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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=LMPHR o/f=2,4,6,8,10,
     rocket  frozen  nfz=1  tcest,k=3800
   p,bar=20,25,30,
 react
   oxid=H2O(L) wt=100
   oxid=CH3OH(L) wt=100
   oxid=NH3(L) wt=100
   fuel=Sasoll Wax 6003  wt=100  t,k=298.16
     h,kj/mol=-953.071  C 32 H 66

 WARNING!! Wax             NOT RECOGNIZED (INPUT)

 WARNING!!  LITERAL EXPECTED FOR 6003           (INPUT)
 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=F  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 =    20.000000    25.000000    30.000000

 Pc/P =

 SUBSONIC AREA RATIOS =

 SUPERSONIC AREA RATIOS =

 NFZ=  1  Mdot/Ac= 0.000000E+00  Ac/At= 0.000000E+00

    REACTANT          WT.FRAC   (ENERGY/R),K   TEMP,K  DENSITY
        EXPLODED FORMULA
 O: H2O(L)           0.333333   0.000000E+00     0.00  0.0000
          H  2.00000  O  1.00000
 O: CH3OH(L)         0.333333   0.000000E+00     0.00  0.0000
          C  1.00000  H  4.00000  O  1.00000
 O: NH3(L)           0.333333  -0.860604E+04   239.72  0.0000
          N  1.00000  H  3.00000
 F: Sasoll           1.000000  -0.114627E+06   298.16  0.0000
          C 32.00000  H 66.00000

  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
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FileEditor:Sasolwax0907.out

g 4/02	CH3	g11/00	CH2OH	g 7/00	CH3O
g 8/99	CH4	g 7/00	CH3OH	srd 01	CH3OOH
g 8/99	*CN	g12/99	CNN	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 9/00	CH3CN	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	CH3N2CH3	g 8/88	C2H5OH
g 7/00	CH3OCH3	srd 01	CH3O2CH3	g 7/00	CCN
tpis91	CNC	srd 01	OCCN	tpis79	C2N2
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
srd 01	CNCOCN	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 6/01	C4N2	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 6/01	HCN	g 1/01	HCO
tpis89	HCCN	g 6/01	HCCO	g 6/01	HNC
g 7/00	HNCO	g10/01	HNO	tpis89	HNO2
g 5/99	HNO3	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	*N
g 6/01	NCO	g 4/99	*NH	g 3/01	NH2
tpis89	NH3	tpis89	NH2OH	tpis89	*NO
g 4/99	NO2	j12/64	NO3	tpis78	*N2
g 6/01	NCN	g 5/99	N2H2	tpis89	NH2NO2
g 4/99	N2H4	g 4/99	N2O	g 4/99	N2O3
tpis89	N2O4	g 4/99	N2O5	tpis89	N3
g 4/99	N3H	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 = 2.000000

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ENTHALPY (KG-MOL)(K)/KG	EFFECTIVE FUEL h(2)/R	EFFECTIVE OXIDANT h(1)/R	MIXTURE h0/R
	-0.25423813E+03	-0.16844346E+03	-0.19704169E+03

KG-FORM.WT./KG	bi(2)	bi(1)	b0i
*H	0.14638481E+00	0.13733597E+00	0.14035225E+00
*O	0.00000000E+00	0.28905870E-01	0.19270580E-01
*C	0.70974455E-01	0.10403058E-01	0.30593524E-01
*N	0.00000000E+00	0.19572704E-01	0.13048470E-01

POINT	ITN	T	H	O	C	N
1	22	1139.222	-7.808	-35.287	-1.060	-12.331
ADD	C(gr)					
1	3	1137.142	-7.733	-34.927	-1.714	-12.340

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 290.1 PSIA
CASE = LMPHR

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 2.00000 %FUEL= 33.333333 R,EQ.RATIO= 6.816773 PHI,EQ.RATIO=-1.776024

