Introduction to Aircraft Design
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Lecture - 29
Few Novel Concepts_01

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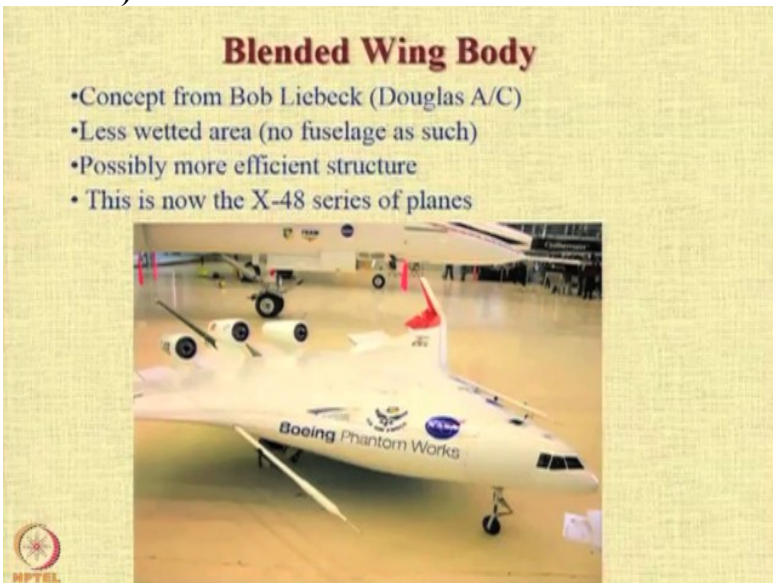

Let us have a look also at a few novel concepts. This was discussed in detail in the introductory lecture the blended wing body, which is the shape of the future, once we remove the specific fuselage as such, where the fuselage ends and where the wing starts, it is difficult to say you have lesser wetted area and you have more efficient structure and the X 48 was tested with this particular configuration as a forerunner for the future transport aircraft, which we have already seen.

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Another very unique configuration that was considered as the candidate for supersonic transport aircraft is the oblique wing in which the wing rotates around the on a pivot about the fuselage such that 1 wing is ahead and 1 wing is backward. Let us have a look at how this happens.

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So, you can see this is the rotation of the wing has been initiated. And once the wing is locked, you have a wing which is skewed. Now you are back to the inclined configuration.

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This is a concept given by R. T. Jones of NASA. And the aim of this particular configuration is to create a fore and aft symmetry of lift. And going from the nose to the tail you get a better distribution of cross sectional area and this is going to give you lesser drag during the transonic flow and supersonic flow regimes, many people feel that this is the only practical supersonic transport aircraft configuration, but it is actually too radical flying wing versions of oblique wing have also been proposed, in which we just have the wing at an inclination.

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Then recently we came across a mother daughter configuration as designed by Burt Rutan for the Virgin Galactic, in which we have a carrier aircraft called as a white knight, the white knight 2 was a modified version of white knight. And in the middle of the 2 fuselages of white knight we have the daughter aircraft called as the spaceship 2 this particular aircraft, spaceship 2 is supposed to give a near space flying experience and a 0 gravity experience to the passengers.

Let us watch a small animation that tries to show you what do you have in store for in future for tourists who want to use spaceship 2 for a near space flight experience. So, this was just an artist impression of how people are going to be given tourists are going to be given a near space flying experience.

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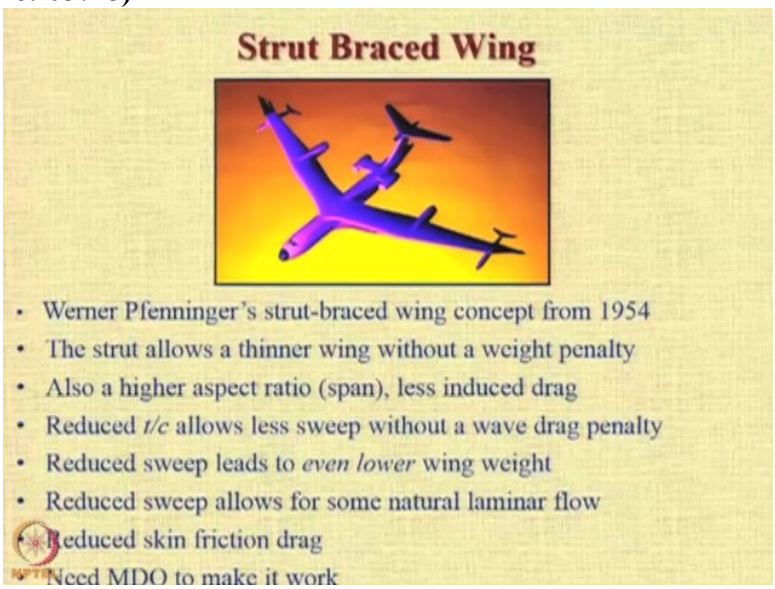

The strut braced wing is also a novel concept about which we had discussed briefly in the introductory lecture. This was not a new concept there are reports that it was suggested by fenninger in 1954. The strut allows a very thin wing without a weight penalty. And also it allows a higher aspect ratio with lower induced drag. This reduced t / c allows less sweep without the wave drag penalty.

And then because we have lower sweep we have lower weight, we have a possibility of providing some natural laminar flow, and we have reduced skin friction drag all benefits are there. However, for us to be able to realize this in practice, we need to resort to very careful multi disciplinary design optimization analysis.

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The Lockheed, Virginia Tech and NASA team have come up with this configuration which we discussed. And as I mentioned, it is expected to have lower takeoff weight, lower fuel, lower noise and emissions, the targets of the NASA.

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And this is a slightly modified configuration, which was proposed about 8 years ago by Virginia Tech and the NASA team.

