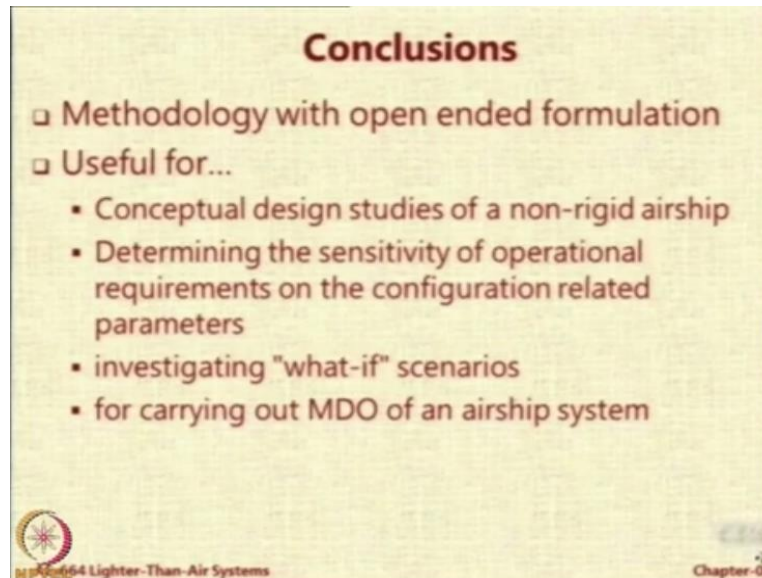**Lighter-Than-Air Systems**
Prof. Rajkumar S. Pant
Department of Aerospace Engineering
Indian Institute of Technology - Bombay
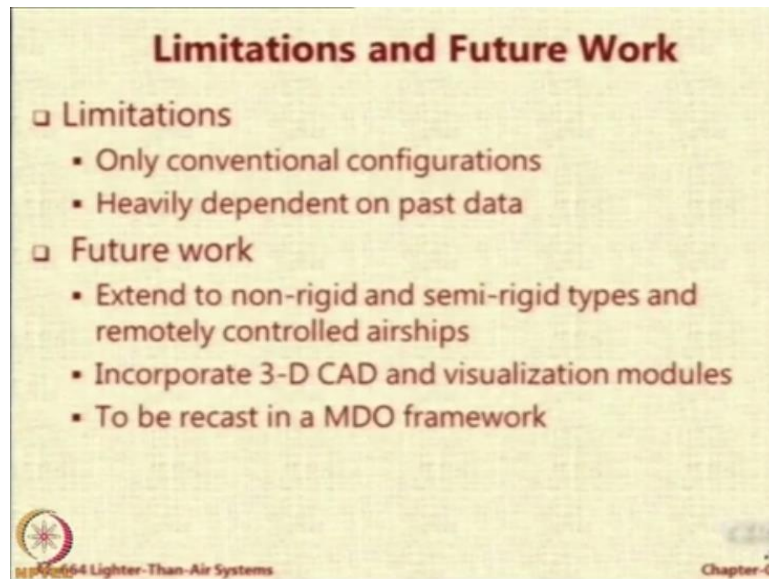
Lecture - 82
Conclusions and Limitations of Airship Design Methodology

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So what is the conclusion? This conclusion is this is a methodology with open ended formulation, which means you can modify anything that you feel like in the methodology. It is useful for conceptual design studies for non-rigid airships. It is useful for finding the sensitivity of some operating parameters and it also helps you in looking at what-if scenario. What if the engine changes from petrol to diesel? What if we have a ducted propeller? And the purpose is to carry out the multidisciplinary analysis and optimization of the airship.

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Limitations and Future Work

❑ Limitations
  • Only conventional configurations
  • Heavily dependent on past data
❑ Future work
  • Extend to non-rigid and semi-rigid types and remotely controlled airships
  • Incorporate 3-D CAD and visualization modules
  • To be recast in a MDO framework

What are the limitations? So, this is the area where some of you can come forward and improve it. There are many limitations. First of all, it only looks at conventional axisymmetric body of revolution. It might be a good idea to have a shape generation scheme so that more complicated shapes could be investigated and you can do the analysis. It depends heavily on past data and past data in 2003 is lower than past data in 2015.