	CHAMBER	THROAT
Pinf/P	1.0000	1.8064
P, BAR	20.000	11.072
T, K	1137.14	1010.07
RHO, KG/CU M	2.7483 0	1.7129 0
H, KJ/KG	-1638.31	-2044.23
U, KJ/KG	-2366.02	-2690.63
G, KJ/KG	-18643.6	-17149.2
S, KJ/(KG)(K)	14.9544	14.9544
M, (1/n)	12.992	12.992
MW, MOL WT	11.861	11.861
Cp, KJ/(KG)(K)	3.2479	3.1400
GAMMAs	1.2454	1.2560
SON VEL,M/SEC	952.0	901.0
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1295.9

CF	0.6953
Ivac, M/SEC	1618.4
Isp, M/SEC	901.0

MOLE FRACTIONS

CH4	0.13599	*CO	0.12361	*CO2	0.01614
C2H4	0.00001	C2H6	0.00002	HCN	0.00001
*H2	0.48682	H2O	0.07269	NH3	0.00054
*N2	0.07711	C(gr)	0.08708		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

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

POINT	ITN	T	H	O	C	N
1	3	1152.828	-7.650	-34.555	-1.736	-12.244

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 362.6 PSIA
CASE = LMPHR

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 2.00000 %FUEL= 33.333333 R,EQ.RATIO= 6.816773 PHI,EQ.RATIO=-1.776024

	CHAMBER	THROAT
Pinf/P	1.0000	1.8044
P, BAR	25.000	13.855
T, K	1152.83	1025.49
RHO, KG/CU M	3.4137 0	2.1268 0
H, KJ/KG	-1638.31	-2046.34
U, KJ/KG	-2370.64	-2697.79
G, KJ/KG	-18714.1	-17236.0
S, KJ/(KG)(K)	14.8121	14.8121

M, (1/n)	13.088	13.088
MW, MOL WT	12.015	12.015
Cp, KJ/(KG)(K)	3.2583	3.1492
GAMMAs	1.2422	1.2527
SON VEL,M/SEC	953.8	903.4
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1301.2
CF	0.6943
Ivac, M/SEC	1624.5
Isp, M/SEC	903.4

MOLE FRACTIONS

CH4	0.14417	*CO	0.12515	*CO2	0.01612
C2H4	0.00001	C2H6	0.00002	HCN	0.00001
*H2	0.47964	H2O	0.07414	NH3	0.00061
*N2	0.07808	C(gr)	0.08205		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

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

POINT	ITN	T	H	O	C	N
1	3	1165.877	-7.582	-34.251	-1.754	-12.165

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 435.1 PSIA
CASE = LMPHR

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 2.00000 %FUEL= 33.333333 R,EQ.RATIO= 6.816773 PHI,EQ.RATIO=-1.776024

	CHAMBER	THROAT
Pinf/P	1.0000	1.8027
P, BAR	30.000	16.642
T, K	1165.88	1038.35
RHO, KG/CU M	4.0757 0	2.5385 0
H, KJ/KG	-1638.31	-2048.02
U, KJ/KG	-2374.38	-2703.58
G, KJ/KG	-18772.8	-17308.3
S, KJ/(KG)(K)	14.6966	14.6966
M, (1/n)	13.169	13.169
MW, MOL WT	12.145	12.145
Cp, KJ/(KG)(K)	3.2671	3.1572
GAMMAs	1.2395	1.2500
SON VEL,M/SEC	955.2	905.2
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1305.5
CF	0.6934
Ivac, M/SEC	1629.4
Isp, M/SEC	905.2

MOLE FRACTIONS

CH4	0.15111	*CO	0.12642	*CO2	0.01613
C2H4	0.00001	C2H6	0.00003	HCN	0.00001
*H2	0.47356	H2O	0.07536	NH3	0.00067
*N2	0.07889	C(gr)	0.07780		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

