FLYING HEALTH

KAFKA

Flying Health

From an original sculpture done by D. Champlain.

Flying Health

By M. Martyn Kafka

With forewords by

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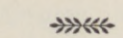
Dedication



This book is dedicated to my friends who have given their lives in the service of their country . . . Brigadier-General Adna R. Chaffee, former Chief of the U.S. Army Armored Forces; Lieutenant-Colonel Rufus B. Davidson, Major Fred H. Murchison, Captain Colin Kelly and Lieutenant Charles Milton José, of the United States Army Air Corps

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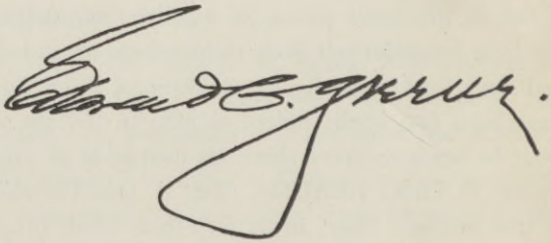
Foreword

The drawer marked "Aviation" in the catalogue of any great public library contains hundreds of cards. There are books on every phase of design, construction, operation, and maintenance of every type of aircraft. There are books full of the intricate mathematics of aerodynamics, and books on "how to fly" in a dozen easy lessons. There are books that dig deep into the anatomy of the modern airplane engine. There are books on fuel, on meteorology, on aerial navigation, and on the beautifully ingenious instruments that make modern flying safe. There are epic narratives of successful pioneer flight, and tragic stories of brave men who sacrificed their lives to plant a little farther ahead the flag of human achievement. It may well seem that every imaginable side of aviation has been thoroughly written about.

But in this great stream of aviation knowledge, one subject has been comparatively little discussed except in technical papers and specialized works for the professional Flight Surgeon. There have been few books indeed written to tell the working pilot what he needs to know about his own body in order to keep in tip-top FLYING HEALTH. That is what Dr. Kafka has done in this manual. Here, in an inch-thick block of printed paper, in straightforward non-technical language, is a compendium of information that every man who flies needs quite as much as he needs his special knowledge of propellors, engines, and aerial navigation. Here, too, the Flight Surgeon will find his memory refreshed, and will gain, perhaps, a renewed sense of the scope and accomplishment of his chosen profession.

The field of aviation medicine is large and growing. Now that our military and commercial airmen are flying over practically the whole world, the special job of the Flight Surgeon has enormously expanded. He must guard the delicate human mechanisms entrusted to his care from the arctic to the tropics, and from sea level to the stratosphere. He must know the stresses and strains that the pilot undergoes in routine shuttling between well equipped airports, and he must know also the hazards and emergencies that arise in far flung flights beyond the edge of civilization. The common cold and the Indian kala-azar must be equally within his purview. The "blackout" caused by the drain of blood from the brain during a dive pull-out, and the complex maladjustments of the neurotic personality are both directly related to flying health. Dr. Kafka has discussed all these subjects in plain and understandable terms, and has produced a book that should find a place in every Flight Surgeon's office and in every pilot's cockpit.

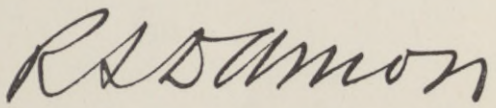


EDWARD C. GREENE

On Flying Health

There are few things in life more important than life itself, Honor is one. Aside from such few things, life itself is the most important. Life without health is misery. Most of us enjoying good health never realize this until it is too late. It would pay us all to devote more time and effort to our health. The price is small and the reward is great.

Health is particularly important to a person whose earning power is definitely limited by his health. This is especially true of the pilot. It is true not only in war time, but also in the peace to come. Of all the peace-time adjustments when the war has been won, the biggest adjustment and the greatest expansion will be in the field of aviation. The extent of this expansion will be hard to believe. If Horace Greeley were alive today, he would say "Go up, young man, go up," and, in order to go up, we must understand the rules of health involved.



R. S. DAMON

Contents

I

Sowing Fatigue

THE mechanization of modern war has produced a chain of health problems. One of the greatest of these is fatigue. In the complicated meshwork of speed and change, many factors make for fatigue. Scarcely any key man in modern war is more subject to stress and strain, to demands on his body and mind making for fatigue, than the military pilot.

To a greater extent than most other men, the pilot is on his own. In complicated maneuvers, on cross-country flights and inter-hemispheral ferryings, he must keep in physical trim without constant guidance by the Flight Surgeon. He soon learns that his annual and semi-annual physical examinations are important safety precautions. But between checkups he sometimes fails to realize that it is just as necessary to maintain a high day to day standard of fitness as it is to come through the periodic medical examinations with flying colors.

This book is designed to give the military or civilian pilot the practical advice and knowledge he needs to keep himself in flying health. Since fatigue in all its forms is the commonest underlying cause of physical breakdowns, perhaps the best way of introducing our general subject is to consider the causes, the symptoms, the results, and the best ways to avoid this constant lurking menace to the efficient life.

Fundamental in any consideration of the problem of fatigue is the fact that everyone has noticed—that a high level of general health and well-being enables a man to do more work with-

out getting unduly tired. Fatigue attacks first those who are already below the "pink" of condition. To beat the saboteur fatigue, therefore, the first job is to learn and practice the simple rules of healthful living.

Later in this book we shall discuss in some detail the fundamental matter of diet. Here we may note that faulty diet holds a high place among the factors tending to produce premature fatigue, while good eating habits, with attention paid to vitamins, minerals, and calories, will help to mold a healthy body and counteract the enemy's ravages. As a simple example of the importance of diet in fighting fatigue, we may note the way in which diet is tied up with vision, and vision in turn with fatigue.

The nature of the aviator's work compels him to use his eyes even under bad conditions of weather and light. If he neglects balancing his diet, he may eventually suffer from acquired "night-blindness." In this condition vitamin A is lacking. He will attempt to compensate for the reduced visual acuity by straining, and the constant mental effort necessary, coupled with psychological reactions of worry and anxiety (probably not consciously recognized) will tire his whole body. This single example serves to indicate how complex are the causes of fatigue, and how directly they are related to factors that at first sight may seem irrelevant.

Most of the factors that produce fatigue in ordinary life are important also for the airman, and in addition he faces a hundred special conditions that add to the burden his body and nervous system must carry. Flight in extreme heat or cold, monotony of noises produced by vibrations from the engine or propellor, incessant glare, thunderstorms, blizzards and hurricanes, sudden changes in atmospheric pressure—all these must be endured by the airman. The man on the ground may have to deal with similar conditions, but rarely must he meet them in the intense form, for so long a time, or under such conditions of responsibility as the airman.

Consider the simple matter of seat comfort. In many occupations of ordinary life men are compelled to sit, sometimes for long periods, in a straining or tense position. But the man

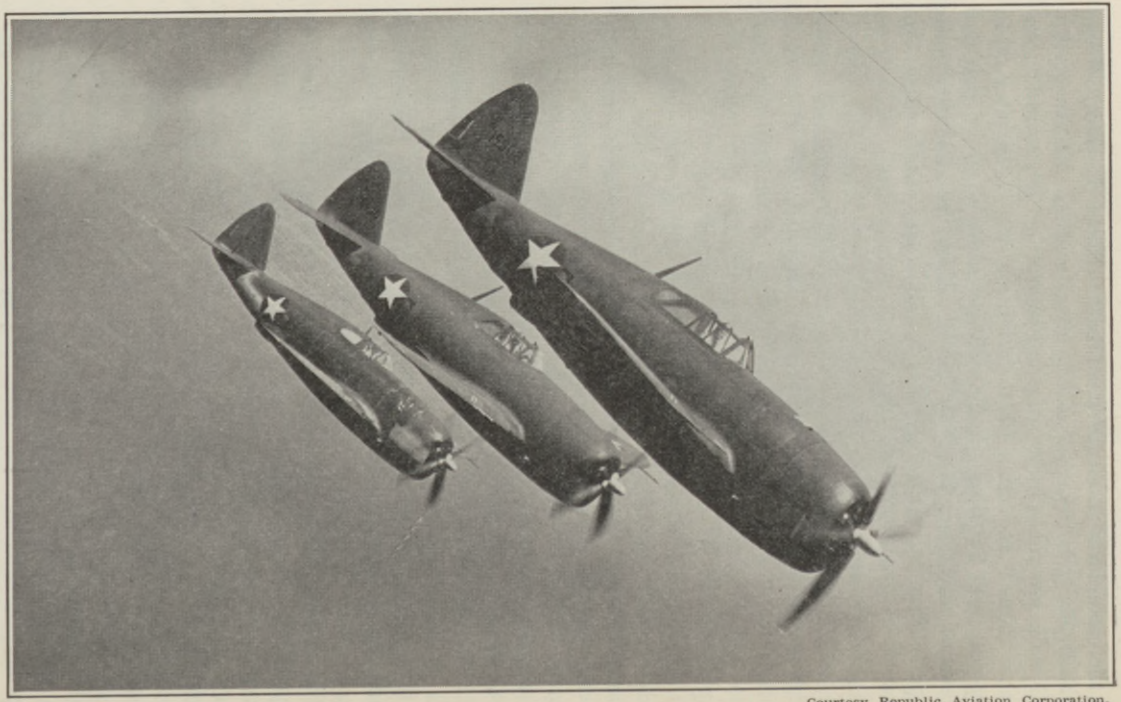
on the ground has an escape valve that is denied the pilot. When a shoemaker gets tired of bending over his work, he can get up and walk around, can go out and smoke or get a drink, can stretch himself and relax for a minute or two. The pilot must stay put, must keep his attention from wandering, must wait for relaxation until he gets safely landed. Upon his shoulders rests responsibility for the safety of the plane and the lives of the crew.

Excessive work without frequent rest periods tends to affect the central nervous system as well as bodily resistance—poor judgment and a condition known as "aero-neurosis" is created. This is really a change in the personality by accumulative and persistent anxiety coupled with an inability to escape from the responsibilities to which one is incessantly subjected.

Improper nourishment preceding long flights, over-smoking, and excessive drinking may produce premature fatigue. Low blood pressure may be caused by over-exercise having used up reserve energy. The presence of infections in teeth, tonsils, sinuses or gall bladder may cause fatigue. Loss of sleep, lack of exercise, over-work, shock following anxiety from thwarted love affairs are additional fatigue-producing agencies.

Headaches may be caused by poor lighting during reading and study, or reading maps during flight. Again, when flying in high altitude, vacuum headaches—caused by nasal obstruction —may result in fatigue. Glare from reflections of sun will increase eye strain and may produce headaches.

Flying cadets are often subjected to great strain through new responsibilities and added pressure of concentrated work. When hazing is added to these trying experiences, there is an inevitable multiplication of intense fatigue, which may lead to disaster. It is a psychological fact that when a person is in a new environment and is trying to absorb technical knowledge, stress is increased and fatigue prematurely develops. If fear and harassing, in the form of hazing, is included, fatigue may develop to the point of exhaustion. Thus, learning is made more difficult and efficiency is greatly decreased. Some failures attributed to poor pilot material may be caused by adverse conditions ag-



Courtesy Republic Aviation Corporation.

The Thunderbolt In Action.

gravated by excessive hazing. When the cadet has been "washed out," it may be that he was poor material. But weariness to a state of exhaustion may have been a responsible factor for his failure. Perhaps the hazing contributed to excessive fatigue and anxiety, and affected his flying.

Although the author believes that a flying cadet should be able to "take it on the chin," so to speak, regardless of how much work he has to perform in his curricula, there are limits to a man's tolerance. There is no reason for the student not to accept a little humor thrown into his serious daily life. During a national emergency, however, every pilot has enough serious responsibility to keep him fairly well occupied.

Fatigue together with tenseness and some anxiety are inevitable in the career of a flyer. These may become exaggerated in the mind of the pilot and color his mental and emotional outlook. Some understanding of psychological and mental hygiene is therefore most useful. (See Chapter IX)

Subconscious anxieties allied with fear have a tendency to increase physical strain and produce emotional disturbances. These emotional conflicts may show themselves several years after the completion of the basic training. Emotions will eventually affect the "sympathetic" nervous system. This in turn burdens the organs which are supplied by that system, and the various bundles of nerves supplying these organs are damaged. This often accounts for marked upsets in the stomach, heart, lungs and liver, and may tire the voice and exhaust the entire body.

Emotional and psychological problems are often important. There may be no noticeable changes which the Flight Surgeon can recognize when psychological complications enter the pilot's sub-conscious mind. Even the aviator may not suspect them. Or he may know that something is wrong and try to conceal it at best he can, so that his medical officer will not observe the symptoms.

What are these psychological storms the aviator must weather? There are several which undermine his efficiency and produce the dangerous condition known as "Pilot Fatigue." All of us have read casual newspaper accounts—how overworked a

pilot is in actual combat and how stale some of them eventually become. The recognition of "staleness" (which is caused by piloting planes too many hours in a week or during a month) by the commanding officer of the outfit is important. A timely change made in the usual routine often helps to avoid a probable disaster. In the eagerness to carry on under adverse conditions, many pilots forget that systematic relaxing exercises are essential for their safety—staleness completely discourages the pilot's desire to exercise. Moderate exercise under conditions of combat will often delay staleness and increase physical and mental efficiency.

The pilot, too, may have certain fatigue-producing anxieties which come into his subconscious mind involuntarily. The types of anxieties vary. There may be a fear deep in his subconsciousness of the occurrence of an accident. Bad weather flying, as in thunder storms, snow storms, or fog, flying over unknown terrain, worry over possible mechanical defects in the radio or engine, all produce marked anxiety and fatigue in flight. There may lurk a vague picture of an accident his roommate or one of his colleagues had experienced some time in the past. Or the aviator who is enonomically insecure may fear that he may be involved in some sort of chronic illness which would remove him from flying status; thus he would be affected economically through loss of flying pay. Or he may be worried about the health of some loved one of his family. All these causes may contribute to an intricate psychological mechanism which will result in marked mental fatigue.

Pilots with nervous and neurotic temperaments aggravated by domestic troubles may suffer the consequences of frayed nerves and tenseness later, when encountering unusual conditions such as bad weather flying. This accumulated, suppressed tension will make fatigue a dangerous condition, and it is during such times that the pilot should seek the friendly and professional advice of the Flight Surgeon, who will guide him intelligently. Often the Flight Surgeon can simplify problems that have become magnified in the subconscious mind of the worried man.

The description of one extreme case followed this pattern:

Certain physiological symptoms were present and were focused on the stomach or intestinal canal. (This is termed gastric neurosis or intestinal neurosis.) Such upsets came on suddenly, but the trouble originated in years of accumulated mental and physical strain. Associated with this condition was marked irritability, accompanied by excessive psycho-motor restlessness (or so-called "mind over matter" over activity). The aviator complained about overwork. He found fault with his routine duties and ordinary details. These became, in his mind, exaggerated into difficult tasks. This mounted up until simple assignments could not be properly performed and, when accomplished, took much time and energy so that fatigue became even more pronounced, leaving him exhausted. Ordinary rest did not seem to refresh him. Anxiety over not accomplishing his work, and fear that his commanding officer might find fault with his slowness forced an extreme neurotic state.

A cycle of symptoms arose in the form of gastric upsets, irritability, lack of concentration, poor judgment and persistent clashes with companions. He felt gurgling sensations following meals, and if the nervousness was not relieved, there would be spells of diarrhea. The pilot became conscious of rapid heart beat. (The Flight Surgeon usually terms these signs "aero-neurosis" and, if recognized, may be the cause of immediate temporary grounding. If not recognized, a state of hysteria may ensue and emotional upsets may be followed by periods of discouragement. Sometimes the pilot has an endless desire to seek pleasure outlets entirely out of proportion to the normal impulse.) A persistent state of anxiety was present, resulting in forced and unnecessary activity. (This is one of the important signs of aero-neurosis.) Sleeplessness resulted progressively, and much needed rest was repeatedly lost with consequent increase in nervous tension.

During the course of his sleeplessness, flights of imagination appeared in his subconscious mind. Vague ideas paraded through his brain. Some of these were that his associates were discriminating against him—often he showed signs of being disgruntled, would argue at the slightest provocation and was hard

to get along with. He became unreasonable, impulsive, used poor judgment, and often antagonized his superiors and subordinates. Finally that which he feared most—being grounded —became a reality. This seemed to add insult to injury. He became depressed. An inferiority complex resulted, which in turn, led to permanent grounding.

Unless the pilot is conscious of these dangers, he may not seek the advice of his medical officer, since most of these symptoms are inorganic or subjective. It is the pilot's responsibility to confide in his Flight Surgeon who may be able to cut the chain of disaster by preventive care and treatment. The pilot, of course, does not wish to complain, for he thinks he may be showing weakness or be ridiculed by his colleagues for making a fuss about a minor subjective symptom. Then again, the economic factor may enter the picture. Knowing that he may be grounded with consequent loss of flying pay, he makes little of these symptoms and keeps early signs more or less a secret.

The pilot must make up his own mind in these early symptoms and signs to confide in the Flight Surgeon. He may temporarily lose flying pay, but that is far less serious than to under estimate the early signs and perhaps later meet with a serious accident as a result of neglect.

II

Relaxation

ONE of the first lessons the pilot learns is the operation and care of the airplane engine. Does he learn as well the machinery of his own body? Meeting the Flight Surgeon is a help to learning about his own body machine. It takes two machines to run a plane with safety: the airplane mechanism and—just as vital—the smoothly running human mechanism within the pilot's body. Neither can fly safely without the other.

In modern living, with electricity our slave, we push buttons and have many duties performed with little expenditure of energy. Automobiles, elevators, streamlined trains, airplanes and endless other inventions have made it less necessary to exercise our muscles in carrying on our day to day lives. At the same time the speed of our mode of living has greatly increased the number of our social and commercial activities. As a result tenseness has multiplied, and has placed a burden upon the central nervous system such as our forefathers never dreamed of carrying. It becomes essential that we learn the secret—HOW TO RELAX.

The human body is made up of a very delicate and intricate system of nerves which must be carefully guarded. The constant pressure of daily activities, long-continued physical and mental tension, seems to surcharge this infinitely fine mechanism and result in extensive fatigue—fatigue that accumulates insidiously until exhaustion seems to superimpose itself with serious detriment to the general health.

Relaxation must be geared to personal need and temperament. One man's relaxation may be another man's tension. Everything depends upon the type of work one does, the amount of energy and the concentration of mental anxiety associated with the execution of the duties. Some people can relax by a certain amount of sleep and feel perfectly refreshed afterwards. Shakespeare believed it was *sleep* "that knits up the raveled sleave of care"—and certainly there are times when restful sleep will create the best possible relaxation. It is advisable to retire early and get the benefit of a good prolonged rest. This, done at regular intervals, may be just as important as short periods of relaxation while awake. Winston Churchill relates that he gains the greatest amount of new energy from little "cat naps" snatched in the hours of his most trying tension.

On the other hand, some people need a change of environment as a temporary escape from a tiring routine. Fatigue comes not only from overwork and montony of work done, but also from mental problems and strain due to professional responsibilities or domestic conflict. Toxic absorption from various occupational exposures, infectious disease, food poisoning, sexual inhibitions, and thyroid maladies may be responsible for the presence of fatigue.

The pilot's profession subjects him constantly to all sorts of mental strain. Anxiety as to whether his plane will perform with full efficiency, or whether the judgment of the operator will be normal under stress, may create great fatigue following flight. When disease exists the Flight Surgeon can usually recognize it long before definite harm is caused. But dangerous inorganic disturbances of the flyer cannot be detected by external signs, and under great tension, may lead to serious mishap. Some pilots are of nervous temperament, and when a series of disagreeable events occur accumulatively, may be thrown into a state of nervous irritability, associated with marked excitement. Distracting noises, may be sufficient to jangle the nerves and upset the nervous system. Everyone should attempt to seek quiet, soothing surroundings which are free from nerve-racking effects.

It is important in seeking relaxation to stay away from tiring,

irritating, noisy places. A quiet room with fine, soft music and subdued lights helps to produce complete relaxation.

It is a mistake to listen to blasting, noisy radios or look at glaring, bright lights. In this case both the auditory and visual nerves are fatigued and in turn, tire the entire body. The noises of the airplane motor often fatigue the pilot—this is another reason why he should seek a quiet place for relaxation immediately after his flight. Continually being subjected to loud noises has tendency to affect the general health.

Learning to relax is an art that can be developed according to the particular needs of the individual concerned. Useful hobbies will release pent-up emotions and permit relaxation—as suggestions: painting, sketching, sculpturing, carpentry, ship modeling, sports, writing, stamp collecting. Franklin Delano Roosevelt often obtains relaxation through his hobbies of stamp collecting and swimming, when the nervous tension of his busy days—and nights—proves too difficult.

The adjustment can be made by the pilot, too, and the pattern of approach depends upon the amount of fatigue present.

There are many ways of direct relaxation. It does not have to depend upon how much leisure one has available for such rest. If one is to relax seated in a chair and the time is limited, it is necessary to clear the mind of tension and to permit the arms and legs to hang as if suspended from their joints. The eyes should be shut and a sort of placid attitude assumed as if nothing mattered and that one could fall asleep in that position. If possible, the chair should be cushioned for such relaxation. Some have found just five minutes of this type of attitude to be as refreshing as hours of peaceful slumber. The same method can be used in a reclining position with the extremities hanging alongside of the body trunk, as though one was not a part of the other. The head must be on the same level as the spinal column and without tenseness over the cervical vertebra. A few minutes of this position is more restful than that in a chair for a much longer period. This can be done at any time *before* exhaustion sets in—if one's vitality is low, this type of relaxation is futile since rehabilitation requires a long rest.

A great deal of relaxation may be obtained by pivoting the head. This exercise is started by swinging the head from right to left in a circular motion, and should be done very slowly with the entire body being at ease and free from any strain. One should be seated on a comfortable chair during this exercise which should be repeated about fifteen to twenty times to accomplish relaxation.

The pilot must learn the importance of eating at proper times; since the tired and exhausted feeling can often be prevented by eating some nourishing food. If hot food is not available, the best substitute is a few bars of chocolate which can be nibbled on for extra energy between meal hours, if restlessness or fatigue should come on.

Drugs to induce sleep are dangerous. Their habitual use may permanently damage the central nervous system. Many blood disorders have also been produced by prolonged use of strong sedatives taken without the guidance of a physician. All such drugs are habit-forming, and the user comes finally to a complete dependence on them with sorry effects upon the general health.

Nearly everyone has noticed that a change of scene is sometimes more resting than sleep. Going to a dinner party, dance, the theatre, opera, lecture—may be just as relaxing to some as complete rest after a day's routine. On the other hand, others would be totally bored with such entertainments, but would be perfectly relaxed engaging in some sport such as squash, tennis, bowling, horseback riding, swimming, gymnastics, volley ball, basket-ball, ping pong, or badminton. Of these types of relaxation more details will be presented in succeeding chapters. Still others would enjoy passive amusements such as card games or jig-saw puzzles; even a chat, either in a friendly or debating discourse, can be stimulating and at the same time relaxing in its nature. Each one of these, in its place and at the proper time, will serve the purpose.

Massage and warm bathing will aid restful sleep. It was Napoleon's greatest comfort to take a hot tub bath at regular intervals. This gave him the necessary relaxation when his nerves were on edge after exhausting work.

III

Exercise

THE big muscles of the body must be kept in use to maintain good health. Under ordinary circumstances of flying, or sitting behind a desk pushing buttons and following the usual routine, the larger muscles of the human machine are not given much work. By supplementing sedentary work with physical activity one conditions his body to withstand longer hours of work and materially improves his mental efficiency.

But when one contemplates exercising he should be mentally tuned up for the task. Only through enthusiasm can real benefit be derived. In a state of mental depression exercise should be avoided. If the body is exhausted a brief period of refreshing sleep will be beneficial. After a short nap, the body will be sufficiently relaxed to engage in the contemplated games or exercises.

What Exercise Does For The Body: When a man engages in exercise he increases the flow of blood to different body tissues. Waste products are removed; the water and heat content of the body is more equally distributed. The glands of internal secretion are stimulated. Food is more efficiently absorbed. By the rapid increased breathing there is augmented oxygen supply to the lungs. Carbon dioxide is eliminated. By sweating, accumulated body wastes are thrown out of the system through the skin. The kidneys and intestinal tract are stimulated. Appetite for food is improved and reserve energy is stored up for future emergency use. Finally, the neuro-muscular tone is improved,

hardening the entire muscular system. A greater amount of work can be accomplished without undue strain. *Those who exercise sensibly and routinely have a greater capacity to do hard work* and fatigue is delayed; the efficiency of the brain to do creative work is immeasurably enhanced.

Brig. General Adna R. Chaffee, formerly Chief of the U. S. Army Armored Force, knew well the value of exercise. He exercised *routinely* even during the hours of his greatest mental drives. He always found a *little time* to devote systematically to building up the body. He knew that men in the armored force should have bodies toughened to withstand the rigors of this branch of the service. The demands upon the flier are no less exacting.

Systematic exercise strengthens the diaphragm, improves the abdominal muscle tone, and gives greater vigor to the spinal muscles and the pelvic floor muscles. Muscular contractions and relaxations help to force the flow of the blood more readily through the heart and lungs and improve all eliminative processes.

Exercise may be active as in swimming, rowing, boxing, bicycle riding, and competitive sports generally, or passive, as in massage when external force is used by the masseur but no active motions are used by the receiver. The physiologic effects of massage are less than those of active exercise. While passive exercise induces greater circulation in a part—as in legs, arms, abdomen, active exercise develops added strength and produces greater endurance and coordination of all bodily muscles.

Resistive exercises combine some of the effects of both active and passive forms. They are particularly useful when one is tired or is just beginning a gradual program of vigorous exercise. In resistive exercise, the receiver resists the masseur or trainer, thus putting stress on certain muscles that need to be developed without over strain. Resistive exercises may be of a static nature with a certain part of the body held rigid, maintaining the flexor muscles and extensor muscles in balance. Or there may be concentric movements, as the forearm being bent and resisted to bending force.

In active exercise, the movements of the different parts of the body are coordinated to a harmonious whole; both consciously and unconsciously the brain directs the response of the body to a simple end. Active exercises usually give more pleasure to the exerciser as they arouse the competitive impulse and enable one to test his speed, skill, strength, and endurance. Over-indulgence in active exercise, however, may produce various fatigue symptoms, and it is advisable to lighten the program with passive exercises to avoid chronic fatigue or "staleness."

Staleness arises from accumulated fatigue over a period of weeks or months. When this occurs, much weight is lost and even sleep fails to restore the required energy. Loss of appetite for food is a usual feature. When staleness is present, even the change from a sitting to a standing position substantially accelerates the pulse. Chronic fatigue should always be avoided by not over-exercising. Proper periods of relaxation and rest should be sought. If staleness occurs routine exercise must be avoided.

Exercises which are easily performed can add power to the body. But—above all—the exercises performed *must produce pleasure* in order to obtain the greatest useful results. Forced exercises or games lose their psychological effect. One relaxes only when specific pleasure is obtained in what is being done. Games should be accompanied by enthusiasm to promote true physiologic and psychologic stimulation.

Exercise properly done helps to avoid poor posture. Poor posture may affect such vital organs as the lungs, heart, and liver. This is especially true when the shoulders are slouched. Good posture can be practiced daily by developing proper body positions in lying, standing and sitting. Even exercise is not a substitute for good posture. The abdomen should not be pushed forward, neither should the shoulders be rounded. It is important that the weight be equally distributed to maintain equilibrium. Over-fatigue often results in a poor posture not only during work but also during exercise. Infections and long drawn out illnesses may be followed by bad posture habits. If bodily defects do exist these may be aggravated by poor postures.

