TECHNOLOGY

Climates Made To Order

Alaska and New Guinea are laboratory neighbors in tests that help design military equipment for all climates of the world.

See Front Cover

By WADSWORTH LIKELY

➤ AN ARTIFICIAL leg hangs on a hook in the "jungles of New Guinea." A truck motor chugs away in the "Arctic weather of Alaska." One man walks 30 feet and checks, within five minutes, on the condition of both.

These are man-made samples of the world's worst climates, frigid and tropical.

Outside the prosaic brick building which contains these extremes of weather, there is a typical warm and somewhat humid Virginia day. The humidity is something of a problem to the Climatic Research and Test Branch of the Army's Engineer Research and Development Laboratories, which controls the various climates inside. Put this Virginia air, suddenly, into a chamber where the temperature is 85 degrees below zero Fahrenheit, and the humidity becomes snow and ice.

On the other hand, the Virginia humidity is not enough for the tropical chamber. There, the engineers keep a constant humidity of 90% in the day and 95% at night.

Adjust to All Climates

This humid warmth, this dry cold, are produced because the responsibilities of the United States have become world-wide. With the broadening of our responsibilities has come a vast outpouring of American men—and the equipment necessary to them—to all climates of the world.

That equipment must be constructed so it can withstand the tropical heat and the arctic cold and still do its job efficiently. Hence, at Fort Belvoir in Virginia, the Army Engineers have simulated the varied climates of the world, so the equipment can be tested.

This climate laboratory is one of several such laboratories used for various testing and experimental purposes by different branches of the Armed Forces. The Air Force has one at Eglin Field and another at Wright-Patterson Field in Ohio. There is one at the Army Proving Grounds, Aberdeen, Md., and the Signal Corps tests communications equipment in climatic chambers at Fort Monmouth, N. J. The Navy has one at Dahlgren, Va.

Simulating the Arctic or the tropics in Virginia is no easy task. At first glance, it would seem that all that is necessary is one refrigerating plant for the make-believe Alaska and some steam pipes for New Guinea.

But the chambers themselves must be built to withstand these climatic extremes. In the tropical chamber, for instance, the shelves on which equipment is placed to be tested are made of California redwood, a wood that was found to withstand the high humidity and the attacks of fungi best. Even then, the redwood shelves last only two years before they rot into uselessness. The electric light circuits in the tropical chamber are in exposed conduits and must be constantly repaired.

Special Lubricants for Cold

The pump which circulates the ammonia in the Arctic chamber's cooling system takes a beating too. To get the temperature in the chamber down to minus 85 degrees Fahrenheit means that the ammonia which goes through the pump reaches a low of minus 100 to minus 110. No lubricant has yet been developed which lubricates at that temperature and so the pump sometimes has to contend with ice cubes of oil.

And then the engineers are faced with a peculiar sort of "which comes first, the chicken or the egg" problem. Delicate equipment is needed for testing purposes. But how do the engineers know that the testing equipment will provide accurate data readings under extreme temperature conditions? They must devise ways of testing the testing equipment.

Most of the data is recorded on steadily moving graphs or seen on oscilloscopes outside the Arctic chamber. These are attached by thermocouples to the parts of equipment to be tested. Other gadgets must measure accurately, at these extreme temperatures, the expansions and contractions which take place in various materials. The thermocouples and all the other gadgets must transmit accurate data at temperatures ranging from minus 94 degrees to plus 138. And they must also work at simulated altitudes up to 50,000 feet.

Chamber Placed on Rollers

While expansion and contraction are sometimes being measured inside the Arctic chamber, with instruments which themselves will withstand the effects of expansion and contraction, the chamber itself expands and contracts. To take care of this, the 32-foot long, heavily insulated chamber is placed on rollers.

The extremes in climate and altitude are not much health hazard to the men who work with the chambers. There seems to be no higher incidence of colds or diseases of the respiratory tract among them. However, they look out for possible cardiac conditions after the age of 50.

But rigid safety precautions are in effect. No man can go into the big Arctic chamber alone and a third man usually watches the two from the outside. On extremely rare occasions, however, the human factor enters.

Several years ago, Robert C. Faylor, chief of the Climatic Research and Test Branch, was in the chamber testing a motor. He planned to stay in about 40 minutes. In order to draw off the carbon monoxide gas, the operator on the outside turned on the vacuum pump.

When it came time for Mr. Faylor to leave the chamber, he found that he could not open the door to get out. The operator had neglected to blow any fresh air into the chamber to replace the air being taken out by the vacuum pump. Consequently, Mr. Faylor found himself at a simulated altitude of about 5,000 feet with the sea level altitude on the outside effectively sealing the door.

According to Mr. Faylor, the operator, at this point, was reading a magazine. When Mr. Faylor finally got his attention and he realized what the trouble was, he lost his head. Excitedly summoning several other men, he began prying the door open with crowbars, instead of turning on the fresh air.