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

O/F = 4.000000

	EFFECTIVE FUEL	EFFECTIVE OXIDANT	MIXTURE
ENTHALPY	h(2)/R	h(1)/R	h0/R
(KG-MOL)(K)/KG	-0.25423813E+03	-0.16844346E+03	-0.18560240E+03

KG-FORM.WT./KG	bi(2)	bi(1)	b0i
*H	0.14638481E+00	0.13733597E+00	0.13914574E+00

*O	0.00000000E+00	0.28905870E-01	0.23124696E-01
*C	0.70974455E-01	0.10403058E-01	0.22517338E-01
*N	0.00000000E+00	0.19572704E-01	0.15658164E-01

POINT	ITN	T	H	O	C	N
1	4	1189.967	-7.779	-34.162	-1.787	-12.363

REMOVE C(gr)

1	3	1193.629	-7.760	-33.922	-2.101	-12.371

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 290.1 PSIA
CASE = LMPHR

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 4.00000 %FUEL= 20.000000 R,EQ.RATIO= 4.956067 PHI,EQ.RATIO=-0.888012

	CHAMBER	THROAT
Pinf/P	1.0000	1.8338
P, BAR	20.000	10.906
T, K	1193.63	1039.77
RHO, KG/CU M	2.3439 0	1.4673 0
H, KJ/KG	-1543.19	-2026.67
U, KJ/KG	-2396.46	-2769.95
G, KJ/KG	-20893.4	-18882.7
S, KJ/(KG)(K)	16.2113	16.2113
M, (1/n)	11.631	11.631
MW, MOL WT	11.631	11.631
Cp, KJ/(KG)(K)	3.1935	3.0903
GAMMAs	1.2884	1.3009
SON VEL,M/SEC	1048.5	983.3
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1386.1
CF	0.7094
Ivac, M/SEC	1739.2
Isp, M/SEC	983.3

MOLE FRACTIONS

CH4	0.08080	*CO	0.16560	*CO2	0.01547
C2H6	0.00001	HCN	0.00001	*H2	0.57437
H2O	0.07243	NH3	0.00052	*N2	0.09079

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

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

POINT	ITN	T	H	O	C	N
1	3	1210.730	-7.672	-33.534	-2.160	-12.277

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 362.6 PSIA
CASE = LMPHR

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 4.00000 %FUEL= 20.000000 R,EQ.RATIO= 4.956067 PHI,EQ.RATIO=-0.888012

	CHAMBER	THROAT
Pinf/P	1.0000	1.8317
P, BAR	25.000	13.648
T, K	1210.73	1056.24
RHO, KG/CU M	2.9051 0	1.8180 0
H, KJ/KG	-1543.19	-2030.24
U, KJ/KG	-2403.74	-2780.98
G, KJ/KG	-20978.1	-18985.1
S, KJ/(KG)(K)	16.0522	16.0522
M, (1/n)	11.698	11.698
MW, MOL WT	11.698	11.698
Cp, KJ/(KG)(K)	3.2041	3.0998
GAMMAs	1.2851	1.2975
SON VEL,M/SEC	1051.6	987.0
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1393.3
CF	0.7084
Ivac, M/SEC	1747.6
Isp, M/SEC	987.0

MOLE FRACTIONS

CH4	0.08409	*CO	0.16384	*CO2	0.01543
C2H4	0.00001	C2H6	0.00001	HCN	0.00002
*H2	0.56893	H2O	0.07581	NH3	0.00059
*N2	0.09128				

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

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

POINT	ITN	T	H	O	C	N
1	3	1225.007	-7.601	-33.218	-2.208	-12.200

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 435.1 PSIA
CASE = LMPHR

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 4.00000 %FUEL= 20.000000 R,EQ.RATIO= 4.956067 PHI,EQ.RATIO=-0.888012

