**Lighter Than Air Systems**
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**Lecture - 45**
**Effect of change in Relative Humidity**

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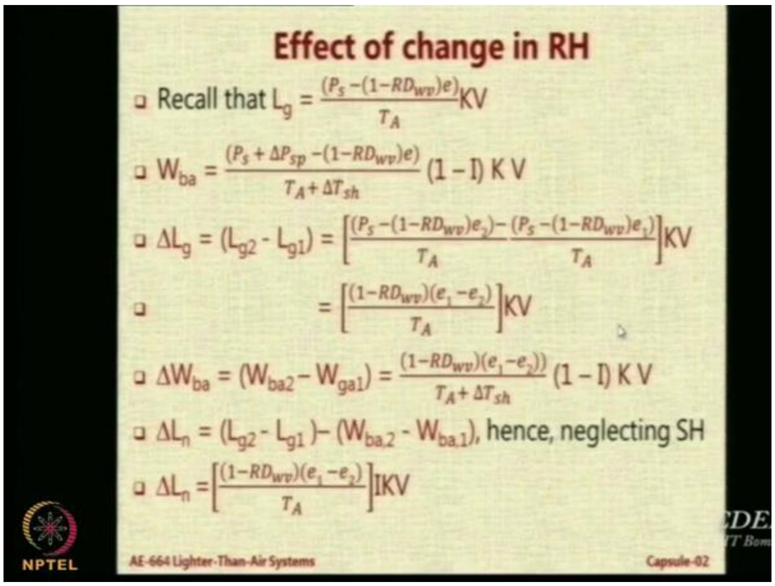


Now we come to the humidity. So let us recall that the gross lift can be expressed as

$$L_g = \frac{(P_S - (1 - RD_{wv})e)}{T_A} KV$$

Now the weight of the ballonet air will also have one component in the so the pressure will be first added by the super pressure and from that you will subtract the contribution because of the relative humidity.

But the ballonet air occupies only (1-I) into V so therefore you put (1-I) into V here. So, if you take the difference of the gross lift after and before that is $L_{g2}$ minus $L_{g1}$, you get the expression as shown. In this expression you can see that the $P_s$ terms can actually cancel out so what will be remaining is just

$$\Delta L_g = \frac{(1 - RD_{wv})(e_1 - e_2)}{T_A} KV$$

The ambient temperature remains the same we assume that there is no change in any other parameter and volume also remains the same externally. So, the change in the ballonet air also will be correspondingly obtained as

$$\Delta W_{ba} = \frac{(1 - RD_{wv})(e_1 - e_2)}{T_A + \Delta T_{SH}}(1 - I)KV$$

So therefore, the net lift change will be the difference between the gross lift change and the weight of the ballonet air.

And suppose we neglect super heat just to make an expression simpler if you do not then you will have a much bigger expression because then you cannot do anything common but if superheat is neglected then $T_A$ can be taken common and you will get it as $e_1 - e_2$.

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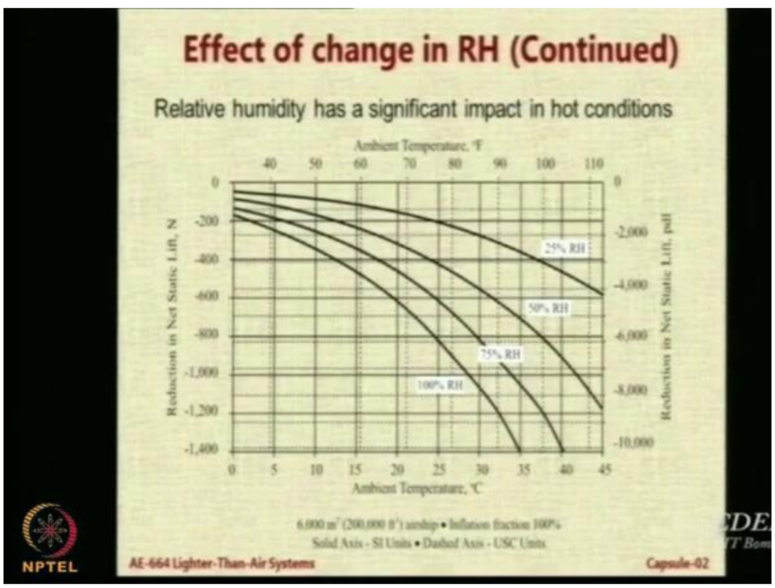


So, if you look at this expression what we see is that the effect of humidity change $e_1$ to $e_2$ is going to create a change in the net lift. Now let us see the variation so this graph shows the reduction in net static lift for various values of relative humidity versus the ambient air temperature. So, we notice for example that if the ambient air temperature is 35 degrees, then this line is the one which is followed for reduction of the net static lift.

So as the ambient air temperature increases if you go along the x axis you will find that the reduction in the net static lift is also increasing but the lines are different for different values of relative humidity more effect is felt when you have hot conditions that means at high temperatures you can notice that the reduction the net lift is more when the temperatures are high. If you have only from 0 to 5 degrees there is hardly any change.