

PRESS NOTES

CLIMATIC RESEARCH LABORATORY

Institute of Aviation Medicine

History

Soon after the last war had begun a number of problems arose as a result of the extremes of climate faced by airmen of the Royal Air Force. Bomber crews, after flying at high altitudes over European targets, had to work under conditions of extreme cold while, at the other end of the scale, it was found that cabin temperatures of aircraft in the tropics frequently rose to dangerously high levels. Little was known at the time of the physiological effects of these and similar conditions such as those extremes of climate encountered by survivors of crashed aircraft. Several climatic chambers, which reproduced certain climatic conditions for laboratory study, already existed in this country and much useful knowledge was gained with their aid but none provided for full, independent and accurate control, of all the important climatic factors. It was felt that there was a need for such a chamber and it was realised that apart from the immediate war-time service problems at issue, the facilities envisaged would prove invaluable in peace-time for the fuller investigation of problems of civil and military aviation, as well as providing unique opportunities for basic physiological and medical research in the field of temperature regulation.

The requirements for the laboratory were drafted by Wing Commander (then Squadron Leader) H.L. Roxburgh, O.B.E., Ph.D., B.Sc., Ch.B., towards the end of 1944 and the design of the laboratory was begun by Mr. A.H. Coombs of the Air Ministry Works Directorate. Although a limited number of the various factors that effect climatic conditions - temperature, humidity, etc, - had previously been simulated and controlled for various purposes, the combination of control of them all raised special problems. The design of the laboratory was further complicated by the need for simple remote control of the environmental factors by the research staff, with the necessary safeguarding of the machinery, the need for the continuous running of the plant for many days on end and the elimination of manual adjustments for the stabilisation of climatic conditions. The design was completed by the beginning of 1946.

Facilities

In general terms the wind tunnel provides a research chamber of 15' by 9' 9" floor space for the independent and accurate control of the following variables:-

1. Air temperature
2. Relative humidity
3. Wind velocity
4. Ventilation
5. Surface temperatures
6. Sunlight
7. Rain

At the far end of the chamber, where the tunnel sweeps round to the left, is another room in which the conditions of air temperature, relative humidity and wind velocity can be maintained and which is suitable as sleeping or living space during prolonged tests.

/An

An air conditioned room - called the Acclimatisation Room - is provided adjacent to the wind tunnel in which temperature, humidity and ventilation can be controlled. This is used in conjunction with the wind tunnel so that experimental subjects may be brought to a standard thermal state before entering the tunnel. It also allows observations to be made on the effect of sudden transfer from one environment to another.

A second room, known as the Metabolism Room, is also provided, in which experiments not requiring the full facilities of the wind tunnel may be conducted.

As part of the experimental work to be carried out in the laboratory will involve study of the different types of clothing under varied conditions a Clothes Conditioning Room is provided in which clothing can be brought to a measurable state of dryness and temperature, prior to experimental tests. This is vital in the investigation of the thermal properties of clothing.

There is also a special room, supplied with hot air, for the straight forward drying of clothes.

The remaining accommodation in the front part of the building consists of a kitchen which has access to the wind tunnel by way of a hatch for the controlled feeding of subjects during long experiments, changing and shower rooms, a dark room, two small laboratories for chemical and gas analyses and two small offices.

By far the greater part of the building which houses the climatic laboratory is taken up with the various components of the wind tunnel itself and the air conditioning plant. In general terms the wind tunnel is a complete circuit through which air is forced by an axial flow fan, only a small portion of this tunnel providing the test chamber referred to above. Air velocity through this circuit is controlled by varying the speed of the 110 B.H.P. electric motor which drives the fan. Processing of the tunnel air, to obtain the various climatic conditions required, is carried out in a bye pass loop through which part of the tunnel air is drawn. This loop contains coolers, dryers, and electric heaters. The coolers are paired so that the operation of the tunnel need not be interrupted during defrosting, a process which takes place automatically. Humidification of the air is carried out by the injection of steam after the bye pass air has rejoined the main tunnel circulation.

Plant for the auxiliary rooms is located inside the loop of the tunnel.

Scope of Experimental Work

The work for which the Climatic Laboratory is intended can be grouped from a technical point of view under three headings. All these involve projects related to military and civil flying as well as more fundamental aspect of physiology.

1. General climatic problems. For example, what is the maximum temperature which can be permitted for the performance of given work for a given time; what is the best way of achieving cooling in aircraft (i.e. is air refrigeration sufficient or must the surfaces of the aircraft be cooled); what are the best arrangements for cooling by ventilated clothing; what are the limits of temperature change permissible for comfort or efficiency?
2. Investigations which require very accurate control of conditions. For example, the control of body temperature in the comfort zone; the effects of wind on clothing (as opposed to fabrics in their uncut form); the regulation of sweat production; the measurement of clothing insulation.

/3.

3. Work in fields not strictly climatic but in which control of the environment is important. For example, water and salt requirements for survival in the tropics; choice of foods for short term survival in various regions; the body energy used by having to wear heavy and bulky clothing.

Information Division,
Air Ministry,
Whitehall,
London, S.W.1.

Flying Officer G.D. FORWELL, an R.A.F. doctor, is investigating the sweating from the sole of the foot.

In the experiment depicted the right foot is in a hot bath & the left in a cold one while the subjects body temperature is kept constant by conducting the experiment in a thermostatically controlled room. The sweat is collected on foot pads & analysed.

Results to be applied to the scientific design of footwear suitable for use in hot and cold climates and also to the prevention of the common ailments affecting the feet in such extremes of climate.