32.602
5	4	981.197	-9.456	-10.607	-35.184
5	3	990.267	-9.549	-10.597	-34.912
6	3	939.423	-9.010	-10.658	-36.502
6	3	930.743	-8.912	-10.669	-36.791

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1305.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 3.00000 %FUEL= 25.000000 R,EQ.RATIO= 1.123726 PHI,EQ.RATIO= 1.284089

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7562	136.24	267.04	414.81	575.87
P, BAR	90.000	51.247	0.66061	0.33703	0.21697	0.15628
T, K	2696.41	2490.02	1214.61	1074.72	990.27	930.74
RHO, KG/CU M	8.4296 0	5.2078 0	1.3785-1	7.9481-2	5.5531-2	4.2558-2
H, KJ/KG	-5962.44	-6540.02	-9626.09	-9929.74	-10109.1	-10233.4
U, KJ/KG	-7030.11	-7524.08	-10105.3	-10353.8	-10499.8	-10600.6
G, KJ/KG	-38145.9	-36260.1	-24123.3	-22757.3	-21928.6	-21342.4
S, KJ/(KG)(K)	11.9357	11.9357	11.9357	11.9357	11.9357	11.9357
M, (1/n)	20.998	21.039	21.073	21.073	21.073	21.073
MW, MOL WT	20.998	21.039	21.073	21.073	21.073	21.073
(dLV/dLP)t	-1.00195	-1.00086	-1.00000	-1.00000	-1.00000	-1.00000
(dLV/dLT)p	1.0473	1.0226	1.0000	1.0000	1.0000	1.0000
Cp, KJ/(KG)(K)	3.0296	2.7734	2.1974	2.1423	2.1037	2.0721
GAMMAs	1.1647	1.1739	1.2188	1.2257	1.2308	1.2352
SON VEL,M/SEC	1115.1	1074.8	764.3	720.9	693.5	673.5
MACH NUMBER	0.000	1.000	3.542	3.907	4.153	4.339

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1607.9	1607.9	1607.9	1607.9	1607.9
CF	0.6684	1.6834	1.7518	1.7910	1.8176
Ivac, M/SEC	1990.4	2883.9	2967.4	3015.5	3048.3
Isp, M/SEC	1074.8	2706.9	2816.8	2879.8	2922.6

MOLE FRACTIONS

*CO	0.07184	0.06908	0.03328	0.02495	0.01959	0.01582
*CO2	0.12633	0.12948	0.16561	0.17394	0.17930	0.18307
*H	0.00147	0.00085	0.00000	0.00000	0.00000	0.00000
*H2	0.06209	0.06357	0.09873	0.10706	0.11241	0.11618
H2O	0.73301	0.73471	0.70239	0.69406	0.68870	0.68493
*O	0.00007	0.00002	0.00000	0.00000	0.00000	0.00000
*OH	0.00486	0.00221	0.00000	0.00000	0.00000	0.00000

*O2 0.00032 0.00008 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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH4	CH3OH	CH3OOH	COOH
*C2	C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene
O(CH)2O	HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4
C2H4O,ethylen-o	CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5
C2H6	C2H5OH	CH3OCH3	CH3O2CH3	C2O
*C3	C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne
C3H4,cyclo-	C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox
C3H6O,acetone	C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8
C3H8O,1propanol	C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne
C4H4,1,3-cyclo-	C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-
C4H8,1-butene	C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-
(CH3COOH)2	C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl
C4H10,n-butane	C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-
C5H10,1-pentene	C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane
C5H12,i-pentane	CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy
C6H6	C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-
C6H13,n-hexyl	C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx
C7H14,1-heptene	C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene
C8H10,ethylbenz	C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane
C9H19,n-nonyl	C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl
HCO	HCCO	HO2	HCHO,formaldehy	HCOOH
H2O2	(HCOOH)2	O3	C(gr)	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 3

Pin = 1305.3 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 3.00000 %FUEL= 25.000000 R,EQ.RATIO= 1.123726 PHI,EQ.RATIO= 1.284089

