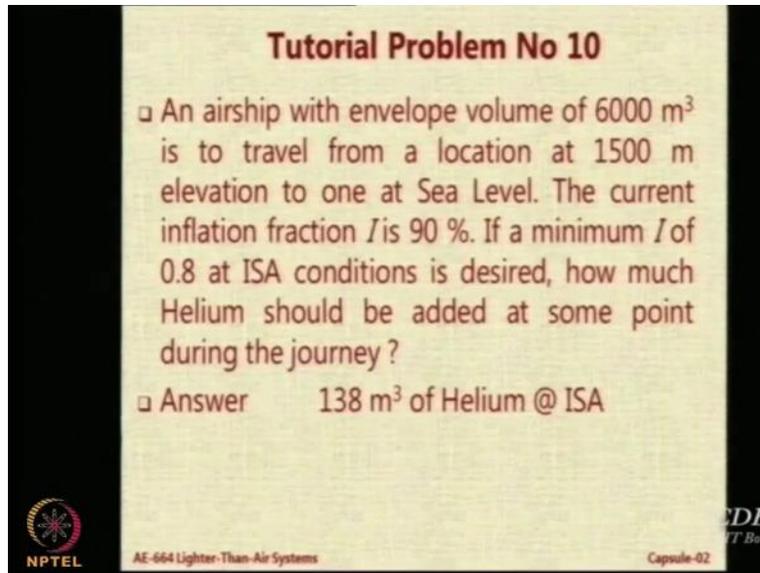**Lighter Than Air Systems**
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Lecture - 50
Tutorial Problem 10 on Helium Addition

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Let us do this by a small problem. We have an airship with envelope volume of 6000 meter cube. If you want to travel from a location at 1500 meters elevation at sea level. And it has an inflation fraction of 0.9. The question is that how much Helium to be added in the journey. So, this airship is flying from a location which is at 1500 meters to a location which is at sea level. The ΔH required is 1500 meters.

And the value of current inflation fraction is I how do you get Inflation fraction?

$$\frac{I_2}{I_1} = \frac{\sigma_1}{\sigma_2}$$

So, what is the density ratio at a height equal to 1500 meters. if you have access to the standard Table of atmosphere you can read Sigma directly from there, but it is better that you calculate. Correct, 4.536 meter around right, 136 meter cube the Helium has to be added.

So, what do, what do you get is the density ratio 1.5 kilometer? 0.8637, 0.866. So, the density ratio is 0.8637. What is the value of Sigma at sea level? It is 1. So, the current inflation fraction is 0.9 that is I_1.

I_2 will be 0.9 into 0.8637 which is 0.777. But the maximum the desirable value is minimum value is 0.8. So, there is a shortfall of 0.8 – 0.777, 0.023 that much into the volume of the envelope will be the Helium to be filled, 138 meter cube of Helium at ISA level.