GLAST The Gamma Ray Large Area Space Telescope

Modelling the High Altitude Environment

Parameters used by one or more of these models:

Temperature at sea level:	T_0 = 288 K = 15°C = 59°F = 518 R
Air density at sea level:	r_0 = 1.225 kg/m^3 = 0.07648 lb/ft^3 = 0.0023769 slug/ft^3
Air pressure at sea level:	P_0 = 101325 N/m^2 = 2116 lb/ft^2 = 14.69 lb/in^2
Effective height of atmosphere:	a = 8.42 km. This is the height the atmosphere would have to have if its density were *constant* with altitude, and equal to r_0, in order to maintain pressure P_0 at sea level.

Simple Exponential Atmosphere Model:

If you assume that the atmosphere consists of an ideal gas (a reasonable assumption) at constant temperature (not so reasonable), then you come up with the following model of pressure and density vs. altitude:

Temperature:	$T = T_0$, independent of h.
Pressure:	$P = P_0\ e^{-h/a}$
Density:	$r = r_0\ e^{-h/a}$

1976 Standard Atmosphere Model:

For altitudes between 32 and 47 km, NASA, NOAA, and USAF use this empirical model:

Temperature:	$T = T_0$ (0.482561 + h / 102910 m)
Pressure:	$P = P_0$ (0.898309 + h / 55282 m)$^{-12.20114}$
Density:	$r = r_0$ (0.857003 + h / 57947 m)$^{-13.20114}$

Models' Predictions for the Environment at Float Height:

	Exponential Model	**1976 Empirical Model**
Air Temperature:	288 K = 15 C	251 K = -22 C
Air Pressure:	P = 876 N/m^2	P = 277 N/m^2
Air Density:	r = 0.0106 kg/m^3	r = 0.0039 kg/m^3

So, which model did the GLAST Balloon Flight designers use to design their hardware and plan its course? And what conditions did the GLAST Balloon actually encounter at this height? Check the GLAST Flight Parameters page to see what the planners

expected, or the GLAST Balloon Flight environmental data page to find out what the balloon actually measured...