Sometimes, it is not so much the fault of the individual as it is the type of bench, bed, or chair that is used.

During sleep, the body should lie in a straight line, and the hips should not sag below the level of the rest of the frame. The bed should therefore be level and sufficiently firm to keep the weight from pressing in deeply. A good bed is necessary to refreshing sleep.

The Heart in Exercise: While moderate exercise almost never harms the normal heart, violent exercises and severe physical exertion may cause definite injury. For instance, playing handball to the point of physical exhaustion may be sufficient to damage a heart. Especially is this true in persons who have not exercised for years and then suddenly enter into physical activity. It is not common sense to exert oneself to a state of complete exhaustion.

Professional athletes never allow sudden strain on their hearts. It is only the inexperienced man who will attempt such folly. There may be periods when one must cease systematic exercise. After such a lay-off, it is better to resume activity gradually. Failure to follow the rule of moderation may end disastrously. Sometimes sudden physical exertion after an interval of years may result in heart failure. This may arise from an intense demand placed on the heart when it is not prepared.

During a long period of physical inactivity the heart muscles degenerate. Professional athletes who fail to exercise for years after their competitive careers often develop fatty degeneration (fat deposits) around the heart. If a sedentary type of work is pursued by such an ex-athlete, his heart muscle will degenerate more rapidly during such long periods of inactivity than in another person over a similar period. Such hearts when thrown into sudden physical exertion may become overburdened with too heavy a load which may result in an acute dilatation (sudden stretching of the heart). This may be fatal.

According to some authorities there are types of hearts which have been damaged by diseases early in life. Hearts which have been subjected to acute rheumatic fever or chronic heart valvular diseases usually should not engage in violent exercises. These hearts have not the wherewithal to stand the stress and strain.

The normal heart rate for the healthy male while in a lying position is 66 to 74 beats per minute. In the seated position the rate should be 70 to 72. In the standing position the reading should be 79 to 91. In a study of a large group of aviators' pulse rates it was found that the average pulse in reclining position was 72; in standing position, 92. Some experiments indicate that the heart rate is lowest in winter time.

In conjunction with exercise and massage, various other agencies are available. Machines for ultra-violet and infra-red radiation, for diathermy, and for electrical stimulation are all valuable in skilled hands. They may be dangerous if used by the untrained. The ultra-violet lamp provides skin stimulation similar to that produced by natural sunlight, but can produce also very serious burns if too great exposure is permitted. Diathermy apparatus should never be used except by an expert.

Shower baths, needle baths, and alcoholic rubs all improve the circulation and tone up the muscles. One should beware, however, of taking too many showers without using a rubber cap to protect the scalp, as there is evidence that excessive wetting and soaping may lead to premature baldness.

Very hot baths are weakening, and should never be used when the body is exhausted, especially after illness. A warm tub bath, on the other hand, is a relaxing agent when the body is tired.

It is harmful to engage in violent exercise immediately after a meal. The stomach should have at least two hours to get the process of digestion well started before the extra demands of exercise are imposed. No one should engage in exercise following convalescence from any prolonged illness. To participate suddenly in any form of physical strain after illness may lead to fatal results. Several months should be allowed to regain proper reserve strength.

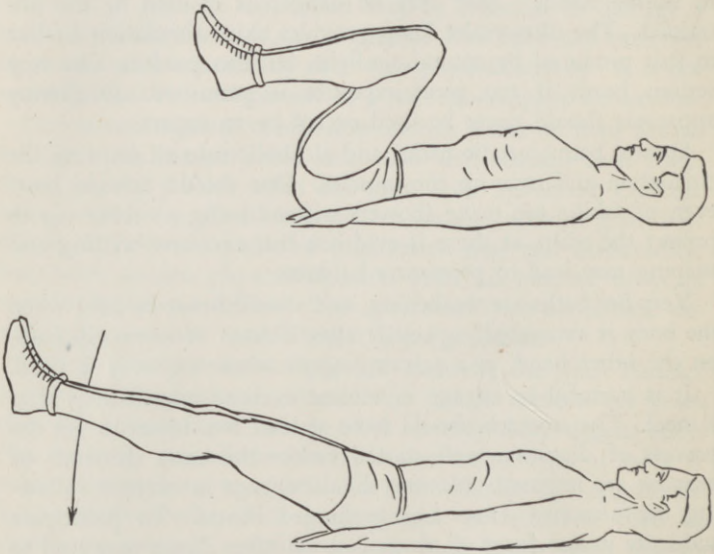
SETTING UP EXERCISES

When group games are not possible, setting up exercises will be beneficial for keeping the body in good trim.

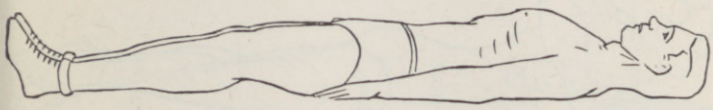
Setting up exercises can be done anywhere and in spare time. Although they lack the element of pleasure that is a valuable

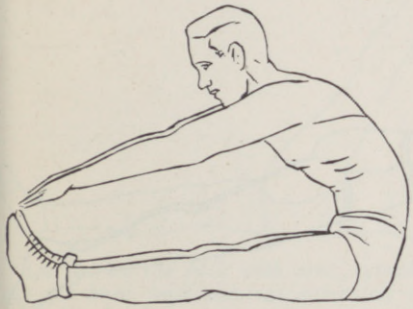
feature of games and sports, they are a useful supplement to a balanced exercise program.

The following exercises may be suggested for developing the various parts of the body.

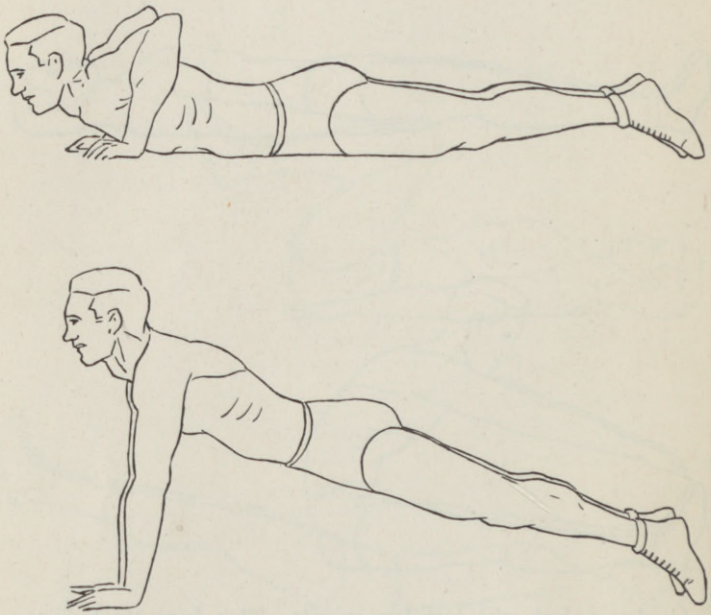


Assume position lying flat on back. Bring both knees up toward the chest keeping hips on the floor. Then stretch both legs straight up, making a right angle with the trunk of the body. Then bring legs slowly back to the level of the body without bending the knees. Repeat after a short rest. Twenty times is a good stint.

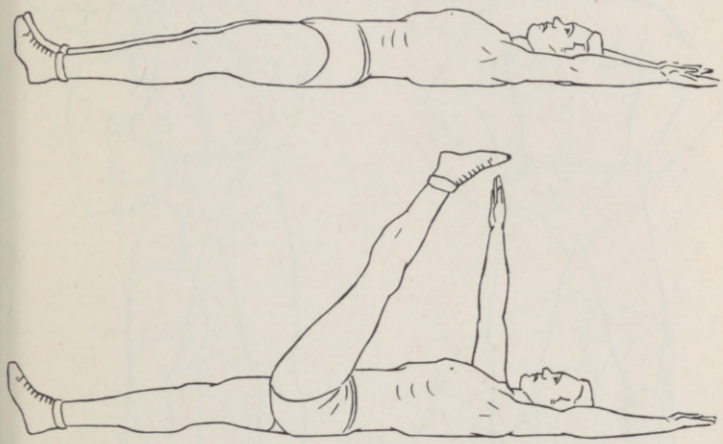




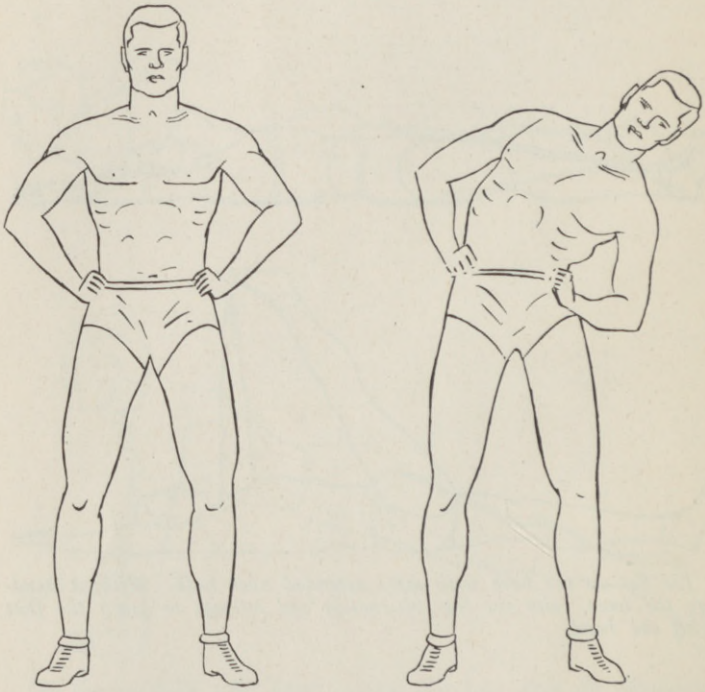
Lie flat on back with both legs straight. Then bring the body to a sitting position and touch toes with fingers. Do not bend the knees. Bring body slowly back to lying position with both hands over the head.



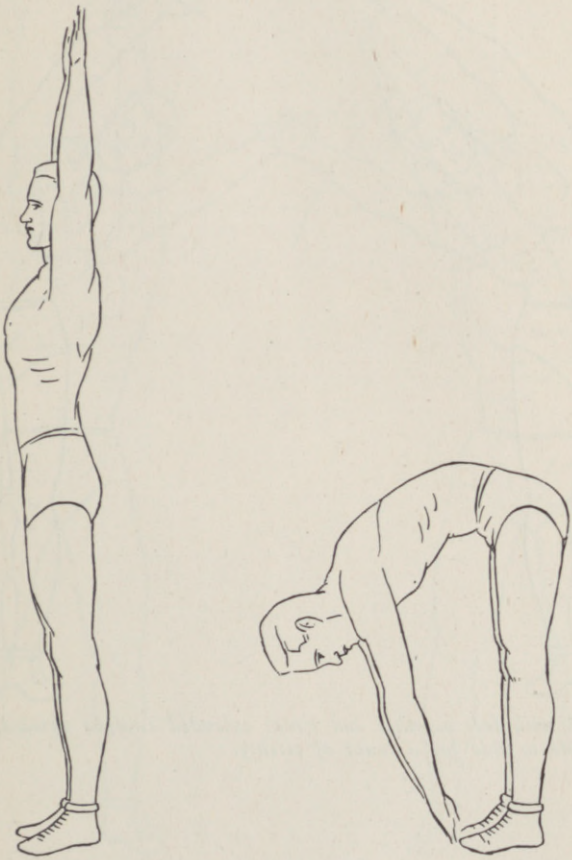
Lie flat on belly with hands against the floor near the shoulders. Push up from the floor, holding the body stiff. Let the body down slowly without quite touching the floor and repeat.



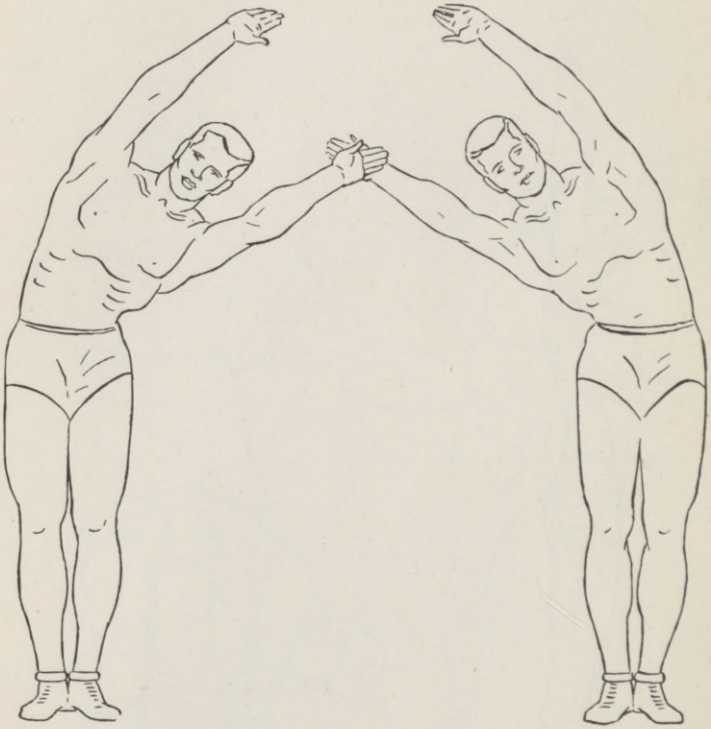
Lie flat on the back with arms extended over head. Without bending the knee, raise the legs alternately and attempt to grasp the foot with the hand.



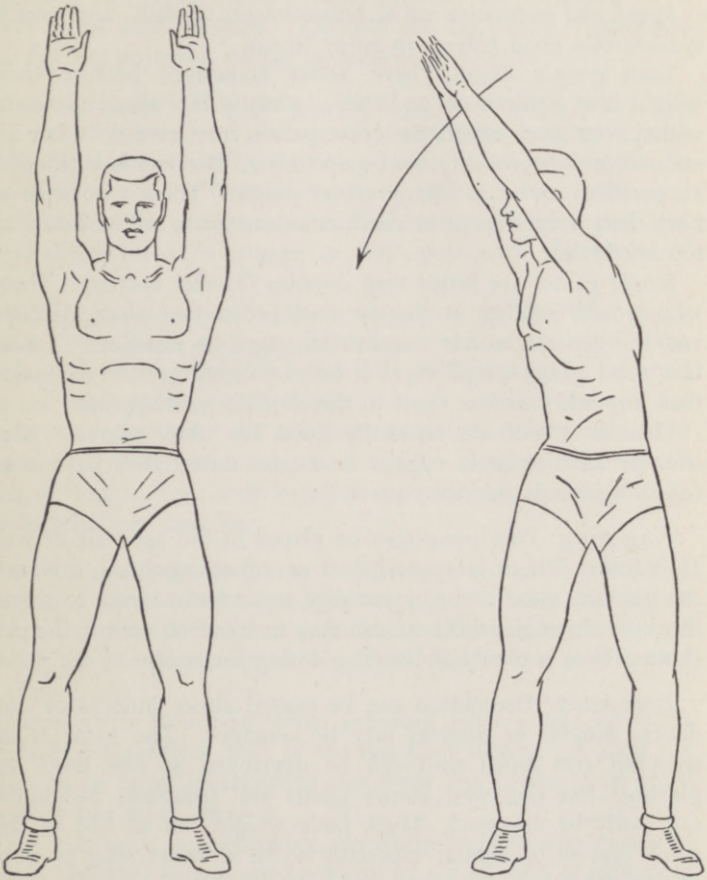
Place hands on hips with feet about twenty inches apart. Bend the body to right and to left twenty times. Keep the feet firmly planted and the legs straight. This exercise helps to keep the waist line slim.



Stand with feet together and hands extended straight upward. Then bend forward and touch the toes keeping the legs straight.



Stand with feet together and hands extended straight upward. Bend from side to side for a count of twenty.



Stand with feet twenty inches apart and hands extended straight upward. Then turn as far as possible to the right without moving feet. Try to feel the stretch at the waist. Then bend, attempting to place both hands on the outside of the right foot without bending the knees. Repeat the exercise to the left.

SPORTS*

Tennis: Tennis is a sport of skill, speed and endurance. As in any other undertaking, skill comes from consistent practice. Speed and endurance are accompaniments of skill; and usually it takes two good players to enjoy tennis.

Lean people usually have better endurance because their weight is at a minimum and they can easily race about the court without too much effort; the obese person may have skill, but his endurance will probably not be up to par. But tennis is, indeed, an excellent means of losing excess weight. Those who wish to keep their weight down to a minimum can do so without wasting too much time.

Single games are better than doubles for real exercise. Those who would indulge in singles must be in fine physical shape and the general muscle coordination must be excellent. Tennis is a good game for pilots as it helps to give greater relaxation than any other similar sport in the shortest possible time.

Doubles games are especially good for older players. Men over 40 should rarely engage in singles unless they have been following tennis for many years.

Ping pong: Ping pong may be played in the open air as well as indoors. There is a good deal of effort expended, and one can get up a good sweat by jumping around and trying to return the difficult angle shots or running in close to return the net shots. There is plenty of bending during the course of the game.

Badminton: Badminton can be played either indoors or outdoors. Singles or doubles may be arranged. The game is interesting and much skill can be developed as one keeps on playing. For one who knows tennis and handball, badminton can easily be mastered. Much body weight can be lost in this game just as in tennis; especially so, if a sweat shirt is worn during the game.

Handball: Handball may be played either indoors or outdoors.

* Three extremely valuable books on sports are *Sports As Taught And Played At West Point; Modern Judo,* by Charles Yerkow; and the *Military Ski Manual,* by Frank Harper. The Military Service Publishing Company.

A single wall can be employed or four walls—enclosed. Some can play either game but many prefer the four-wall game. When playing singles in either game, a greater amount of energy is expended and much more weight can be lost especially if a heavy sweat shirt is worn. Doubles can be played vigorously, too, but not so much energy is used as in singles.

Squash racquet: This game is most popular among pilots and is a convenient way of "letting off steam" and getting a good deal of physical benefit. As many as six to eight sets can be played in as short a time as one hour. Pilots between the ages of 21 and 55 can play the game. The body must be in excellent physical condition to engage in this sport with the necessary speed.

While playing squash the heart beats rapidly—even more rapidly than while engaging in the game of tennis—and often air hunger is experienced when a difficult shot must be returned against the opponent. The body is toned up and exercise for the eyes is excellent. All ocular muscles are developed and it has been observed that those who engage in sports like squash racquet, tennis, four-wall handball—rarely have weaknesses of the external eye muscles.

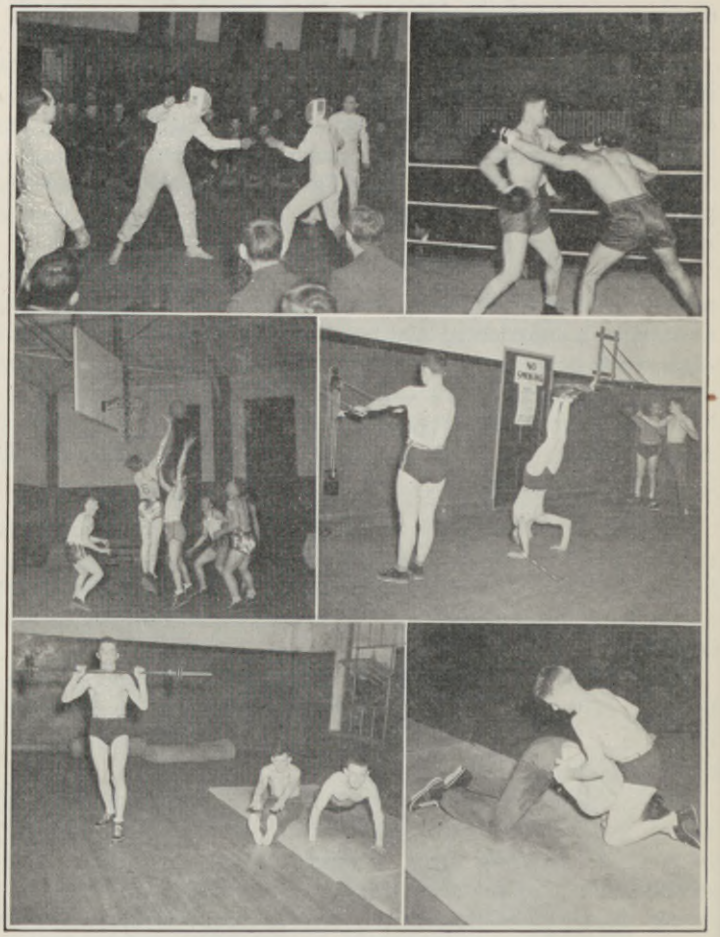
Swimming: Swimming is a healthful sport and as a form of exercise it is excellent, especially during the summer months. Swimming offers a complete well-balanced form of exercise since all the long, large muscles can be developed and no interference is offered.

Never swim in a pool when suffering from a cold or when the body resistance is low. If one has sinus disease, an acute ear infection or boils, it is best to stay away from swimming pools or other bodies of water.

Eye infections are apt to become worse for one who swims in a pool. Neither should anyone swim in a pool who is extremely fatigued or suffering from intestinal upset—such individuals should stay out of the water for, obviously, cramps may be produced. Never swim immediately after a meal—always wait for about 2 hours after eating before going into the water.

There is perfect relaxation in this type of exercise—weight cannot be lost but the body can be developed and greatly strengthened.

Archery: Archery makes a splendid pastime for the pilot who



Good exercise.

wishes to develop his body and at the same time, add some glamour to his sport. Although this form of exercise is not too strenuous, it is vigorous enough to make it a beneficial form of exercise, and in shooting an arrow one must assume a perfect posture. Besides target practice, which can be played alone, archery lends itself to group contests for skill as well as for pleasure. Archery can be practiced indoors as well as outdoors and one can arrange different distances according to the convenience.

Golfing: Golfing is relaxing as well as invigorating. It provides light exercise and pleasant companionship in the open air with the spur of competition to give zest. The average round of golf is five miles so that 18 holes affords a good day's exercise.

Golf is a little more strenuous than the average person may be led to believe—small hills must be climbed, hazards must be overcome and if one is willing to act as his own caddy, he can do plenty of bending and additional walking while searching for the ball.

Boxing: Boxing is a decidedly valuable sport in learning self control and has the added advantage of building up the entire body.

Basketball: Basketball may be played individually or collectively in team work.

Basketball should only be played by younger pilots as it requires much endurance and is a game of speed. Rapid sweating takes place, also. For a short workout, basketball is excellent, provided the men playing are not previously fatigued. Basketball demands heavy work from the heart. Men past 25 years should never participate in competitive basketball games.

Indoor Baseball: This is a good collective sport which helps to develop good fellowship as well as sportsmanship. One can practice catching, batting, running, throwing—or a regular game can be conducted with the use of a soft ball.

Indoor baseball played outdoors adds the advantages of fresh

air and sunlight to relaxation. Games can be arranged between different organizations of the post or inter-post games can be scheduled.

Bowling: This sport is primarily a game of skill and does not call for much strength. It is a friendly sport and appeals by its sociability and good fellowship. Though it does not require great muscular strain, it is an excellent game for decreasing abdominal fat.

Horseshoe Pitching: Horseshoe pitching is a relaxing game of skill not requiring much exertion.

Fencing: Fencing is a stimulating sport. Physical coordination of the body is quickly developed. It is valuable also as a reducing, corrective exercise, and there are many opportunities for complex coordinated movements in attack while fencing.

Gymnastics: Gymnastics as well as tumbling exercises help to tone up the neuro-muscular system. When one runs, jumps, throws, and climbs, all the large muscles are brought into play and the physical condition is markedly improved. Sweating is promoted and body poisons are thrown off.

Volley Ball: Volley ball is a group sport helpful in producing friendliness among squadrons. There is no danger of injury and any age group may play the game. The game improves the posture of round shouldered people. It can be played indoors or outdoors. Any number of men can participate. It is a good relaxing agent before tense duties.

Wrestling: Wrestling is a sport which should be practiced by those who are trained equally. It offers a good opportunity to bring every muscle into play. Although brawn is important, quick thinking is essential also.

Wrestling helps to develop weak abdominal muscles, and to decrease weight; it strengthens weak joints, corrects round shoulders, and develops the chest. Wrestling produces a good healthy sweat in a short time, and can also be used for relaxation before pilots engage in difficult formation flying.

Judo or Ju-Jutsu: A valuable sport for training the muscles and mind to act with split-second coordination. Since strength and weight have little affect on one's skill at Judo, it can be practised by all types of men.

Paddle Squash: This game is similar to squash racquet except for the racquet which is as large as a tennis racket but the handle is short and has a leather string which can be twisted around the wrist to prevent dropping. This game can be played by older players. This was a favorite game of Brigadier General Adna Chaffee.

EASY GAMES FOR RELAXATION

Back to Back Lift: Two men are placed back against back so that elbows become linked. At proper time each can try to lift the other up off the floor. When one of the two is lifted off the floor, he loses. It is necessary to win 2 out of 3 games.

Back to Back Stick Pull-Away: A small round stick about 4 feet long can be used. Two men are placed back to back and both get hold of the stick overhead. At proper time signaled each one attempts to pull the stick down in front of the chest. He who releases his hold of the stick loses the game.

Hand Push: Two men are placed facing each other, toe to toe; while in this position the feet should be spread about 20 inches. Then each places his palms at the level of the shoulders. At designated time each one tries to push against the hands of the other with the idea of forcing one to step back. When one steps backward, he loses the game.

Hand Wrestle: Two men stand with feet spread in stride position. Each one stands with right foot forward, touching outer part of the other's foot. Each grasps the other's right hand. At designated time each attempts by pulling, pushing, twisting or turning to upset his opponent. If either one touches the ground with his hands, or moves his feet from the places set, he loses the game.

Another two-man game similar to this is stick wrestle. A

heavy stick about four feet long is used. One man faces the other at about 4 feet distance. Each one grasps the stick with 2 hands and at designated time each attempts to pull the stick away from the other. He who succeeds wins the game.

There are many similar games: Indian wrestling, stork wrestling (where each one stands on one leg while wrestling), mat wrestling, rough and tumble, etc.

IV

Food for Thought

THE old saying that an army travels on its stomach was true when Napoleon's legions slogged through the snows on the steppes of Russia, and it is true today, though modern mechanized legions careen over the landscape in jeeps and tanks.

It is also an axiom for today's fighting eagles. The fighter or bomber pilot, as well as the commercial pilot, depends more than he realizes upon an adequate and balanced diet for his high pitch of efficiency. That diet does not have to be of gargantuan proportions in order to fuel his personal engine. He does not have to eat a barrel of food. Scientifically-calculated vitamin and energy intake answers the purpose. On the other hand, lack of vitamins in his body may lead to serious consequences—poor nervous or muscular coordination, lowered vitality, a decrease in the keen perceptions upon which his crew or passengers depend for safety.

Pilots are truly lone eagles. Once they leave the ground, they must depend upon their own physical and mental resources to see them through. The safety of others in the plane is directly in their charge. It is, therefore, of prime importance that their own physical mechanism be properly tuned up. The right amounts of food and the correct quantities of vitamins will keep them the perfect human machines they are required to be.

The ground work for this independence of thought and action, and the safety factors that depend so greatly upon it, is

laid before the pilot takes off. It is laid, to a large extent, at the mess table or in the pilot's home dining room, where his wife or his cook shares the responsibility for keeping him physically and mentally fit. The pilot's diet is, to a greater degree than is commonly realized, the determining factor in his efficiency.

