PILOTING A FREE BALLOON

"Flight" photograph.

Translating Aerostatic Principles into Practice: What the Efficient Aeronaut Must Know

By . . .
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Unless and until there is a revival of free ballooning in Britain the subject of this article must necessarily be largely of academic value: but that fact makes it no less interesting. What may surprise the present "heavier-than-air" generation, many of whom have never even seen a spherical balloon, is that a successful ascent (and landing) is not just a matter of standing in the basket and casually emptying a sandbag or pulling a valve-line; on the contrary, the balloon is, as the author says, a temperamental craft, and one that calls for real skill and understanding in its handling. Lord Ventry is an authority on lighter-than-air aviation, and holds a current balloon licence.

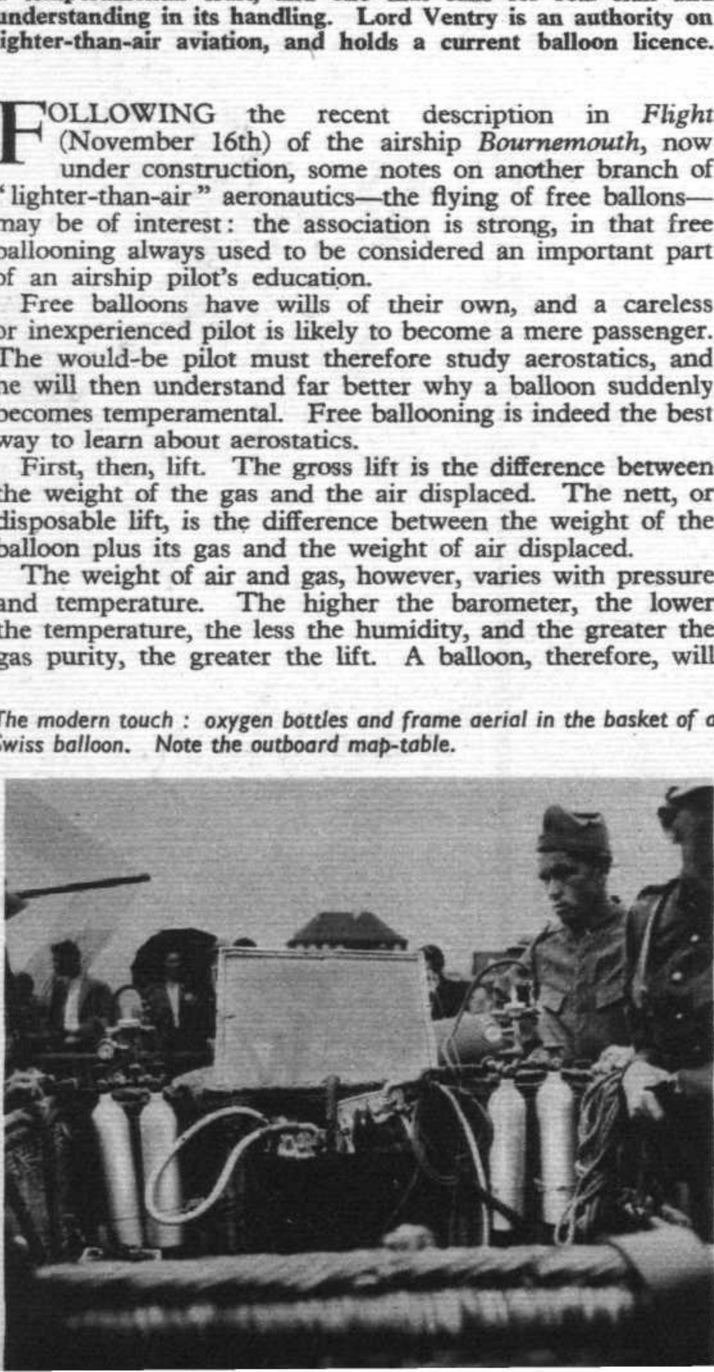
FOLLOWING the recent description in *Flight* (November 16th) of the airship *Bournemouth*, now under construction, some notes on another branch of "lighter-than-air" aeronautics—the flying of free ballons—may be of interest: the association is strong, in that free ballooning always used to be considered an important part of an airship pilot's education.

