

NASA-GLENN CHEMICAL EQUILIBRIUM PROGRAM CEA2, FEBRUARY 5, 2004
 BY BONNIE MCBRIDE AND SANFORD GORDON
 REFS: NASA RP-1311, PART I, 1994 AND NASA RP-1311, PART II, 1996

prob case=68461405 ro equilibrium

```
! iac problem
o/f 2
p,atm = 40
pip 40
reac
  fuel RP-1 wt%=100. t,k=298.15
  oxid O2(L) wt%=100. t,k=90.17
output short
output trace=1e-5
end
```

THEORETICAL ROCKET PERFORMANCE ASSUMING EQUILIBRIUM

COMPOSITION DURING EXPANSION FROM INFINITE AREA COMBUSTOR

Pin = 587.8 PSIA
 CASE = 68461405

	REACTANT	WT FRACTION (SEE NOTE)	ENERGY KJ/KG-MOL	TEMP K
FUEL	RP-1	1.0000000	-24717.700	298.150
OXIDANT	O2(L)	1.0000000	-12979.000	90.170

O/F= 2.00000 %FUEL= 33.33333 R,EQ.RATIO= 1.702833 PHI,EQ.RATIO= 1.702833

	CHAMBER	THROAT	EXIT
Pinf/P	1.0000	1.7585	40.000
P, BAR	40.530	23.048	1.0132
T, K	3298.17	3059.10	1802.63
RHO, KG/CU M	3.0682 0	1.8966 0	1.4351-1
H, KJ/KG	-859.93	-1575.49	-4538.39
U, KJ/KG	-2180.91	-2790.72	-5244.44
G, KJ/KG	-40683.3	-38512.2	-26304.0
S, KJ/(KG) (K)	12.0744	12.0744	12.0744

M, (1/n)	20.759	20.930	21.228
(dLV/dLP)t	-1.01182	-1.00739	-1.00005
(dLV/dLT)p	1.2177	1.1455	1.0015
Cp, KJ/(KG) (K)	3.7818	3.2932	2.0599
GAMMAS	1.1699	1.1777	1.2356
SON VEL,M/SEC	1243.1	1196.3	934.0
MACH NUMBER	0.000	1.000	2.904

PERFORMANCE PARAMETERS

Ae/At	1.0000	5.8290
CSTAR, M/SEC	1786.3	1786.3
CF	0.6697	1.5184
Ivac, M/SEC	2212.1	2972.7

Isp, M/SEC 1196.3 2712.4

MOLE FRACTIONS

*CO	4.1822-1	4.1789-1	3.9048-1
*CO2	7.6858-2	8.1282-2	1.1580-1
*H	2.4784-2	1.7256-2	1.7506-4
HCO	2.4217-5	1.1938-5	4.0085-8
*H2	1.8774-1	1.9219-1	2.3111-1
H2O	2.7461-1	2.8114-1	2.6242-1
*O	1.1553-3	4.7653-4	7.7025-9
*OH	1.5937-2	9.4817-3	1.5125-5
*O2	6.5668-4	2.7465-4	3.8666-9

* THERMODYNAMIC PROPERTIES FITTED TO 20000.K

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