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7562	136.24	269.06	420.42	586.44
P, BAR	90.000	51.247	0.66061	0.33449	0.21407	0.15347
T, K	2696.41	2490.02	1214.61	1066.95	977.40	914.26
RHO, KG/CU M	8.4296 0	5.2078 0	1.3785-1	7.9458-2	5.5512-2	4.2544-2

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H, KJ/KG	-5962.44	-6540.02	-9626.09	-9932.10	-10112.0	-10236.2
U, KJ/KG	-7030.11	-7524.08	-10105.3	-10353.1	-10497.6	-10596.9
G, KJ/KG	-38145.9	-36260.1	-24123.3	-22666.9	-21777.9	-21148.6
S, KJ/(KG)(K)	11.9357	11.9357	11.9357	11.9357	11.9357	11.9357
M, (1/n)	20.998	21.039	21.073	21.073	21.073	21.073
MW, MOL WT	20.998	21.039	21.073	21.073	21.073	21.073
Cp, KJ/(KG)(K)	3.0296	2.7734	2.1974	2.0333	1.9844	1.9491
GAMMAs	1.1647	1.1739	1.2188	1.2408	1.2482	1.2538
SON VEL,M/SEC	1115.1	1074.8	764.3	722.7	693.8	672.5
MACH NUMBER	0.000	1.000	3.542	3.899	4.152	4.347

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1607.9	1607.9	1607.9	1607.9	1607.9
CF	0.6684	1.6834	1.7523	1.7916	1.8182
Ivac, M/SEC	1990.4	2883.9	2967.1	3014.7	3047.0
Isp, M/SEC	1074.8	2706.9	2817.7	2880.8	2923.6

MOLE FRACTIONS

*CO	0.03328	*CO2	0.16561	*H2	0.09873
H2O	0.70239				

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH4	CH3OH	CH3OOH	COOH
*C2	C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene
O(CH)2O	HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4
C2H4O,ethylen-o	CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5
C2H6	C2H5OH	CH3OCH3	CH3O2CH3	C2O
*C3	C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne
C3H4,cyclo-	C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox
C3H6O,acetone	C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8
C3H8O,1propanol	C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne
C4H4,1,3-cyclo-	C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-
C4H8,1-butene	C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-
(CH3COOH)2	C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl
C4H10,n-butane	C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-
C5H10,1-pentene	C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane
C5H12,i-pentane	CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy
C6H6	C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-
C6H13,n-hexyl	C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx
C7H14,1-heptene	C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene
C8H10,ethylbenz	C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane
C9H19,n-nonyl	C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl
HCO	HCCO	HO2	HCHO,formaldehy	HCOOH
H2O2	(HCOOH)2	O3	C(gr)	H2O(cr)
H2O(L)				

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

POINT	ITN	T	C	H	O
1	2	2698.125	-15.018	-9.324	-16.703
Pinf/Pt = 1.750411					
2	4	2491.977	-14.935	-9.455	-17.503
Pinf/Pt = 1.756480					
2	2	2490.717	-14.934	-9.456	-17.508
3	5	1203.391	-11.231	-10.327	-29.705
3	3	1214.490	-11.307	-10.316	-29.484
4	4	1084.173	-10.314	-10.441	-32.365
4	3	1074.611	-10.232	-10.451	-32.604
5	4	981.041	-9.349	-10.555	-35.188
5	3	990.165	-9.442	-10.544	-34.915
6	3	939.380	-8.903	-10.605	-36.504
6	3	930.646	-8.805	-10.616	-36.794

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 1450.4 PSIA
CASE =

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 3.00000 %FUEL= 25.000000 R,EQ.RATIO= 1.123726 PHI,EQ.RATIO= 1.284089