In clinics and in remote laboratories scientists have carefully studied dietary habits, and have learned much concerning the secrets of maintaining health through balanced vitamin consumption. The history of diet advancement has not been one of chance or guess work, but has been carefully worked out, step by step. The food that appears on Army and Navy mess tables is the best food for fighting, and not merely what the kitchen police or invisible chefs think should be prepared. This careful balancing of diet makes our own armed forces the finest and most physically fit in the world.

For the air pilot, however, this business of proper and balanced diet assumes the greatest significance. He requires physical and mental stability and well-being more than do the infantry or other arms. Flying uses up the reserve of the body tissues faster than ground work, and therefore the pilot should have more than a merely general understanding of diet. He must have a definite and well grounded knowledge of what foods are essential to maintain a high level of health.

The pilot must be the controller of his appetite and eat not merely what he desires, but what he knows has the vitamin and nutrient content.

If the pilot ignores the danger signals and neglects dietary precautions, he will almost certainly expose himself to a variety of physical or mental maladjustments, among them poor eyesight, hearing deficiencies, anemia, night-blindness, prolonged fatigue, varying degrees of neuritis, and frequent and recurrent colds.

For medical care the pilot depends largely upon the professional guidance of his Flight Surgeon, but it often happens that between the annual or semi-annual examinations definite weaknesses caused by an improperly balanced diet crop up. Ob-

viously, the medical officer cannot stand behind the individual pilot and observe whether a balanced diet is adhered to, even though scrupulous care is taken to calculate a correct weekly menu.

After his physical examination, the pilot stands on his own concerning his health; what he eats, how he sleeps and when he exercises. A normal diet requires balance, and one must not depend entirely upon foods that are particularly liked. If a pilot develops a conscious dislike for certain types of food, it is almost inevitable that he will deny himself certain vitamins which are essential to his complete well-being.

Statistics indicate that about fifty per cent of aeronautical catastrophes are due to errors of judgment on the part of the pilot. A balanced diet for the pilot may be helpful in avoiding some accidents. For in flight, nearly all the vitamins play an important role in mental alertness, sense acuity, and muscle coordination. We cannot say exactly what proportion of these "pilot error" disasters are caused fundamentally by a deficiency in the pilot's physical or mental health, but every qualified observer believes that the proportion is large.

Vitamins: One vitamin urgently required by the pilot is vitamin A. The absence of this vitamin results in night-blindness (medically termed nyctalopia), corneal ulcers, opaque whitish deposits on the conjunctiva of the eye, conjunctivitis, mild eruptions of the skin, frequent susceptibility to colds, irritation to the mucous membranes of the nose and throat, and weaknesses associated with mild loss of weight. To prevent these conditions, the flier should partake of a varied diet during each week, and his menu should contain plenty of vegetables. Beet greens, dandelion greens, endive, kale, chard leaves, carrots, green peppers, spinach, summer and winter squash, lettuce, tomatoes, sweet potatoes, brussel sprouts, pumpkin; also fruits as oranges, grapefruit and apricots all rank very high in vitamin A content. In addition, he may consume cod liver oil, liver and whole milk, which incidentally offers a richer source of vitamin A than any other food. Butter, egg yolk and animal fats from beef and mutton yield supplies of this essential vitamin.

Many green foods carry carotinoid pigments marked by a green or yellow color. There seems to be a relationship between these pigments and vitamin A potency. Vitamin A, however, cannot be considered as identical with carotene.

The natural sources of vitamin B_1 are brewer's yeast, whole grain cereal, liver and kidney, leafy vegetables, egg yolk. Oranges have one-fifth as much as yeast. It is important to bear in mind that the concentration of B_1 in the majority of raw foods is generally low, and there is danger of further losing this vitamin through cooking. Most vegetables and fruits have a small amount of B_1.

The natural sources of vitamin B_2 are brewer's yeast, liver, kidney, egg white, milk, meat, vegetables such as tomatoes and lettuce, and bananas.

Vitamins B_3, B_4 and B_5 have been found in the same sources as vitamin B_2. These vitamins still are in an experimental stage as regards their significance and sources.

Deficiency of vitamin C may produce such conditions as dental caries, pyorrhea, vague aches and pains, fatigue, pallor, anemia—scurvy, if completely absent. There may also be increased susceptibility to infectious diseases and arthritis (pain in joints). The natural sources of vitamin C are the fresh fruits and vegetables generally, especially oranges, lemons, grapefruit, tomato juice, lettuce, fresh raw strawberries, watercress, apples, bananas, paprika, fresh pineapple, spinach, carrots, tangerines, and grapes. Vitamin C may also be found in potatoes, peas and string beans, if these are not boiled too long. Long cooking and steaming destroys this vitamin, but it can withstand the short cooking necessary in canning. Canned tomato juice is practically as rich a source as fresh tomato juice.

When fruits and vegetables are kept in certain metal containers, too long, the vitamin C power is affected; this occurs where copper and unlacquered tin are used. Such containers as nickel, chromium, aluminum and glass, however, will not have any effect on the vitamins.

The natural sources of vitamin D are the fish oils, cod, percomorph, burbot, salmon, sardine, and egg yolk. Ultra-violet

radiation forms vitamin D from ergosterol in the skin. The vitamin D is then absorbed into the blood and carried to the tissues where it is needed. By irradiation, milk, yeast, and other foods may be made good sources of vitamin D. A concentrate known as viosterol taken internally is converted into vitamin D within the body, just as the naturally formed ergosterol is converted.

Vitamin E is found in wheat germ, vegetables, oils such as cotton seed, corn oil and olive oil, as well as in lettuce, whole grain cereals, legumes and soy beans.

Vitamin F may be found in fats. Persons on a fat-free diet sometimes suffer from vitamin F deficiency. In this condition they may develop scaliness of feet and hands. Vitamin F is in the experimental stage.

Vitamin H is found in wheat germ, oil and yeast. It is still in the experimental stage.

Vitamin K is anti-hemorrhagic in its nature. It helps clotting and coagulation of the blood. It is usually found in pig liver and hemp seed. Green vegetables also have a fair supply.

Vitamin P has been isolated from orange juice, but little is as yet known about its properties. It is supposed to be similar to vitamin K, and its main function is related to blood diseases.

Daily vitamin intake is not a "cure all" multiple chemical potion. Nor will it create a miraculous reserve of energy. What balanced vitamins in a day's diet actually do is to give the body the natural means to carry on its normal physiological functions.

Minerals: Besides the vitamin intake so necessary for the balanced diet, certain minerals must also be considered. Such minerals are potassium, phosphorous, calcium, magnesium, iron, copper, manganese, iodine, zinc, cobalt, sulphur. All these occur in most accessible form in milk. Milk is a well-balanced nutritional mixture and is a composition of many complex parts. Pure milk is definitely a rich food. Besides water, its composition is about 2½% protein, 5% fat, 4.6% sugar, and 0.71% ash. The protein component is made up of about 50% casein, 40% albumin, and 7% globulin. The casein is rich in phosphorous.

Milk allergy perhaps causes discomfort in about 2.5% of the total population. The allergic reaction can generally be avoided by using pasteurized instead of raw milk. A tolerance can also be established by gradually increasing doses of raw milk over a long period of time. The protein content of milk is vital in replacing the wear and tear of the body in young people. The butterfat in milk contains cholesterol, lecithin, cephalin and fat soluble vitamins, as well as the provitamin which produces vitamin D when milk is irradiated with ultra-violet light.

The minerals of milk which make up the most important part of the ash content are: calcium, .118%; phosphorous, 0.093%; magnesium, 0.012%; sodium, 0.051%; potassium, 0.143%; chlorine, 0.106%; and sulphur, 0.034%.

Smaller amounts of iron, copper, zinc, aluminum, manganese, iodine and fluorine are found. There are traces of chronium, lead, tin, titanium, vanadium, rubidium, germanium, silicon, boron, barium, lithium and strontium.

Milk also has many enzymes which help the digestive processes.

In addition to the above, there are important vitamins in milk such as vitamins A, B_1, C, D and G. No definite minimum amount of vitamin B for adults has been established. A quart of milk will provide about 3000 International Units of vitamin A, 100 International Units of B_1, and 600 Sherman-Bourquin of vitamin G. Vitamin A is not influenced by pasteurization or any of the usual processes to which milk may be charged. However, pasteurization may influence about 15% of vitamin C which, incidentally, happens to be unstable in milk subjected to unusual conditions. Light and overabundance of oxygen have a tendency to rapidly decrease the vitamin C content. Fresh raw milk contains about 500 International Units of vitamin C per quart.

Vitamin D in milk is very low; however, metabolized vitamin D milk can be produced by feeding cows a special diet rich in D. Irradiated milk is produced by exposing a flowing film of milk to a special intensity of ultra-violet rays. This form of milk contains 135 U S P units of vitamin D per quart. Fortified or

concentrate vitamin D milk is prepared from a concentrated form of vitamin D which has been added to increase the amount. Concentrates from fish liver oils are the ones usually used. These milks have approximately 400 U S P units of vitamin D per quart. Vitamin D milks may be used in preventing rickets. The National Medical Association feels that these are acceptable standards of vitamin content.

Vitamin D milk aids the hygiene of teeth and the bone structure. What has been called vitamin G, or vitamin B_2, is now considered to be the chemical substance riboflavin. Milk contains about 0.1-0.3 mg per 100 grams.

Milk fat furnishes about 50% of the energy value of milk; and because of its finely emulsified form it is fairly easily digested. The fat of milk contains the fat soluble vitamins A, D and E, as well as most of the phospholipids and cholesterol.

Grade B milk should be used within 54 hours after pasteurization and Grade A milk should be used within 36 hours after pasteurization.

Grade A has better flavor and taste, a higher fat content and more milk solids.

Milk is pasteurized by heating to 143° Fahrenheit and being maintained at this temperature for not less than 30 minutes. By this method all pathogenic organisms are destroyed and about 90% of all other bacteria.

Canned milk does not taste as good as fresh milk, but it can be conveniently stored and carried long distances.

Condensed milk, first introduced in 1857, has been used in various modified forms, such as evaporated, whole milk dry and powdered milk. All of these vary in fat content from 9 to 28%, and protein content from 8 to 37% and milk sugar from 9 to 32%.

Homogenized milk is produced by breaking up the fat globules so that the cream layer is not seen but instead is equally distributed throughout. This softens the fat content and improves the flavor. Homogenized milk has to be pasteurized to prevent rancid odors from developing.

Acidophilus milk has special culture of lactobacillus acidoph-

ilus added. If used over a long period, it helps in simple types of chronic constipation in adults.

The pilot who cares for his figure should remember that a person who sits behind a desk requires as much protein as a person doing difficult labor, but that starchy foods and fats should be curtailed. If sweets and starches are taken in large quantities, it decreases the appetite for other proper items, which balance a diet. Substantial foods can be mixed and there is no danger of any harmful effects occurring from such combinations.

When one is "out of sorts" and the digestive system seems to be overworked, or when the stomach is greatly upset, or if a tooth has been extracted and some infection exists in the mouth, or if there is a severe sore throat, or if one is extremely nervous—it is best to use a simple, bland, soft diet, such as soups, gelatin, junket, custard, ice cream, tea and dry toast.

Food Allergy: "Allergy" has recently been much discussed among laymen as well as physicians. It may be defined as an excessive sensitivity to minute quantities of certain proteins. A common example of allergy is seen in the hay fever sufferer, who is abnormally sensitive to the irritation of certain plant pollens. Some people are extremely sensitive to dust and hair particles shed by certain animals, and may become seriously ill merely by being in the neighborhood of such an animal.

Perhaps the most important types of allergy are those associated with common foods. Certain people are susceptible to milk, others to eggs, still others to sea food. There are scarcely any common foods that may not produce allergic reactions in occasional individuals.

The allergic reaction is a response to a specific irritation, and the most difficult problem in dealing with a case is to identify the agent responsible. Once the cause is found, the victim can either eliminate the offending food from his diet, or can acquire an immunity to its effects by controlled gradual increases in the quantity taken.

The symptoms of allergic reaction are various. Most commonly there are skin manifestations in the form of tiny red spots, weals, or swellings of different types. The face or other

parts of the body may be markedly puffed; perhaps an eye will be swollen shut. There is generally some fever. There may be asthma (difficulty in breathing associated with involuntary contractions of the bronchial tubes), or shortness of breath. Some types of allergic reaction involve the digestive system; others produce eliminative upsets; still others are manifested by rheumatic pains in the joints. There is no specific time of onset of symptoms: the disturbance may occur within a few minutes after exposure to the irritating agent or may be delayed for several days. These irregularities in symptoms and time of onset make it sometimes a tedious job to "run down" the cause. No very useful rules can be set forth regarding the types of food responsible. A process of elimination requiring much time and patience is usually necessary. The Flight Surgeon may recommend various skin tests to determine whether any of the specific plant pollens cause difficulty.

Food Poisoning: At times, while on a sustained flight in a distant area, it may be necessary for the pilot to live solely on canned foods or those available in the immediate environment, and he may be confronted with the problem of food poisoning. The most serious common type is that produced by a specific microorganism, *Clostridium botulinum,* which sometimes infects canned food, particularly meat. The poisoning is directly caused not by the microbe itself, but by toxic by-products which the microbe produces in the food. The toxin attacks the nervous system, causing paralysis, and death in severe cases. There is usually no fever or pain symptoms.

Botulism results from imperfect sterilization of canned products. The microbe is killed by ordinary cooking, but the toxic by-product does not break down except with prolonged cooking at the boiling-point of water or higher. If any doubt exists concerning food, it should not be eaten, as the cooking process may not be effective in destroying the toxin.

Another type of food poisoning is an infection of the intestinal tract often incorrectly called ptomaine poisoning. (True ptomaine poisoning is poisoning by toxic by-products produced in putrefying meat by bacterial action; botulism, just discussed,

is an example). The infective type of food poisoning is characterized by digestive upset and severe diarrhea. It is usually of short duration, and unless complicated by other disease, is never fatal.

The bacteria that cause food spoilage do not thrive in an acid medium, and accordingly acid fruits and juices such as pears, peaches, plums, apricots, and apples, and vegetables such as tomatoes are safe from attack. Bland or neutral food, particularly meat, must be closely watched.

A third type of food poisoning may be caused by certain specific poisonous plants such as toadstools or nightshade berries. Strange berries should never be eaten in woods.

Occasionally foods are contaminated with mineral poisons such as lead, copper, arsenic, or zinc. The source may be an insecticide used during the cultivation of the fruit or vegetable, or zinc or copper cooking utensils that may be attacked by food acids. In the case of poison from cooking utensils, the contamination arises from improper cleaning of the utensil before use. Soluble salts of zinc or copper may collect on a utensil that is exposed to weather, or that stands for a long time in contact with fruit or vegetable juices. With proper care, it is perfectly safe to use zinc and copper vessels in cooking.

FOOD AND WEIGHT

Gaining Weight: Loss of body weight may be the first sign of some disease. If excessive and rapid, it may mean the beginning of tuberculosis, or some other bacterial or parasitic infection. In many cases, however, underweight is the simple result of too little food. It may be that mental strain, and general overexertion accompany a failing appetite, and the individual loses weight and becomes further "run down."

Generally speaking, a person past thirty years of age is better off with a little less weight than normal rather than a little more. But marked underweight is sufficient cause for rejection in the military services, and should be corrected by attention to diet.

Assuming that no infection or organic disability exists, a little

care and knowledge in the selection of daily food will bring the body weight up to the desired level, with great improvement in the general well-being.

The foods necessary to form body tissues are mainly starches, fats, and foods containing proteins. The measuring unit used in scientific calculation of diet is the calory, the amount of heat required to raise 1,000 grams of water one degree centigrade. (The *small calory,* used in chemical and physical work, is 1/000 of the large calory, used in diet calculation). To build up an underweight body, we supply a somewhat larger number of calories than would normally be required. Typical calory values of food elements are 9 calories per gram (255 calories per ounce) for fats, and about 4 calories per gram (113 calories per ounce) for carbohydrates and proteins.

Since concentrated fatty foods in a diet become obnoxious, and fats in large quantities are relatively indigestible, there is an upper limit on the amount of the high-calory fats that can be used for the purpose of gaining weight. There should be a good mixture of sugar and starch in the weight-gaining diet.

In suggesting a diet for weight-gaining, vitamin and mineral balance must not be lost sight of. In addition, it will probably be necessary for the man who wants to gain weight to change his habits of eating, and perhaps his general habits of life as well. A high-calory diet is of little avail unless the body *makes use,* by digestion, of the food that is supplied to it. Perhaps the most important factors in securing thorough digestion of food are adequate rest, and moderation in the use of tobacco and alcohol.

The following are two suggested fattening diets:

(1)

Breakfast	Dish of prunes
7:30 A.M.	3 tbsp. grapenuts
	1 cup light sweet cream
	2 slices whole-wheat toast
	1 tbsp. butter
	1 tbsp. sugar
	1 glass pasteurized milk

10:30 A.M. Cup of cocoa

Lunch
1 stalk celery
1 raw carrot
3/5 cup corn chowder
1 serving fruit salad
1 roll
1½ tbsp. butter
1 cup chocolate pudding
2 tbsp. whipped cream
½ head of lettuce
1 medium tomato

4:00 P.M. Egg in orange juice
(1 egg, 3 tbsp. orange juice, 2 tbsp. sugar)

Dinner or Supper
1 moderately large-sized portion steak (broiled)
Scalloped potatoes } 1 cup each
Buttered beets }
1 serving lettuce & tomato salad
1 dozen salted almonds
½ cup boiled custard
2 macaroons

(2)

Breakfast
1 banana served with shredded wheat
2 scrambled eggs
1 tbsp. butter
1 tbsp. sugar
1 cup coffee containing plenty of sweet cream

Lunch
1 cup macaroni and cheese
1 serving lettuce with French dressing
3 slices whole-wheat bread, about ½" thick
1½ tbsp. butter
½ cup stewed prunes
1 cup milk chocolate

Dinner
1 cup cream of celery soup
1 loin lamb chop about 2" thick
1 medium baked sweet potato
1/3 cup canned corn
2 rolls
1½ tbsp. butter
½ cup lemon milk sherbert
2 plain cookies, medium size
1 glass milk

These specimen diets are typical of the bulk, fat, and starches which are necessary to an underweight person. It would be wise

to take combined vitamin pills as an adjunct to improve the appetite. This will also help in gaining weight.

A normal adult working moderately should have from 2,500 to 3,000 calories per day. A person doing heavy manual work should have from 3,500 to 4,000 calories per day. A person of sedentary life should have from 2,000 to 2,500 calories per day, with the necessary iron and vitamin intake.

Correcting overweight: Generally speaking, overweight is a more serious condition than underweight. After the age of thirty, overweight people are more frequently victims of heart failure, kidney disease, diabetes, and other ailments than those who are underweight. The man who is heavily above the average normal weight for his age and height will probably be rejected on his annual physical examination. Insurance companies are wary about issuing policies to those who are overweight.

Overweight creates a definite burden of superfluous body bulk, and taxes the heart and circulatory system. Physical exertion leads to shortness of breath, and in extreme cases to failure of the heart. At best, the fat man is unfitted for any kind of active life.

The common error of the heavyweight is that he eats too much and exercises too little. This may be due to lazy habits, to underactivity of the thyroid gland, to mere self-indulgence in the matter of food, or to losing the habit of physical activity after an injury or operation. Overweight due to glandular unbalance (thyroid, pituitary, or parathyroid disturbance) is a serious pathological condition, and medical aid should be sought. Under these circumstances self-dieting and self-medication may be dangerous. There are other types of obesity that point to an underlying condition of disease, and in general a program of weight reduction should not be attempted until a thorough physical examination has been made and the possibility of organic disorder has been ruled out. Under no circumstances should one attempt weight reduction by *self-medication with proprietary pills or dopes.* There is no known substance that can be safely used with any effect. Either the pills contain no deleterious

materials and are useless for weight reduction, or they contain thyroid extract or other dangerous substances. Thyroid extract, taken over a period of time, will whip up the heart, and may cause irreparable damage.

If no disease or organic disability is responsible, a calculated program of diet and exercise will bring the obese person's weight down to normal. The most important factor is persistence and regularity in sticking to the program. It does no good to starve for a week and then load up with heavy food the next. A loss of 2 to 3 pounds a week should be the maximum attempted, but the program should be steadily adhered to.

The average calory requirement for the normal adult is, as was pointed out earlier, about 2,500 to 3,000 calories per day. The man who wishes to lose weight may safely cut 1,000 calories a day from this average intake. He should go light on sugar and starches, and assuage the feeling of hunger with the bulky vegetables and fruits that are low in calory value. The following is a suggested day's diet totaling 1,500 calories:

Breakfast:	1 large cup orange juice	100 calories
	1 cup rolled oats	100 "
	1 large boiled egg	100 "
	1 cup black coffee	
	¾ glass of milk	100 "
Lunch:	½ cup chicken soup	100 "
	1 tsp. butter	25 "
	1 slice graham bread	50 "
	1 medium serving bluefish	100 "
	½ medium sweet potato	50 "
	2 tbsp. string beans	35 "
	¼ head lettuce	15 "
	½ custard	100 "
	½ tbsp. olive oil (for salad)	50 "
	Tea—no sugar	
Dinner:	½ grapefruit	50 "
	3½ oz. lamb chop broiled	200 "
	½ head lettuce	30 "
	½ cup chowder	100 "
	¾ corn muffin	100 "
	2 tsp. butter	50 "
	¼ cup fresh green peas	35 "
	1 cup tea—2 tsp. cream	25 "

TABLE OF CORRECT WEIGHT FOR MEN

Height	*Age* 19-24	25-39	40-49	50-59
5 ft.	111-118	122-128	131-133	134-135
5 ft. 1 in.	116-121	124-130	133-135	136-137
5 ft. 2 in.	122-125	126-132	135-137	138-139
5 ft. 3 in.	127-129	131-135	138-140	141-142
5 ft. 4 in.	130-134	135-138	141-143	144-145
5 ft. 5 in.	134-137	138-142	145-147	148-149
5 t. 6 in	139-142	143-146	149-151	152-153
5 ft. 7 in.	142-145	146-150	153-155	156-158
5 ft. 8 in.	147-150	151-155	158-160	161-163
5 ft. 9 in.	152-155	156-160	163-165	166-168
5 ft. 10 in.	155-158	159-162	165-170	171-173
5 ft. 11 in.	159-162	164-170	174-176	177-178
6 ft.	163-166	168-176	180-182	183-184
6 ft. 1 in.	167-171	173-182	186-188	190-191
6 ft. 2 in.	171-176	179-189	193-195	197-198
6 ft. 3 in.	175-181	184-195	200-202	204-205
6 ft. 4 in.	178-186	189-201	206-209	211-212
6 ft. 5 in.	183-191	194-207	212-215	217-219

100-CALORY PORTIONS OF COMMON FOODS

This chart may be used as a reference for selecting a variety of foods according to the total calories necessary

Foods Rich In Protein

Bluefish ..... Medium serving (2.4 oz.)
Clams (raw) 12
Codfish balls ..... 1 (2 inches in diameter)
Halibut ..... piece 3 x 2¼ x 1 inch
Lobster, canned ..... ¾ cup
Mackerel ..... medium serving (2.6 oz.)
Oysters 15
Salmon, canned ..... ½ cup
Sardines ..... 3 to 6
Scallops ..... ¾ cup
Shad ..... Medium serving
Shrimps ..... ½ cup
Bacon ..... 5 oz.
Beef, rib roast ..... 1½ oz.
Chipped beef, creamed ..... 1/3 cup
Egg ..... large
Ham, boiled ..... 1.3 oz.
Lamb chops ..... 1 (1.6 oz.)
Mutton, roast ..... 1.2 oz.
Sausages ..... 1.1 oz.
Veal, roast ..... 2.3 oz.