	CHAMBER	THROAT
Pinf/P	1.0000	1.8300
P, BAR	30.000	16.394
T, K	1225.01	1070.02

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RHO, KG/CU M	3.4622 0	2.1660 0
H, KJ/KG	-1543.19	-2033.14
U, KJ/KG	-2409.70	-2790.02
G, KJ/KG	-21048.9	-19071.0
S, KJ/(KG)(K)	15.9229	15.9229
M, (1/n)	11.754	11.754
MW, MOL WT	11.754	11.754
Cp, KJ/(KG)(K)	3.2131	3.1080
GAMMAs	1.2823	1.2946
SON VEL,M/SEC	1054.1	989.9
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1399.2
CF	0.7075
Ivac, M/SEC	1754.5
Isp, M/SEC	989.9

MOLE FRACTIONS

CH4	0.08687	*CO	0.16235	*CO2	0.01540
C2H4	0.00001	C2H6	0.00001	HCN	0.00002
*H2	0.56433	H2O	0.07867	NH3	0.00066
*N2	0.09169				

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

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

O/F = 6.000000

	EFFECTIVE FUEL	EFFECTIVE OXIDANT	MIXTURE
ENTHALPY	h(2)/R	h(1)/R	h0/R
(KG-MOL)(K)/KG	-0.25423813E+03	-0.16844346E+03	-0.18069984E+03

KG-FORM.WT./KG	bi(2)	bi(1)	b0i
*H	0.14638481E+00	0.13733597E+00	0.13862866E+00
*O	0.00000000E+00	0.28905870E-01	0.24776460E-01
*C	0.70974455E-01	0.10403058E-01	0.19056115E-01
*N	0.00000000E+00	0.19572704E-01	0.16776604E-01

POINT	ITN	T	H	O	C	N
1	5	1234.366	-7.776	-33.035	-2.753	-12.407

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 290.1 PSIA
CASE = LMPHR

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 6.00000 %FUEL= 14.285714 R,EQ.RATIO= 4.335832 PHI,EQ.RATIO=-0.592008

	CHAMBER	THROAT
Pinf/P	1.0000	1.8456
P, BAR	20.000	10.837
T, K	1234.37	1066.20
RHO, KG/CU M	2.1643 0	1.3577 0
H, KJ/KG	-1502.43	-2029.39
U, KJ/KG	-2426.51	-2827.58
G, KJ/KG	-22138.3	-19854.0
S, KJ/(KG)(K)	16.7178	16.7178
M, (1/n)	11.106	11.106
MW, MOL WT	11.106	11.106
Cp, KJ/(KG)(K)	3.1813	3.0854
GAMMAs	1.3077	1.3204
SON VEL,M/SEC	1099.3	1026.6
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1435.0
CF	0.7154
Ivac, M/SEC	1804.1
Isp, M/SEC	1026.6

MOLE FRACTIONS

CH4	0.03706	*CO	0.15964	*CO2	0.01492
HCN	0.00001	*H2	0.60927	H2O	0.08570
NH3	0.00048	*N2	0.09292		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

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

POINT	ITN	T	H	O	C	N
1	3	1251.320	-7.687	-32.680	-2.789	-12.312

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 362.6 PSIA
CASE = LMPHR

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 6.00000 %FUEL= 14.285714 R,EQ.RATIO= 4.335832 PHI,EQ.RATIO=-0.592008

	CHAMBER	THROAT
Pinf/P	1.0000	1.8436
P, BAR	25.000	13.561
T, K	1251.32	1082.42
RHO, KG/CU M	2.6832 0	1.6826 0
H, KJ/KG	-1502.43	-2033.17
U, KJ/KG	-2434.15	-2839.12
G, KJ/KG	-22213.3	-19948.5
S, KJ/(KG)(K)	16.5512	16.5512
M, (1/n)	11.167	11.167
MW, MOL WT	11.167	11.167
Cp, KJ/(KG)(K)	3.1905	3.0932
GAMMAs	1.3044	1.3170
SON VEL,M/SEC	1102.4	1030.3
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1442.2
CF	0.7144
Ivac, M/SEC	1812.5
Isp, M/SEC	1030.3

