Second Level Technologies
Benchmark SCN 2-20a

Physics of Flight Pt 1

Exploring Planet Earth and its Atmosphere.

Finding out about The Earth and its Atmosphere

Our Sun and its Planets.
Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune

This is where our planet Earth is in space. We orbit around a star that we call our Sun. There are eight planets orbiting around the Sun at different distances and speeds. Earth is 93 million miles [149 million kilometres] from the Sun, not too close to burn up and not too far away to freeze.

This is our home, the Earth, whirling around in space dragging its oceans and atmosphere around with it.
When humans first travelled far enough out into space to see the whole earth they saw that we live on a blue planet with a very thin atmosphere to protect us from the Sun.

The Earth spins on its axis once a day and so, here in Scotland, we are all rotating with the Earth heading east at about 600 mph. [1,000 kph]

The Earth also travels round the sun once a year but it is such a long way it has to travel at about 67,000 mph. [170,000 kph]. Not only that, but also our Sun is whizzing around our galaxy at about 500,000 mph [833,000 kph] and our galaxy is itself travelling at 1,300,000 mph [2,160,000 kph] through space.

Isn't it strange that we talk of sending men into space and yet here we all are spinning round in space at speeds many times higher than any of our rockets and spacecraft can achieve.

Finding out about the density of air

The first life on our Earth started in the oceans and there are still more species of animals in the sea than on land. However life broke free of the sea and started the long process of evolution that eventually produced mankind. Humans eventually evolved a questioning brain that needed answers and it became difficult to explain many of the things that happened around us.

Early humans did not know that they were completely surrounded by our atmosphere, it could not be seen so why would they know it was there. It seemed that the only explanation for natural events would be to claim that they were the work of the Gods.
For instance, wind could be explained by having wind gods. The Ancient Greeks gave the wind gods names and they also assumed that the Sun and Moon must be gods driving their chariots across the sky.

The concept that we were living at the bottom of a shallow pool of a mixture of gases, that we call air, did not occur to them.

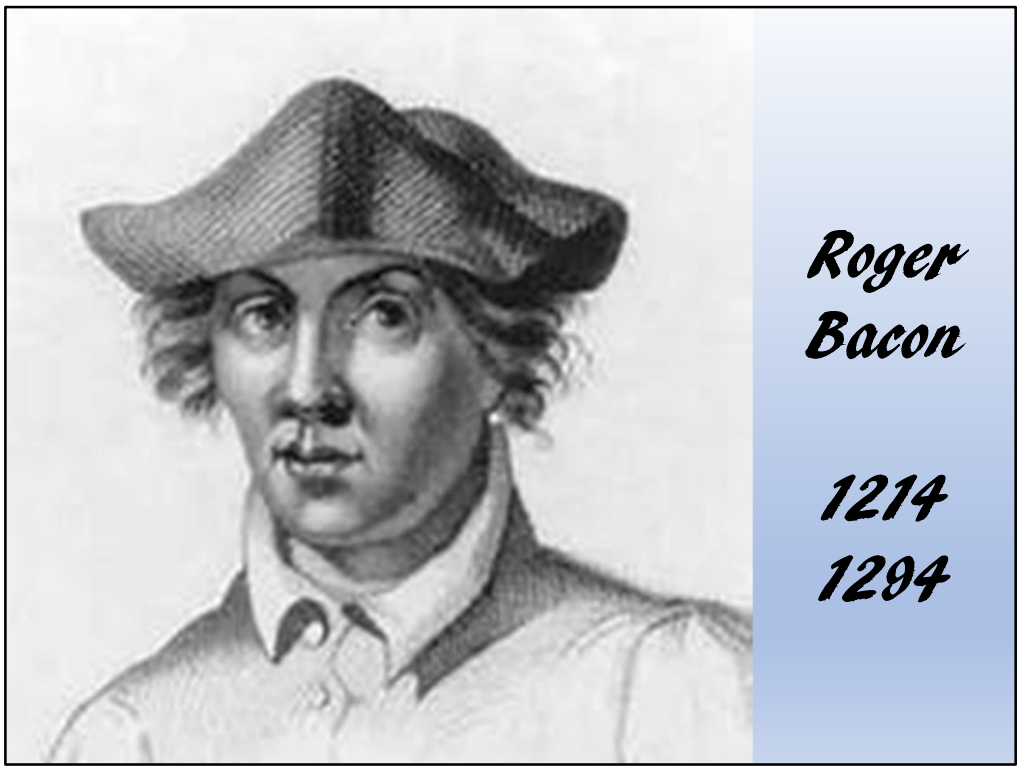
This painting shows Juno, the Queen of the Gods, asking Aeolus to take charge of the wind gods. Aeolus picked four gods to be the winds and released them on the world. Interestingly we have used the word “wind” ever since, even although we now know that it is actually the atmosphere moving under the influence of the heating by the Sun.

