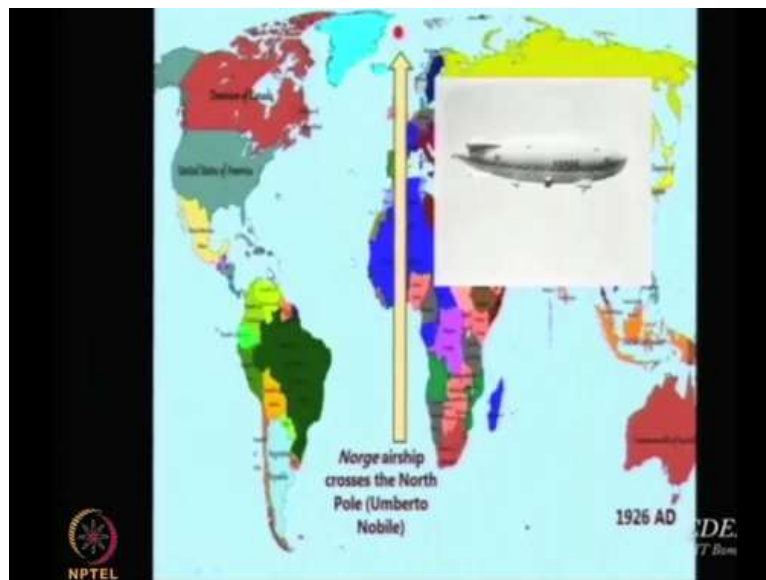


Lighter-than-Air Systems
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Lecture -13
Historical developments of LTA systems, Part-IV

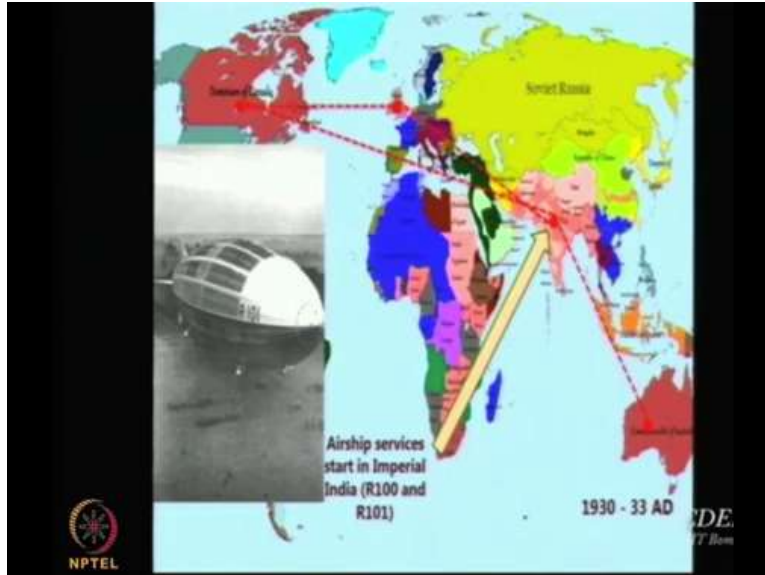
So then the next person whom we have to know about is Umberto Nobile who was an adventurer who took airships over North Pole. So that is a very adventurous journey

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And there is a very interesting book about his journey and his experiences, so find out about that book if you can give the link on Moodle page. Nowadays many books are available free online, so if somebody is able to download a free version of the book it will be very handy for us to just have it. So the Moodle page is meant for these things adding information to what we see and learn in the classroom.

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Now aircraft are still struggling to get to you know be designed safely and properly etcetera. Airships people are thinking of running them as airlines. So interestingly this is where India comes into picture. So the British were planning to operate airships to all the colonies which they were ruling. So you can see there was a dominion of Canada which was under the British territory then we had India of course England and then the commonwealth of Australia.

So, since they were very far away and they had to be administered their one month journey on ship etcetera. They said we will reduce it by going by airship. So there was a plan that they will travel in a week and reach, so that was a big achievement that time. So the airship that was planned to be used for this particular application was the R101. R101 is also a very interesting airship.

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So in 1930's now we have Britain, US Germany, Italy, Russia and Japan they were the people who make airship. Japan has now come into the picture why? Because Japan was also a big military power so they also realized the importance of airships. So they came in for that reason and the first British airship to arrive in India was in Kanpur 1930. So I have an interesting video about this particular airship and what happened to it.