MOLE FRACTIONS

CH4	0.03994	*CO	0.15801	*CO2	0.01482
HCN	0.00001	*H2	0.60425	H2O	0.08903
NH3	0.00055	*N2	0.09339		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

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

POINT	ITN	T	H	O	C	N
1	3	1265.541	-7.615	-32.390	-2.819	-12.235

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 435.1 PSIA
CASE = LMPHR

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 6.00000 %FUEL= 14.285714 R,EQ.RATIO= 4.335832 PHI,EQ.RATIO=-0.592008

	CHAMBER	THROAT
Pinf/P	1.0000	1.8419
P, BAR	30.000	16.288
T, K	1265.54	1096.05
RHO, KG/CU M	3.1983 0	2.0050 0
H, KJ/KG	-1502.43	-2036.26
U, KJ/KG	-2440.43	-2848.64
G, KJ/KG	-22277.3	-20028.8
S, KJ/(KG)(K)	16.4158	16.4158
M, (1/n)	11.218	11.218
MW, MOL WT	11.218	11.218
Cp, KJ/(KG)(K)	3.1984	3.1000
GAMMAs	1.3016	1.3142
SON VEL,M/SEC	1105.0	1033.3

MACH NUMBER 0.000 1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1448.1
CF	0.7135
Ivac, M/SEC	1819.5
Isp, M/SEC	1033.3

MOLE FRACTIONS

CH4	0.04238	*CO	0.15662	*CO2	0.01474
HCN	0.00002	*H2	0.59999	H2O	0.09185
NH3	0.00061	*N2	0.09378		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

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

O/F = 8.000000

ENTHALPY	EFFECTIVE FUEL h(2)/R	EFFECTIVE OXIDANT h(1)/R	MIXTURE h0/R
(KG-MOL)(K)/KG	-0.25423813E+03	-0.16844346E+03	-0.17797620E+03

KG-FORM.WT./KG	bi(2)	bi(1)	b0i
*H	0.14638481E+00	0.13733597E+00	0.13834140E+00
*O	0.00000000E+00	0.28905870E-01	0.25694107E-01
*C	0.70974455E-01	0.10403058E-01	0.17133213E-01
*N	0.00000000E+00	0.19572704E-01	0.17397959E-01

POINT	ITN	T	H	O	C	N
1	4	1274.325	-7.809	-32.229	-3.343	-12.444

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 290.1 PSIA
CASE = LMPHR

REACTANT	WT FRACTION	ENERGY	TEMP

FileEditor:Sasolwax0907.out

		(SEE NOTE)	KJ/KG-MOL	K
OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 8.00000 %FUEL= 11.111111 R,EQ.RATIO= 4.025714 PHI,EQ.RATIO=-0.444006

	CHAMBER	THROAT
Pinf/P	1.0000	1.8505
P, BAR	20.000	10.808
T, K	1274.33	1096.85
RHO, KG/CU M	2.0560 0	1.2908 0
H, KJ/KG	-1479.78	-2035.96
U, KJ/KG	-2452.55	-2873.25
G, KJ/KG	-23120.8	-20663.1
S, KJ/(KG)(K)	16.9824	16.9824
M, (1/n)	10.892	10.892
MW, MOL WT	10.892	10.892
Cp, KJ/(KG)(K)	3.1802	3.0870
GAMMAs	1.3158	1.3285
SON VEL,M/SEC	1131.4	1054.7
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1469.1
CF	0.7179
Ivac, M/SEC	1848.6
Isp, M/SEC	1054.7

MOLE FRACTIONS

CH4	0.01717	*CO	0.15503	*CO2	0.01440
HCN	0.00001	*H2	0.62240	H2O	0.09603
NH3	0.00042	*N2	0.09453		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