and this is
Boreas the North wind

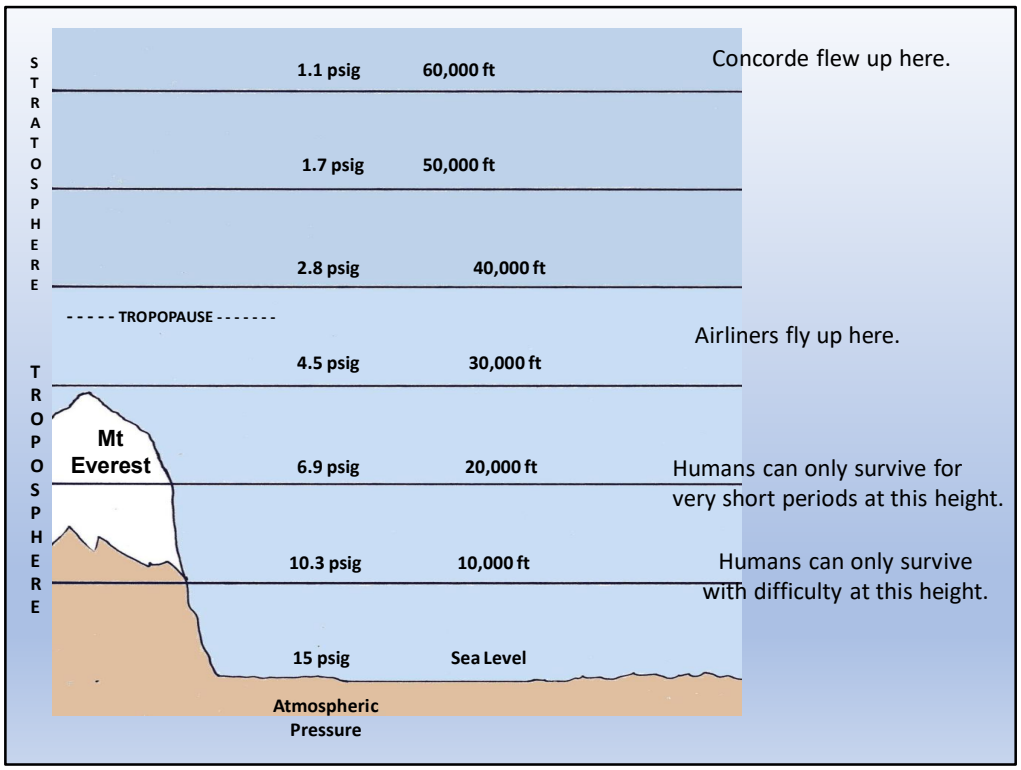
Notus was the
the South Wind

Eurus was the
the East Wind

Zephyrus was the
the West Wind



People were quite happy with these explanations of natural phenomena until this man came along. Roger Bacon was a philosopher and he thought a lot about many things that puzzled him. He lived in a monastery and every so often he had to take his turn at collecting water from the river. He noticed that when he dipped the buckets into the fast flowing river that he had to hold on tightly to stop the buckets from being dragged away. He knew why that happened. Water is heavy, he knew that since he had to carry two full pails back to the monastery. However he also noticed that on windy days the wind tried to knock him off-balance when carrying the pails. He suddenly realised that, just like water, the wind must be heavy also and it must have enough weight to knock him about. He at that stage did not know what the atmosphere was and it was to be much later that men discovered that our atmosphere was a mixture of gases that we call air.



We now know that Roger Bacon was right. We are surrounded by a mixture of gases which we call air. The mixture is composed mainly of nitrogen,78%, but there is also oxygen, 21%, and that is the one we need. All mammals, including humans, have lungs which have the ability to dissolve oxygen into the bloodstream and it is that that allows us to burn the energy that we get from food to keep us active.

Because the gasses that make up the air are held down onto the earth by gravity they becomes heavier, more dense, the closer they get to sea level. The vast majority of people on earth live at, or close to, sea level so we have adapted well to the air pressure at that level. A few people live in high places such as Tibet or the Andes and, over time, they have gained a special ability to absorb more oxygen into their blood and that allows them to cope with the low oxygen pressure. If we try to climb too high too quickly we soon run into the limit of our lungs to be able to absorb enough oxygen to keep us going.

Now that we know a little bit about our atmosphere we will look at how we learned to fly through it.