(Video Start Time: 02:30)

Perhaps the most famous disaster ever recorded when the Hindenburg felt worth in a ball of fire in 1937 the world at a front row seat. But in 1930 no cameras were present to capture the disaster that befell the R 101 airship which burst into flames in an equally spectacular fashion killing 48 passengers and ending the British Airship program. During the early 1900s the majestic lighter than air dirigibles ruled the skies over Europe.

While the airplane of the 1920s remained to work in progress, the airship was viewed as a sophisticated and efficient mode of air travel. Airplanes were wick and unreliable and noisy and uncomfortable and drafty and did not carry many people. The Zeppelin had established excellent reputation for reliability and safety and they were so much more comfortable and would carry so many more people.

After World War 1 the British Empire controlled roughly one quarter of the Earth's surface looking for a way to connect its far empire written developed a program to build two airships the R-100

would be built by private enterprise and would connect Britain to North America. The R101 would be built under government control and would bring Britain closer to India and the far east.

The R101 was designed to be the largest airship that had ever been built it was designed to have range sufficient that was just a couple of intermediate stops it could go from England to India in less than a week carrying 60 passengers and remarkable luxury. Although Germany had a successful airship design with a Graf Zeppelin, so to improve on it with the R101. The structural design and layout of the R101 was very innovative.

The twistable surface was built in circular frames that had individual structural rigidity well to build these rigid frames and still have this thing fly the frames had to be built out of a very new material for the day called aluminum. In a typical derivable passengers and crew were carried in gondolas that were suspended below the gas bag. In the R101 they decided to streamline the vessel and the passengers were actually inside there were two levels like on a ship two decks with all manners of stake rooms, dining rooms and recreation rooms smoking lounges it was very luxurious.

Non-flammable helium, which was used on the US Airship Shenandoah was not readily available in Britain. As hydrogen, which is highly flammable but provides more lift than helium was chosen for the R101. 16 gas bags were held in a mesh screen containment above the passenger accommodations. Each bag weighed approximately 1,000 pounds. Together they were designed to give the R101 a gross lift of around 150 tons more than any other airship ever built.

In October of 1929, 732 foot R101 was taken out of its shed in Cardington undergo preliminary testing in preparation for its maiden flight to India immediately it became apparent that the lighter than air ship was not all that light. When the R101 was first tested, they discovered the hard way that, they had over built it and it was much heavier than they plant it did not have near the spare lift that they wanted or needed for the mission.

They discovered that the gas bags themselves h believe it or not are made out of cow intestines which are stitched together and then coded with varnish. These gas bags are leaking prodigiously.

In fact, it has been reported that they were losing about 22,000 cubic feet of hydrogen per day from pinhole leaks. And even more alarming problem arose in June of 1930, while they R101 was more to its tower.

The outer covering along the starboard side suffered a tear that extended 140 feet. A Fisher that would have been fatal had the ship been in flight. Engineers believe that the gas bag leakage could be controlled with ballast but to give the R101 the required lift needed to drive into India. They opted for a radical solution. They cut the ship in half adding an extra bay and an additional gas bag making the world's longest airship even longer.

It was nearly 800 feet long. When you have something that is that long the pressures on one end of the ship can be very different from the other end of the ship. You can have wind shears that act on the nose that do not act on the tail, so there is going to be some flexing in twisting either nose to up. And down or from side to side and the metal structure was designed to actually flex but that creates a problems later on in the fabric outer covering did not fetch in the same metal structure did.

By 1930 the R 101 was massively over budget and far past its original completion date. Political pressure over the ship's made in flight to India began to mount. The decision to take the R-101 to India was singly driven by one man and that was the first air Lord, Lord Thompson. and he was the principal advocate and the guy whose prestige was on the line for the success of this program.

And he fell back into his mode of management, which had served him well all of his career insists action occur. Damn the doubters were going to go. This was a government project government funded government controlled when the Air Minister said let us go, they went with great anticipation 54 people including Britain's Air Lord. Board of the R101 on October 4th 1930 when the R 101 takes off the hanger and Cardington it symbolizes the embarking upon the longest airship voyage in history.

The first air Lord is going to go all the way to India and back and do it in two weeks which at the time would have been on the order of Lindbergh's flight across the Atlantic. After the R101 took

off from Cardington it circled over London giving onlookers a chance to gaze at Britain's newest technological model it then headed for the English Channel on its way to France, it will be the last time Britain would see the R101.

Took off on a rainy misty day and the winds were along the path of travel in the 30-35 mile an hour range, not the most favorable conditions for the reachable travel but certainly not the sort of things you would expect to wipe out this particular craft. But just after 2 am is the R101 was passing through a rainstorm the ship began losing altitude. The captain assumed that the fabric had become waterlogged into heavy what he did not know is that the top fabric from the nose back had whipped off.