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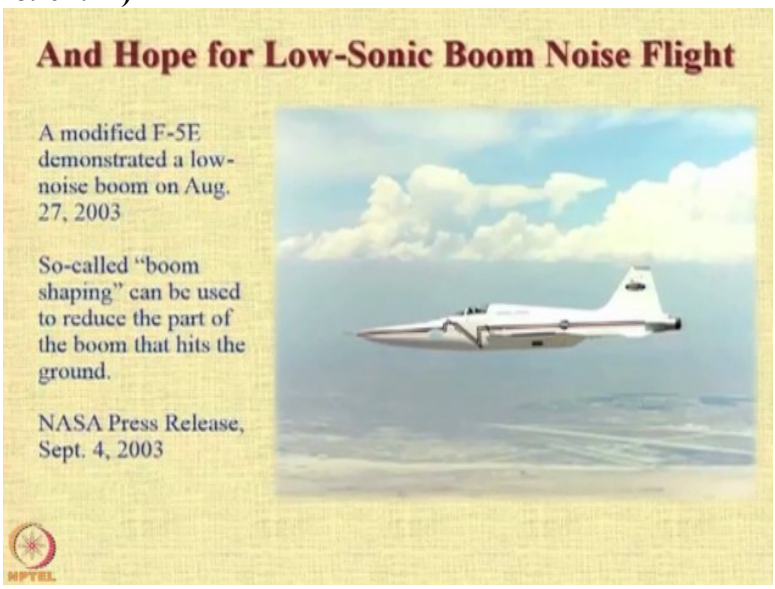

Now, there is also some hope for a supersonic flight using a configuration that allows a lower value of the sonic boom. So, a modified F 5E was demonstrated to fly with much lower sonic boom, this is done by what is called as a boom shaping. So if you notice the shape in the front, the shape in the front is the one that allows us to create supersonic flow with very comparatively weaker sonic boom that hits the ground and hence causes the less disturbance.

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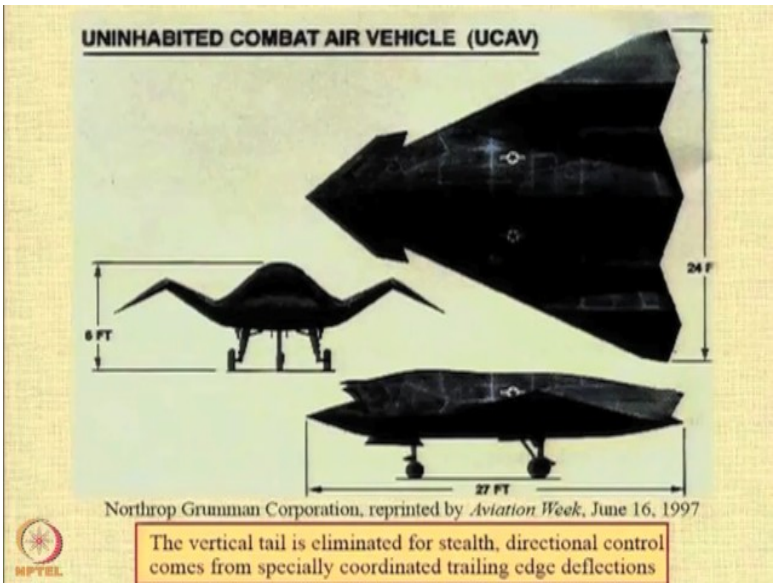

Unmanned combat aerial vehicles or UCAV's are the shape of the things that are going to be more and more common in the future. And India also is working on a project of this particular type. The vertical tail is eliminated for stealth. And by deflecting the trailing edges, you can come up with the requirement for the control.

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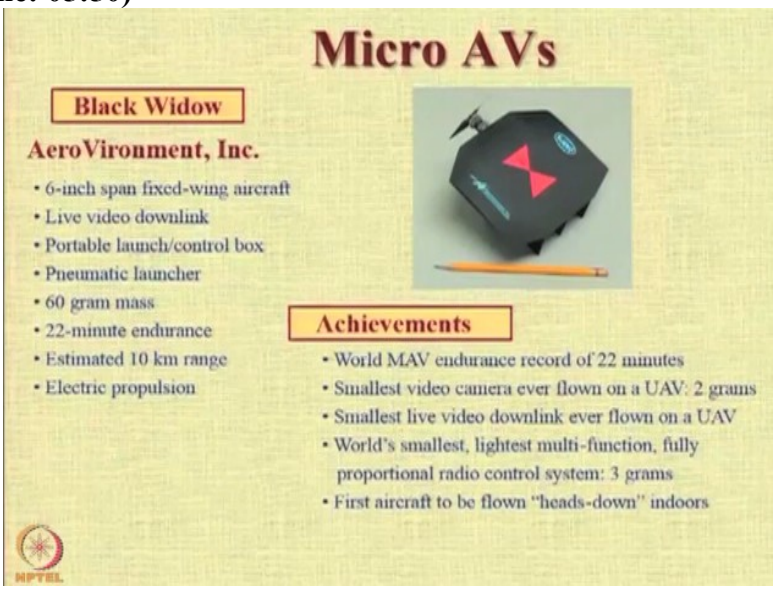

Let us have a look also at very small aircraft, so called micro aerial vehicles, which are becoming very popular nowadays. A good example of that would be this black widow aircraft, which is from the stable of aerovironment. This is a 6 inch span fixed wing aircraft, but it packs a huge punch. So you can notice that, within this 60 gram mass, you get close to 20, 30 minutes of endurance, and a 10 kilometer range.

And that gives you a live video feed. There are many achievements in the name of black widow. So it for example, the smallest video camera that has been flown all of 2 grams

smallest live video downlink ever flown in the UAV and its radio system is just 3 grams. Thanks for your attention we will now move to the next section.