Foods Rich In Energy

Almonds	12 to 15 nut meats
Butternuts	4 to 5
Cocoanut, prepared	½ cup
Hazel nuts	8 to 10
Hickory nuts	15 meats
Honey	1 tbsp.
Olive oil	1 tbsp.
Peanuts	20 to 24 meats
Pecans	12 meats
Pine nuts	¼ cup
Sugar cane	2 tbsp.
Syrup	1½ tbsp.
Walnuts	8 to 16 meats

Foods Rich in Starch

Biscuits (baking powder)	2
Corn muffins	¾ muffin
Graham crackers	2
Graham bread	2 slices (1.4 oz.)
Griddle cakes	1 cake (4½ inches diam.)
Raised bread	2 slices (1 oz.)
Zwieback	3 pieces

Desserts

Cake, chocolate	0.9 oz.
Caramel	1 oz.
Custard	½ cup
Doughnuts	½
Fudge	1 square
Ices	½ cup
Ice cream (rich)	2½ tbsp.
Jams	1 tbsp.
Jellies	1 tbsp.
Tapioca	¼ cup

Varied Common Vegetables

Asparagus	20 large stalks
Beans (baked)	1/3 cup
Lima beans (fresh)	½ cup
Lima beans (dried)	⅛ cup
String beans	2¼ cups
Beets	4 (1 1/3 cups sliced)
Cabbage (shredded)	5 cups
Cauliflower	1 small head
Carrots	4 to 5 (young)
Celery	4 cups
Corn (canned)	1/3 cup
Corn (fresh)	½ cup

Cucumbers	2½ (7 inches long)
Lentils	2½ tbsp.
Lettuce	2 large heads
Onions	3 to 4 medium
Peas (canned)	¾ cup
Peas (fresh)	¾ cup
Potatoes	1
Radishes	3 dozen
Spinach (boiled)	1½ cups
Sweet potatoes	½ potato
Turnips (raw)	2 cups

Nourishing Soups

Barley soup	¾ cup
Beef broth	4 cups
Bouillon	4 cups
Celery soup (creamed)	½ cup
Chowders	½ cup
Corn soup (creamed)	½ cup
Mutton broth	4 cups
Noodle soup	¾ cup
Pea soup (creamed)	¾ cup
Rice soup	1 cup

Beverages

Chocolate	½ cup
Cocoa	1/3 cup
Egg-nog	½ cup
Fruit juice	½ cup
Grape juice	½ cup
Lemonade	1½ cups
Orange juice	1 cup

Milk Products

Butter	1 tbsp. (scant)
Buttermilk	1⅛ cups
Cheese (American)	1⅛ cubes
Cottage cheese	3½ tbsp.
Cream (thick)	1⅓ tbsp.
Sweet milk	⅝ cup

Cereals and Grains

Bran	1/3 cup
Barley	2 tbsp.
Corn flakes	1¼ cups
Cornmeal (cooked)	1/3 cup
Hominy (cooked)	1 cup
Rice (cooked)	¾ cup
Oatmeal	1 cup
Spaghetti (cooked)	1 cup
Vermicelli (cooked)	1 cup

Fruits

Apples	1 large
Apricots (stewed)	¼ cup
Bananas	1 large
Blackberries (fresh)	½ cup
Cherries	1 cup
Cranberries	2 cups
Currants (fresh)	1½ cups
Dates	3 to 4
Figs	1½
Grapefruit	1 large
Grapes	1 large bunch
Huckleberries	1 cup
Lemons	3 large
Muskmelon	1 small
Oranges	1 large
Peaches (fresh)	3 medium
Pears (fresh)	2 medium
Pineapple (fresh)	2 slices
Plums (fresh)	3 to 4
Prunes (stewed)	2 and 2 tbsp. juice
Raisins	¼ cup
Raspberries	1⅛ cup
Rhubarb (stewed)	½ cup
Strawberries (fresh)	1½ cup
Tomatoes (fresh)	2 to 3

FOODS WHICH HAVE ADEQUATE PHOSPHORUS CONTENT IN 100 CALORY PORTIONS

Food Material	*Measure of Portion*
Dairy Products	
Buttermilk	1⅛ cups
Cheese, cottage	5 tbsp.
Egg yolk	2 yolks
Eggs	1⅓ eggs
Milk	⅝ cup
Meats and Fish	
Haddock	5 oz.
Codfish, fresh	5 oz. (uncooked)
Beef, lean	2¼ oz. (uncooked)
Vegetables	
Celery	4 cups of ¼" pieces
Lettuce	2 large heads
Cauliflower	½ medium head
Spinach	2½ cups cooked
Asparagus	20 stalks
Tomatoes	2 cups (cooked)

Turnips	2 cups of ½" cubes
Beans, dried	⅛ cup cooked
String beans	2¼ cups of 1" pieces
Corn, green	½ cup
Onions	3-4 medium
Peas, dried	2 tbsp. (uncooked)
Potatoes	1 medium
Cabbage	5 cups shredded
Fruits	
Rhubarb	4 cups of 1" pieces
Cereals and Breads	
Oatmeal	1 cup (cooked)
Whole wheat bread	2 slices ¼" thick
Nuts	
Peanuts	2 doz. singles

FOODS WHICH HAVE ADEQUATE CALCIUM CONTENT IN 100 CALORY PORTIONS

Food Material	*Measure of Portion*
Vegetables	
Collards	1⅔ cups, steamed
Celery	4 cups of ¼" pieces
Beans, string	2¼ cups of 1" pieces
Cabbage	5 cups shredded
Carrots	3-4 medium
Onions	3-4 medium
Asparagus	20 stalks 8" long
Beets	2-4 medium
Tomatoes	2 cups cooked
Beans, dried	⅛ cup uncooked
Peas, fresh	¾ cup
Potatoes	1 medium
Dairy Products	
Buttermilk	1⅛ cups
Cheese, American	1⅛" cube
Eggs	1⅓ eggs
Milk, whole	⅝ cup
Fruits	
Figs	1½ large
Prunes	4-5 medium
Raisins	¼ cup
Meats and Fish	
Beef, lean	2¼ oz. uncooked
Cereals and Breads	
Whole wheat bread	2 slices ¼" thick
White bread	2 slices ¼" thick
Oatmeal	¾ cup cooked
Cornmeal	⅔ cup cooked
Soda crackers	4 crackers

FOODS WHICH HAVE ADEQUATE IRON CONTENT IN 100 CALORY PORTIONS

Food Material	*Measure of Portion*
Vegetables	
Spinach	2½ cups (cooked)
Celery	4 cups of ¼" pieces
Beans, dried	⅛ cup (uncooked)
Beans, string	2⅔ cups of 1" pieces
Tomatoes	2 cups (cooked)
Beets	2-4 medium
Turnips	2 cups of ½" cubes
Peas, dried	2 tbsp. (uncooked)
Cabbage	5 cups shredded
Carrots	2-4 medium
Potatoes	1 medium
Onions	3-4 medium
Dairy Products	
Egg Yolk	2 yolks
Eggs	1⅓ eggs
Milk	⅝ cup
Meats and Fish	
Beef, lean	2¼ oz. uncooked
Fruits	
Strawberries	1⅓ cups
Prunes	4-5 medium
Figs	1½ large
Raisins	½ cup
Cereals and Breads	
Oatmeal	¾ cup cooked
Whole wheat bread	2 slices ¼" thick
White bread	2 slices ¼" thick

MEATS AND POULTRY PRODUCTS RICH IN VITAMINS

International units per 100 grams

Name	A	B_1	C	G	*Measure*
Beef brains	54	56	370	120	¼ lb.
Beef heart (lean)	†	220	84	300	¼ lb.
Beef kidney	1100	100	210	840	1 cup
Beef liver	9000	89	820	1000	¼ lb.
Egg Yolk	2800	140	0	160	1 yolk
Eggs	1000	50	0	120	1, shell removed
Ham (fat)	*	480	0	100	¼ lb.
Herring	200	40	0	150	1 filet
Mackerel	150	40	0	240	1 filet
Oysters	140	50	60	180	6 oysters
Pork chops (common grade)	0	450	38	100	2 chops
Pork sausage	*	150	0	100	2
Salmon	270	40	180	80	1 cup canned

† fair
* good

VEGETABLES RICH IN VITAMINS

International units per 100 grams.

Name	*A*	*B1*	*C*	*G*	*Total Calories*	*Measure*
Artichokes (globe)	390	50	220	†	50	1 heart, edible leaf portion
Asparagrus	1400	60	800	55	23	6 stalks
Beans, green	1100	31	430	60	37	1 cup stringless
Beans, dried lima	100	170	0	200	91	⅛ cup shelled
Beans, green lima	900	110	840	62	125	⅔ cup shelled
Beans, kidney	300	72	*	†	88	⅔ cup shelled
Beet greens	21,000	37	1000	150	28	1 cup
Broccoli	9000	42	1300	87	32	1 cup "curd"
Brussel sprouts	400	60	3000	30	53	6
Cabbage	38	28	2000	25	14	¾ cup shredded as slaw
Carrots	7700	23	75	30	40	1 large, scraped
Cauliflower	70	56	1500	50	27	1 cup "curd"
Celeriac (celery root)	*	*	*	*	39	¾ cup pared
Celery	35	10	170	14	8	2 stalks
Chard, leaves	9000	150	750	55	30	1½ cups
Collards	6200	53	1400	100	45	⅔ cup
Corn, green (yellow)	560	50	850	40	104	½ cup cut from cob
Cucumbers	35	30	200	18	7	10 slices, pared
Dandelion greens	12,000	63	2000	90	45	1 cup
Eggplant	70	20	200	12	25	2 slices, pared
Endive	15,000	26	400	24	9	½ head
Escarole (chicory)	23,000	25	140	94	3	¼ head
Horseradish	*	*	1800	*	9	1 tsp.
Kale	20,000	63	2900	190	45	1 cup leaves
Kohl-rabi	†	10	1000	30	32	½ cup

Lambsquarters	19,000	†	†	†	44	1 cup leaves
Leeks	25	50	470	†	23	2 bulbs
Lentils, dried	200	170	0	130	94	2 tbsp.
Lettuce	2200	29	250	30	12	¼ head
Marrow, vegetable	30	15	220	*	17	⅝ cup
Mustard greens	11,000	46	3500	150	25	1 cup leaves
Okra	400	42	340	†	17	5 pods
Onions	0	11	190	40	23	1
Parsley	5000	27	2800	*		1 sprig
Parsnips	200	38	800	†	75	½ large, scraped
Peas, dried	5100	180	0	120	92	2 tbsp.
Peas, green	2000	130	500	70	92	¾ cup shelled
Peppers, green	5000	6	3600	55	55	1 empty pod
Potatoes, sweet	4200	35	650	28	175	1 pared
Potatoes, white	56	40	560	20	101	1 pared
Pumpkins	2500	18	190	18	31	½ cup seeded, rind removed
Radishes	0	30	520	14	7	5
Rhubarb	650	8	300	*	15	1 cup stems
Rutabagas	25	25	600	40	36	¾ cup scraped
Sauerkraut	20	8	190	†	21	⅞ cup
Spinach	8400	35	1500	100	22	1 cup leaves
Squash, summer	2100	14	460	21	17	1 cup seeded, rind removed
Squash, winter	7000	16	60	30	38	1 cup seeded, rind removed
Tomatoes	2000	26	540	36	20	1 small, cored
Turnip greens	11,000	45	2600	150	32	1 cup leaves
Water cress	4000	45	1200	90	21	2½ cup leaves

* data lacking or insufficient
† fair

FRUITS RICH IN VITAMINS

International units per 100 grams.

Name	*A*	*B1*	*C*	*G*	*Measure*
Apples	110	15	120	29	1 large, cored
Apricots	4000	9	200	30	4 halves, stoned
Avocados	550	20	560	30	½ pear, pared, stoned
Bananas	320	20	560	38	1 small, peeled
Blackberries	400	13	75	*	1 cup
Blueberries (huckleberries)	100	15	170	7	⅔ cup
Cherries	200	17	250	†	18 stoned
Currants	400	10	2000	*	1 cup
Dates, dried	210	20	0	18	4 stoned
Gooseberries	150	50	500	*	⅔ cup
Grapefruit	0	24	820	40	½ cup juice
Grapes	50	15	110	10	1 bunch, seeded
Guavas	200	52	2500	35	1 pared, seeded
Lemons	0	18	910	††	½ cup juice
Limes	130	†	720	*	½ cup juice
Loganberries	†	11	690	*	1 cup
Manfoes	1500	21	1200	24	½ pared, seeded
Melons—Cantaloupes	300	10	550	30	½ seeded, rind removed
Honeydew	*	*	1800	*	⅙ seeded, rind removed
Muskmelons	590	19	500	30	½ seeded, rind removed
Watermelons	120	20	150	14	1 slice, seeded
Nectaries	2800	24	500	*	2 pared, stoned
Olives, green	190	0	0	0	5 small, stoned
Oranges	90	26	960	25	½ cup juice
Papayas	3000	25	840	60	½ seeded, rind removed
Peaches	980	6	200	26	1 large, pared, stoned
Pears	15	19	100	30	2 halves, cored, pared
Persimmons	180	0	350	*	1 small, seeded
Pineapples	100	25	760	23	2 slices, canned
Plums	130	40	100	18	3 stoned
Prunes, dried	2500	60	0	260	4 stewed, stoned
Raspberries, black	††	7	600	*	⅞ cup
Raspberries, red	260	7	600	*	⅞ cup
Strawberries	120	11	1200	120	12 hulled
Tangerines	300	40	960	16	2 peeled, seeded

† fair †† good * data lacking or insufficient

CEREALS RICH IN VITAMINS

International units per 100 grams.

Name	*A*	*B1*	*C*	*G*	*Measure*
Cornmeal, yellow	420	78	0	26	3 tbsp.
Wheat germ	420	1100	0	300	2 tbsp.

NUTS RICH IN VITAMINS

International units per 100 grams.

Name	*A*	*B1*	*C*	*G*	*Measure*
Almonds	580	100	0	240	12 nuts
Brazil nuts	10	340	0	††	2 nuts
Hazelnuts (filberts)	440	220	0	††	10 nuts
Peanuts	360	220	0	200	16 nuts, skin removed
Pecans	400	350	0	100	12 meats
Pistachios	200	*	0	*	⅛ cup

†† good
* data lacking or insufficient

V

The Pilot's Heart

THE heart is an organ which never rests. Its important task is to pump the blood which feeds and purifies the tissues, ceaselessly forcing the arteries to dilate and contract so that the rich red fluid can reach all parts of the body.

This vital center is affected by disease or physical abuse, and care and hygiene are essential to its proper maintenance. Let us compare the heart to an airplane motor. If the motor is full of carbon, the speed decreases and the pistons and valves send out danger signals. The trouble will disappear if the carbon is removed from the valves, and it is exactly the same in the human machine. The heart, when it begins to knock, reacts on the human frame, too. Unfortunately, the human pump does not mend so easily as the valves of a motor.

Incidentally, the heart has valves, also—the tricuspid on the right and the mitral or bicuspid on the left. These valves separate the four chambers of the heart. There are two compartments on the right side and two on the left. The blood comes into one side of the heart through various channels in an impure state, it is pumped from there into the lungs, where it is purified, returns to the other side of the heart from which, by the process of powerful contractions and relaxations, the cleansed blood is forced through the arteries to all parts of the body. After the nutriment it carries is extracted by the body tissues, and wastes are poured into it, the blood is returned to the heart through the veins, completing the cycle.

Systematic Heart Tests: To have a normal heart, there must be perfection of muscles, nerves, and circulation. In addition, the various elements carried by the blood stream must be in balanced amounts for heart stimulation to be normal.

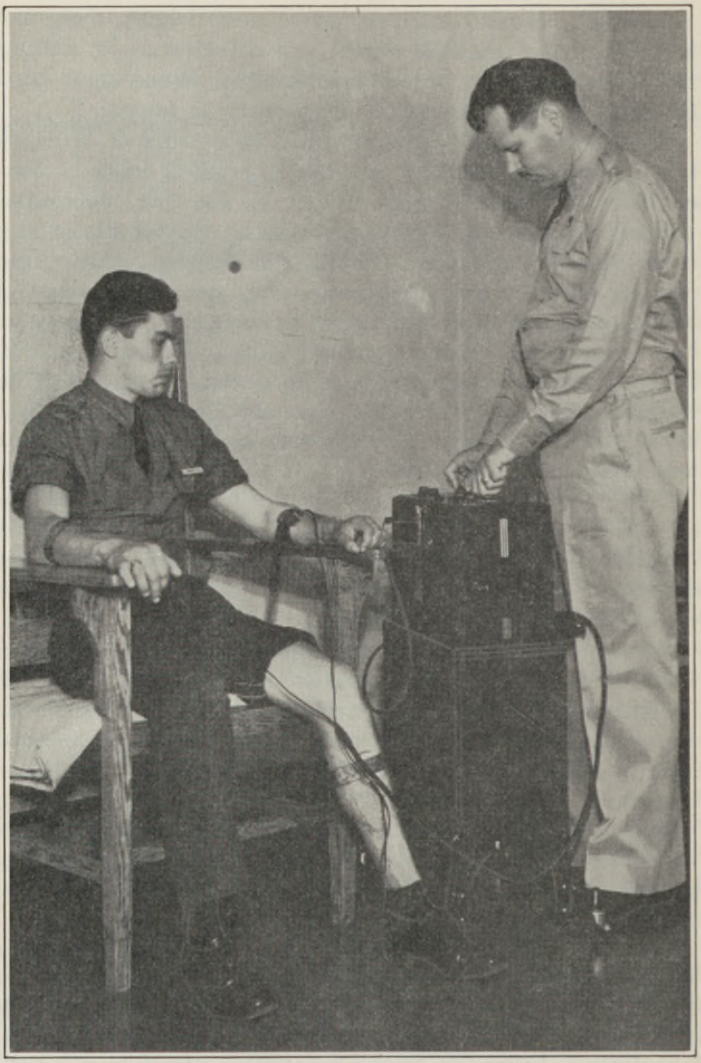
Several scientists recently attempted by a series of systematic tests to determine the heart strength and how it reacted. Some of these will be described briefly. In the first, fluoroscopic (X-ray) examination of the heart is made after exercise to learn if the organ was enlarged. In the second, blood pressure readings are taken before, immediately after, and a short time following measured exertions. Exercise increases blood pressure, but normally the pressure promptly falls to its previous level. If it falls below normal, the heart is shown to be weak or the exertion excessive. The pulse rate also should increase with exercise, but not abnormally, and within a reasonable time it, too, should return to normal.

When the heart is examined by the flight surgeon, he can immediately tell when the normal sounds of the heart become relatively abnormal after exercise. In such a case your medical officer will warn you that your heart is not up to par, and that you should avoid overexertion.

The pulse rate and the blood pressure are the two factors which must be guarded and considered at all times. They help in estimating the working power of the heart. Dumb-bell exercise tests are of great value in noting the gradual improvement in heart strength of patients who are suffering from heart ailments.

The holding-of-the-breath test is very important, and is a suggestive way of estimating the heart efficiency or weakness; but it is necessary to have a series of such tests before limitations are proved.

The heart may be strained by driving the body too much. When excessive work is performed the blood pressure will be considerably increased over the normal limits, and indirectly the heart will be strained. Overindulgence in cigarette smoking, alcoholic beverages or eating may damage the heart muscle. Too much continuous physical activity without proper rest may



Official photograph, U. S. Army Air Corps.

Operation of electrocardiograph, School of Aviation Medicine, Randolph Field, Texas.

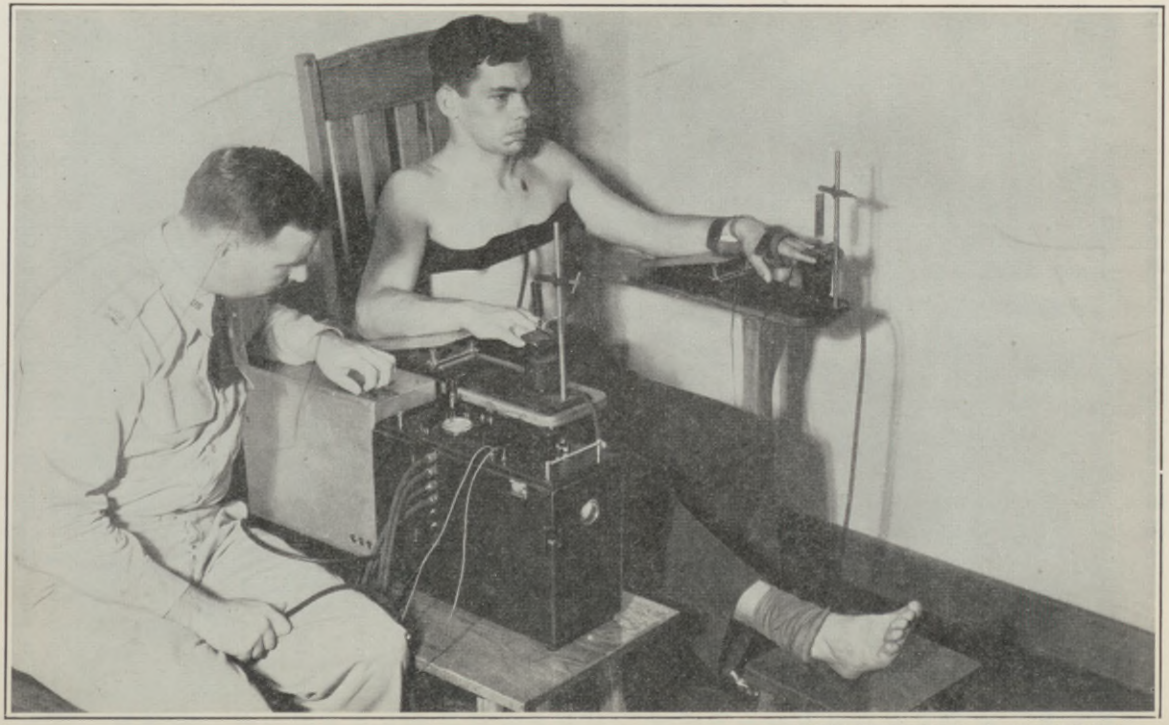
strain the heart and the circulation. Athletes throw a tremendous strain on the heart when competing in major sports, such as cross-country running, swimming, etc.

The Heart in Disease: When disease overtakes the body, the heart has a gigantic burden to carry in fighting the invading germs. Infections such as pneumonia or rheumatic fever can cause heart trouble. In fevers of any sort the great pumping organ can become overworked, and may be considerably impaired for a long period thereafter. A focus of infection in the tonsils, teeth, sinuses, ear, nose, appendix, or gall bladder may damage the heart, but the absorption of the pus into the blood stream is insidious, and sometimes it takes several years before the effect is apparent. Various upsets of the heart rhythm may result from foci of infection in the body. If these foci are not early eliminated by proper treatment, considerable damage can be done to the heart and blood vessels.

The heart may be enlarged as a result of heavy labor or the exertions of the professional athlete. The danger does not lie in the youthful years of the athlete's life, but in middle age, when a sedentary habit is adopted, and the heart does not get its usual amount of activity. Then the tone previously established is too rapidly lost and the heart becomes too weak to take care of the surplus tissue. If excessive enlargement takes place, the valves stretch, and when the heart contracts and dilates, there is imperfect coaptation. In this case the organ is said to have a leak or a murmur. Leaky valves of the heart are also found in rheumatic diseases and in certain types of blood diseases. Some persons are born with latent heart conditions, and the stress and strain of arduous life bring them into the open.

There are two types of heart enlargement—dilation and hypertrophy. In dilation the muscles of the heart actually stretch, and the chamber capacity increases. In hypertrophy the muscle itself is increased in size.

The size of the heart is proportional to the weight and height of the person, and depends on the amount of physical exertion and the burden placed on the circulation. A man



Official Photograph, U. S. Army Air Corps.

The photopolygraph in use, School of Aviation Medicine, Randolph Field, Texas.

who is light weight and does sedentary work naturally will have a smaller pump than a heavy-built laborer.

Some of the important causes for dilation of the heart are: Scar-tissue formation in part of the heart wall, poor rhythmical beating of the ventricle, poisons which lodged in the heart muscles following such diseases as pneumonia, diphtheria, scarlet fever, and rheumatic fever, and poor blood circulation to the heart muscles, as in anemia or coronary artery disease. These heart diseases are only temporary, for when the causative agent has been removed, the heart condition improves. The heart responds to added burdens, and becomes larger as a result of increased muscular contractions and relaxations. Such conditions as persistent high blood pressure, defects in the heart valves, and adhesions of the heart lining cause the heart to overwork.

Usually, physical examination with the aid of X-ray and fluoroscope helps in detecting the presence of various degrees of enlargement. An electrocardiogram gives more exact information as to actual overwork of the heart muscle and the condition of the coronary arteries, but even with this aid, diagnosis is not infallible. Electrocardiographic studies show that it is impossible to foretell in all cases whether a heart condition is dangerous in flying. Hence, not only are the physical findings important to the flight surgeon, but all laboratory data, as well as the history of the pilot, must be carefully studied before any conclusion can be drawn.

It is important to detect an enlarged heart because it indicates weakness of the heart muscle, and the reserve power of the organ may be depleted. If this condition persists, congestive heart failure may follow eventually. It is always best for one who has cardiac enlargement to lead as quiet a life as possible, with no extra or frequent strain on this vital organ.

Tachycardia: In simple tachycardia (fast heart beat) the heart rate is modified by posture, rest, and exercise, whereas paroxysmal tachycardia is not influenced by these conditions. A pulse rate between 60 and 100 is considered normal, but if the pulse persistently registers below 60 or above 100, it is sufficient

cause to ground a flier. A slow heart beat may be considered normal if no other disease can be found, such as jaundice, underfunctioning of the thyroid gland, or drug addiction. The usual causes for a rapid heart beat are the presence of fever with infections, low blood pressure, anemia, certain forms of heart disease, and goiter.

Paroxysmal tachycardia (periodic rapid heart beat of from 100 to 200 beats per minute) may be found most commonly in persons from 20 to 30 years of age. Those who have this condition may have had rheumatic fever several years before, but no heart valve disease is present in these types. Attacks may be started by emotional upsets or sudden physical strain. A fluttering sensation comes on first, associated with a feeling of coldness, sweating, and exhaustion. Some patients may also have nausea and vomiting, and sudden congestion around the chest. These signs may be so serious as to warrant immediate medical care and hospitalization. Such disease disqualifies for flying.

Irregular Heartbeat: Another type of irregular heart beat is known as "premature ventricular heart beat." This results from excesses in the use of tobacco, or coffee, from overeating and the overuse of certain heart medications taken for valvular diseases. If no cause can be found for the presence of premature ventricular contraction, it may be regarded as unimportant.

When a person complains that his heart has skipped a beat and it is found that the use of coffee and tobacco or exercise aggravate it, this condition is called "premature auricular heart beat," and such subjective symptoms told to the flight surgeon will be helpful in diagnosing the flier's heart disease.

Such conditions as congenital heart disease, rheumatic fever, rheumatic heart disease, endocarditis, acute toxic inflammation of the heart muscle, thyroid heart disease, and neurocirculatory asthenia usually disqualify flying cadet candidates. Rarely do these diseases concern the pilot, as they will be detected in early examinations.

Syphilis of the Heart: An important disease of the heart, which may be overlooked in its early stages, is cardiovascular

syphilis. Generally, this heart trouble produces disability in fliers or other personnel several years after entering service. When this occurs, there is danger for both passengers and crew. Unfortunately, the early stages of syphilis of the heart may not be observed by the doctor or even by the victim himself. The first change is found in the large vessel near the heart known as the aorta, and is due to lack of the proper treatment which might have been given had the early signs been evident. Since these signs were not observed, however, the changes go on in the aorta, and subsequently in all the blood vessels of the heart. It is, therefore, of the utmost importance that a flyer who realizes he has heart signs report them to the doctor as early as possible, and not try to keep it a secret. This will protect himself as well as his crew.

The "bug" of syphilis *(Treponema pallidum)* has a particular affinity for heart tissue in some individuals. Signs of the disease may appear anywhere from ten to twenty-five years after the initial infection. Usually sufferers from this condition are between thirty-five and fifty-five years of age. The ravages of syphilis do not start on the day of the initial simple sore, known as a chancre, but show themselves long after the discomfort of the skin disease has been forgotten. The parasite of syphilis has no respect for age, sex, intelligence, or position in life. Therefore, for safety's sake, every possible remedy should be employed long before serious heart signs appear.

The advanced heart disease of syphilis is called aneurism of the arch of the aorta (pouch of the large heart vessel). The danger is rupture of the aorta, which may be followed by sudden death. The heart valves may also become diseased, as well as the heart muscle. This is caused by the slow process of invasion by the syphilis microbes into the substance of the heart mechanism. Any part of the heart may degenerate when these "bugs" begin their work.

The signs of spyhilitic heart disease may be both subjective and objective. The first stage shows no symptoms, since the degree of degeneration is very slight, and it is not until the sac formation of the large heart vessel begins that physical signs are

discernible. Aneurism of the aorta is the second stage of this disease. In this stage the pressure produced by the pouch (aneurism) on surrounding tissues causes severe pain and breathlessness. The pain is produced by pressure on adjoining bony structures and nerve fibres, while the shortness of breath is the result of pressure within the chest and on lung tissue. With these two main signs comes the "brassy cough" and a peculiar, whispered type of speech, known as aphonia, due to pressure on nerves of the larynx. Painful swallowing may or may not be present, depending on whether or not the aneurism presses on the esophagus (tube leading into the stomach).

If there is pressure on the smaller heart vessels, such signs as angina pectoris may arise (pain over the heart caused by spasms of the coronary arteries). The medical officer can usually diagnose all of these signs by physical examination and x-ray plus laboratory tests. He will then give scientific care and treatment. *The most important thing is to recognize this disease early,* as late developments are rarely amenable to treatment and very little hope can be given once the late stages have been reached. Early treatment by such medications as bismuth and the arsenicals is best. The arsenicals are usually given by vein and bismuth by intramuscular injections in a series of alternating treatments early in the disease.

When doubt exists concerning syphilitic heart disease, blood check-up should be done routinely every three to four months. If, after frequent testing, no positive signs are found, it may safely be assumed that syphilitic heart disease is not present.

Pain in any part of the chest or upper abdomen may be an indication of heart disorder. Reflex pain may be felt in the back. There are some individuals with heart disease who suffer from sleeplessness at night, or they have pain in the back of the head or shoulders, or pain may radiate over the front of the chest and down the left arm. Other types of heart disease show themselves in exhaustion and weariness when any sort of work is done, or by shortness of breath after walking rapidly, climbing a hill, or going upstairs.

Arteriosclerosis (Hardening of the Arteries): There are two

important causes of this malady—inheritance of a predisposition to the disease, and the struggle created by variable economic factors. Constant abuses of the body from unhygienic living, lack of regular rest, and overuse of coffee, tea, alcohol, and tobacco usually irritate the heart and arteries to a greater or lesser degree. Persistence of high blood pressure may be another factor, as well as infectious diseases.

The arteries generally begin to show some changes after thirty-five years of age. Hardening of the arteries is directly caused by deposits of small plaques of calcium carbonate on the inner walls of the vessels. This may take place in the larger or smaller vessels. The walls of the arteries become thicker, and their elasticity is gradually lost, resulting in a decreased supply of blood to the vital tissues. Pulsations of the vessels are decreased in intensity, and the force of the blood flow is slowed up. There may be local or generalized signs of arteriosclerosis. Various parts of the body may be affected all at one time, as in old age, or premature signs may take place, as in early hardening of the arteries of the heart, kidneys, bladder, brain, or legs.