So, there is scope for improvement by putting data for newer airships, more experience. What can be done? You can extend this to non-rigid, semi-rigid types and also to RC airships. So, extension of this methodology to RC airships have already been done by few students who came for internships and one dual-degree student few years ago, sorry a B. Tech student few years ago. He had already done this as part of his BTP.

So, I now have publications which talk about a methodology for sizing RC airship on the same lines. But now the data is changed based on our experience and knowledge. So there are a series of publications in AIAA which you will see in recent times. And there are some students who are working now on design of semi rigid airships, but there is nobody working on the methodology or the calculations.

Secondly, I am not happy with the visualization. I can just draw the cross section but I would like to see in 3D coupled with this with some CAD technology so that we can see it better. I want to recast the whole thing in optimization framework.

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So briefly now the two papers which have been published based on this work, this is the first one which was presented by me in this conference in Denver, Colorado in 2003. This is the conference paper. So when you read the papers, read this paper first because this was written earlier.

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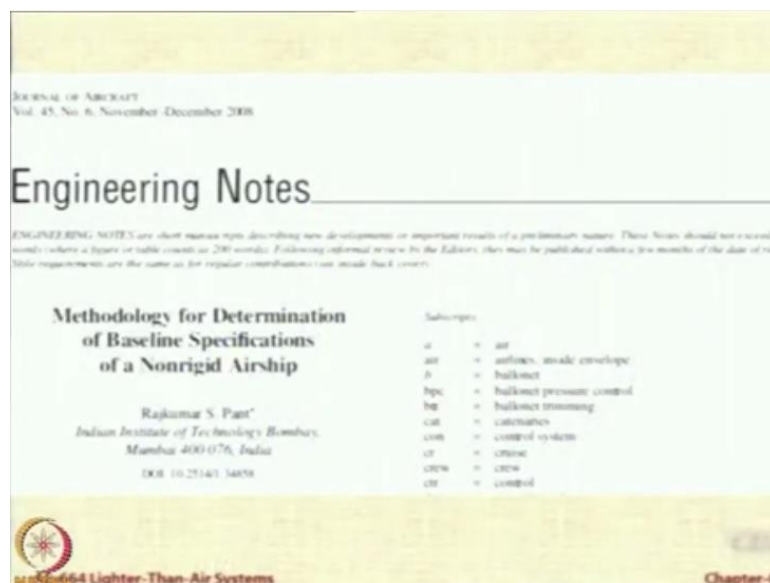
And then it appeared as a technical note in Journal of Aircraft. Do you know what a technical note? And how is it different from a paper? So a technical note or engineering notes are short manuscripts. Maximum words are 2500 which describes a new development or important results of a rendering nature. So look when you do research and when you realize that you have done something which is a small thing but new and useful, you do not wait till you take it to a logical conclusion.

You immediately claim authorship of that by sending an engineering note or technical not. This is what we did. We did not want other people working on airship technology to publish before us and claim the credit because when we were doing this work, we were contacting several airship manufacturers getting their data. They would ask us what are you doing with it? And some of them said okay run the numbers for us.

So they knew that these guys are up to something and they are developing a methodology. If we had waited long enough, we could have lost and somebody else would have become the first person to do it. But we are the first people to do it. So therefore, our paper is now always quoted as the first paper in modern times which gives a methodology for arriving at the baseline specifications of an airship given the operational and customer requirements.

Before this, the information was only available in individual operating manuals of airships. So, if someone wants to do an independent study there was nothing available. So we have the option of keeping it to ourselves, but we decided to share it with the world and we wrote this technical note, it appeared in December 2008. Right, so now these two notes are uploaded and you are requested to go through them and ask specific questions on the Moodle page.