They got the door open. This meant that Mr. Faylor dropped from a height of 5,000 feet to sea level in an instant. As the door came open, he screamed as loud as he could to relieve the impact of the pressure on his ear drums.

When Mr. Faylor came out of the suddenly "grounded" chamber, he let the operator have the benefit of his opinion and went home with nothing worse than a severe headache.

Building Desert Chamber

Now building is a new chamber. This will simulate conditions to be found in the desert. With this chamber the effects of intense solar radiation on motors, equipment and packaging materials can be tested.

The climate chambers are part of a four-step testing process through which all equipment goes. The first step is to test the machinery or equipment for its inward functioning. This can be done completely at Fort Belvoir.

The second step is to find out the relationship of the machine to its operator in various climatic conditions. A part of that process can be accomplished at Fort Belvoir.

The third step is to test the relationship of the machine-operator team to the job it has to perform. And the final step is

service-testing by the Army unit which will use the machinery.

Part of the second step, and all of the third are accomplished at testing grounds in Fort Churchill, Canada, and in Arizona, where the Army Engineers maintain establishments.

Americans are counting on their technical superiority to maintain a lead over the greater manpower of the Communist nations. For this to count, our technology must be effective all over the world, in all kinds of weather. The Army Engineers' Climatic Research and Test Laboratory is designed to make sure that this happens.

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INVENTION

Patent Electrically Heated Clothes Drier for Home

➤ QUICK DRYING of clothes in the home is promised with an electrically heated clothes drier which brought patent 2,567,434 to Alice P. Hoskings of San Diego, Calif. It resembles the familiar rack now widely used which has two side pieces, and cross pieces on which the garments are hung. In this, the crossarms are hollow and have heating elements inside them. The household current provides the energy.

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CHEMISTRY

Hit DDT Resistant Flies

➤ A SWISS discovery of a new insecticide that knocks down and kills flies that are resistant to DDT was announced to the World Chemical Congress in New York. Growing resistance of flies to DDT has limited its effectiveness in the last year or so.

It is called Pyrolan and the claim is that it is not dangerous to man and other warm-blooded animals as its toxicity corresponds approximately to that of rotenone. This promises to allow its use where DDT can not now be used.

Already in Switzerland and Sardinia tests, the new insecticide has freed for several weeks rooms of flies that are not affected by DDT. Moreover, the house fly does not seem to develop a resistance to Pyrolan.

Dr. Robert Wiesmann of the J. R. Geigy Co. of Basle, Switzerland, presented the paper to the congress, but Dr. H. Gysin synthesized the new chemical which has the complex structure of 1-phenyl-3-methyl-pyrazolyl-(5)-dimethylcarbamate.

The new insecticide has the advantage of not affecting moths, butterflies, roaches and beetles. Insects taking up food by sucking may be killed by small doses.

The quick action of Pyrolan is one of its most useful properties and in this respect it will compete with rotenone, a natural product, used in fly sprays for quick knock down of the insects.

Du Pont also gave details of an insecticide with a wide range of insecticidal action. It is known as EPN, and chemically it is ethyl p-nitrophenyl thionobenzene-phosphonate.

It has been in use since the spring of 1950 when it was used to control mites in the Pacific Northwest. It is effective against orchard pests and European corn borers, Dr. S. S. Sharp of Du Pont reported.

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ENGINEERING

Water Tunnel Carries Cable

➤ WATER and electric power are both being carried through a tunnel under the Continental Divide in Colorado, the tunnel being built to provide irrigation water to farmlands on the eastern slope of the Rockies.

The tunnel, recently constructed, is 13 miles in length and is known as the Alva B. Adams water tunnel. It brings water from the western slope of the Divide to the eastern slope. At the time of its construction no thought was given to its use to carry electric cables. This idea developed when plans were made to transmit electric power from the Granby Pumping Plant on the west side to the Estes Power Plant on the east.

This unique underground installation of an electric cable was described to the American Institute of Electrical Engineers meeting in Portland, Ore., by F. M. Wilson and R. A. Nelson of the U. S. Bureau of Reclamation. The tunnel was used to avoid the difficulties of erection and maintenance of transmission lines if built over the top of the Divide through the 11,850-foot Buchanan Pass.

The principal part of the electrical installation was made during the winter months of 1949-50 when the tunnel could be drained of water. The circuit consists of three single-conductor cables housed in a steel cable which is filled with nitrogen at an average pressure of 200 pounds per square inch. The cable is hung from the roof of the tunnel, suspended by 71 anchors of corrosion-resistant stainless steel.

Provision was made in the design to use the cable circuit for carrier current communications, the engineers were told. The initial installation will include two communication channels over the Phase A conductor. One future channel over the Phase C conductor is planned.

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