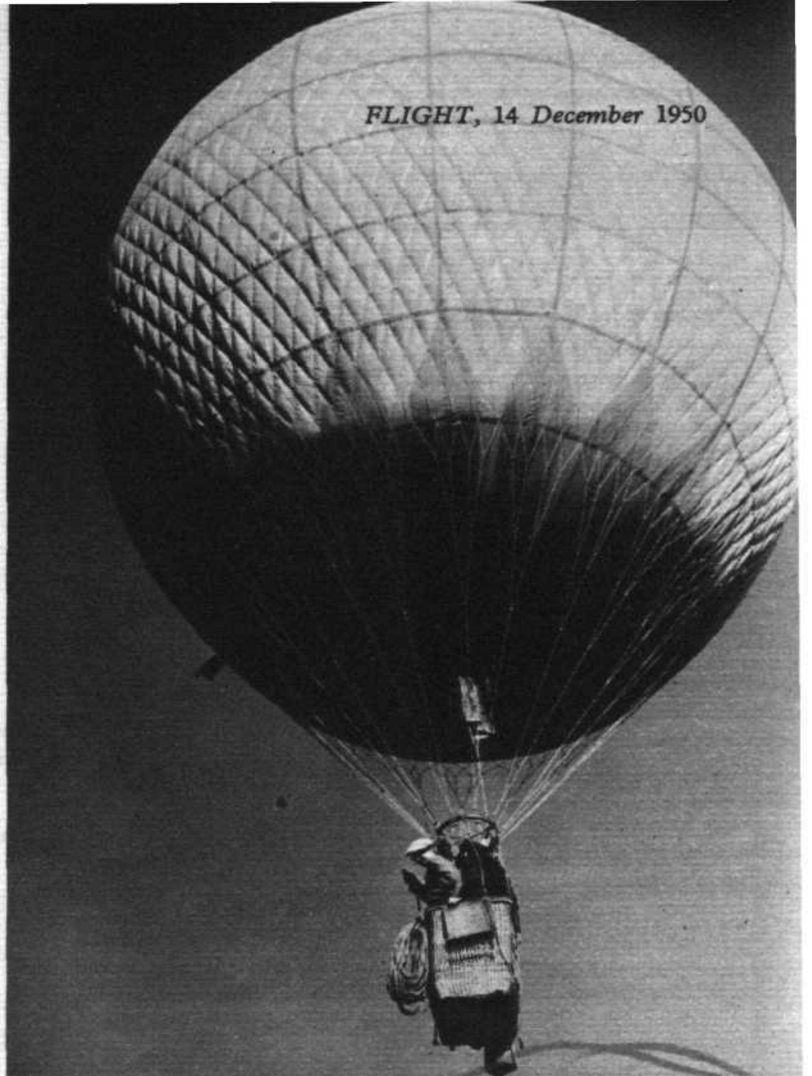
Free balloons have wills of their own, and a careless or inexperienced pilot is likely to become a mere passenger. The would-be pilot must therefore study aerostatics, and he will then understand far better why a balloon suddenly becomes temperamental. Free ballooning is indeed the best way to learn about aerostatics.

First, then, lift. The gross lift is the difference between the weight of the gas and the air displaced. The nett, or disposable lift, is the difference between the weight of the balloon plus its gas and the weight of air displaced.

The weight of air and gas, however, varies with pressure and temperature. The higher the barometer, the lower the temperature, the less the humidity, and the greater the gas purity, the greater the lift. A balloon, therefore, will usually have a greater lift in winter than in summer. When in flight, however, and provided air and gas are at the same temperature and no gas is lost, changes in pressure and temperature have no effect on lift.

The modern touch: oxygen bottles and frame aerial in the basket of a Swiss balloon. Note the outboard map-table.





"Flight" photograph.

The only spherical-balloon flights in this country since the war have been made by the French balloonist M. Charles Dollfus, seen here ascending from an R.Ae.S. Garden Party. The "quilted" appearance of the envelope is caused by the fabric bulging through the meshes of the net.

A spherical balloon leaves the ground with a certain lift. It rises until its own weight is the same as the weight of air it displaces. Usually, however, a certain momentum is obtained, and this causes the balloon to overshoot the equilibrium point. It continues to rise, stops, and then starts to fall. The more the original lift, the greater the altitude attained before this first run-down begins. Under these conditions, however, less ballast can be carried and more gas is lost, thus shortening the flight. This method is the usual practice with very large balloons on stratospheric flights, for otherwise an enormous quantity of ballast would have to be carried.

As the barometer falls approximately one inch per thousand feet, it is easy to work out the equilibrium point for a given discharge of ballast, assuming that air and gas temperatures are the same. For practical purposes it is assumed that barometric pressure at m.s.l. is 30in. Therefore, and assuming that the balloon leaves the ground totally filled, about one-thirtieth of the gas, and also of the lift, is lost per 1,000ft. In reality it is a little less.

The weight of the balloon, its gas and crew must be known. If, for example, 3,000ft is the desired objective three-thirtieths of the gross lift must be discharged at the start. The weights of 1,000 cu ft of gas and air are assumed to be 75 lb and 5 lb respectively, at 30in pressure and 60 deg F. Thus, under these assumed conditions, 1,000 cu ft of hydrogen lifts 70 lb. For practical purposes, however, it is safer to assume a lift of 68lb/1,000 cu ft.

Normally the balloon ascends full. In this case the expanding gas overflows through the open neck and, as gas is lost, so is lift. If the balloon is flabby and air and gas temperatures are the same there is no loss of lift until the balloon is full. In this case the weight of air displaced decreases at the same rate as the volume of air displaced increases, so the lift does not alter.

Returned to Lord Ventry