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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 0907  wt=100  t,k=298.16
     h,kj/mol=-1422.526  C 50 H 102

 WARNING!! Wax             NOT RECOGNIZED (INPUT)

 WARNING!!  LITERAL EXPECTED FOR 0907           (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  -0.171090E+06   298.16  0.0000
          C 50.00000  H ********

  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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	EFFECTIVE FUEL	EFFECTIVE OXIDANT	MIXTURE
ENTHALPY	h(2)/R	h(1)/R	h0/R
(KG-MOL)(K)/KG	-0.24325133E+03	-0.16844346E+03	-0.19337942E+03

KG-FORM.WT./KG	bi(2)	bi(1)	b0i
*H	0.14502132E+00	0.13733597E+00	0.13989775E+00
*O	0.00000000E+00	0.28905870E-01	0.19270580E-01
*C	0.71088880E-01	0.10403058E-01	0.30631666E-01
*N	0.00000000E+00	0.19572704E-01	0.13048470E-01

POINT	ITN	T	H	O	C	N
1	22	1141.750	-7.810	-35.264	-1.052	-12.334
ADD	C(gr)					
1	3	1139.485	-7.734	-34.894	-1.717	-12.343

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	-1422526.000	298.160

O/F= 2.00000 %FUEL= 33.333333 R,EQ.RATIO= 6.808939 PHI,EQ.RATIO=-1.772286

	CHAMBER	THROAT
Pinf/P	1.0000	1.8066
P, BAR	20.000	11.070
T, K	1139.49	1011.95
RHO, KG/CU M	2.7419 0	1.7089 0
H, KJ/KG	-1607.86	-2014.80
U, KJ/KG	-2337.28	-2662.59
G, KJ/KG	-18645.9	-17146.0
S, KJ/(KG)(K)	14.9524	14.9524
M, (1/n)	12.989	12.989
MW, MOL WT	11.847	11.847
Cp, KJ/(KG)(K)	3.2441	3.1366
GAMMAs	1.2458	1.2564
SON VEL,M/SEC	953.3	902.2
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1297.2

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CF	0.6954
Ivac, M/SEC	1620.2
Isp, M/SEC	902.2

MOLE FRACTIONS

CH4	0.13412	*CO	0.12493	*CO2	0.01590
C2H4	0.00001	C2H6	0.00002	HCN	0.00001
*H2	0.48801	H2O	0.07156	NH3	0.00054
*N2	0.07702	C(gr)	0.08788		

* 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	1155.213	-7.651	-34.522	-1.739	-12.247

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	-1422526.000	298.160

O/F= 2.00000 %FUEL= 33.333333 R,EQ.RATIO= 6.808939 PHI,EQ.RATIO=-1.772286

	CHAMBER	THROAT
Pinf/P	1.0000	1.8046
P, BAR	25.000	13.853
T, K	1155.21	1027.41
RHO, KG/CU M	3.4057 0	2.1219 0
H, KJ/KG	-1607.86	-2016.92
U, KJ/KG	-2341.93	-2669.78
G, KJ/KG	-18716.7	-17233.0
S, KJ/(KG)(K)	14.8101	14.8101

M, (1/n)	13.085	13.085
MW, MOL WT	12.000	12.000
Cp, KJ/(KG)(K)	3.2544	3.1458
GAMMAs	1.2426	1.2531
SON VEL,M/SEC	955.1	904.5
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1302.6
CF	0.6944
Ivac, M/SEC	1626.3
Isp, M/SEC	904.5

MOLE FRACTIONS

CH4	0.14225	*CO	0.12646	*CO2	0.01589
C2H4	0.00001	C2H6	0.00002	HCN	0.00001
*H2	0.48086	H2O	0.07301	NH3	0.00061
*N2	0.07798	C(gr)	0.08290		

* 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	1168.300	-7.583	-34.219	-1.757	-12.168

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	-1422526.000	298.160

O/F= 2.00000 %FUEL= 33.333333 R,EQ.RATIO= 6.808939 PHI,EQ.RATIO=-1.772286

	CHAMBER	THROAT
Pinf/P	1.0000	1.8030
P, BAR	30.000	16.639
T, K	1168.30	1040.31
RHO, KG/CU M	4.0660 0	2.5326 0
H, KJ/KG	-1607.86	-2018.61
U, KJ/KG	-2345.68	-2675.60
G, KJ/KG	-18775.6	-17305.5
S, KJ/(KG)(K)	14.6946	14.6946
M, (1/n)	13.165	13.165
MW, MOL WT	12.130	12.130
Cp, KJ/(KG)(K)	3.2633	3.1537
GAMMAs	1.2400	1.2504
SON VEL,M/SEC	956.5	906.4
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1306.9
CF	0.6935
Ivac, M/SEC	1631.2
Isp, M/SEC	906.4