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

POINT	ITN	T	H	O	C	N
1	3	1289.570	-7.717	-31.932	-3.338	-12.348

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 362.6 PSIA
CASE = LMPHR

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 8.00000 %FUEL= 11.111111 R,EQ.RATIO= 4.025714 PHI,EQ.RATIO=-0.444006

	CHAMBER	THROAT
Pinf/P	1.0000	1.8487
P, BAR	25.000	13.523
T, K	1289.57	1111.42
RHO, KG/CU M	2.5518 0	1.6016 0
H, KJ/KG	-1479.78	-2039.40
U, KJ/KG	-2459.50	-2883.76
G, KJ/KG	-23160.6	-20725.0
S, KJ/(KG)(K)	16.8124	16.8124
M, (1/n)	10.944	10.944
MW, MOL WT	10.944	10.944
Cp, KJ/(KG)(K)	3.1880	3.0936
GAMMAs	1.3129	1.3255
SON VEL,M/SEC	1134.1	1057.9
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1475.5
CF	0.7170
Ivac, M/SEC	1856.1
Isp, M/SEC	1057.9

MOLE FRACTIONS

CH4	0.01961	*CO	0.15359	*CO2	0.01429
HCN	0.00001	*H2	0.61803	H2O	0.09903
NH3	0.00049	*N2	0.09495		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

FileEditor:Sasolwax0907.out

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

POINT	ITN	T	H	O	C	N
1	3	1302.579	-7.643	-31.683	-3.340	-12.269

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 435.1 PSIA
CASE = LMPHR

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 8.00000 %FUEL= 11.111111 R,EQ.RATIO= 4.025714 PHI,EQ.RATIO=-0.444006

	CHAMBER	THROAT
Pinf/P	1.0000	1.8472
P, BAR	30.000	16.241
T, K	1302.58	1123.87
RHO, KG/CU M	3.0440 0	1.9100 0
H, KJ/KG	-1479.78	-2042.26
U, KJ/KG	-2465.33	-2892.60
G, KJ/KG	-23199.2	-20782.0
S, KJ/(KG)(K)	16.6742	16.6742
M, (1/n)	10.989	10.989
MW, MOL WT	10.989	10.989
Cp, KJ/(KG)(K)	3.1948	3.0994
GAMMAs	1.3103	1.3230
SON VEL,M/SEC	1136.4	1060.6
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1480.9
CF	0.7162
Ivac, M/SEC	1862.4
Isp, M/SEC	1060.6

MOLE FRACTIONS

CH4	0.02171	*CO	0.15234	*CO2	0.01420
HCN	0.00002	*H2	0.61425	H2O	0.10161
NH3	0.00055	*N2	0.09531		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

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

O/F = 10.000000

	EFFECTIVE FUEL	EFFECTIVE OXIDANT	MIXTURE
ENTHALPY	h(2)/R	h(1)/R	h0/R
(KG-MOL)(K)/KG	-0.25423813E+03	-0.16844346E+03	-0.17624298E+03

KG-FORM.WT./KG	bi(2)	bi(1)	b0i
*H	0.14638481E+00	0.13733597E+00	0.13815859E+00
*O	0.00000000E+00	0.28905870E-01	0.26278064E-01
*C	0.70974455E-01	0.10403058E-01	0.15909549E-01
*N	0.00000000E+00	0.19572704E-01	0.17793368E-01

POINT	ITN	T	H	O	C	N
1	4	1317.432	-7.852	-31.417	-3.941	-12.485

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 290.1 PSIA
CASE = LMPHR

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 10.00000 %FUEL= 9.090909 R,EQ.RATIO= 3.839643 PHI,EQ.RATIO=-0.355205

