One of each - by 1 Dec Balloon,
5 of each 1 Jan

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After our discussion of yesterday I thought the following calculations might prove useful:

A. system requirements 44½" sphere and 24" sphere to 50,000 feet in. s. l., rate of rise 1000 ft/min

B. lifter balloon size determination

$$V = \frac{W_1 + W_2}{.070} \times \text{exp. factor}$$

where V is volume of lifter balloon

W_1 is the weight of all components except the lifter balloon, 2# is used to aid the weigh off and to orient the load train

W_2 is the weight of the lifter balloon. This can be expressed in terms of the volume, heresassumed to be .006V for 1 mil mylar

.070 is the lift per cubic foot of hydrogen gas.

The expansion factor is from the standard atmosphere ; for 50 thousand feet it is 6.55

substitution in the formula above:

$$V = \frac{2 + .006V \times 6.55}{.070}$$

$$.070V - .0393V = 13.1$$

$$V = 425 \text{ ft}^3$$

a five foot diameter cylinder with a volume of 425 ft ^{3} of course has a length $\pi \times (5)^2$ L = 425

$$L = \frac{425 \times 4}{25\pi} = 21.6 \text{ feet}$$

the weight of the lifter balloon is .0062V or .006 x 425 = 2.55 pounds

total weight is 2 + 2.55 = 4.55

free lift at 10% is .455 lbs.

gross lift then is 5.005 lbs.

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Using $S = \frac{Pr}{2t}$ t = 1 mil
r = radius of cylinder in inches = 30"
s = unit material stress = 8000 psi

P = the allowable pressure in pounds/in^2

$$P = \frac{2ts}{r} = \frac{2 \times .001 \times 8000}{30}$$

$$= 8/15 \text{ psi}$$

$$= 31.8 \text{ millibars}$$

giving a safety factor of almost 3 for the 8000 psi figure which itself contains a safety factor of 1.5 obviously the balloon won't burst at 10% free lift, or at 20% for that matter.

Unfortunately the figures for the balloon weight in terms of the volume (.006V) may not be exact but it is close, and I revise my estimate of the lifter balloon length accordingly.

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