Laboratory Report

13/08/2021

Description: Visit of the TEC wind tunnel

Hours 9am-1pm

Participants: Victor LANCE

Nicolas QUETGLAS

Charlotte GIROUD

Summary

We went to the TEC lab to see their wind tunnel and help the teacher to install it and see if we can use it for our project by doing various calculations.

The Wind Tunnel

The wind tunnel is installed in the LIENE laboratory of TEC, it is a school project to do the wind tunnel themselves to save money and have an interesting and enriching project to do with students.

The wind tunnel consists of different parts who each have their role:

We have a motor that activates a fan that is going to suck the air through the wind tunnel to create an airflow.

We have the Test chamber here to be used to install our sensors and forms that we want to try inside the wind tunnel.

We also have at the entry of the wind tunnel a flow straightener which usually has the appearance of a honeycomb but here was made using PVC tube attached to each other's.

We can say that this is a study wind tunnel in an open circuit which is the easiest and simplest form of wind tunnel with a rather small dimension (less than 60x60) and few power speed (here 15m/s maximum).

Preparation of the Wind Tunnel

As said earlier, this Wind Tunnel is still unfinished and so we helped the teacher by working on finishing it.

We mostly worked on the Test chamber because it is the most unfinished part of the wind tunnel, we had to find the center of the glass board to make a small hole that will allow us to install the support for all our experimentations, we also had to level some parts of the test chamber to be sure everything will be aligned correctly. There is still many things to do to finish the preparations of the test chamber so that we can use the wind tunnel

Calculation of the similitude parameters

To see if we can use this wind tunnel for our experimentation, we calculated the similitude parameter which consist of seeing if we can obtain the same Mach and Reynold's Number parameter in the Wind Tunnel, for this you

can change a few parameters that are all depending's of each other's:

- Dimensions of the plane
- Pressure
- Temperature
- Airspeed in the wind tunnel

Our calculations gave us the following results:

To respect the similitude parameters (Re= 4,6.10^7, M=0,329), we have 2 scenarios: Either we keep the conditions of the laboratory in Cartago (T=294,45K P=863 hecPa) which require a model of 8,56m and a wind speed of U=95,64 m/s; or we keep the parameters of the wind tunnel (U=15 m/s and a model at 20cm) and modify the environment of the laboratory (T=7242K P=36,5.10^5 Pa).

A third possible scenario is that we use another wind tunnel at UCR which would provide us with a wind speed of 70 m/s which would certainly get us closer to the conditions we need.

As you can see using this wind tunnel for our experimentations seems complicated as the parameters needed to achieve the same Mach Number and Reynolds are irreplicable in the conditions of our Wind Tunnel so unless there is an unknown solution that allow us to have equivalent data with our wind tunnel, we won’t be able to use it for AeroTec.