MOLE FRACTIONS

CH4	0.14915	*CO	0.12772	*CO2	0.01589
C2H4	0.00001	C2H6	0.00003	HCN	0.00001
*H2	0.47480	H2O	0.07423	NH3	0.00067
*N2	0.07880	C(gr)	0.07869		

* 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	-0.24325133E+03	-0.16844346E+03	-0.18340504E+03

KG-FORM.WT./KG	bi(2)	bi(1)	b0i
*H	0.14502132E+00	0.13733597E+00	0.13887304E+00

*O	0.00000000E+00	0.28905870E-01	0.23124696E-01
*C	0.71088880E-01	0.10403058E-01	0.22540223E-01
*N	0.00000000E+00	0.19572704E-01	0.15658164E-01

POINT	ITN	T	H	O	C	N
1	4	1191.493	-7.780	-34.144	-1.789	-12.365

REMOVE C(gr)

1	3	1195.146	-7.761	-33.904	-2.102	-12.373

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	-1422526.000	298.160

O/F= 4.00000 %FUEL= 20.000000 R,EQ.RATIO= 4.952150 PHI,EQ.RATIO=-0.886143

	CHAMBER	THROAT
Pinf/P	1.0000	1.8340
P, BAR	20.000	10.905
T, K	1195.15	1040.94
RHO, KG/CU M	2.3409 0	1.4655 0
H, KJ/KG	-1524.92	-2009.09
U, KJ/KG	-2379.30	-2753.23
G, KJ/KG	-20897.5	-18882.0
S, KJ/(KG)(K)	16.2094	16.2094
M, (1/n)	11.631	11.631
MW, MOL WT	11.631	11.631
Cp, KJ/(KG)(K)	3.1907	3.0878
GAMMAs	1.2887	1.3013
SON VEL,M/SEC	1049.3	984.0
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1386.9
CF	0.7095
Ivac, M/SEC	1740.3
Isp, M/SEC	984.0

MOLE FRACTIONS

CH4	0.08012	*CO	0.16668	*CO2	0.01532
C2H6	0.00001	HCN	0.00001	*H2	0.57491
H2O	0.07164	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	1212.266	-7.674	-33.516	-2.161	-12.279

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	-1422526.000	298.160

O/F= 4.00000 %FUEL= 20.000000 R,EQ.RATIO= 4.952150 PHI,EQ.RATIO=-0.886143

	CHAMBER	THROAT
Pinf/P	1.0000	1.8319
P, BAR	25.000	13.647
T, K	1212.27	1057.42
RHO, KG/CU M	2.9013 0	1.8157 0
H, KJ/KG	-1524.92	-2012.66
U, KJ/KG	-2386.60	-2764.27
G, KJ/KG	-20982.2	-18984.6
S, KJ/(KG)(K)	16.0503	16.0503
M, (1/n)	11.697	11.697
MW, MOL WT	11.697	11.697
Cp, KJ/(KG)(K)	3.2014	3.0973
GAMMAs	1.2854	1.2978
SON VEL,M/SEC	1052.4	987.7
MACH NUMBER	0.000	1.000

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PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1394.1
CF	0.7085
Ivac, M/SEC	1748.7
Isp, M/SEC	987.7

MOLE FRACTIONS

CH4	0.08340	*CO	0.16492	*CO2	0.01529
C2H4	0.00001	C2H6	0.00001	HCN	0.00002
*H2	0.56949	H2O	0.07500	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	1226.560	-7.602	-33.200	-2.209	-12.202

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	-1422526.000	298.160

O/F= 4.00000 %FUEL= 20.000000 R,EQ.RATIO= 4.952150 PHI,EQ.RATIO=-0.886143

	CHAMBER	THROAT
Pinf/P	1.0000	1.8302
P, BAR	30.000	16.392
T, K	1226.56	1071.22

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RHO, KG/CU M	3.4576 0	2.1632 0
H, KJ/KG	-1524.92	-2015.56
U, KJ/KG	-2392.57	-2773.32
G, KJ/KG	-21053.0	-19070.5
S, KJ/(KG)(K)	15.9210	15.9210
M, (1/n)	11.754	11.754
MW, MOL WT	11.754	11.754
Cp, KJ/(KG)(K)	3.2103	3.1055
GAMMAs	1.2826	1.2950
SON VEL,M/SEC	1054.9	990.6
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1400.0
CF	0.7076
Ivac, M/SEC	1755.5
Isp, M/SEC	990.6

