HOLCOMBE

GEOPHYSICAL CONSTANTS FOR USE IN GEMINI MISSION PLANNING STUDIES

1. The gravitational and related constants listed below have been established for use in Project Gemini.

2. Gravitational model. - All constants below are used as exact with the exception of b and μ, which are derived from other constants in the list. Accuracies are shown for information only.

a = Earth's gravitational radius = 6,378,166 ($\pm$70) meters

=20,925,741 International feet

b = 6,356,784 meters

$1/f$ = Reciprocal of earth's flattening = 298.3 ± 0.1

g_E = 9.78030 meters/sec^2

$\mu_e = GM_e$ = Geocentric gravitational constant derived from g_E

= 3.986031×10^{14} ($\pm 44 \times 10^8$) meters^3/sec^2

= 1.407654×10^{16} International feet^3/sec^2

$$\Phi = \frac{GM_e}{R}\left[1 + \frac{JR_e^2}{3R^2}(1 - 3\sin^2\phi) + \frac{H}{5}\frac{R_e^3}{R^3}(3-5\sin^2\phi)(\sin\phi) + \frac{+D}{35}\frac{R_e^4}{R^4}(3-30\sin^2\phi + 35\sin^4\phi)\right]$$

$J = 1623.46 \times 10^{-6}$
$H = -0.575 \times 10^{-5}$
$D = 0.7875 \times 10^{-5}$

$T = \sqrt{a^3/\mu}$ = canonical unit of time = 806.8137 sec

ω = Rotational speed of earth = $0.7292\ 11508 \times 10^{-4}$ radians/sec

3. Conversion Factors. -

1 International foot = 0.3048 meter (exact)

1 International nautical mile = 1852 meters (exact) = 6076.115486 International feet

1 International pound = 0.45359237 kilogram

1 Slug = (9.80665 + 0.3048) = 32.174048 pounds (International Commission on Weights and Measures)

1 American Survey foot = 0.30480061 meter