	CHAMBER	THROAT
Pinf/P	1.0000	1.8517
P, BAR	20.000	10.801
T, K	1317.43	1132.97

RHO, KG/CU M	1.9752 0	1.2403 0
H, KJ/KG	-1465.37	-2044.69
U, KJ/KG	-2477.93	-2915.47
G, KJ/KG	-24046.7	-21464.3
S, KJ/(KG)(K)	17.1404	17.1404
M, (1/n)	10.818	10.818
MW, MOL WT	10.818	10.818
Cp, KJ/(KG)(K)	3.1867	3.0938
GAMMAs	1.3178	1.3305
SON VEL,M/SEC	1155.2	1076.4
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1498.0
CF	0.7185
Ivac, M/SEC	1885.4
Isp, M/SEC	1076.4

MOLE FRACTIONS

CH4	0.00764	*CO	0.15056	*CO2	0.01390
HCN	0.00001	*H2	0.62556	H2O	0.10591
NH3	0.00036	*N2	0.09606		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

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

POINT	ITN	T	H	O	C	N
1	3	1329.286	-7.756	-31.201	-3.878	-12.384

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 362.6 PSIA
CASE = LMPHR

REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K

FileEditor:Sasolwax0907.out

OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 10.00000 %FUEL= 9.090909 R,EQ.RATIO= 3.839643 PHI,EQ.RATIO=-0.355205

	CHAMBER	THROAT
Pinf/P	1.0000	1.8503
P, BAR	25.000	13.511
T, K	1329.29	1144.32
RHO, KG/CU M	2.4560 0	1.5419 0
H, KJ/KG	-1465.37	-2047.30
U, KJ/KG	-2483.27	-2923.56
G, KJ/KG	-24022.3	-21465.5
S, KJ/(KG)(K)	16.9692	16.9692
M, (1/n)	10.858	10.858
MW, MOL WT	10.858	10.858
Cp, KJ/(KG)(K)	3.1927	3.0989
GAMMAs	1.3155	1.3282
SON VEL,M/SEC	1157.2	1078.8
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1502.9
CF	0.7178
Ivac, M/SEC	1891.1
Isp, M/SEC	1078.8

MOLE FRACTIONS

CH4	0.00949	*CO	0.14943	*CO2	0.01382
HCN	0.00001	*H2	0.62218	H2O	0.10826
NH3	0.00042	*N2	0.09638		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

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

POINT	ITN	T	H	O	C	N
1	3	1339.893	-7.678	-31.010	-3.838	-12.303

THEORETICAL ROCKET PERFORMANCE ASSUMING FROZEN COMPOSITION

Pin = 435.1 PSIA
CASE = LMPHR

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
OXIDANT	H2O(L)	0.3333333	0.000	0.000
OXIDANT	CH3OH(L)	0.3333333	0.000	0.000
OXIDANT	NH3(L)	0.3333333	-71555.000	239.720
FUEL	Sasoll	1.0000000	-953071.000	298.160

O/F= 10.00000 %FUEL= 9.090909 R,EQ.RATIO= 3.839643 PHI,EQ.RATIO=-0.355205

	CHAMBER	THROAT
Pinf/P	1.0000	1.8491
P, BAR	30.000	16.224
T, K	1339.89	1154.50
RHO, KG/CU M	2.9337 0	1.8414 0
H, KJ/KG	-1465.37	-2049.60
U, KJ/KG	-2487.98	-2930.72
G, KJ/KG	-24015.5	-21479.6
S, KJ/(KG)(K)	16.8298	16.8298
M, (1/n)	10.894	10.894
MW, MOL WT	10.894	10.894
Cp, KJ/(KG)(K)	3.1981	3.1035
GAMMAs	1.3134	1.3261
SON VEL,M/SEC	1158.9	1081.0
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1507.2
CF	0.7172
Ivac, M/SEC	1896.1
Isp, M/SEC	1081.0

MOLE FRACTIONS

CH4	0.01115	*CO	0.14841	*CO2	0.01375
HCN	0.00001	*H2	0.61914	H2O	0.11038
NH3	0.00049	*N2	0.09667		

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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

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