And the gas bags were exposed to the storm to the rain to the wind and while it was only a moderate wind 25 miles an hour the airship was going at about 50 miles per hour, so this was hurricane force winds blowing on these gas bags. The high winds violently shook the gas bags closest to the ship's bow causing them to chafe against the airship's frame the added stress is turned the numerous pinhole leaks into a fatal fissure accelerating the loss of hydrogen and causing the dirigible to nose over realizing that a crash was inevitable.

The crewmen cut the ship's engines to soften the landing it's estimated they hit the ground that less than 13 miles an hour not even a bad bicycle fall with the truth be no however a spark from the twisted metal ignited the gas bag closest to the bow of the ship. Setting off a chain reaction of fast-moving fires that spread from the bow to the stern engulfing the airship in flames of the 54 people on board all but 6 died including Lord Thompson.

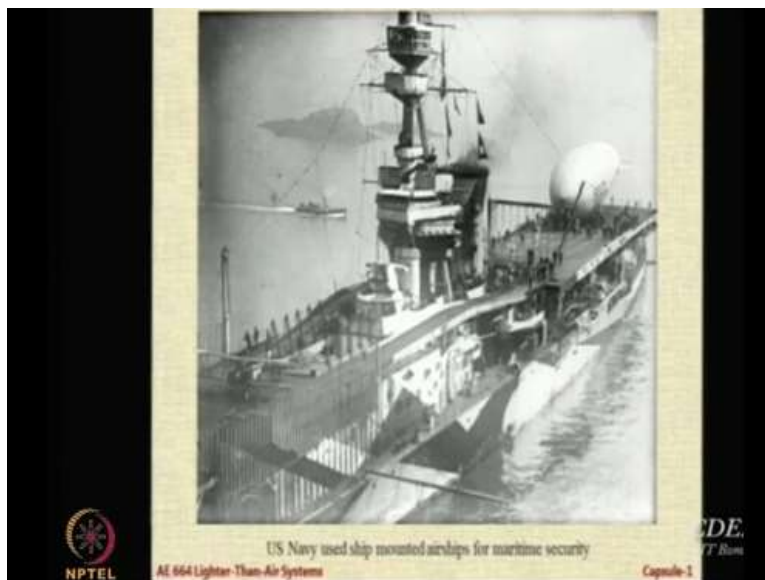
Several of the survivors testified that the front end of the airship's outer covering had ripped off a crucial piece of evidence that may have explained the loss of altitude covered by the dark cloud of the R-101's failure the sister ship R-100 was dismantled and sold for scrap. Skeletal frame of the R-101 which represented the best technology in British lighter than air travel was eventually sold for scrap as well, putting an end to the British airship program.

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So what we saw is that they designed this airship for the travel to India and then from there to Australia, but this disaster took place. Now we are going a little bit out of time now but what I wanted to do is look carefully at the picture you will see large number of people here and also on that side these are the people who are required to hold the airship. So if you look at an airship like R101 it may require a ground crew of 200 people may be 300 people, the more the merrier.

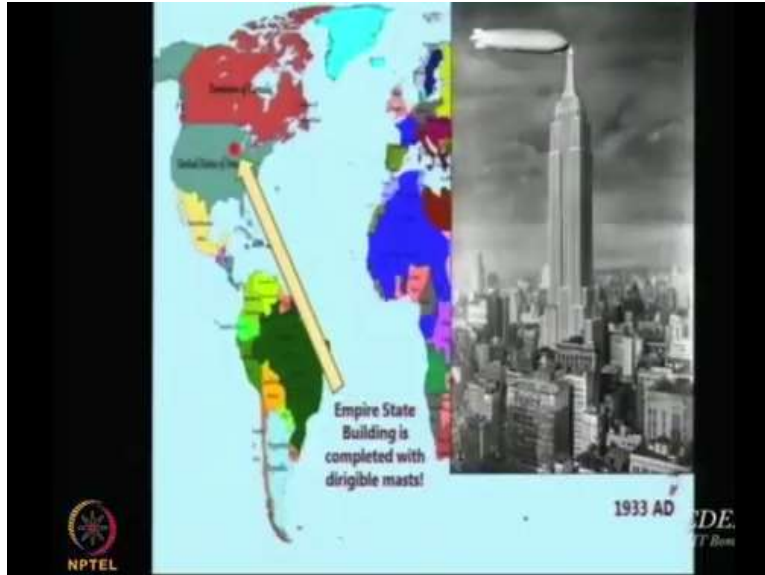
Because it is generating so much of lift and it is a buoyant vehicle that to restrain it on the ground you need to have large number of people to help out. So we have gone a bit out of time now because we have seen the Hindenburg disaster and then R101 disaster. I will come back to that, but let us go back now in history little bit.