When local areas are involved, various signs and symptoms may appear, depending upon the degree of involvement and location. Pain may be prominent symptom of hardening of the arteries when the heart, kidneys, liver, brain, or legs are involved. The severity depends upon how markedly the arteries have been hardened.

The prevention of arteriosclerosis lies in *avoiding excesses in alcohol, tobacco, and coffee, and in minimizing the strain resulting from life's battles.* Exposure to infections must be avoided and body resistance must be kept on a high level. There must be moderation in exercise, over-eating should be definitely avoided, and the use of good, wholesome food should be a regular routine. In the presence of exhaustion or fatigue, only mild, passive exercise, in the form of massage, should be employed.

Hardening of the heart arteries resulting in such diseases as coronary sclerosis and coronary occlusion is common among

elderly adults. It is the most common cause of death amongst the aged. Coronary disease is prevalent even in younger adults between the ages of forty and fifty.

Hardening of the heart arteries is of particular significance to flight surgeons, since the older pilots may be subjected to these disabilities due to the stress and tension of their lives. People who work out in the open and lead robust lives rarely have coronary disease, but those who engage in high-tension businesses and professions are frequent victims.

It is rare for this disease to occur in extremely warm climates. But overindulgence in tobacco, even in tropical regions, definitely helps to bring on sudden heart attacks when coronary disease is preexistent.

Heart pains, as in angina pectoris, usually come on suddenly following even slight bodily exertion. These distressing pains vary in nature and duration. They may appear at any time of the day or night, and advanced sufferers may have pain without physical exertion. The attack simulates a choking sensation, as though one were being suddenly denied air, associated with intense pain over the chest near the heart, which may or may not radiate down the left arm to the small finger. The pain may last from a few seconds to several hours. Attacks may be infrequent and irregular or they may come in a series. Persons who suffer from this disease are subconsciously fearful, and when the attacks come on more frequently, the fear becomes even greater.

The physician often prescribes long periods of rest without any excitement or physical exertions. A quiet life must be lived. Emergency drugs are given which the patient can carry with him to be used for attacks.

Those who suffer from coronary occlusion or obstruction of the coronary arteries are also subject to severe and painful attacks, often accompanied by stomach upsets, severe dizziness with or without fainting spells, nausea, vomiting, or nervousness accompanied by spurts of restlessness. X-ray and electrocardiogram examination may indicate that the condition of the heart is serious. Laboratory tests such as blood counts also

yield important clues. The treatment includes complete bed rest for about six weeks, with special nursing care and a calculated diet. Special drugs are used, and often the patient is required to discontinue his work for several months, years, or even permanently.

Excitement, no matter how slight, will often bring on a heart attack in one who suffers from very high blood pressure. Others will feel a sensation of tightness around the chest after any sort of exertion. When such little things as excitement or emotions cause disturbance in the heart action, medical observation is indicated to determine whether there is any disease of the heart.

Every intelligent person should recognize the importance of a periodic examination to determine the exact condition of the heart and other parts of the body. Authentic figures reveal that cardiac diseases rank highest in annual mortality data.

Common Causes of Heart Disease: The newspapers often publish stories about the sudden death of a prominent man. Apparently he had been well on one day and the next day he had passed away. It may be of interest, in this connection, to consider the common causes of heart disease.

Such ailments as high blood pressure, with or without kidney disease, or excessively low blood pressure, or acute pericarditis (inflamed lining of the heart) following some primary general sickness or disease of the lungs, may have been the cause. Maladies involving the heart muscle, known as myocardial disturbances, including fatty degeneration of the heart muscles, and those serious heart ailments due to blood-borne diseases from potent germs, such as streptococci, are also causes.

When an acute bacterial infection of the heart is present, the situation usually is grave. The patient may pull through the acute stage only to develop a chronic condition of heart valves and muscles. In the presence of chronic valvular disturbances, secondary complications may be produced, such as kidney disease, with swelling of ankles and feet. When the big pump goes on a long strike, naturally all the dependent organs related to the blood-vascular system go out of gear, too. As a result,

the kidneys and bladder are overworked, and a swelling of tissues follows because of the retained water.

The purpose of a heart examination is to prove to the flight surgeon that the flier's heart mechanism and its associated system of blood vessels is free from organic disease, as well as to rule out functional disorder. Physical examination usually is supplemented by a series of tests such as blood pressure and pulse readings in both lying and standing positions, with pulse readings before and after exercise (Schneider Index). X-ray plates of the heart are often taken, in addition to fluoroscopic study.

The pilot often wonders why such careful examinations are made of his heart, and even is baffled by occasional use of the highly sensitive electro-cardiograph. The purpose of this test is to check the tone of the heart muscle, in an attempt to rule out muscular heart disease or maladies of the heart vessels.

There are types of heart murmurs that are functional, and are not disqualifying if they appear in the reclining position. When both pulses are irregular, however, the pilot may be disqualified.

A very slow pulse is not serious if it is of a temporary nature and disappears after rest. If the pulse continues slow after rest, it may be indicative of organic heart disease. In like manner, a rapid pulse does not mean that a serious condition of the heart exists, since nervousness, as well as fatigue, may produce such a condition. When, however, the rate increases after exercise and remains rapid, it is possible that some organic heart disturbance exists, and the condition warrants careful study.

When a flier notices that he gets excessively short of breath after slight exertion and his weight has increased considerably, he should report to the flight surgeon for a heart check. Overweight throws a marked burden on the heart, and excessive exercise may be detrimental. The body weight must be watched carefully, and the blood pressure should be checked oftener than twice a year. Under such circumstances, the urine should be examined for information about the condition of the kidneys.

Pilots who are over forty years of age, especially, should visit their flight surgeon for a blood-pressure reading more often than semi-annually. Persistent high blood pressure may be a fore-

runner of some organic heart disease, and overexertion in this condition is definitely harmful. Those who run a variable pressure that is higher than normal, but otherwise show no heart disease, may be permitted to fly, provided frequent heart checks are made. When the pressure is taken at more frequent intervals and found to go higher, however, the pilot may be grounded. Persistent high blood pressure may begin at thirty-five years of age, and keep rising to a higher level for several years thereafter.

The flier should not have his Schneider index taken while he has a cold, since colds and excessive smoking or drinking often make the reading low.

High Blood Pressure: High blood pressure may be caused by the presence of toxins in the body or by poor habits in diet. Abnormalities of endocrine glands, overweight, various emotional disturbances, and the presence of focal infections in the human mechanism also will raise the pressure. The most commonly accepted medical explanation for high blood pressure is the irritability of the small arteries, which increase their resistance to the flow of blood, so that the heart must exert more contracting force. Some people have a hereditary predisposition to high blood pressure, and emotional upsets will eventually increase it.

There is an intimate relationship between peripheral (surface blood) circulation and the amount of work the heart has to do. When the additional burden of excesses in tobacco, alcohol, and toxins from syphilis, tuberculosis, and other diseases is added to the already overburdened heart, there is sure to be an even higher level of the blood pressure.

There are two types of high blood pressures. The origin of one is known, but it accounts for only fifteen percent of the cases. This type is usually found in persons suffering from goiter, kidney infection, and heart disease. The other type is known as "essential hypertension" (of unknown origin). It is responsible for about eighty-five percent of high blood pressure victims. High blood pressure is frequently associated with heart disability, and occurs in the age group over fifty years. In these people there is a greater tendency toward emotional upsets,

which adds another hardship to the heart. Continued high blood pressure may lead to such complications later on in life as apoplexy (brain hemorrhage caused by ruptured arteries), kidney diseases, and digestive upsets. Sudden heart attacks may occur with continued high blood pressure.

Those in the hypertension class suffer from fatigue, headaches, dizzy spells, and nose bleeds. Sometimes there is swelling of the lower legs, and this usually is the sign of a failing heart when accompanied by shortness of breath following slight exertion.

Normal blood-pressure readings usually range from 110 to 130 systolic and 70 to 85 diastolic. The U. S. Army will accept readings of 150 systolic and 100 diastolic. Anything over these figures is not acceptable. For flying cadet applicants, any reading over 135 systolic and 100 diastolic is considered sufficient grounds for rejection. Incidentally, one reading of blood pressure is not sufficiently accurate for normal individuals. There are always changes in blood pressure following severe fatigue, excitement, disturbed rest, and emotional upsets, particularly in anticipation of annual or semi-annual physical examination.

Pilots who develop signs of high blood pressure should give their confidence to the Flight Surgeon, and he will attempt to adjust the difficulty through rest and medication.

Commercial Aviation and Heart Disease: Heart failure of the congestive or anginal class has occurred in tests at simulated altitudes of 14,000 to 20,000 feet. But normal hearts can tolerate high altitudes with little danger. It has been reported recently that among 7,000,000 commercial airline passengers who were transported by five large airlines, only three deaths from heart failure occurred during flight. Five additional deaths occurred after landing, two being ascribed to heart failure. The percentage, therefore, is very small. It has also been demonstrated that passengers who have a fairly well compensated heart disease should not fear to fly at higher levels than the commercial lines follow, provided oxygen is used before reaching the higher altitudes. But valvular heart disease or advanced coronary artery disease makes flying definitely dangerous.

VI

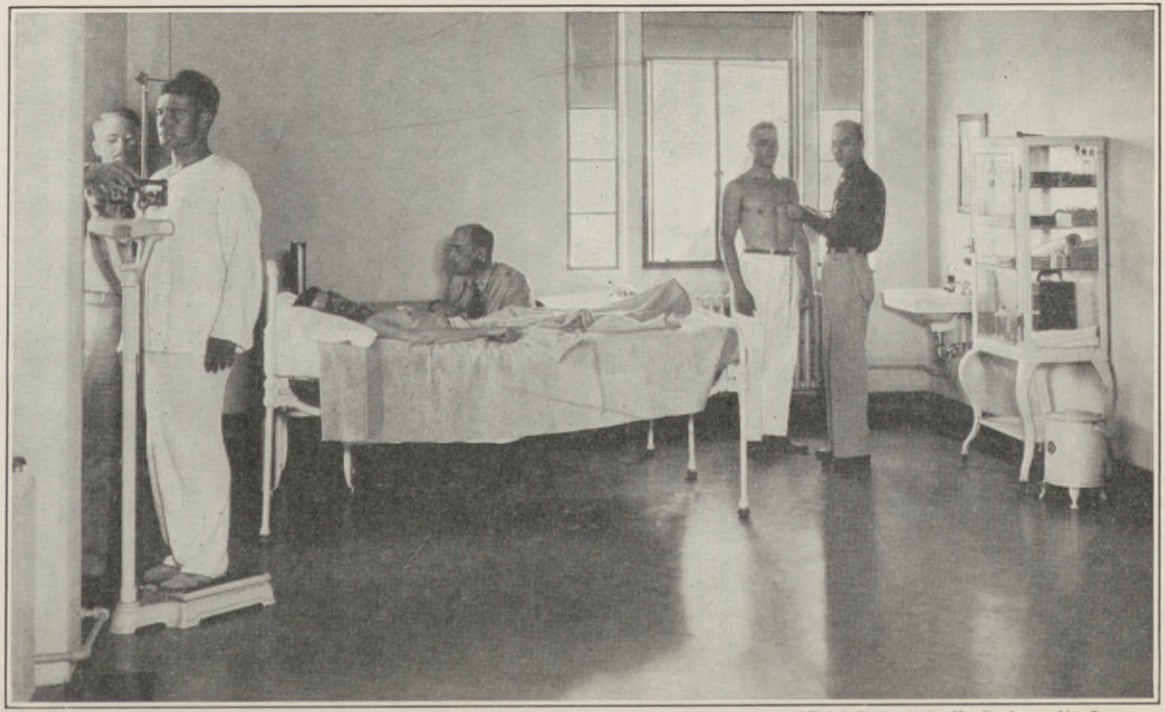
The Eagle's Eyes

THE aviator's eyes have always been important, but with the development of instrument flying, the normal functioning of his eyes is of paramount significance, since in the take-off and landing of aircraft normal eyesight plays an immeasurable role in avoiding a serious crash. In flight as well, healthy and normal eyes have their part in keeping the plane flying safely. With the discovery of instrument flying, the flight surgeon is guarding the flier's eyesight more carefully than ever.

"Instrument flying" is a method pursued by referring to the instruments on the dashboard of an aircraft. In "blind flying" no visible reference can be made to the earth for ascertaining the position due to weather conditions, such as dust, fog, darkness, clouds, or any other type of man-made or natural occurrence. Blind flying requires visual reference to instruments on the plane's dashboard although attempts have been made to fly with the aid of a radio beam and audible signals.

Blind flying was developed through the work of William C. Ocker, (Colonel of the United States Army Air Corps) now known as the "Father of blind flying," whose foresight, self-sacrifice, careful observation, and study made it possible.

Up to the inception of blind flying, fliers were trained to depend upon their own sensations of motion, but in blind flying these sensations are incorrectly interpreted, for if a flier is rotated and if no visual point of reference can be seen the mes-



Official Photograph, U. S. Army Air Corps.

Flight Surgeon's Office, Station Hospital, Randolph Field, Texas.

sages relayed to the brain center will be false. When visual reference to the terrestrial mass does not exist, only muscle and vestibular senses are left, and the airman is incapable of judging the speed and direction of his plane. As a result, the flier finally goes into a circular movement, becomes violently dizzy, and then cracks up.

As every flier knows, instrument flying has become an important phase of his basic training. Today every flying cadet must demonstrate his skill in this art before he receives his "wings."

Every airman remembers how difficult it was at first for him to disregard totally the sensation of reverse motion which came from his stimulated internal-ear centers, and how reluctant he was to accept the readings of his dashboard instruments. The "Link Trainer" instruction, however, finally instilled sufficient confidence to help him become skillful in instrument flying. What airman has not been thrilled by his first experience as he sat in his covered cockpit and with the aid of a safety pilot made his first successful blind flight?

Such instruments as the magnetic compass or crutch, the Sperry gyro-horizon, the directional gyro, the turn-and-bank indicator, the altimeter, the rate-of-climb and the rate-of-speed indicators, all assist in the process of blind flight. To have normal eyes for reading these instruments is as vital to the pilot as is oxygen in high-altitude excursions.

The Feel of the Plane: There is an intimate relationship between the muscles and kinetic-static sense. Some flight instructors humorously refer to this valuable flying sense as "seat sense." Others speak of "the feel of the plane." Normal eyesight plus this peculiar inner feel of the plane maintain equilibrium in the air, and enable the pilot to interpret his position, speed of motion, and direction, as well as his orientation to the surface of the earth.

Defective Vision and Aircraft Accidents: The visual apparatus of the airman may become fatigued, strained, or diseased, although he may not be aware of any deficiency. Such eye disturbances are responsible for certain aircraft accidents. Between

42 and 45 per cent of air accidents occur during landing of planes, and from 20 to 22 per cent during take-offs—an aggregate of 65 per cent. Is it any wonder, then, that the flight surgeon spends so much time in checking the condition of the eyes?

The value of normal eyes cannot be overemphasized. Failure on the flier's part to report visual disturbances or eye disease to his medical officer may spell disaster in flight. There is a possibility of some eye disturbance arising between regular physical examinations, and such difficulties should be reported without delay. Temporary changes in acuity of vision may be arrested by proper care and treatment without loss of flying time. Sometimes a short rest may correct fatigued eyes. If cumulative eye fatigue creeps up on the pilot, it may mean serious consequences to him, since his depth perception can become affected. Defective depth perception may be brought on by inequality of vision, or from weakness of the external eye muscles produced by excessive eye exertion.

Paradoxically, after an aviator has become an experienced operator, his normal depth perception may fail, yet, he may continue to be a very capable flier. This has been demonstrated by one-eyed fliers, as in the case of Wiley Post, the intrepid airman who flew solo around the world in 7 days, 18 hours, and 49½ minutes.

Day Blindness: Mild day blindness may occur in those who smoke excessively, and is known as tobacco ambylopia. Those who suffer from this condition may be able to see relatively well and sometimes considerably better in dull than in bright light.

Color Vision Disturbances: Disturbance of color vision sometimes occurs, especially as related to red. This condition (erythropsia) is found in snowblindness, and the victim imagines alarmingly that he has a hemorrhage in his eyes. Sometimes in normal individuals, black print will suddenly turn deep red, due to powerful light entering the side of the eye through the sclera (the thick white covering of the eyeball). Partial color blindness can occur in the presence of disease of the optic nerve

or disease of the central nervous system, or it may result from disease of the inner lining of the eye-ball, as in detachment of the retina following a head injury. In the latter condition changes in color perception affect principally the blue end of the spectrum. It is especially important for the pilot to recognize red and green since in landing planes in bad weather, quick and accurate perception of these colors is of great moment when the radio goes out of commission.

There are times when the eyes become deficient in function, and acuity of vision itself may deteriorate. Under such circumstances the flier's eyes should be examined to find out if lenses are necessary. When such corrective measures are required, it is essential to incorporate them in the goggles which are worn during flight.

If a pilot develops eyestrain he may have local symptoms such as redness, itching, burning of lids, tears, redness of the lining of the eyeball, associated with pain and some tenderness. Sometimes there are neuralgic pains over the eyebrow, and he sees small specks before his eyes. Occasionally, the eyes cross and the vision blurs. This comes after long use of the eyes in flight, although general conditions, such as digestive disturbances or chronic constipation, may affect the vision.

Sometimes the aviator experiences a violent headache which disappears upon retiring. Should this occur repeatedly, he should go to his flight surgeon for eye examination to ascertain if he needs glasses for close work and reading. If these eye headaches are not corrected by properly fitted glasses, stomach upsets may result which, in turn, greatly reduce his efficiency. Some people become very nervous and irritable if the vision is uncorrected. If visual weaknesses exist and the eyes are used from five to nine hours daily for close work, there may be permanent damage to the vision.

Errors of Refraction: Errors of refraction may be classified as follows:

(1) Myopia (near-sight) is a condition of the eye in which light rays are focused in front of the light-sensitive layer of the retina (the perceptive structure of the eye).

Theoretically, myopia may be caused by abnormal length of the eye, or by abnormal curvature, abnormal refractive index, or forward displacement of the lens.

The treatment of near-sight is the wearing of suitable glasses, with proper attention given to the care of the eyes. The oculist attempts to correct the condition by suitable lenses, but it may be necessary to use general body tonics and exercises, together with personal hygiene if near-sightedness is progressive. Even a complete vacation from close work may be required when the eyes are overburdened.

(2) Hyperopia (far-sight) is a condition in which light rays come to a focus back of the light-sensitive layer of the retina. It may be caused by abnormal shortness of the eye, abnormal curvature of the refracting surfaces, or backward displacement of the lens.

The proper treatment of this condition is to use correct lenses. The Flight Surgeon may insist upon fliers using lenses in their goggles during flight. Sometimes the full correction is not employed at once, but correction is applied gradually, first giving a partial correction, then when the flier has become accustomed to the glasses, the full strength is ordered. This gives the long-overworked eye muscles an opportunity to adjust.

(3) Astigmatism is a condition in which a point of light cannot be made to produce a punctate image upon the retina by any spherical correcting lens. There are various types of astigmatism, but regular astigmatism is the only type which permits optical correction. When regular astigmatism is present, it creates a defect of acuity of vision, which causes eye strain. Eyestrain produces aching of the eyes and severe headache, and it may be associated with migraine (one-sided headaches). Some times in astigmatism the letters have a tendency to come together and the eyes tire easily even after short periods of reading.

In treatment of astigmatism, full correction is employed, and the glasses should be worn all the time for the best results if the astigmatism is marked. In low astigmatic conditions glasses can be worn for close work only.

Pilots past the age of 40 years develop a condition termed

presbyopia, a physiologic change in accommodation of the eyes. Presbyopia is essentially a condition of far-sight due to a hardening of the lens. For corrective lenses, up to one diopter may be required for every five years past 40. This correction should be included in the flier's goggles to facilitate instrument and map readings. It will help greatly to decrease eye and body fatigue.

Eye examinations should be made by an oculist or the flight surgeon. Usually the prescription is filled by an optometrist or optician.

Type of Illumination: The pilot should carefully watch what type of illumination he uses during his study periods as well as when he exercises. The intensity, rate of diffusion, steadiness of the light, color, and amount of glare should be considered. Daylight is the best type of lighting, and a north light is preferable, as it creates the least shadow. Indirect lighting is next best. The spotlight type of lamp should not be employed for studying, since the volume is too small and the intensity too great, so that the farther part is dark and the near part glaring. A much sharper shadow is thrown by artificial light, since most lamps produce a higher concentration of rays which irritate the eyes. Eye fatigue is greater and is produced much sooner by artificial light than daylight.

Generally speaking, it is essential for each one to determine for himself which is the best type of illumination to use. Some require less light while others require more. It has been found that long-continued exposure to bright lights causes marked exhaustion of the retina. If this is continued over a long period, the retina will eventually be capable of reacting only to a powerful light stimulus. For good hygiene of the eyes, therefore, it is best to have less intensity and a more equalized diffusion of light. The eyes become fatigued very quickly under flickering lights. The reason for this is the rapid and frequent change in intensity of illumination. Thus, constant quick eye movements result and marked exhaustion of the eye muscles and retina is produced.

Snowblindness: Snowblindness is produced by exposure to

ultra-violet rays, especially those ranging from 311 to 290 Angstrom units, an unsually large percentage of which are reflected from snow surfaces. To prevent this, smoked or dark glasses should be used. The best type of protective lens is made of Crookes' glass.

Signs and symptoms of snowblindness or electric-light eye irritation: Extreme burning pain, excessive tearing, sensitiveness of the eyes to light, spasm of the eyelids, and swelling of the lids around their margins. Treatment of snowblindness includes the application of cold compresses over the eyes, the wearing of dark glasses, and the use of mild antiseptic eye washes to soothe irritation.

Bad Weather and Night Flying: The aviator may be compelled to fly into unpredictable weather during the course of his day, and he must be ready to cope with rain, snow, or sleet at night. This implies that the airman's vision must be perfect for ordinary night flying. If there is a slight defect of vision or weakness of his eye muscles, his depth perception may be so affected as to cause an accident.

The most damaging visual imperfection for the pilot flying at night is night blindness. This malady may exist without his knowledge, as it develops insidiously.

There are pilots who have a good range and speed of adaptation, and yet have little ability to see in low illumination at the beginning and at the close of adaptation to change in light intensity. *These fliers are not safe for night flying.* The pilot is concerned only with the acquired type of nyctalopia (night blindness). There is a hereditary type, also, but the Flight Surgeon discovers that long before the cadet candidate enters training. (See Chapter III for the relation between night blindness and vitamins).

Prevention of Pilot Eye Strain: Usually the airplane cockpit is poorly illuminated. Sometimes maps must be read and charts graphed, and if the terrain is looked at occasionally during night flying, a constant strain on the eyes is created. This, coupled with bodily fatigue produced by subconscious anxieties, produces a greater degree of ocular fatigue.

In motion picture theatres it is well to sit toward the rear, never in front. Avoid watching a poorly taken picture or one in which there are film imperfections. When these are present, eye-strain results. A flicker is annoying and adds to eye-strain, as does prolonged gazing over several hours. Those whose eyes are near-sighted or far-sighted, either with or without astigmatism, should wear corrective lenses in moving picture theatres, as failure to correct visual defects will cause marked eye-strain.

Glare: Aviators may be confronted with the problem of glare when flying an airplane. Glare is usually interpreted as light in the wrong place, which will impair vision and cause bodily discomfort. Generally, there are three different types of glare such as veiling glare, dazzle glare, and blinding glare.

In the veiling glare the pilot experiences a sensation like an illuminated fog, which produces a light superimposed upon the retina image, thus producing contrasts of visibility and non-visibility.

Every pilot soon learns that the higher he flies the clearer the rays of the sun become, and the higher the altitude reached the greater the concentration of the rays. For instance, at 52,000 feet altitude, the sun's rays are one and a half times as concentrated as at 35,000 feet. Beacon-light glares during night flight also add strain on the eyes. Glares from signal lights, flares, and high-candlepower lights create additional problems of eye strain.

Dazzle glare is produced when the reduction in visibility is barely noticeable. Yet the effect may be distracting and even painful. It is caused by light entering the eyes which is not essential to vision. The aviator is concerned with the amount of glare, and he will notice that when the reflecting surface is polished, practically the entire amount of light will irritate the eyes, whereas if the surface has a dull finish, the light glare is broken up and thereby deflected in all directions, so that details of the surface become visible. These sensations are often felt during flight over bodies of water or surfaces covered with pure white snow. A concentrated glare is produced and reflected again from the body or wings of the plane into the flier's eyes

during day flight. Well-fitted goggles will help to solve this problem. The lenses must be the best type and tinted to overcome the glare and to protect the retina from harmful eeffcts.

Desk Illumination: Ordinary desk work, when much reading and writing are necessary, should be done under a light which does not come below two foot-candles. This is about the amount of light given by an ordinary 40 watt lamp at 5 feet. It should be remembered that intensity of illumination diminishes as the *square* of the distance from the source of light. When special work, as in sketching or where fine instrument work is to be performed, the light should be four foot-candles. In assembly rooms and for general illuminations, a minimum of one foot-candle measured on a horizontal plane three feet and three inches from the ground, should be used.

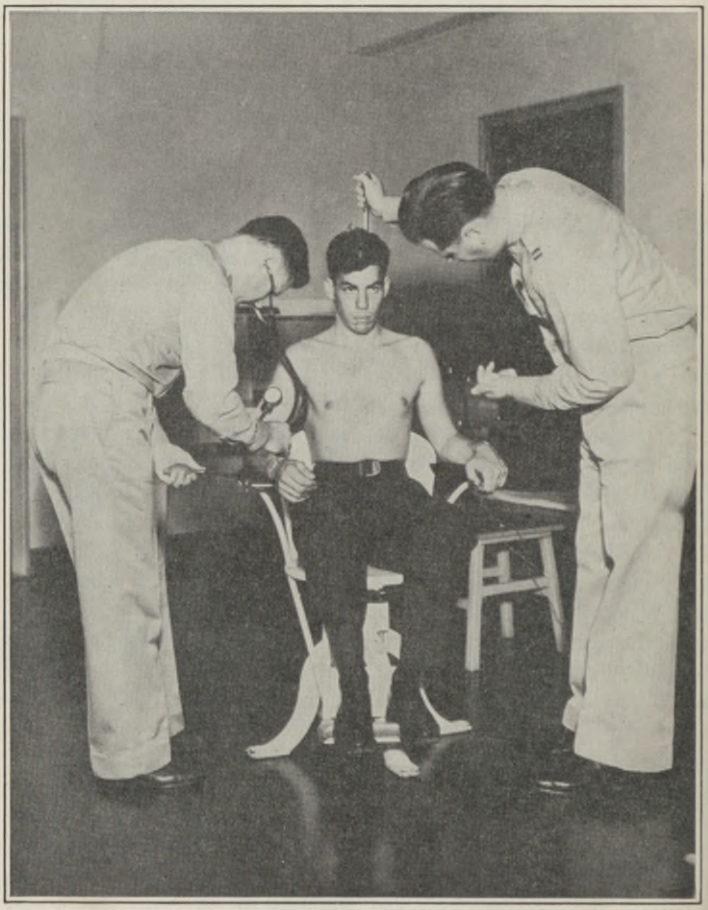
VII

Ear, Nose and Throat

DURING the first World War, medical authorities placed great emphasis upon the internal ear (semi-circular canals). If a flier responded to certain turning tests favorably and passed that examination according to the regulations then set down, he was thought to be good material for flying. No attention was given to the middle ear functions or the condition of the Eustachian tubes.