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7565	136.26	267.09	414.88	575.97
P, BAR	100.00	56.932	0.73387	0.37441	0.24103	0.17362
T, K	2698.12	2490.72	1214.49	1074.61	990.17	930.65
RHO, KG/CU M	9.3618 0	5.7843 0	1.5315-1	8.8305-2	6.1697-2	4.7283-2
H, KJ/KG	-5962.44	-6540.38	-9626.36	-9929.97	-10109.3	-10233.6
U, KJ/KG	-7030.61	-7524.62	-10105.5	-10354.0	-10500.0	-10600.8
G, KJ/KG	-38053.9	-36164.9	-24071.5	-22711.4	-21886.3	-21302.7
S, KJ/(KG)(K)	11.8940	11.8940	11.8940	11.8940	11.8940	11.8940
M, (1/n)	21.002	21.041	21.073	21.073	21.073	21.073
MW, MOL WT	21.002	21.041	21.073	21.073	21.073	21.073
(dLV/dLP)t	-1.00185	-1.00082	-1.00000	-1.00000	-1.00000	-1.00000
(dLV/dLT)p	1.0449	1.0214	1.0000	1.0000	1.0000	1.0000
Cp, KJ/(KG)(K)	3.0065	2.7611	2.1974	2.1423	2.1037	2.0721
GAMMAs	1.1654	1.1744	1.2189	1.2258	1.2309	1.2352
SON VEL,M/SEC	1115.7	1075.1	764.2	720.9	693.4	673.5
MACH NUMBER	0.000	1.000	3.542	3.907	4.153	4.340

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1608.0	1608.0	1608.0	1608.0	1608.0
CF	0.6686	1.6834	1.7518	1.7909	1.8176
Ivac, M/SEC	1990.6	2884.0	2967.4	3015.5	3048.3
Isp, M/SEC	1075.1	2707.0	2816.9	2879.9	2922.7

MOLE FRACTIONS

*CO	0.07180	0.06907	0.03327	0.02494	0.01958	0.01581
*CO2	0.12640	0.12950	0.16561	0.17394	0.17930	0.18307
*H	0.00141	0.00081	0.00000	0.00000	0.00000	0.00000
*H2	0.06202	0.06354	0.09873	0.10706	0.11242	0.11619
H2O	0.73336	0.73487	0.70238	0.69405	0.68870	0.68493
*O	0.00006	0.00002	0.00000	0.00000	0.00000	0.00000
*OH	0.00465	0.00211	0.00000	0.00000	0.00000	0.00000
*O2	0.00029	0.00008	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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH4	CH3OH	CH3OOH	COOH
*C2	C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene
O(CH)2O	HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4
C2H4O,ethylen-o	CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5
C2H6	C2H5OH	CH3OCH3	CH3O2CH3	C2O
*C3	C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne
C3H4,cyclo-	C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox
C3H6O,acetone	C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8
C3H8O,1propanol	C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne
C4H4,1,3-cyclo-	C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-
C4H8,1-butene	C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-
(CH3COOH)2	C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl
C4H10,n-butane	C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-
C5H10,1-pentene	C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane
C5H12,i-pentane	CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy
C6H6	C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-
C6H13,n-hexyl	C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx
C7H14,1-heptene	C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene
C8H10,ethylbenz	C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane
C9H19,n-nonyl	C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl
HCO	HCCO	HO2	HCHO,formaldehy	HCOOH
H2O2	(HCOOH)2	O3	C(gr)	H2O(cr)
H2O(L)				

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

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THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION
AFTER POINT 3

Pin = 1450.4 PSIA
CASE =

REACTANT		WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	C2H5OH(L)	0.8695652	-277301.667	300.000
OXIDANT	H2O2(L)	1.0000000	-187614.740	300.000
NAME	H2O(L)	0.1304348	-285690.685	300.000