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We see that now the US has started using airships for as the aircraft to be used on aircraft carriers. So they began patrolling the ship the sea for maritime security using airships mounted on the ships.

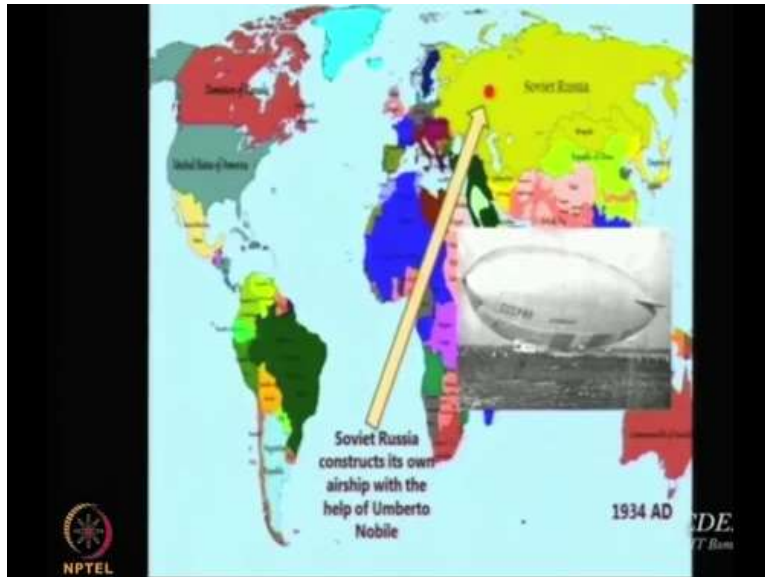
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And interestingly the US had very ambitious plans about use of airships. So when they built at that time the world's tallest building, the empire state building the top of the building was supposed to be an airship mast. Even now when you go to empire state building if you visit the empire state building they say that on the 101st floor if you go to the empire state building beyond that there is a conducted tour for the airship mast.

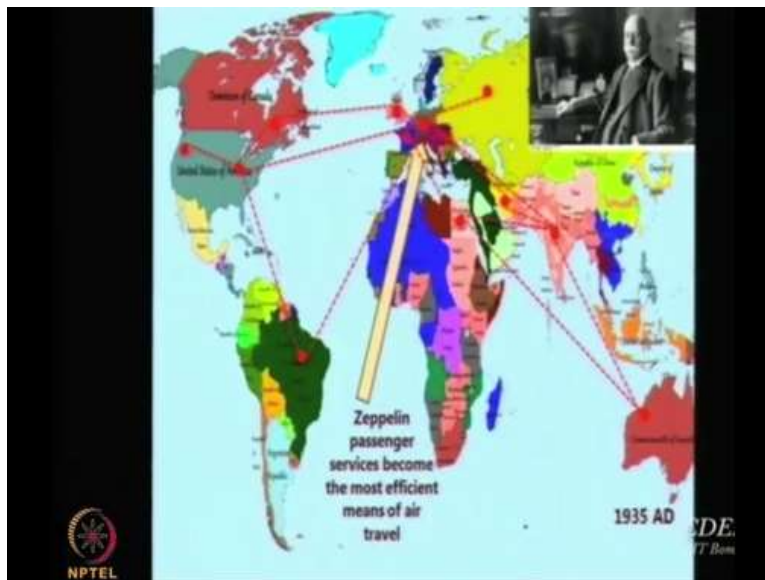
So their idea was that people would travel in airships they would dock at the top of these buildings and then get down and then use the elevator and come down. So this way they said we do not have to really have very large grounds. But imagine how windy it will be and how bumpy it will be for people to walk out at that altitude from an aircraft and then come to a building. So it was planned to be used but it was not used I think except in some attempts like this.

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Then the Russians are also catching up very soon but what they are doing is they have now taken help from Umberto Nobile from Italy the same gentleman who went to the North Pole. His technology is being used by the Russians to make their own airships.

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And in 1935, we see that Count Zeppelin is again planning to connect the whole world using airships. So he was planning an airline using airships for connecting various places all over the world.