

Before flight, the Captain of ANY aircraft must make certain that it is correctly loaded, that is:

- Not overloaded i.e. too heavy
- Correctly balanced

Why is this important?

Let's look at a few examples of what can happen if insufficient attention is paid to aircraft loading.



The nose wheel of this Royal Air Force Vickers VC-10 transport should be on the ground. This incident occurred during maintenance when the aircraft was being de-fuelled prior to some work to repair leaks in the fuel system.

The engineer supervising the exercise did not realise that the fuel tank in the aircraft's tail fin (the vertical part of the tail) was full of fuel too. As the wing tanks emptied, the front of the aircraft became lighter and lighter until the aircraft sat back on its tail as shown.

The tail was not designed to support the weight of the aircraft like this and structural damage resulted.

Given the age of the aircraft, it was deemed beyond economic repair and was scrapped.



This Boeing 747 freighter aircraft was taxiing for departure and lined up on the departure runway.

It was loaded with heavy components for a power station.

As the pilots powered up the engines and the aircraft began to roll, the inadequately secured load moved aft and the aircraft sat down in the ungainly attitude shown.

It does not take much imagination to think about what would have happened had the load moved a few seconds later when the aircraft was airborne.

Also, this airport now has its runway blocked by an aircraft that cannot be moved...

...and how is the situation going to be resolved anyway? A lot of head scratching went on I suspect.

Unlike the VC-10 in the previous slide, this one was repaired and returned to service.



This Britten Norman Trislander (an aircraft with which you are soon to become more familiar) makes an unusual garden feature!

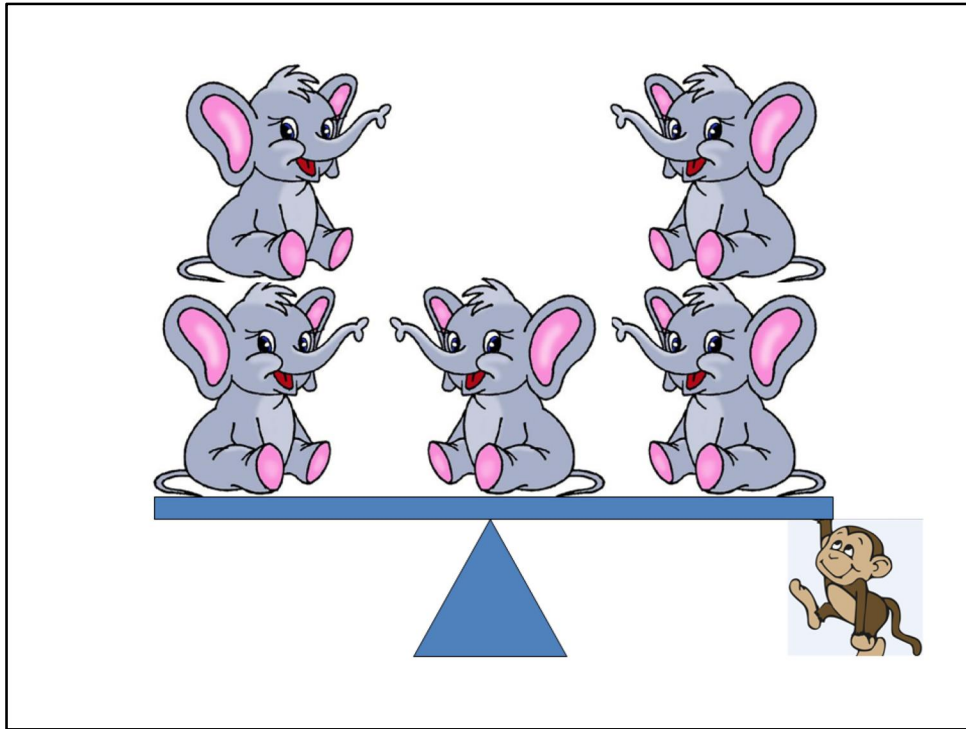
In this incident, the aircraft was taking off on a pleasure flight. Because there were only a few passengers, it was decided to allow them to sit in the rows immediately behind the pilot.

The aircraft rolled for take-off and the pilot pulled back on the control yolk to lift the nose and become airborne.