O/F= 3.00000 %FUEL= 25.000000 R,EQ.RATIO= 1.123726 PHI,EQ.RATIO= 1.284089

	CHAMBER	THROAT	EXIT	EXIT	EXIT	EXIT
Pinf/P	1.0000	1.7565	136.26	269.11	420.49	586.55
P, BAR	100.00	56.932	0.73387	0.37159	0.23782	0.17049
T, K	2698.12	2490.72	1214.49	1066.84	977.30	914.17
RHO, KG/CU M	9.3618 0	5.7843 0	1.5315-1	8.8279-2	6.1675-2	4.7268-2
H, KJ/KG	-5962.44	-6540.38	-9626.36	-9932.33	-10112.2	-10236.4
U, KJ/KG	-7030.61	-7524.62	-10105.5	-10353.3	-10497.8	-10597.1
G, KJ/KG	-38053.9	-36164.9	-24071.5	-22621.3	-21736.2	-21109.5
S, KJ/(KG)(K)	11.8940	11.8940	11.8940	11.8940	11.8940	11.8940
M, (1/n)	21.002	21.041	21.073	21.073	21.073	21.073
MW, MOL WT	21.002	21.041	21.073	21.073	21.073	21.073
Cp, KJ/(KG)(K)	3.0065	2.7611	2.1974	2.0332	1.9844	1.9490
GAMMAs	1.1654	1.1744	1.2189	1.2408	1.2482	1.2538
SON VEL,M/SEC	1115.7	1075.1	764.2	722.7	693.8	672.5
MACH NUMBER	0.000	1.000	3.542	3.899	4.153	4.348

PERFORMANCE PARAMETERS

Ae/At	1.0000	15.000	25.000	35.000	45.000
CSTAR, M/SEC	1608.0	1608.0	1608.0	1608.0	1608.0
CF	0.6686	1.6834	1.7523	1.7916	1.8182
Ivac, M/SEC	1990.6	2884.0	2967.1	3014.7	3047.0
Isp, M/SEC	1075.1	2707.0	2817.8	2880.9	2923.7

MOLE FRACTIONS

*CO	0.03327	*CO2	0.16561	*H2	0.09873
H2O	0.70238				

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

*C	*CH	CH2	CH3	CH2OH
CH3O	CH4	CH3OH	CH3OOH	COOH
*C2	C2H	C2H2,acetylene	C2H2,vinylidene	CH2CO,ketene
O(CH)2O	HO(CO)2OH	C2H3,vinyl	CH3CO,acetyl	C2H4
C2H4O,ethylen-o	CH3CHO,ethanal	CH3COOH	OHCH2COOH	C2H5
C2H6	C2H5OH	CH3OCH3	CH3O2CH3	C2O
*C3	C3H3,1-propynl	C3H3,2-propynl	C3H4,allene	C3H4,propyne
C3H4,cyclo-	C3H5,allyl	C3H6,propylene	C3H6,cyclo-	C3H6O,propylox

C3H6O,acetone	C3H6O,propanal	C3H7,n-propyl	C3H7,i-propyl	C3H8
C3H8O,1propanol	C3H8O,2propanol	C3O2	*C4	C4H2,butadiyne
C4H4,1,3-cyclo-	C4H6,butadiene	C4H6,1butyne	C4H6,2butyne	C4H6,cyclo-
C4H8,1-butene	C4H8,cis2-buten	C4H8,tr2-butene	C4H8,isobutene	C4H8,cyclo-
(CH3COOH)2	C4H9,n-butyl	C4H9,i-butyl	C4H9,s-butyl	C4H9,t-butyl
C4H10,n-butane	C4H10,isobutane	*C5	C5H6,1,3cyclo-	C5H8,cyclo-
C5H10,1-pentene	C5H10,cyclo-	C5H11,pentyl	C5H11,t-pentyl	C5H12,n-pentane
C5H12,i-pentane	CH3C(CH3)2CH3	C6H2	C6H5,phenyl	C6H5O,phenoxy
C6H6	C6H5OH,phenol	C6H10,cyclo-	C6H12,1-hexene	C6H12,cyclo-
C6H13,n-hexyl	C6H14,n-hexane	C7H7,benzyl	C7H8	C7H8O,cresol-mx
C7H14,1-heptene	C7H15,n-heptyl	C7H16,n-heptane	C7H16,2-methylh	C8H8,styrene
C8H10,ethylbenz	C8H16,1-octene	C8H17,n-octyl	C8H18,n-octane	C8H18,isooctane
C9H19,n-nonyl	C10H8,naphthale	C10H21,n-decyl	C12H9,o-bipheny	C12H10,biphenyl
HCO	HCCO	HO2	HCHO,formaldehy	HCOOH
H2O2	(HCOOH)2	O3	C(gr)	H2O(cr)
H2O(L)				

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