In recent years ear specialists have observed that a flier must have not only a normal semi-circular canal system, but he must possess normal middle ears and normal Eustachian tubes. The Eustachian tubes must be patent *(i.e.,* the passage between the middle ear and throat should be normally closed). During the process of swallowing, drinking or chewing, this tube opens up. When a flier makes a rapid descent from high to low altitude, the atmospheric pressure becomes rapidly greater than the pressure within the middle ear, and a partial vacuum is created which produces a painful sensation over the ear drum. At times when the altitude change is too sudden the ear drum may be ruptured, or the flier's hearing seriously impaired. Permanent damage may result. Many airmen have learned from experience to yawn or swallow when rapid changes are made from higher to lower altitudes. Some fliers chew gum at such times. Chewing, swallowing or yawning opens the Eustachian tube and equalizes the pressure between the middle ear and the atmosphere.

Even those who have normal Eustachian tubes may have difficulty in equalizing the pressure within the middle ear. This difficulty may arise from nasal obstructions caused by colds, from enlarged nasal bones (congested turbinates), or from some in-



Official photograph, U. S. Army Air Corps.

Vestibular test for equilibrium using the Barnay chair.

jury to the nasal septum which has deflected nasal cartilage to one side, blocking ventilation of the middle ear.

Any pilot who is suffering from a fracture of the nasal cartilage which causes nasal obstruction should visit his Flight Surgeon to have it surgically treated. Failure to clear up an obstructed nose is to invite progressive hearing deficiencies and attacks of acute or chronic sinus disease. There is also danger developing a middle ear infection from nasal obstruction. Because his work subjects him to large changes in temperature and pressure, the pilot must keep closer watch over his nose and ear system than the ordinary man.

The dive bombing pilot is subject to particularly severe conditions. A special test has been devised at the School of Aviation Medicine, Randolph Field, Texas, to determine the ability of pilots' Eustachian tubes to be ventilated properly and thus to keep the air pressure on the inner side of the ear drum the same as on the outer side. This ability is measured by the amount of pressure necessary to force the Eustachian tube open during the act of swallowing. Incidentally, the writer has devised an instrument (in May 1937) called "The Eustachian Tubometer" for testing this pressure.

The author found the average diameter of the Eustachian cartilage tube to be 2-2.25 millimeters, and the average diameter of the bony part of the Eustachian tube to be 1-1.25 millimeters. The pressure measured by "The Eustachian Tubometer" varied between 150 and 260 millimeters of mercury.

The principle of "The Eustachian Tubometer" might be applied for obtaining the normal readings of Eustachian tubes. Hence, Eustachian tubes might be tested for the amount of space present by these pressure readings. Thus, dive bomber pilots could be selected with greater accuracy. The instrument was originally developed for use in checking the differences in Eustachian tube ventilation.

Disease of Nose and Throat in Flight: When a pilot is suffering from a head cold, (head catarrh) or from acute sinusitis, he should not fly until this condition clears up. Head colds cause marked congestion of nasal mucous membranes and nasal bones

(turbinates). Acute infections of the throat such as streptococcic sore throat, acute tonsilitis or acute pharyngitis may cause a great deal of discomfort for the flier, especially if he expects to reach high altitudes where there are variations in temperatures.

If sinus disease exists, not only will there be poor ventilation for the Eustachian tube and the middle ear, perhaps severe headaches caused by the nasal congestion. Unless there is good drainage from the infected sinuses, vacuum pressure may arise which will cause intensification of head pains. Dizzy spells (vertigo), and blurred vision may develop as the sinus disease becomes aggravated. Flying is definitely contra-indicated under such circumstances.

The Flight Surgeon will always excuse a pilot from flying duty if acute ear, nose or throat infections are reported to him.

With every acute upper respiratory infection there is danger that the inflammation may extend down towards the larynx, bronchial tubes or lungs. If an aviator fails to report that he has a head cold, or an acute infection of his nose, throat or ears, he may aggravate his condition and contract a serious disease. No flier should take undue chances of flying in presence of ear, nose and throat infections. If this condition develops while on a long range flight, it should be reported to his medical officer immediately after landing.

Hearing in Modern Aviation: Normal hearing is necessary for fliers. Since every type of modern aircraft is equipped with radios, it is essential for the man sitting behind the controls to hear the radio beam. If the hearing is defective, the radio signals will not be heard and safety will be jeopardized.

Routine hearing tests are made with regular physical examinations. In case of doubt, a test can be performed with an audiometer. This device is equipped with a mechanism which imitates tuning fork vibrations produced electrically. A chart is made graphing the hearing. If one has defective hearing, the graph will so indicate it. Marked loss in hearing is detrimental to safe flying and usually the Flight Surgeon is compelled to ground a flier under such circumstances.

Air Accidents and Deafness: If marked hearing deficiency

exists, the radio beam may not be heard. If a flier keeps his defective hearing a secret, it may lead to a serious accident in blind or instrument flying. The deafness may develop between annual or semi-annual physical examinations. In such a case, the pilot owes it to himself as well as the crew members to report his hearing deficiency to his Flight Surgeon. The medical officer will try to correct the deficiency by medical treatment. The radio beam when heard in bad weather flying may actually be the life line for the pilot's safety.

Infected Tonsils: If acutely infected tonsils are present, a surgical operation is not always necessary. Medical treatment plus rest in bed for a short time may be sufficient. On the other hand, when frequent, recurrent infected tonsils are experienced, there is no reason why the pilot should not submit himself for a tonsillectomy (surgical removal of tonsils). Failure to remove chronic recurrent infected tonsils may lead to such complications as acute rheumatic fever or heart disease, and resistance may be so lowered as to permit recurrent colds. Chronic infection of tonsils may also cause the Eustachian tube to become obstructed with the bad results previously discussed.

Pilots occasionally do not report such "minor" ailments as colds, hearing difficulties, or infected tonsils for fear of being grounded with loss of flying pay. Subconscious fears of various sorts may similarly prevent a man from seeing the Flight Surgeon. These fears should be overcome by a conscious effort of will. The pilot risks not only his own life, but the lives of all the men in his plane when he takes the air in an unfit physical condition. He should remember that the Flight Surgeon is solely interested in keeping the men under his charge in good flying health, and that he will not ground a pilot except for good reason. It is better to spend a few days grounded than to crack up with other lives besides your own. Very often the Flight Surgeon can prevent serious complications and permanent grounding if he is given the chance to treat a "minor" illness in its early stages.

Focal Infections: In the last decade, doctors have placed great emphasis on focal infections. Generally, when a focal point of

an infection exists the individual does not realize it. Only when the body resistance is lowered by carelessness or dissipations do the microbes begin to cause changes. Teeth may have cavities, which subsequently may become infected without the person knowing it until pain flashes the red light of danger, so to speak. Tonsils which have been subjected to recurrent frequent infections may later break down the body resistance and start a series of many colds or even influenza attacks. Sinuses may harbor infections and affect other parts of the body during the state of lowered resistance. In the presence of chronic sinus disease latent stomach disorders can arise from constantly swallowing mucous and pus. Headaches may result, poor vision may be produced and even rheumatic pains in various joints may follow. Even heart disease may be caused by the toxic material.

Infections starting in the gall bladder or in the appendix may be latent until the body resistance is lowered. Then an acute attack of illness may develop. When focal infections are discovered by the routine semi-annual or annual physical examination, no time should be lost in removing them. Failure to do so may lead to serious illnesses.

Prevention *always* saves time. The flier must be on the alert, not only for his own safety, but for that of his crew as well.

Vacuum Sinus Headache: In high altitude flying vacuum headache may be experienced. If an airman reaches from 20,000 to 25,000 feet in altitude, the change in temperature is usually sudden after the take off on a bright summer day. In 25,000 feet altitude the weather is equivalent to 20 degrees below zero. A sudden and rapid descent to much lower altitude may result in the nasal mucous membranes becoming swollen. This may close the natural openings of some of the nasal sinuses, and prevent equalization of pressure. (See Chapter XIII). When this takes place, a violent headache may suddenly appear. The pain may be so intense that it may compel the flier to seek a landing. Usually it is impossible to concentrate or be alert in the presence of such violent pain. If such a condition should arise, the pilot should report this after landing, to his medical officer. Usually a mild watery solution of Ephedrine spray will

give quick relief. However, if pre-existing sinus disease is present, it should also be treated.

The Airman's Ears: It is unnecessary for our purpose to describe in detail the anatomy of the external, middle and internal ear. Generally, the ear is made up of three parts: the external ear, which consists of the auricle with its external canal; the ear drum and behind it the ossicles and fine network of nerves and blood vessels with a complex system of diffusing received sound into the internal ear channels (middle ear); and the internal ear, which sifts sound out in a complicated way by a meshwork of microscopic highly sensitive nerves which stimulate various centers in the brain where sound is ultimately interpreted.

The external ear may be subject to minor diseases, injuries and infections. Accumulated wax may sometimes cause deafness of a mild or severe degree due to pressure on the ear drum. Even severe pain may be experienced and if this pain is persistent, the flier may think he has mastoid disease. However, washing the ear out with warm water from a syringe should force the wax out, and the symptoms of pain and deafness quickly disappear. If the wax is not removed, the pressure against the ear drum may be so intense as to cause skin breaks leading to infection. The pain may be severe enough to cause sleepless nights.

The Equilibrium: Balance is dependent upon the cooperation of various senses—chiefly the sense of sight and the interpretation by the brain of nervous reactions in the internal ear. In the internal ear are three bow-shaped tubes (the semi-circular canals) arranged in three mutually perpendicular planes, horizontal, vertical side-to-side, and vertical front-to-back. These tubes are partially filled with fluid. When the body is turned in any direction, the fluid in the semi-circular canals flows past sensitive nerve ends which relay the reaction to the brain. Through years of normal living on the ground, the brain develops automatic interpretations and responses to the stimuli from the internal ear, coordinated with sight and touch sensations. In aerial maneuvers, this normal coordination may fail. The visual report to the brain may be different from the internal ear report. This is one of the principal causes of airsickness.

Vertigo is a sense of dizziness or giddiness. External objects may seem to whirl around, or one may imagine that he is falling. Since vertigo is only a symptom, its cause should be investigated.

Pain and Ear-phones: Sometimes pain of a variable degree may be experienced when ear phones are worn for radio use. This may be due to pressure from too tightly adjusted ear phones. The ear phones are very flexible at the head band region but there are additional parts which can be manipulated to increase or decrease the measurements to properly fit the head. The ear-phones need not be placed over the ear but can be placed over the mastoid or temporal bones and sounds can be heard equally well if too much pressure is experienced over the ears.

Noise in Aviation: Noises produced by the propeller, and the exhaust and vibration of the engine have recently been reduced by sound-proof cabins. These noises were a source of great distraction and fatigue when the planes had open cockpits.

The noise produced by the radio beam in the earphones is almost musical in nature and is not distracting. But coupled with propeller, engine and exhaust noises, the beam helps to produce fatigue of the body to some degree. These noises may affect the hearing over a period of years. The average loss of a pilot's hearing after 5 to 10 years is about 5% for bone conduction deafness and 2% for air conduction.

The effect of vibrations from the plane upon hearing is negligible. There are no definite data to show that vibration decreases the acuity of the pilot's hearing.

There may be a temporary loss of hearing after a prolonged flight. This condition lasts several hours but progressively improves after a day.

Ear Protection Against Noise: It has been found that plain cotton used in the external ear canals reduces noises about 50%. Cotton mixed with ear wax decreases noises about 75%. Rubber ear plugs diminish noises about 80 to 85%. However, stuffing the external ear canals with wax or rubber plugs is a great annoyance to fliers. In the future, engineering development of sound-proof cabins should make the use of ear defenders unnecessary. The ear phones decrease external noise somewhat.

VIII

Dissipations

EVERYONE has some leisure time at his disposal—time for rest, for taking it easy, for pursuing inclinations, for getting away from the grind. Perhaps one likes to spend this free time at a bar in conversation indulging moderately in alcoholic beverages, or while away the time playing cards. Or one may spend the extra time reading, or may go to the theatre to take in a show. Sometimes a cocktail party will furnish just the right combination of relaxation and pleasure; sometimes one may prefer a brisk walk or an active game. The *worst ways of killing time* are by excessive drinking, gambling, and indulgence in sex excitement. These are the dangerous pleasures that tear the nervous system to rags and make a man old before his time.

Whatever his relaxation, the prudent person will indulge moderately. There is no harm in drinking an occasional highball for sociability's sake. There may even be times when a "good drunk" will be followed by an over-all relaxing effect. Excessive drinking, however, will in the long run ground the ablest flier.

Alcohol first stimulates the central nervous system, particularly the brain, but later the stimulatory effect wears off, and there results a temporary mental disturbance with muscular incoordination. A moderate supply of alcoholic drink is not very harmful, but it is all too easy to overstep the line between exhileration and drunkenness. It requires a strong determination to stop before the alcohol controls the drinker. The rule of the pilot

should be that "he controls the drink" and knows the right time to quit. If responsibilities are to be faced the next morning in formation flying, or if aero-acrobatics are to be performed, one wants to be "in the pink" to carry on efficiently.

As little as three ounces of whiskey affects quick and precise muscular coordination. Judgment is markedly unbalanced, and skillful handwork and flow of thought are slowed down. To continue drinking while carrying on important work is harmful to safe flying and—happy landing.

The acute alcoholic goes through four different phases. At the end of the first phase he feels increased energy. He speaks profusely and feels buoyed up with self-confidence. At this stage his blood pressure is raised and his face becomes suffused. But soon his flow of conversation is slowed down and his thoughts become befuddled. In the second phase, his speech becomes slurred, and when he walks his gait is unsteady. He becomes awkward in all his movements. He upsets things. He gets progressively more clumsy. In the third phase, digestive upsets show themselves, particularly if the drinker has had little food; he becomes nauseated. He may even vomit, and while he attempts to empty his stomach he turns a pallid color and gets very sick. When large amounts of alcohol have been consumed, he even loses sense of pain. Soon a drowsy feeling overtakes him. A strong desire to sleep characterizes the fourth phase. His skin now becomes bluish and moist and his breathing is noisy. He may fall and injure himself and yet not know it. At this stage he may fracture his skull or get a violent concussion of his brain. This is therefore a dangerous phase of acute alcoholic poisoning. (Fracture of the skull or some other dangerous condition such as apoplexy may not be recognized since it is mistaken for alcoholic intoxication.)

In the advanced stage of alcoholic poisoning the pulse is feeble and a general condition of shock exists. However, after about eight hours of sound sleep the effects wear off with no harmful results, except for the "blue after effects" of headache and poor appetite. During alcoholic sprees hardly any food is taken and the body resistance is lowered.

Alcohol and gasoline don't mix well and in attempting to operate a motor vehicle one may get into a serious accident. In like manner airplane engines and alcoholics do not get along well. There are times when the pilot wishes he could eradicate the effects of too frequent indulgence in alcoholic sessions. When he meets with sudden bad weather or must fly in difficult formation for several hours, he would like his judgment clearer, and his muscular coordinations operating a little faster.

All states have adopted laws making it a serious offense to drive a motor vehicle under the influence of alcohol. A test is now available to determine the degree of alcoholic concentration in the blood. It is generally considered that *two milligrams or more of alcohol* in 100 c.c. of blood is sufficient to stamp the operator as drunk.

During 1939 about half of the persons killed in automobile accidents in United States were between the ages of *twenty and forty-nine years.* Probably the majority were bread-winners of families.

Motor vehicle accidents caused 39,761 deaths in 1936; 32,468 in 1939. These figures do not reveal the *millions* of lesser injuries of both pedestrians and drivers.

One of the *important causes of fatal automobile accidents is driving a motor vehicle under the influence of alcohol.*

Chronic alcoholism arises in those who habitually drink more than they can tolerate. Those who can drink moderately or *leave it alone* as occasion dictates are not chronic alcoholics or pathological drinkers. They do not permit their controlled drinking to interfere with their business or profession. Neither does their conduct affect their family relationships.

The chronic alcoholic, by contrast, loses control of himself, and allows his drinking sprees to prevent the carrying out of his duties. At home and among his friends he becomes unbearable. He eventually becomes a medical problem. Such a drinker is usually trying to substitute alcohol for the satisfactions of real achievement. He tries vainly to escape from realities, and seeks to obliterate unpleasant thoughts. Instead of escaping, he finds

himself becoming more and more obnoxious to his superiors and associates.

Long continued use of too much liquor eventually does damage to important organs of the body, especially to the stomach. The central nervous system is affected. Habitual inebriety is generally accepted among psychologists as one of the stigmata or signs of degeneration characteristic of unsound personalities.

Chronic alcoholism leads to tremors of the hand and tongue. More subtle than the physical damage is the change that occurs in the drunkard's moral make-up. He may become a pathological liar and he is found to be unreliable in all his work. His sense of responsibility is crippled. Later he becomes markedly absent-minded, and his capacity for work shrinks. His energy decreases and he complains of progressive fatigue. He becomes incompatible with his wife, and his domestic relationships are wrecked. He suffers fits of anger, often accompanied by unreasoning jealous tantrums.

In the advanced stage, the chronic alcoholic suffers profound depression and melancholia, alternating with feelings of persecution. Marked changes in emotions, hallucinations, severe neuralgic pains, loss of memory, and finally, total inattention to responsibilities and duties are typical consequences.

Visual disturbances, skin rashes over the face and body, persistent indigestion and gastric ulcers, enlarged liver, diseased kidneys, and hardened arteries may result. Resistance is so decreased by lack of balanced diet that the alcoholic becomes an easy victim of infectious disease, especially pneumonia.

The chronic alcoholic is a diseased person in need of medical and psychological care. Careful psychological study aided by body building, open air exercises and medications are necessary. Useful hobbies, which may relieve a sense of inferiority, are helpful in building self-respect. Alcohol in every form must be withheld from the addict and he must be placed in an environment which will not suggest resort to drink as a means of stimulation.

Excessive Use of Tobacco: Smoking a cigarette, a cigar or sitting back leisurely and puffing away on a pipe may be a

pleasant and soothing way to relax. But to smoke large numbers of cigarettes or cigars each day is folly.

Frequently those who smoke in excess are equally addicted to over-use of alcoholic beverages. Those who decrease the intake of nicotine stimulation usually also decrease their desire for alcoholic exhileration.

Excessive use of tobacco may cause severe muscular cramps in the leg muscles of some individuals. Intermittent claudication (periodic leg muscular cramps) is usually found in inveterate cigarette smokers.

The extract derived from cigarettes is termed "nicotine" and it is this drug which seems to affect the blood circulation. It appears that chronic overuse of tobacco will weaken the heart and raise the blood pressure. After a spell of excessive smoking there is no alteration in the blood pressure, because the heart muscle has become weakened. Excessive use of tobacco or alcohol may lead to a condition of "toxic ambylopia" (defective vision). Those who smoke "shag" or combinations of tobacco mixtures are more prone to get marked deficiencies in vision. If defective vision does follow use of tobacco or alcohol, it is best to stop smoking or drinking promptly, otherwise the disease may become chronic.

The active ingredients of tobacco are principally nicotine, a camphor-like drug, and cellulose, resins, and sugar. Little doses of carbon monoxide gas, small amounts of prussic acid and a toxic agent termed furfural are found in the smoke. When one uses tobacco moderately, the effect produced is relaxing; but over-smoking in an exhausted state is definitely harmful, especially during periods following overwork and loss of sleep.

Overuse of tobacco may lead to mouth infections, gastric disturbances, muscular trembling, weariness, muscle cramps and profuse perspiration of hands and feet. Excessive smoking may create a tired look and sallow complexion, pain over the heart, cold hands and feet.

There are times when a person, who is not addicted to tobacco, is exhausted and weary to the point of marked irritability; in

such a condition a few cigarettes or a cigar will act as a tonic as well as a soothing agent.

Smoking in flight is not dangerous in ordinary circumstances. If oxygen is being used, however, smoking must be PROHIBITED because of the danger of fire. Smoking must also be avoided in a closed cabin with poor ventilation and possible gas fumes.

Chronic inflammation of the throat and constant irritation of the lingual tonsil may cause the so-called "smoker's cough," which is dry or non-productive and found in those who inhale smoke constantly.

Smoking before a meal decreases the flow of gastric juices and so produces poor appetite for food.

Those who smoke pipes with *jagged edges may in the course of time, so irritate the tip of the tongue or lips as to create small ulcers;* these constant irritations *may eventually produce cancer of the mouth.*

Gambling: For centuries man has been thrilled by the effects of gambling in all forms. The unknown has always awed man, even when he occupied caves and lived in a primitive environment. Engaging in hazardous tasks such as hunting wild animals and daring the camps of antagonistic tribes helped to satisfy the basic gambling instincts in those days.

Men have always done daring things to satisfy their craving for adventure. New discoveries have been made because man gambled his leisure time on a "hunch," which he followed through for many years. Christopher Columbus gambled his life, his men, and his ships to prove his point. Our modern conception of adventure is greatly modified for the average city dweller. Civilization has made daring less necessary and today, many people seek thrills in different forms of sports and card playing. Betting on a horse for a small sum is, indeed, normally stimulating, especially, when one sees his horse race to beyond "the nose." This really is good relaxation.

But to gamble for large stakes and damage one's health and standing by over-indulgence is stupid. Think back to the times when you were off your guard and lost long hours of sleep in

card-play for money stakes. You burned up the reserve energy you needed for the following day's difficult work. You lost the important sleep your body needed and with only an hour or two of rest, reported for duty. When the plane flew aloft you could hardly realize you were the same skillful pilot behind the controls. The dissipated time had used up some of your reserve judgment and you questioned your own ability.

Card playing for sociability is an excellent form of relaxation but to abuse this method of fun is as bad as eating ten pounds of steak at one sitting when only one-half pound is necessary to the body.

Flying is a career and that career must be carefully guarded. A single *serious error* and that career will be spoiled, perhaps forever. There is too much fascinating adventure in flying to risk it by needless waste of energy and accumulated dissipations which are not at all important to genuine satisfaction with life.

Overeating: All foods taken in normal quantities are practically harmless; but—like anything else—in excess, the food may become a poison.

If you attempted to fill your airplane tank with more gasoline than it could hold the surplus would overflow and you would be able to place the cap on just as easily as if the tank were empty. But the overloaded stomach cannot send a message up that it has received its fill of rich food. There is no cap to place on the stomach, save the cap of "a good habit of pushing away from the table" when you have had enough.

Overloading the stomach with greasy, starchy, excessively sweet foods is a mistake and may lead to airsickness. To overstuff the stomach is to lay the foundation of chronic stomach trouble. Burdening the stomach with large amounts of alcoholic beverage (which is rich in carbohydrates) and then loading the stomach with a heavy meal is poor pilot judgment.

Excessive Use of Coffee or Tea: Like an occasional highball, or a relaxing smoke, a cup of coffee or tea has its place in giving that fatigued body and mind an extra temporary crutch. A morning cup of coffee is good. It is not harmful to take a cup

of coffee or tea in mid-noon—that has its place and it is not a bad habit.

But to "fuel up" on coffee and then more coffee without consideration for the future consequences is nothing but shortsightedness. Coffee has caffeine extract, a basic, stimulating drug. The person who smokes two or three packages of cigarettes and then "turns on the hose" and pours in the coffee from 8 to 16 cups per day is reaching out (as an inmate) for the nearest psychiatric institution. Those who live on coffee or tea and cigarettes look like human wrecks in due time. The hands and fingers get shaky and the personality nervous and irritable. The caffeine stimulates the tired brain artificially and the person living on large amounts of coffee never gets the required sleep so important for relaxation of the mind and body.

Sleeplessness: Sleeplessness is commonly due to such causes as over-fatigue of mind or body; abuse of tobacco and alcoholic beverages; excessive intake of coffee or tea, which whips a body already nervous, and irritable; and anxiety states produced by psychological or economic problems. When the pilot finds his nights troubled with loss of sleep, he should not hesitate to confide in his Flight Surgeon, who will seek out the basic cause and cure the condition by proper therapy. To rob oneself of needed sleep is to undermine the body for sickness and mental inefficiency. A worn out person wears down the bodily resistance. When bodily resistance is low, germs are able to attack the human mechanism and cause various diseases.

Self-medication: Much harm is done by attempts at self-medication. Thousands of proprietary compounds are on the market, advertised to cure nearly every ailment from athlete's foot to sleeplessness. Most of these compounds do no special harm in themselves; a few may even do some good. Some palliate and relieve the *symptoms* of certain conditions without touching causes, and these are dangerous because they lull the user into a false sense of security. A few are habit-forming drugs or cumulative poisons, and when used over a long period may seriously damage the system.

A common but very bad habit is the regular use of cathartics

and laxatives. An occasional cathartic may flush out the system and give the body a fresh start, so to speak. But the habitual use of salts, laxative chewing gums, milk of magnesia, aperient waters, bromo-quinine, or other "regulators" is very harmful.

Acetanilide and acetyl-salicylic acid (Aspirin) are useful sedatives for occasional relief of headaches and other minor pain. They are, however, slow cumulative poisons, and if used habitually over a period of months or years may produce grave disorders. Another sedative drug is potassium bromide, found (frequently with acetanilide or one of the barbiturates) in many proprietary "headache powders." The habitual use of potassium bromide may produce a chronic poisoning condition known as "bromism."

The best that can be said about the use of most proprietary medicines is that they are a waste of money. One widely advertised remedy for indigestion consists of sodium and calcium carbonates in about equal proportions. These ingredients (ordinarily called soda and chalk) can be bought at retail for a few cents a pound. When dressed up with a trade name and put up in pill form in a bottle, they sell for 50c for four ounces.

Much has been written about the sulfa drugs, and the marvelous cures that have been obtained by their use. In the hands of a trained physician, these drugs are powerful weapons against disease germs. But they are also powerful poisons, and must be used with great care under controlled conditions. The individual reaction of each patient must be studied throughout the treatment. Any attempt at self-medication with sulfa drugs is a reckless act that may be attended with most disastrous consequences. Grave forms of anemia (depletion of red blood cells) and even mental symptoms may follow careless sulfa drug administration.

Back of the pilot the Flight Surgeon stands ever ready with friendly advice and expert knowledge. It is to him, and not to the proprietary medicine vendor, that the pilot should turn for advice and help with problems of health.

Venereal Infections: The sexual passion may under certain circumstances totally intoxicate. Under the spell of this powerful impulse, a man may forget, not only the restraints imposed by

morality, but also the dangers of infection with serious disease. Many a man has paid for a few seconds of intense excitement with months or even years of partial disability.

There can be no question that the best way to avoid venereal disease with all its attending misery is to abstain entirely from promiscuous sexual intercourse. Sexual continence in man is not harmful, nor impossible, nor a sign of inferior virility. The normal male can so arrange his life as to use up the excess sex energy in vigorous work and harmless play. If one does not excite himself artificially by alcoholic debauches and by seeking sex stimulation, he can control himself readily. Nature takes care of sexual maturity by creating nocturnal emissions which may be accompanied by exciting dreams. These so-called "wet dreams" are safety valves, relieving accumulated tension, and are in no way detrimental to health.

Sexual power and appetite in man is at its highest pitch between the ages of 21 and 45. To abuse the power may bring on impotence many years before old age sets in. After 45, the sexual power diminishes considerably, and generally ceases almost entirely between 60 and 70.

The strange subconscious desire in man to experience change accompanies his sexual life, and is often a strong factor leading to promiscuous indulgence. In many men the sexual appetite is stimulated and becomes more intense with change of women, and such men frequently resort to prostitutes in their search for renewed excitement. The prostitute is primarily interested in *money gains;* her sexual response is entirely faked; she may have relations with hundreds of different men in the course of a few days, some of whom are certain to be infected with disease. No matter what precautions she takes, there is ever-present danger.