Unfortunately the weight in the nose was too much for the elevator control (the hinged surface at the rear of the horizontal tail section) to overcome and the aircraft stayed on the ground.

The pilot realised something was wrong and attempted to stop the aircraft but the airfield fence arrived before this was achieved.

The amount of force that can be supplied by the elevator is called its 'authority' and this is discussed in the next slides.



In this cartoon, the elephants are the aircraft's load and the monkey is its elevator control.

The blue triangle represents the position of the aircraft's centre of gravity.

The monkey is quite happy while there is an elephant at each end of the see-saw...

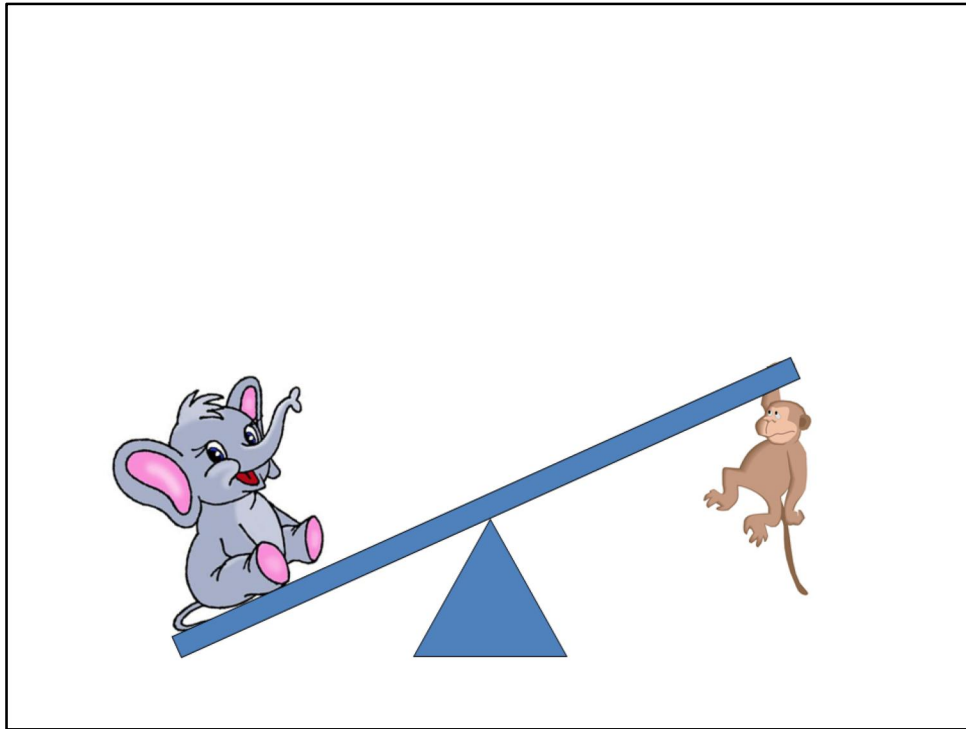
(Click)

Or even if the see-saw is kept balanced with two elephants at each end...

(Click)

Or even if another elephant is added directly over (or close to) the centre of gravity, but...

(Click)



Once the see-saw becomes significantly unbalanced, there is no way that the monkey can correct it.



So let's introduce the aeroplane you are going to work with, the Britten Norman Trislander.

This one is in a slightly happier situation than the one in the earlier slide.

Can anyone see anything unusual?

- It has eyes, a smile, a red nose and (not easily visible) eyelashes! This is G-JOEY and he was a celebrity aeroplane in the Channel Islands for many years, with books written about him.
- More relevant to this subject, the door of the forward hold is open.
- There is a trestle under the tail to prevent the aeroplane tipping up during the loading process.

The author has flown on one of these, with only a few passengers and we were all seated in the middle under the wing. The Captain apologised, he wasn't being anti-social he was "just balancing his see-saw".



And finally...

It is unlikely (but by no means impossible) today that you will be weighed prior to boarding an aircraft.

This is London (Croydon) Airport in the 1930s, when it was clearly routine and it was also routine when the author flew on the Trislander.

Whether or not you are actually weighed, due consideration will have been given to the correct weight and balance of the aircraft in which you are going to fly.

Now to work....

Weight and Balance

An Operational Approach



Royal Aeronautical Society
Prestwick Branch

D A Lacey
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