MOLE FRACTIONS

CH4	0.08618	*CO	0.16343	*CO2	0.01527
C2H4	0.00001	C2H6	0.00001	HCN	0.00002
*H2	0.56490	H2O	0.07784	NH3	0.00066
*N2	0.09168				

* 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	-0.24325133E+03	-0.16844346E+03	-0.17913030E+03

KG-FORM.WT./KG	bi(2)	bi(1)	b0i
*H	0.14502132E+00	0.13733597E+00	0.13843388E+00
*O	0.00000000E+00	0.28905870E-01	0.24776460E-01
*C	0.71088880E-01	0.10403058E-01	0.19072461E-01
*N	0.00000000E+00	0.19572704E-01	0.16776604E-01

POINT	ITN	T	H	O	C	N
1	5	1235.701	-7.777	-33.017	-2.758	-12.408

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	-1422526.000	298.160

O/F= 6.00000 %FUEL= 14.285714 R,EQ.RATIO= 4.333220 PHI,EQ.RATIO=-0.590762

	CHAMBER	THROAT
Pinf/P	1.0000	1.8457
P, BAR	20.000	10.836
T, K	1235.70	1067.25
RHO, KG/CU M	2.1621 0	1.3563 0
H, KJ/KG	-1489.38	-2016.93
U, KJ/KG	-2414.43	-2815.87
G, KJ/KG	-22145.6	-19857.2
S, KJ/(KG)(K)	16.7162	16.7162
M, (1/n)	11.107	11.107
MW, MOL WT	11.107	11.107
Cp, KJ/(KG)(K)	3.1793	3.0835
GAMMAs	1.3080	1.3206
SON VEL,M/SEC	1100.0	1027.2
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1435.6
CF	0.7155
Ivac, M/SEC	1805.0
Isp, M/SEC	1027.2

MOLE FRACTIONS

CH4	0.03664	*CO	0.16034	*CO2	0.01483
HCN	0.00001	*H2	0.60960	H2O	0.08518
NH3	0.00047	*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

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	1252.653	-7.688	-32.663	-2.793	-12.314

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	-1422526.000	298.160

O/F= 6.00000 %FUEL= 14.285714 R,EQ.RATIO= 4.333220 PHI,EQ.RATIO=-0.590762

	CHAMBER	THROAT
Pinf/P	1.0000	1.8437
P, BAR	25.000	13.560
T, K	1252.65	1083.46
RHO, KG/CU M	2.6805 0	1.6809 0
H, KJ/KG	-1489.38	-2020.71
U, KJ/KG	-2422.06	-2827.41
G, KJ/KG	-22220.3	-19951.5
S, KJ/(KG)(K)	16.5496	16.5496
M, (1/n)	11.167	11.167
MW, MOL WT	11.167	11.167
Cp, KJ/(KG)(K)	3.1885	3.0913
GAMMAs	1.3047	1.3173
SON VEL,M/SEC	1103.1	1030.8
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1442.8
CF	0.7145
Ivac, M/SEC	1813.4
Isp, M/SEC	1030.8

MOLE FRACTIONS

CH4	0.03951	*CO	0.15871	*CO2	0.01474
HCN	0.00001	*H2	0.60459	H2O	0.08849
NH3	0.00054	*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	1266.873	-7.616	-32.373	-2.823	-12.237

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	-1422526.000	298.160

O/F= 6.00000 %FUEL= 14.285714 R,EQ.RATIO= 4.333220 PHI,EQ.RATIO=-0.590762

	CHAMBER	THROAT
Pinf/P	1.0000	1.8420
P, BAR	30.000	16.287
T, K	1266.87	1097.09
RHO, KG/CU M	3.1950 0	2.0030 0
H, KJ/KG	-1489.38	-2023.79
U, KJ/KG	-2428.34	-2836.92
G, KJ/KG	-22284.0	-20031.6
S, KJ/(KG)(K)	16.4141	16.4141
M, (1/n)	11.218	11.218
MW, MOL WT	11.218	11.218
Cp, KJ/(KG)(K)	3.1964	3.0981
GAMMAs	1.3019	1.3145
SON VEL,M/SEC	1105.6	1033.8

MACH NUMBER 0.000 1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1448.8
CF	0.7136
Ivac, M/SEC	1820.4
Isp, M/SEC	1033.8