The effect of alcohol in *paralyzing one's inhibitions and judgment* is well known. Many men who, when sober, would not consider a sex act with a prostitute, may become, under the influence of a few drinks, entirely careless. They not only find pleasure in acts which under normal circumstances would inspire only disgust, but they are reckless of consequences, and do not take the medical precautions that might save them. It is wise

to think seriously of these facts *before taking a drink* under circumstances that may lead to promiscuous sex indulgence.

Gonorrhea: Gonorrhea, commonly known as "clap," is usually transmitted by sexual intercourse with an infected person. Very rarely it may be acquired without any sex act through infected instruments or through soiled towels or clothes. Gonorrheal infection of the mouth, nose, or eyes may be acquired through kissing or through perverse sex practices. The causative agent, a bean-shaped micro-organism called the gonococcus, cannot live for any length of time except in the mucous lining of a living body, and thus actual contact is generally necessary to transmit it. Usually the invasion is through the narrow canal of the penis.

A few days after infection with gonorrhea, a vague tickling sensation arises in the penis, which soon becomes more irritating and painful on urination; this is especially felt at the opening of the penis. Later a sticky, cream-like discharge is noted. The opening becomes reddened and puffy with discharge of pus; the entire head of the penis becomes inflamed; severe pain, especially during urination, results if the case is not treated.

The urine appears cloudy with presence of pus. Complications such as infection of the eyes, stricture of the canal of the penis, swollen and infected testicles, infected prostate gland, joint pains (gonorrheal rheumatism), and even kidney and heart disease may result from neglect. Even if gross symptoms clear up, the infection may remain in the body and reappear, perhaps years later, to cause limitless misery. Many men who believe they have recovered entirely because of the disappearance of symptoms are really harboring the disease, and may infect innocent people after a lapse of years.

The laboratory test is performed by taking a smear of the discharging fluid and examining it microscopically for gonococci.

Gonorrhea in a prostitute is very difficult to eradicate, and a single prostitute can infect hundreds of men. Even where medical inspections are made of brothels, there is no assurance that the prostitute does not become infected immediately after the examination. Moreover, unless special precautions are taken, an active case of gonorrhea in a prostitute may not be detected, as

the microbes may remain secreted by the million in the deep folds of the genitals, and yet fail entirely to appear in the ordinary smear because of a recent superficial douche. A prostitute has an obvious financial interest in securing a certificate of freedom from disease, and will naturally take such measures as she can previous to an examination to be free of easily detected symptoms. For these reasons it is best to *consider all prostitutes infected,* and to take precautions accordingly.

Many authorities recommend the condom or rubber sheath as a preventive measure, and it is effective if it is of good quality and remains unbroken in use. Care must be taken, however, that the *condom itself* is not a source of infection. Many prostitutes supply their customers with condoms, and these are likely to be infected from the prostitute's hands. Moreover the condom can become infected as it is being put on through contact with fingers contaminated with gonococci. To be of any value whatever the condom must be used *throughout* the act of intercourse, and the unprotected penis should not be touched at any time either by the prostitute's genitals or by hands that have been in contact with the genitals.

For additional safety even if the condom has been used, and always if it has not been used, the following prohylaxis is suggested:

1. As soon as possible after the contact wash the penis and hairy parts with plenty of soap and warm water. Rinse with water.

2. Follow soap-water wash with thorough swabbing of external parts with 1-2000 to 1-4000 solution of bichloride of mercury.

3. Using a small glass syringe (medicine dropper), inject a generous dose of 1% protargol solution directly into the canal of the penis, and close the opening for from 5 to 7 minutes.

4. Anoint the entire head of the penis with 33 1/3% calomel salve, working some of the salve into the opening of the canal. Cover the penis with a loose bandage and leave on for several hours.

These precautions may seem troublesome and excessive. But

whatever trouble they may be is infinitely less than the trouble of treating a case of venereal infection that has become established.

If infection occurs, the following measures should be taken to prevent spread of the disease and bring about recovery:

1. Keep hands cleansed after handling penis by washing with soap and water.
2. Abstain rigorously from all sexual relationships.
3. Rest in bed, whenever possible.
4. Use a suspensory bag to collect discharge in absorbent cotton.
5. Change underclothes daily and keep soiled clothes separate.
6. Avoid exercise or active work.
7. Stop all alcoholic beverages and excessive use of tobacco.
8. Discontinue condiments and spicy foods (pepper, pickles, sharp sauces, etc.). Stop coffee and tea.
9. Drink plenty of water.
10. Place yourself under a doctor's care without loss of time. Modern treatment with sulfa drugs is very effective, but must be carried out under expert supervision.

There is danger of eye infection if the discharge from the penis comes in contact with the eyes. Blindness may result from such infection. Great care must be taken to prevent towels, handkerchiefs, or fingers from becoming contaminated and accidently carrying the infection to the eye.

Syphilis: Peer through the magnifying lenses of a high-powered microscope under dark field illumination at a tiny spiral-shaped parasite wiggling about. This harmless-looking organism is *Treponema pallidum,* and may be found in the watery-like scrapings of any first stage sore of syphilis. When this bug gets into the human blood stream through an abraided skin area, there is no telling what devastating effects it may produce.

Most commonly the syphilis microbe gets into the blood through sexual intercourse. The skin covering the head of the penis is extremely thin and delicate, and minute breaks in it

are made by the friction attending the sexual act. No visible abrasion is necessary to afford an entry for these ultra-microscopic creatures. Although the head of the penis, because of its thin skin protection, is the point most frequently attacked, entry may occur at any place on the body. Any intimate contact such as kissing (the lips are particularly vulnerable because of thin skin) may suffice to transmit the disease. Infected towels, razor-blades, tooth-brushes, and tatooing needles may also transmit syphilis, but this is less common because the organism dies quickly outside the body. Many thousands of infants are born annually with syphilis microbes in their blood acquired from diseased parents.

In the adult, the *first stage* of syphilis infection is characterized by the appearance of a small raised sore or ulcer with a hard base at the point where the organisms secured entrance. This sore, called a *chancre,* appears in from two to eight weeks after infection. In the exudations and scrapings from the chancre are thousands of syphilis microbes, and in this stage the infected person is more dangerous than a rattlesnake to those with whom he comes in contact.

The chancre stage of the disease is a red flag waved at the victim. He should seek competent medical treatment *without delay.* Treatment is greatly simplified and shortened if undertaken during the first stage. Chancres nevertheless heal up in a few weeks, whether treated or untreated. This may give the victim a false belief that he has recovered and that no treatment is necessary. It must be emphasized that the healing of the chancre is *not* an evidence of recovery; unless the parasites are killed in the blood stream by suitable drugs, the disease will inevitably proceed to its later stages, and arrest and cure become problematical.

The *second stage* of syphilis is characterized by the appearance of generalized skin reactions. These rashes may be of any shape or color and may appear on any part of the body. They frequently simulate other skin diseases, and they can generally be recognized as syphilitic in origin only by blood tests and knowledge of the patient's history. The skin rash is funda-

mentally an immunity reaction to the systemic involvement, and its appearance is a proof that the microbes have invaded all parts of the body. Another common symptom of the second stage is the appearance of pearl-gray sores called *mucous patches* on various parts of the mouth. These sores, like the first stage chancre, are teeming with spirochaeta.

A blood test commonly called the *Wassermann Test* usually gives a positive result in the second stage. During the first stage, the Wassermann Test is generally negative, as the microbes have not yet become distributed over the body, but the disease can be recognized by the characteristic appearance of the chancre, or in case of doubt, by microscopic examination of the serous fluid from a suspicious sore under dark field illumination. Sometimes repeated examinations may be necessary to rule out the possibility.

Once the blood reaction (Wassermann Test) becomes positive, the chance for an early cure diminishes greatly. Nevertheless, the disease can be arrested and finally cleared up by persistent effort, while the gravest consequences will follow from neglect.

If no treatment is given, the skin rashes characteristic of the second stage will eventually clear up, and the sufferer will enter the third or *tertiary stage*. This stage is likely to last his lifetime, and may be attended by a great variety of symptoms, many of such severity and repulsiveness as to make the victims among the most pitiable of living creatures.

Large or small tumors, known as *gummata,* may form anywhere in the body, externally or internally; ugly skin ulcers may appear at any point; brain and nerve tissues may become involved through pressure from neighboring tissues or from direct destruction. Finally insanity in various forms, usually accompanied by paralysis, overtakes the victim (called by some authorities the *fourth stage* of the disease), and he may vegetate for years in a state of helpless dependence. Long before this final stage is reached, the patient may suffer severe headaches, loss of strength, swollen lymph glands, and other painful symptoms. Dizzy spells and noises in the ears, blurring and other disturbances of vision, and various nervous disorders are

common. A frequent complication is the appearance of *spinal syphilis,* which affects the spinal cord and creates a peculiar waddling gait.

Tertiary syphilis is slow-acting: sometimes no symptoms appear for years. There is no predicting its precise course; its complications are infinitely various. When it is considered how vast an amount of human misery it causes, no effort seems too great in preventing and combatting it.

The prophylaxis recommended under gonorrhea is also designed to protect against syphilis infection. From what has been said regarding methods of transmission, it is obvious that the ordinary condom is not a sufficient protection. Not only is there danger of the condom's breaking, but infection may occur in parts unprotected, such as the thighs or scrotum. The condom should, however, be used *in addition* to the prophylaxis by soap and antiseptic solutions.

A reputable physician should be promptly consulted in all cases of doubt regarding venereal disease. Do not go to quacks who may advertise quick cures. Modern treatment with the use of sulfa drugs and arsphenamine can cure both gonorrhea and syphilis in their early stages. The price of neglect may be a chronic, destructive disease for which there is no cure.

IX

Psychology for Pilots

THERE are times when the pilot needs special counsel or advice in problems which arise out of the mysterious storehouse of the mind, the mind that feels, perceives, wills, thinks and sometimes gets into a tangle.

The infinitely complex inter-play of one's traits, feeling, attributes and actions as they reflect his conscious and subconscious mind, makes every man a delicate mechanism.

The science of psychology, which treats of the mind in any of its aspects, is a large field. Hundreds of books have been written concerning the subject and only specialists in the field, armed with a systematic knowledge and techniques of investigation into the private world of the mind should be consulted. "A little learning is a dangerous thing," and nowhere is that more true than in psychology.

Yet the pilot should be made familiar with some background of psychological understanding and principles as it affects his special calling.

The mind's reactions to external stimuli is performed by an intricate system of microscopic cells. These infinitely minute brain cells keep wiggling about in complex mystifying systems without definite tracks that the anatomist can set his finger on. Myriads of chains of thought exist and move profusely in the unknown and sub-conscious caverns of the brain. These thoughts organize themselves in special centers of the brain where ideas are stored by the million and lie dormant awaiting stimulation.

When the "button" is pushed by the will, there starts an extraordinary combination of psychic phenomena. One thought awakens another through a chain of association. Thought which lie hidden away deeply in the brain substance can come suddenly to the foreground or into the conscious mind. Certain urges, emotions, or repressions may all seem to intermingle at once. The normal brain is a center so complicated by the accumulation of memories, suppressed desires, thwarted ambitions and various conflicts that it is a great wonder there is no confusion even in the healthy minded individual, free from pressure.

The brain is considered the integrating part of one's personality—and rightly so, for all the roots of one's motor and sensory actions come from this center.

The nervous system is balanced and energized by the glands of internal secretion. These special glands send hormones into the blood circulation. When one of the glands of internal secretion, as the thyroid gland, parathyroid gland or the adrenal gland, is not properly functioning, disturbances result in the entire physiology.

The basic sex drive is essentially of glandular origin; and is inter-related with other internal gland stimulation. When a person reaches maturity, the so-called sex drive may develop into an all-devouring urge caused by excessive secretions of the glands. This may lead to different types of psychological problems that the psychologist must solve. Yet the person suffering from these abnormal sex drives cannot conceive that his basic problem arises in his overcharged glandular system.

When there is confusion of thought or intellect there is usually no appreciable change in the anatomy of the brain itself. What actually happens is that the normal conscious confidence in one's ability and judgment seems to falter. Trivial difficulties may assume exaggerated importance; the everyday, commonplace interpretation of things fails to satisfy the restless mind; problems arise that the brain is unable to solve.

Naturally, the circumstances may differ and each person is highly individual in his responses to the same situations. There

are, however, certain difficulties that are encountered frequently. Among these are:

1. Anxieties, commonly experienced by those who fear meeting new situations.

2. Lack of confidence often caused by so-called inferiority complexes.

3. Economic insecurity, which may be created in the pilot's mind by aeronautical accidents affecting his flying pay, or by fear of being grounded.

4. Emotional insecurities resulting from thwarted ambitions. Unsuccessful love affairs, conflicts carried over from early childhood days, family conflicts related to mother, father, or children, are frequent sources of emotional insecurity.

5. Sexual difficulties arising from various causes but basically of psychological nature, such as fear of physical inadequacy.

A personality is like a book and cannot be properly understood unless time is taken for its analysis. Here the Flight Surgeon comes into the picture. He seeks to learn the problems of adjustments, the conflicts or repressions or thwarted ambitions, if any, that the pilot has, and which may be interfering with his assigned duties or with his happiness.

The mental and emotional life the flier leads on land often mirrors itself in his work as he sits at the controls while the aircraft speeds through the air. While the pilot is keeping his engine in flight he may be developing unconscious emotional conflicts. These conflicts often result in upset digestion and an inner disturbance called *visceral tension.* Symptoms may last a long time after the primary stimulating agency has ceased to exist. A "drive" or persistent urge, often not apparently related to the emotional difficulty, may be started as an aftermath.

The pilot may be secretive or proud and unwilling to reveal the confidential thoughts he has tucked away in his private world. If it were possible for him to "open up" and discuss some of those baffling thoughts, he would feel relieved as a man who has been bleeding from a painful wound feels better when the wound has been surgically dressed to heal the damaged tissue.

Often disturbing problems can be cleared up merely by having a friendly chat with the Flight Surgeon or with some one with a sympathetic understanding. The Flight Surgeon, who has an understanding of problems related to aviation, is particularly fitted to be the pilot's friend and confidant. If the flier can only describe the subconscious thoughts which trouble him, in these brief understanding talks, some approach can usually be found for a solution. The well-trained doctor often senses the "problem" and leads the conversation into channels calculated to bring out the story.

Many factors enter the situation, and influence the benefit the pilot may get from the Flight Surgeon's or psychologist's advice. When a psychologist seeks to explore the emotional life he becomes very personal, and there must not be any resentment on the part of the aviator. Antagonism destroys the freedom of the "give and take" approach.

A mind which is resentful to the psychological approach and evidences opposition is unreceptive to thoughts which can help smooth out ruffled emotions. The pilot must be willing and eager to be benefited by the psychologist's prescription. He must be aware that the examiner is not trying to hinder his progress nor interrupt his daily flying duties; but is rather attempting in a friendly way to avoid breakdowns in some future time. It is really a form of preventive treatment for the pilot. It is better to *avoid* the breakdown than to seek the cure after the damage is done, just as it is better to repair a plane and keep it flying, than to await the time when it is in peril and then try to save it.

If the problem is really an important one, it probably cannot be settled at just one brief meeting. If the flier thinks he would like to have another session, the medical interviewer will probably be very willing to agree. As a matter of fact, the more frequently such sessions are held, the deeper the understanding the psychologist can have of the conflict or mental unrest that is causing trouble. It is only by getting to know a man better and better that a proper analysis can be made of his mind and problems.

Any data revealed in these talks can be used to clarify the problem, or to reach a proper decision. There may be emotional disturbances springing from introvertive or extravertive natures, aggravated by neurotic trends of which the pilot may not be aware. Perhaps these can be adjusted early without loss of flying time. In many cases, the upset mental patterns can be straightened out by the observing psychologist so that no permanent harm is done to the personality.

The psychologist will be interested in finding out just how his man meets the realities of life. Does he attempt to make up for his deficiencies by adequate compensations which are in line with his inner desires? Does he suddenly "give up the ship" and assume the role of a loser when life's problems are difficult to meet? Does he attempt to be a fighter and resist the environment in which he must live and try to reshape it to suit his desires? Other highly personal questions may be asked.

Often there are comparatively trivial considerations, old prejudices to overcome, over-sensitiveness, shyness or the opposite over-aggressiveness, that may lead to qualms of conscience, tension, bitterness or other departures from the well-coordinated personality. In these problems, a talk with the Flight Surgeon may prove to be the soothing balm.

These comparatively minor problems are often solved by simple self-analysis under sympathetic guidance.

We may approach the basic fundamentals of all adjustment from a different viewpoint. Civilization has compelled men to live collectively and it is essential that cooperative living be developed on a more tolerant basis. On the other hand, man's desires are by nature infinite, and as he seeks to satisfy his inner demands, he finds that opportunities do not exist to satisfy them all. He must learn to adjust himself to his limitations. Such adjustment brings a certain peace of mind. If he does not, a conflict will arise between what he seeks and the limitations which make it impossible. These limitations may be economic, moral, physical (being too short or too tall, etc.); psychological, social, or intellectual.

If a man does not recognize his limitations, and accept them in his design of living, he will begin to feel himself frustrated, defeated and inferior; anxiety and tension set in leading to various serious upsets.

The personality suffering from inferiority complex may be strengthened and helped by suggesting a philosophy of life. There may be some confusion resulting from a conflict, and it is best under such circumstances to see by self-analysis, the futility of such a complex. If one can transpose the combination of destructive thought into an adaptive constructiveness, such as seeking knowledge through organized reading and study, the intensity of conflicts and complexes will be lessened.

The principle of adjustment to one's environment is of great importance. It is found that the personality traits of an individual work to develop persistent habits—personal and social. We are all constantly adapting ourselves to new situations. The ways and means—the so-called psychological mechanisms—that we use to produce the greatest amount of comfort and pleasure in this process vary according to the many factors which enter into our emotional make-ups.

Some people seek to adjust themselves by "a defense mechanism" manifesting itself by over-aggressive conduct, and commonly involving reactions of a disagreeable and anti-social nature. Others may wrongly try to adjust themselves by withdrawing from their environment. This is another defensive mechanism. It may ultimately result in active or passive seclusion.

Still another form of adjustment involves fear and repression. Fear, incidentally, is an important factor in most maladjustments. Repression is a characteristic general term of maladjustment.

Others seek to adjust themselves by complaining about ailments. Such a person will suffer from so-called pain symptoms. They may be possessed with sudden seizures of colic, or violent pains which may or may not be associated with objective signs. When such devices fail, the maladjusted one begins to show marked signs of anxiety and exhaustion. He gets extremely nervous. These weaknesses all arise as a result of the extreme

emotional tension. Finally a permanent inferiority feeling may be reached in the form of a mental or social pattern. Sorry disturbances may result.

One can suddenly withdraw from his environment with mental disorders, as in dementia praecox. This is the most common type admitted to psychiatric institutions.

In another form of mental disorder the individual shows signs of emotional confusion manifested by evident stupid behavior. This type shows peculiar motionless positions like a fixed statue. They may remain motionless for many hours. This is termed *catatonia.*

The paranoid type of dementia praecox manifests delusions (false belief) of persecution and false impressions of hearing voices (hallucinations). In this form there may be negativism (one withdraws from his environment and becomes actively stubborn). The individual assumes contradictory attitudes and rebels against authority. There may be phantasies (an imaginary pattern of pleasures) compensating for what is not attained in real life. Common types of such phantasies are day-dreams of being a conquering hero, or a suffering hero, as a sort of a martyr type. There may arise retrogressions in which one seeks solution of problems by going back to special mechanisms which are normal only for lower age groups (infantilism).

Failure to adjust oneself may result in strong fears, worrying, anxiety, or phobias. Psychologists find that many fears, repressions and anxieties are related to sexual functions. They may take the form of fear of sex-frigidity or impotence, or compulsive acts such as exposure of the sex organs, and may eventually lead to degenerative or perverse acts.

The Flight Surgeon must often treat maladjustment by attempting to change the environment of his patient. He also tries to check irregular habits, and to arrange for special systems of exercises.

Much good can be accomplished by setting a favorable time in an informal manner to consider the problem in hand. The psychoneurotic must have confidence in his advisor. This will enable him to use the advice in a constructive manner. Nat-

urally, the earlier the problem is handled the easier it is to eliminate the source of difficulty. Sometimes it is difficult to remove the cause, and it will be necessary for the Flight Surgeon to offer balancing factors. This can often be done by substituting hobbies, sports and special social activities. These will decrease and often eliminate psychomotor tension and other emotional stresses.

Frequently, those who show symptoms of psychmotor upsets have a tendency to bite their finger nails, pick the nose needlessly, drum rapidly on objects with their fingers and react excessively to chance stimuli such as noise. Slight dangers, difficulties, or grievances may result in emotional outbursts.

The extremely nervous person usually dreads the future and is manifestly irritable and indecisive. Nervous behavior is a tense behavior. A common symptom is upset of digestion. The so-called nervous breakdown is merely a form of masquerade of all types of maladjustment patterns which may assume lines of great severity. *Those suffering from emotional difficulties usually disregard the laws of physical hygiene,* and as a general rule, breaks come not from overwork but from *overworry.*

The psychologist attempts to adjust the maladjusted individual and enable him to return to normal living. Sometimes the adjustment requires not only informal psychological guidance, but the help of a psychiatrist as well. Talks are arranged and the problems analyzed, and solutions worked out.

If one seeks help too late, much time, patience and endurance may be necessary. The Flight Surgeon will try to cooperate in every manner to attain a successful result; he will take personal interest in the aviator's welfare. He may ask to see the patient many times. In these interviews the aim of the Flight Surgeon will be to discuss factors of fatigue and analysis of potential air accidents. He will discuss clashes with fellow workers and a deeper understanding may be reached, solving complexes and conflicts. Irritability and dissipations should be analyzed. Hygiene of the body and the mind should be openly discussed between pilot and the Flight Surgeon.

With this cooperation, the airman can adjust himself for the

better and prevent radical changes in his personality, and the ensuing trail of misery.

This chapter is purposely sketchy and brief—because it is believed that a complete and thorough understanding of the vast knowledge in psychology and psychiatry should be reserved for specialists in these fields. Unless one has a thorough knowledge in these fields, there may be a tendency to too much introspection, leading to imaginary mental and emotional ills. This may be dangerous.

There has been just enough included here, to introduce some of the significant, little-appreciated dangers that lurk about those pilots who give no consideration to psychological problems.

X

Tropical Aviation

THE development of the airplane for long-distance transportation has brought with it new health problems resulting from radical changes in atmospheric conditions as well as extreme variations in climate over a short period of time. In a single day the crew of a plane may be subjected not only to a wide range of barometric pressures but to bitter cold and tropical heat, desert drought and drenching rain, dampness, humidity, or fog—with any of the disabilities that may follow in their train, especially if the plane is forced down in an uninhabited region.

In the tropics the danger is increased by the chance that they may contact any of the numerous unusual diseases found chiefly in the hot countries. Aviators, therefore, must be prepared to protect themselves under all sorts of irregular conditions and to adjust quickly to a new environment where they may have to improvise ways of overcoming hardships for many days, weeks, or even months.

Aviators' Clothing: The ultimate destination of a plane or its rate of speed should not prevent the crew from preparing themselves for any emergency which can be foreseen. Their clothes should be carefully planned to meet life at sea, in deserts, tropics, arctic zones, or wherever it is possible that they might be forced down. If the flight takes them over the tropics, light clothes should be carried, and it is especially important to include shoes which will protect against hookworm disease,

since it has been shown that this disease is acquired by walking barefoot over infested land. Heavy leggings are also essential for protection against snake bite and injuries. If there is a chance of landing in the desert, it is only good sense to take proper protective clothing to cover the entire body, with headgear and sun goggles. For life in the Arctic Zone, a different type of equipment is needed, for a description of which, see the chapter Arctic Aviation.

Essential Equipment: If large bodies of water must be crossed, there should of course be pneumatic lifeboats, fitted with sealed canteens of water and concentrated foods which would preserve life during possible long exposure at sea. First-aid kits should be inclosed in special containers capable of floating in water if necessary. A practical, improved first-aid kit should contain the following articles:

Tincture of iodine.
Pure grain alcohol.
Aromatic spirits of ammonia.
Aspirin.
Quinine for malarial fever.
Sedative tablets for severe pain.
Sulfanilamide tablets for infections of open wounds.
Five-per-cent chromic acid for burned skin surfaces.
Potassium permanganate for antiseptic and disinfectant.
Vaseline tubes.
Salve concentrate for burns.
Yellow oxide of mercury eye tubes for eye infections.
Salt tablets for excessive sweating and belly cramps.
Boric-acid powder for eye washes following burns and injuries.
Bicarbonate of soda powder—helpful in burns when used in paste form.
Tincture of green soap.
Clinical thermometer.
Hypodermic syringe with extra needles.
Bandages, two-, three-, and four-inch.
Sterile gauze packs.
Needles and sutures for sewing an open wound.
Wooden splints for broken extremities.
Adhesive tape.
Knife.
Scissors.
Dropper.
Rubber tubing.
Canteens of drinking water, specially sealed.

Matches, specially sealed.
Blankets, hermetically sealed.
Small tent.
Kettle for boiling water.
Hatchet.
Fish hooks and line.
Two revolvers and ammunition for hunting game if necessary.

Any one of the above items may prove to be of great importance in isolated areas away from medical officers and first-aid stations.

Every man in the Service can now receive injections of a toxoid which confers lifetime immunity to tetanus—a disease that usually follows exposure of open wounds to this infection. Preventive inoculations against typhoid and paratyphoid fevers and smallpox are also given following induction into the service.

Tropical climates may be either hot and dry or hot and humid. In the desert or semi-arid lands the days are hot and dry, but the nights are cool or even cold. During the day, precautions must be taken against heat exhaustion, but at night the protection of blankets is necessary to prevent colds and lowering of bodily resistance. In the humid climates, extremely high temperatures do not occur, and the nights are generally mild, the temperature rarely varying more than 10° F. Seasonal variation, however, may be great, especially between rainy and dry seasons. It is the radical changes of weather which are most difficult to meet, whether they are seasonal or irregular, or whether they affect the temperature, barometric pressure, humidity, winds, or rainfall. In forecasting weather changes it is necessary to bear in mind that mountains, ocean currents, vegetation, and changing winds may modify the climate to an important extent.

Because of the difference in climate, tropical diseases present problems new to those accustomed to a temperate climate. While they usually are easily diagnosed by an experienced physician, the layman far removed from trained medical care, marooned in an isolated area, often must exercise quick, accurate judgment in order to avert danger and protect life.

Special care is necessary in tropical regions to prevent infections, and careful attention should be given to even small

wounds, since infections are much more virulent in the warm climates than in the temperate and frigid zones. Dressings should not be air-tight, but as light and porous as they can be made and yet give the needed protection. The reason for this is that certain bacteria which are killed by air and sunlight will flourish where air is shut out, and these bacteria particularly abound in the tropics.

No uncooked foods or water should be taken if this can possibly be avoided, except perhaps fruits with unbroken skins, since meat, vegetables, milk or water may all carry infection of one sort or another.

Care must be taken also to protect against excessive sunlight, even reflected sunlight. Moderate exposure to the sun has a stimulating effect upon the nervous system, but overexposure to the hot and glaring sun of the tropics is definitely dangerous, and may cause a condition known as "tropical neurasthenia" or various types of eye disease. Those most commonly seen are conjunctivitis, in which the eyes become red and irritated; photophobia, in which exposure to light causes pain in the eyes; and retinitis, in which the inner, most sensitive layer of the eyeball becomes inflamed, possibly with added symptoms of dizziness and severe headache. Aside from painful sunburn, prolonged exposure to the tropical sun may also produce various ill effects upon the skin, sometimes causing severe skin disease.