MOLE FRACTIONS

CH4	0.04195	*CO	0.15732	*CO2	0.01466
HCN	0.00002	*H2	0.60035	H2O	0.09130
NH3	0.00061	*N2	0.09379		

* 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

	EFFECTIVE FUEL	EFFECTIVE OXIDANT	MIXTURE
ENTHALPY	h(2)/R	h(1)/R	h0/R
(KG-MOL)(K)/KG	-0.24325133E+03	-0.16844346E+03	-0.17675545E+03

KG-FORM.WT./KG	bi(2)	bi(1)	b0i
*H	0.14502132E+00	0.13733597E+00	0.13818990E+00
*O	0.00000000E+00	0.28905870E-01	0.25694107E-01
*C	0.71088880E-01	0.10403058E-01	0.17145927E-01
*N	0.00000000E+00	0.19572704E-01	0.17397959E-01

POINT	ITN	T	H	O	C	N
1	4	1275.738	-7.810	-32.209	-3.352	-12.446

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	-1422526.000	298.160

O/F= 8.00000 %FUEL= 11.111111 R,EQ.RATIO= 4.023756 PHI,EQ.RATIO=-0.443071

	CHAMBER	THROAT
Pinf/P	1.0000	1.8506
P, BAR	20.000	10.807
T, K	1275.74	1098.01
RHO, KG/CU M	2.0540 0	1.2896 0
H, KJ/KG	-1469.63	-2026.38
U, KJ/KG	-2443.35	-2864.44
G, KJ/KG	-23132.8	-20671.5
S, KJ/(KG)(K)	16.9808	16.9808
M, (1/n)	10.893	10.893
MW, MOL WT	10.893	10.893
Cp, KJ/(KG)(K)	3.1788	3.0857
GAMMAs	1.3160	1.3286
SON VEL,M/SEC	1132.0	1055.2
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.00000
CSTAR, M/SEC	1469.8
CF	0.7180
Ivac, M/SEC	1849.4
Isp, M/SEC	1055.2

MOLE FRACTIONS

CH4	0.01690	*CO	0.15553	*CO2	0.01434
HCN	0.00001	*H2	0.62257	H2O	0.09569
NH3	0.00042	*N2	0.09455		

* 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	1290.937	-7.718	-31.913	-3.347	-12.349

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	-1422526.000	298.160

O/F= 8.00000 %FUEL= 11.111111 R,EQ.RATIO= 4.023756 PHI,EQ.RATIO=-0.443071

	CHAMBER	THROAT
Pinf/P	1.0000	1.8488
P, BAR	25.000	13.522
T, K	1290.94	1112.53
RHO, KG/CU M	2.5494 0	1.6001 0
H, KJ/KG	-1469.63	-2029.80
U, KJ/KG	-2450.27	-2874.91
G, KJ/KG	-23171.5	-20732.4
S, KJ/(KG)(K)	16.8109	16.8109
M, (1/n)	10.945	10.945
MW, MOL WT	10.945	10.945
Cp, KJ/(KG)(K)	3.1866	3.0922
GAMMAs	1.3130	1.3257
SON VEL,M/SEC	1134.7	1058.5
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1476.1
CF	0.7170
Ivac, M/SEC	1856.9
Isp, M/SEC	1058.5

MOLE FRACTIONS

CH4	0.01933	*CO	0.15409	*CO2	0.01424
HCN	0.00001	*H2	0.61821	H2O	0.09867
NH3	0.00048	*N2	0.09497		

* 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	1303.915	-7.644	-31.665	-3.347	-12.271

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	-1422526.000	298.160

O/F= 8.00000 %FUEL= 11.111111 R,EQ.RATIO= 4.023756 PHI,EQ.RATIO=-0.443071

	CHAMBER	THROAT
Pinf/P	1.0000	1.8472
P, BAR	30.000	16.240
T, K	1303.91	1124.96
RHO, KG/CU M	3.0412 0	1.9083 0
H, KJ/KG	-1469.63	-2032.66
U, KJ/KG	-2456.09	-2883.72
G, KJ/KG	-23209.4	-20788.7
S, KJ/(KG)(K)	16.6727	16.6727
M, (1/n)	10.990	10.990
MW, MOL WT	10.990	10.990
Cp, KJ/(KG)(K)	3.1933	3.0980
GAMMAs	1.3105	1.3231
SON VEL,M/SEC	1137.0	1061.2
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1481.5
CF	0.7163
Ivac, M/SEC	1863.2
Isp, M/SEC	1061.2

MOLE FRACTIONS

CH4	0.02142	*CO	0.15284	*CO2	0.01415
HCN	0.00002	*H2	0.61445	H2O	0.10124
NH3	0.00055	*N2	0.09532		

* 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	-0.24325133E+03	-0.16844346E+03	-0.17524418E+03

KG-FORM.WT./KG	bi(2)	bi(1)	b0i
*H	0.14502132E+00	0.13733597E+00	0.13803464E+00
*O	0.00000000E+00	0.28905870E-01	0.26278064E-01
*C	0.71088880E-01	0.10403058E-01	0.15919951E-01
*N	0.00000000E+00	0.19572704E-01	0.17793368E-01

POINT	ITN	T	H	O	C	N
1	4	1319.039	-7.854	-31.393	-3.954	-12.486

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	-1422526.000	298.160

O/F= 10.00000 %FUEL= 9.090909 R,EQ.RATIO= 3.838077 PHI,EQ.RATIO=-0.354457

	CHAMBER	THROAT
Pinf/P	1.0000	1.8518
P, BAR	20.000	10.800
T, K	1319.04	1134.33

RHO, KG/CU M	1.9733 0	1.2391 0
H, KJ/KG	-1457.07	-2036.97
U, KJ/KG	-2470.62	-2908.60
G, KJ/KG	-24064.0	-21478.2
S, KJ/(KG)(K)	17.1389	17.1389
M, (1/n)	10.821	10.821
MW, MOL WT	10.821	10.821
Cp, KJ/(KG)(K)	3.1857	3.0928
GAMMAs	1.3179	1.3306
SON VEL,M/SEC	1155.7	1076.9
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1498.8
CF	0.7186
Ivac, M/SEC	1886.3
Isp, M/SEC	1076.9

MOLE FRACTIONS

CH4	0.00748	*CO	0.15091	*CO2	0.01386
HCN	0.00001	*H2	0.62558	H2O	0.10572
NH3	0.00035	*N2	0.09608		

* 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	1330.796	-7.757	-31.179	-3.890	-12.386

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	-1422526.000	298.160

O/F= 10.00000 %FUEL= 9.090909 R,EQ.RATIO= 3.838077 PHI,EQ.RATIO=-0.354457

	CHAMBER	THROAT
Pinf/P	1.0000	1.8504
P, BAR	25.000	13.511
T, K	1330.80	1145.60
RHO, KG/CU M	2.4538 0	1.5405 0
H, KJ/KG	-1457.07	-2039.55
U, KJ/KG	-2475.91	-2916.60
G, KJ/KG	-24037.7	-21477.8
S, KJ/(KG)(K)	16.9678	16.9678
M, (1/n)	10.860	10.860
MW, MOL WT	10.860	10.860
Cp, KJ/(KG)(K)	3.1916	3.0979
GAMMAs	1.3156	1.3283
SON VEL,M/SEC	1157.7	1079.3
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1503.6
CF	0.7178
Ivac, M/SEC	1891.9
Isp, M/SEC	1079.3

MOLE FRACTIONS

CH4	0.00931	*CO	0.14979	*CO2	0.01378
HCN	0.00001	*H2	0.62224	H2O	0.10804
NH3	0.00042	*N2	0.09640		

* 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	1341.334	-7.680	-30.990	-3.848	-12.305

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	-1422526.000	298.160

O/F= 10.00000 %FUEL= 9.090909 R,EQ.RATIO= 3.838077 PHI,EQ.RATIO=-0.354457

	CHAMBER	THROAT
Pinf/P	1.0000	1.8491
P, BAR	30.000	16.224
T, K	1341.33	1155.71
RHO, KG/CU M	2.9311 0	1.8397 0
H, KJ/KG	-1457.07	-2041.83
U, KJ/KG	-2480.59	-2923.71
G, KJ/KG	-24029.6	-21490.6
S, KJ/(KG)(K)	16.8284	16.8284
M, (1/n)	10.896	10.896
MW, MOL WT	10.896	10.896
Cp, KJ/(KG)(K)	3.1970	3.1025
GAMMAs	1.3135	1.3262
SON VEL,M/SEC	1159.5	1081.4
MACH NUMBER	0.000	1.000

PERFORMANCE PARAMETERS

Ae/At	1.0000
CSTAR, M/SEC	1507.9
CF	0.7172
Ivac, M/SEC	1896.9
Isp, M/SEC	1081.4

MOLE FRACTIONS

CH4	0.01097	*CO	0.14878	*CO2	0.01371
HCN	0.00001	*H2	0.61922	H2O	0.11014
NH3	0.00048	*N2	0.09669		

* 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