For these reasons, exposure should be avoided as much as possible, and if it is necessary to be out in the glaring rays, well-fitted goggles should be worn constantly, the head should be protected either by a sun helmet or by damp cloths, and the skin surface should be covered at all times.

The More Common Tropical Diseases

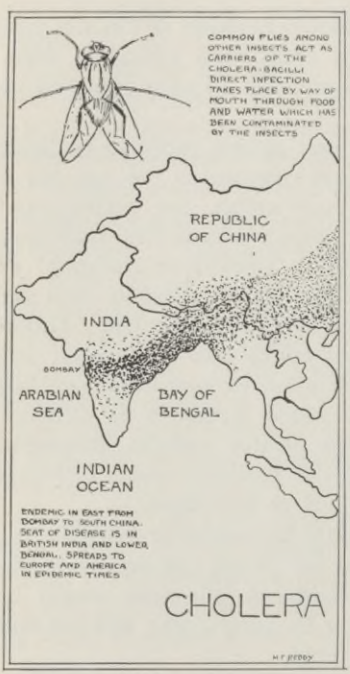
AFRICAN SLEEPING SICKNESS (Trypanosomiasis)

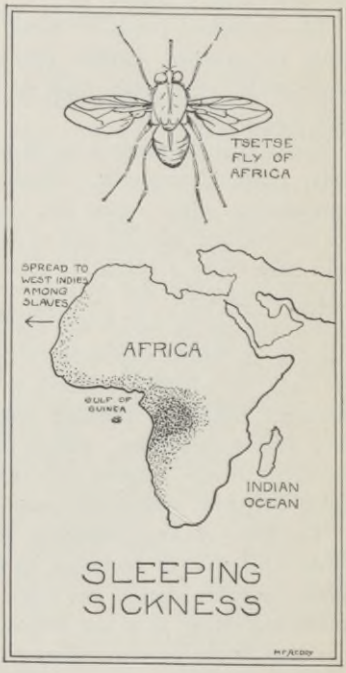
This disease is caused by infection with one of several blood parasites called *trypanosomes* which are commonly found in the blood of game animals. Human beings acquire it through the bite of the tsetse fly, a blood-sucking insect a little smaller than a horsefly, with a somewhat stockier body.

Distribution: Africa, particularly Gambia, Leone, Liberia, Congo Basin, and Rhodesia.

Incubation Period: From 32 to 75 days.

Symptoms: In the early or acute stage the symptoms include fever, often irregular, and sometimes absent for weeks, enlargement of the lymph nodes, especially in the neck, skin rashes,





and collection of fluid in certain areas of the body. After this, the disease may become latent, and months or even years after the original infection, the chronic stage may develop, with headache, weakness, mental and nervous symptoms, and finally coma (sleeping or unconsciousness). Death may be caused by some complicating condition such as meningitis or suppuration of the lymph nodes.

Prophylaxis: To stamp out the disease it will be necessary to destroy the animals which carry it and the flies which transmit it, and to isolate and treat infected humans. Little can be done by the individual except to use protective clothing and mosquito netting.

Treatment: So far, no specific treatment for the disease is known. Intravenous injections of arsenical drugs have been used with occasional success. An effort to build up the strength of the victim by rest, liquids, and the best food available, keeping the bowels open, is about the only course open to the marooned aviator, together with an earnest effort to reach civilization and medical treatment as soon as possible.

ASIATIC CHOLERA (Epidemic Cholera)

This is an acute infectious disease caused by a specific organism known as *Vibrio comma.* Usually it is acquired by swallowing of food or water that has been infected from the excretions of carriers or those who are ill with the disease, or by handling of infected clothing or bedding. Death from exhaustion may occur from a few hours to a few days after the onset.

Distribution: It is endemic in India, China, Japan, Java, and the Philippines, and may be epidemic anywhere in the world.

Incubation Period: This is somewhat uncertain, but it is believed to be from one to five days.

Symptoms: (1) In the first stage there is diarrhea, with colicky pains in the abdomen, sometimes vomiting, headache, and depression. Usually, this lasts for a day or two. (2) In the second stage, the stage of collapse, there are profuse, frequent, liquid evacuations which soon become grayish-white, with flakes of mucus and granular matter and sometimes blood in them (so-called rice-water stools). Extreme thirst, suppression of urine, severe cramps in legs and feet, and incessant vomiting are accompanied by exhaustion and collapse. The features become shrunken, the skin ashy-gray, shriveled, and covered with perspiration, the extremities are blue from lack of oxygen, and the temperature is subnormal. (3) If the patient survives the collapse, during the third stage passage of urine

is resumed, warmth and color gradually return to the skin, heart action grows stronger, and irritability of stomach and bowels is decreased. Relapse must be guarded against.

Prophylaxis: (1) Quarantine of the infected. (2) Extreme care in disposing of excreta, preferably by burning. (3) Use of boiled water, even for brushing teeth. (4) Complete avoidance of raw milk and uncooked vegetables, including salads. (5) Protection of food against insects, especially flies. (6) Care in washing of hands, especially before eating. (7) Cholera vaccine should be given to any person about to enter areas in which cholera is present. This gives protection for two to five months. (8) Alcoholism, chilling of the body, and fatigue should be avoided. (9) In the absence of medical officers, those who must attend a victim should boil all utensils, wash their own hands thoroughly after every contact with the patient, avoid contacts that would infect their own clothing, and take only boiled water or tea and cooked foods into the mouth.

Treatment: In fatal cases, death usually is caused by exhaustion and loss of fluids and mineral salts from the body. Therefore, the essential features of emergency treatment are complete rest in bed, use of warm applications around the body to bring the temperature up to normal, with administration of all the liquids the patient can take, including water to which some salt has been added. No food should be given during the stage of collapse, but afterwards albumin water and coffee may be given, at first in small quantities, then in increasing amounts. Later on, whole boiled milk may be taken. Medical aid should be sought if it is available, as early intravenous administration of fluids and use of cholera bacteriophage may save the patient's life.

BRAZILIAN TRYPANOSOMIASIS (Chagas Sleeping Disease; South American Sleeping Sickness)

This disease may be acute or chronic. It is transmitted by a biting tick.

Distribution: South America.

Incubation Period: About ten days.

Symptoms: (1) High continuous fever. (2) Face may become puffy. (3) Anemia. (4) Thyroid may become enlarged. Also the spleen and lymph glands enlarge. (5) Dullness and sleepiness.

Prophylaxis: Insects to be avoided by use of mospuito netting. The ticks live in huts and houses in the walls and on roofs. They can best be destroyed by sulphur fumigation. There is no specific method of treatment for this sickness.

BRUCELLOSIS (Malta Fever; Undulant Fever)

An infection produced, by the organism *Brucella,* which frequently infects cows, goats, or hogs. In these animals the most prominent symptom is abortion. The disease is commonly transmitted to human beings through the milk of infected cows or goats.

Distribution: Endemic in Malta and in the Mediterranean region as well as different European and Asiatic countries. Also found in South America, United States, and West Indies. In this country about 1,600 cases have been reported.

Symptoms: Remittent fever of an undulatory nature. There are frequent relapses. Characteristic symptoms are pain around joints, neuralgias, enlarged spleen, chills, sweats, anemia, and marked exhaustion.

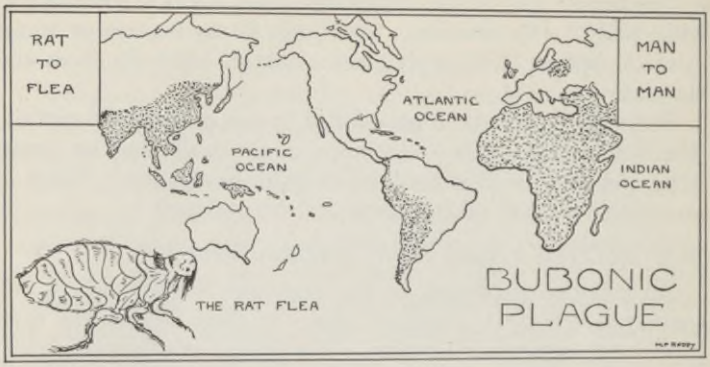
Prophylaxis: All infected animals should be destroyed, and periodic tests of milk should be made. Milk must be pasteurized. The excreta of patients with Malta fever should be disinfected. Food handlers suspected of being carriers must be isolated and should *never be permitted to handle any foods or drinks.* Immunization by vaccine is still in the experimental stage.

BUBONIC PLAGUE (Pestis Plague)

An acute infection caused by the germ *Pasteurella Pestis.* It is a blood-borne disease transmitted by fleas from infected rodents.

Distribution: Africa, China, Central, and Southern Asia, Dutch East Indies, Peru, Ecuador, Argentina, and Japan.

Incubation Period: Two to ten days—average three days.



Symptoms: There are different types of the disease: (1) Pestisminor carriers, with occasional symptoms. (2) Blood-poisoning plague. This form is rapid and fatal, and death occurs within three days (before the buboes appear), due to severity of infection and hemorrhages. (3) The bubonic form shows headache, general malaise, chills, mental dullness, restlessness, fever usually (103 to 104 degrees, though it may reach 106), and infected glands in the groin (buboes). Death may occur on the third or fourth day. (4) Pneumonic type with pulse of 110 to 120. Sputum is mucoid and later blood stained. This type may result in heart failure.

Prophylaxis: Avoid areas where rats are present. Infected rats are found a few blocks from infected areas. They may be destroyed by spring traps and rat poisons, (made of mixed arsenic trioxide, one part, boiled with four parts of rice). Buildings should be rat-proofed, old stables and shacks burned, and dead rats examined by health authorities, when available. Garbage should be disposed of hygienically. Burn all infected bed clothes, burn mouth excreta, and sterilize all cooking utensils.

Personal Hygiene: (1) Wear tight-fitting underclothes for protection against fleas. (2) Avoid infected regions. (3) Use kerosene on tops of shoes, wrists, and neck bands. Use masks

and goggles to protect against droplet infection from the lung type of the disease.

Haffkine's prophylactic vaccine, in doses up to 5 cc given subcutaneously, reduces the chance of infection in about 80 per cent of cases. There is also a specific Yersin-Roux antiplague serum. It does no harm, and may do much good. This should be taken, if possible, in the first twenty-four hours after the disease is contracted, as it does the most good then.

DYSENTERY (Epidemic Dysentery)

This disease begins with bloody mucus in the stools, and ulceration of the large bowel. Onset is sudden. There are several varieties of the microbe. The disease is food or water-borne and is of epidemic or sporadic nature.

Distribution: Tropical countries—South America, southern parts of Asia, southern tip of North America.

Incubation Period: Very short—one to two days.

Symptoms: Bloody mucus in stool, abdominal cramps, and pain on defecation.

Prophylaxis: (1) Avoid food which has been soiled by flies. (2) Watch for carriers. (3) Build up the body by a diet of milk, plenty of fresh fruits, and vegetables, baked or steamed, also liberal use of liver. (4) Disinfect underclothes. Stools must be free from bacilli after three successive laboratory tests. (5) Scrupulous hand disinfection by careful washing, since the disease is transmitted through the mouth. (6) Because vaccines are difficult to make up, it is not practical to use them, but one can use a prophylactic drug, sodium thiocyanate, fifteen grains per day, taken in five grain doses by mouth, when exposed to the disease. There is also an anti-dysentery serum, obtained from horses which were immunized to bacillary dysentery. This serum has been used in the treatment of dysentery where there are more than twelve movements per day. It can be administered by a physician or a nurse.

When the disease is present, complete rest in bed is essential, with hot applications to the body. Nothing is taken by mouth except water or carbonated water for the first twenty-four hours.

Later on, clear liquids, barley liquid, soups, and tea are allowed, given moderately warm. Sugars must be avoided, and the diet must be low in starchy foods, free from fat, and high in protein.

Dysentery bacteriophages have been used with success to prevent and to treat bacillary dysentery, notably in Egypt, Germany, and Russia.

FILARIASIS

In general, the term "filariasis" indicates an invasion of the host by certain invisible parasites known as filaria. These tiny organisms pour their embryo forms into the blood stream of the human body. The adult nematodes are slender, and appear like thin shreds of threads. These have a special affinity for man's lymph glands and lymphatic vessels. The disease is transmitted to man by the bite of an infected mosquito.

Distribution: Tropical countries, and to a lesser degree, subtropical lands. Found in such places as Charleston, South Carolina, Carthagena, Spain, and Brisbane, Australia. In other words, the habitat of this parasite reaches from 30° south to 30° north latitude.

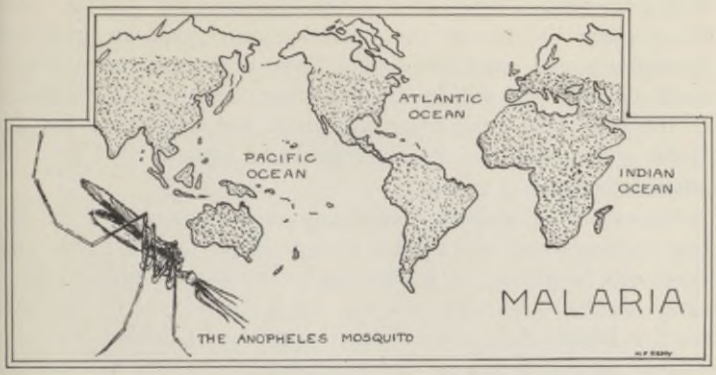
Incubation Period: Several weeks.

Symptoms: Abscesses may be present on the skin and layers beneath it. There may be lymph-gland swellings in the groin. These lymph infections cause a blocking of the lymph channels, and produce a condition known as elphantiasis. The swellings may also be in arms, scalp, or genital organs.

Prophylaxis: Use of screening for dwellings. Destroy mosquito breeding places. Avoid being bitten by mosquitoes or infected insects. Isolate those who have parasite embryos in their blood, and they should sleep with nets over them. In the most common type of filariasis the embryo parasites are found in the peripheral blood only during the hours of sleep.

LEISHMANIASIS

Three types of infection are caused by related parasites of the genus *Leishmania.* (1) Indian Kala-Azar, which produces a large spleen, fever, and anemia. (2) Infantile Kala-Azar. (3) Tropical sore or oriental sore. The organisms are blood-borne.



Distribution: Wide-spread in Asia, Assam, India, Burma, Indo-China, Ceylon, Syria. It is rarely contracted by Europeans.

Symptoms: The sore starts on exposed parts of the body, and is first like a small boil, breaking down to form a weeping ulcer. The skin lesion does not become large.

Prophylaxis: If away from medical aid, the best thing to do is keep the sore clean with an antiseptic solution, and use boric-acid dusting powder. One needs medical attention as soon as it can be obtained to eradicate this skin disease. In endemic areas avoid animals which harbor fleas, especially dogs.

MALARIA (Intermittent Fever. Remittent Fever. Ague. Tertian, Quartan, Estivo-Autumnal Fever)

This disease is caused by protozoan parasites which penetrate and destroy the red blood cells. Periodic fever is characteristic. The disease is transmitted by the bite of an Anopheles mosquito which is infested with the malaria parasites.

Distribution: In all tropical lands; in all southern parts of the United States, Mexico, Central America, South America, Africa, certain parts of Southern Asia, and parts of the West Indies.

Incubation Period: About one week.

Malaria: There are three different species of *Plasmodium* which are responsible for malaria in humans: *Plasmodium vivax*

causes the tertain type, *Plasmodium malariae* the quartan type, *Plasmodium falciparum* the estivo-autumnal type in which a paroxysm occurs every two days. These organisms pass through their asexual cycle within the red blood cells and the bursting of the cells frees toxic materials which are responsible for the chills. The Negro is less susceptible to malaria than men of other races.

One attack of malaria does not produce immunity. The disease increases near the equator and decreases farther north, and death rate is greater in tropical and subtropical countries, especially during the rainy season. It is found chiefly in low, marshy lands, and is less likely to appear at higher altitudes (4,000 to 6,000 feet). In this country, malaria is endemic along the southern banks of the Mississippi, along the Gulf coast, and in the South Atlantic States.

Symptoms of Tertian Malaria: Paroxysms occur every forty-eight hours. There may be yawning, headache, loss of appetite, pain in the pit of the stomach, nausea, vomiting, backache, frequent urination, and constipation or diarrhea. Fever blisters may be present on the nose or lips. The spleen is enlarged only after recurrent attacks. A typical paroxysm consists of cold, hot, and sweating stages.

Symptoms of Quartan Fever: The symptoms are the same as in tertian fever except that the paroxysms occur every seventy-two hours. The fatal cases are less frequent in this type than in the estivo-autumnal type but more frequent than in the tertian.

Symptoms of Estivo-Autumnal Malaria: The incubation period is nine to sixteen days. In the tropics this infection occurs throughout the entire year, but in the sub-tropics and temperate zones, it occurs mostly during July, August, September, and October. The length of a paroxysm is about twenty hours. The rise and fall of the temperature is gradual. The concurrent approach and recession of paroxysms may produce almost continuous fever. The temperature will average 102.5° F., and during the paroxysms it may rise to 105.5° F. During both continued and remittent fever the face is flushed.

It is difficult at times to distinguish this disease from typhoid

fever by the patient's general appearance, but laboratory tests of the blood are decisive.

There is also a pernicious type of malaria. In this type it is very important to have a blood smear taken for diagnosis, since by giving quinine intravenously, life can be saved.

Symptoms of Pernicious Malaria: (1) Sudden coma which may last for one to two days. (2) Severe headache preceding the coma. (3) High temperature, receding to a low level. (4) Irregular and heavy breathing. (5) Feeble pulse. (6) Jaundice may occur. (7) There may be congestion of the lungs.

Unusual Types of Malaria: In certain forms of malaria, parasites are found in the blood, but they do not produce symptoms except when the patient is exposed to cold climate and excessive dampness; also injury or exhaustion may bring on a sudden attack. Persons who have lived in malaria areas for many years may have these dormant infection.

Complications of Malaria: There may be complications of malaria such as enlarged spleen, diseases of the eyes, or kidney diseases.

Prophylaxis: (1) It is most important to avoid areas where mosquitoes thrive. (2) Mosquito control is necessary with eradication of pools, puddles, and swampy areas. If this cannot be done, kerosene should be sprayed over these watery bodies every ten days. The film of oil on the water enters the breathing apparatus of the larvae, which come to the surface and are killed. (3) Destruction of all mosquitoes in houses. (4) Use of screens for all houses to keep out mosquitoes. All persons who have malaria should be isolated in screened houses. The screens used should have sixteen meshes to the inch. (5) Fever paroxysms must be controlled by the use of quinine. The prophylactic treatment by quinine prevents the usual clinical attacks, but *does not prevent* infection. What the prophylactic dose really accomplishes is to keep one up and around. The dose in this case is six grains every day. When atabrine is used, the dose should be 5/6 of one grain for only two days per week. *Those who sleep in tents must use mosquito netting.*

PARASITIC FLIES (Myiasis)

Invasion of the body cavities and skin by fly larvae, termed myiasis, is of different types: gastro-intestinal myiasis, the skin type, caterpillar rash, and harvest rash.

These can be treated locally by antiseptic solutions.

Prophylaxis: Is to prevent access of flies by mosquito nettings, especially when the person is asleep, in coma, or weakened by disease. Although maggots are in general unwelcome in human tissues, they have been intentionally employed in chronic osteomyelitis (W. C. MacNeal).

(1) Gastro-intestinal myiasis may result from swallowing larvae of the common house fly.

(2) The skin type is found in wounds of the skin when the larvae of *Musca vomitoria,* and more frequently the bat fly of ox and sheep, occasionally attack man. In certain parts of Central America another type of bat fly *(Dermatobia)* may rarely be deposited on the surface of man's skin, causing a swelling which resembles a boil.

(3) Caterpillar rash: In some parts of Europe, a caterpillar *(Cnethocampa)* will cause a marked "U" shaped rash on the skin which is rather like hives. This also has been encountered in parts of the United States (in the New England States). In England the yellow-tailed moth *(Porthesia similis)* causes caterpillar rashes.

(4) Harvest rash (erythema autumnale, or autumn rash): In certain parts of England, during the autumn, humans are attacked by a "harvest bug." This condition may become objectionable, and is sometimes thought to be due to a harvest spider. The rash is brick red. Benzine kills this insect.

RELAPSING FEVER (Tick Fever. Febris. Seven Day Fever)

This disease is a specific recurrent fever, caused by a spiral-shaped organism *(Spirachaeta recurrentis).*

Distribution: All parts of the globe, where there are vermin. Endemic in large European cities, as well as India, Africa, Mexico; also in Central and South America and North America.

Experiments show that relapsing fever germs can live within ticks for about five to six years.

Incubation Period: Two to twelve days. The disease may occur seven hours after exposure. The European form is transmitted by lice, the African and North American forms by ticks, but the different types all cause similar symptoms.

Symptoms: Dizzy spells, headache, pain in the body, back and extremities. Chills, fever, constipation, fever sores on lips or anywhere else. There may be some nausea or vomiting, urine is scant and nervousness varies from a slight degree to delirium. Complications such as pneumonia may arise.

The African type is fatal in 25 to 50 per cent of the cases, and the European type in 5 per cent.

Prophylaxis: Prompt treatment and use of arsphenamine by the doctor is indicated. Patients with this disease who are admitted to institutions must be deloused. Attendants should be protected by special clothing. Protection against lice and ticks is essential. In Africa, native huts and camping places should be avoided. In Texas, one should stay away from calves. In California do not live in or around cabins at an elevation of 5,000 feet or more.

SCHISTOSOMIASIS

This disease is caused by little worm like parasites, termed flukes, which get into the human circulation.

Distribution: Southern and northern Africa, southern parts of Asia, Arabia, Persia, India (west coast), and South America.

Incubation Period: Unknown.

Mode of Transmission: By dirty water, where large numbers of these creatures may be harbored. Ova are found in the urine and in bloody mucus from the rectum.

Symptoms: Fever, diarrhea, bloody urine, infection of the urinary bladder. There may be marked loss of weight, anemia (depletion of the red blood cells), and ulcers of the rectum with pain in straining at stool.

Prophylaxis: Avoidance of any body of fresh water where this disease is prevalent. "When in doubt, stay out" should be the motto about bathing in strange waters in the tropics.

TYPHOID FEVER (Enteric Fever)

This is a disease of the human adult. It is uncommon in old people, and not usually severe in children. Some people are naturally immune to it.

Incubation Period: Average, two weeks (rarely three days to four weeks).

Mode of Transmission: Water, food, and flies. The flies carry the germ after having landed on human excreta, and then deposit it on exposed foodstuffs. A milder, closely related disease is designated as paratyphoid fever.

Symptoms: (1) Dull headache and backache. The patient may walk around with the infection for several days and not know he has it. (2) Chills are rare. (3) Loss of appetite. (4) Step-ladder-like temperature which creeps higher and higher until it reaches 104° F. (5) Slow pulse. (6) Loose bowel movements (pea soup type). (7) Spleen becomes enlarged. (8) Rose spots on surface skin of abdomen and back appear about the tenth day to eleventh days of the illness. The disease may last from four to eight weeks.

Complications: There may be intestinal hemorrhages, which can be diagnosed by laboratory tests of the stools. The most serious complication is intestinal perforation. Bronchitis, pneumonia, laryngitis, peripheral neuritis, kidney disease, heart dis-

ease, or congestion of the veins (thrombosis) may develop. Loss of hair is usually temporary.

Prophylaxis: (1) It is best to be innoculated against typhoid fever and A and B types of paratyphoid. (2) Infected eating utensils, clothing, or water used for bathing purposes should be destroyed or disinfected. (3) The sick must be segregated. Excreta should be burned. (4) Drinking water must be boiled and no strange spring water may be used unless tested.

TYPHUS FEVER (Jail Fever. Ship Fever. Prison Fever. Spotted or Louse Fever)

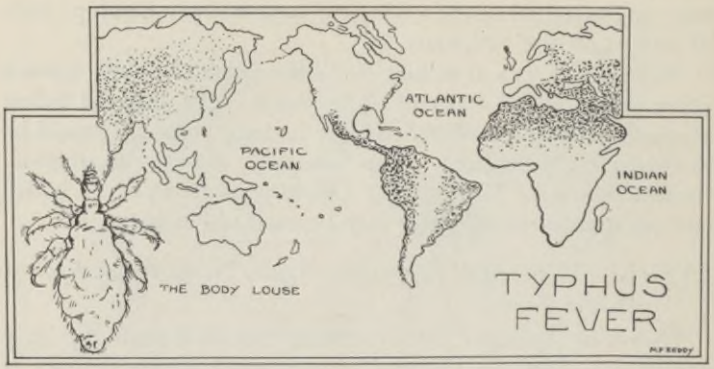
This is an epidemic disease, transmitted to humans by body lice, which thrive in filth and squalor, and wherever there is congestion or close living, as in prisons, camps, poorhouses, and on ships.

Distribution: North Africa and the high altitudes of Mexico and South America. Otherwise it is rare in the tropics. It seems that lice grow best in cool or cold climates, and do not thrive in very warm climates where the temperature remains above 90 degrees Fahrenheit. Typhus fever is commonly encountered in certain parts of Russia, Ireland, and in the Balkan states.

Another type of typhus fever is endemic, and is transmitted by fleas, which get the disease from infected rodents, especially field mice.

Incubation Period: Five to fourteen days, average about ten days.

Symptoms: Poor appetite, weakness, and remote pains over the body, fever, chills, pounding headache, marked prostration, and at times violent vomiting spells. A skin eruption appears about the fifth day. The eruption rarely appears on the face, but generally starts around folds of skin such as the arm pits, and then spreads to the rest of the body. The eruption appears about the ninth day at the maximum, and then the skin condition begins to subside. Spots are a rusty pink color. In the endemic form, the eruption may last just a few days and then disappear.



The nervous symptoms are started with a profoundly severe headache, delirium, prostration, and possibly coma.

The mortality rates vary from 17 to 22 per cent, depending upon the nature of the epidemic and the location. In severe epidemics, death rates may reach as high as 70 per cent.

Prophylaxis: Those who work around restaurants, warehouses, or any place where large amounts of food are stored and rats may dwell should use special hygienic measures, taking care in bathing and the cleansing of clothes.

All patients should be promptly cleansed if lice are on their clothes and skin, preferably at an institution.

The following directions may help, but it is not certain that they will solve the problem: Sterilize clothes exposed to the disease. Attendants should be protected by use of gowns and head covering, legs to be tightly fitted with stockinettes. Use rubber gloves. Rats should be destroyed by poison and traps, and buildings should be rat-proofed.

YAWS (Frambesia)

This contagious disease is encountered in tropical and subtropical regions. The malady is characterized by lesions on the skin which look like raspberries.

Incubation Period: Two to four weeks.

Distribution: Tropical and subtropical climates.

Transmission: By contact through broken skin areas.

Symptoms: First stage: A papule, conical in shape, appears on the trunk of the body, and usually is extragenital. It may also be found around the mouth.

Second stage: An eruption of the skin occurs from one to three months. One may have a headache, and some fever. The rash may be general.

Third stage: Large growths may appear over the body, especially around the groin or on the bones. Ulcers may appear on the soles of the feet (crab yaws).

Prophylaxis: Never permit an abraded skin surface to go untreated with antiseptics in regions where the disease is endemic. No flies or other insects should be permitted to have any contact with the broken skin areas. Those who have yaws should be isolated and screened in rooms. Arsphenamine may be given intravenously, and is almost specific, but it should be administered by a doctor. Bismuth may also be given by intramuscular injection.

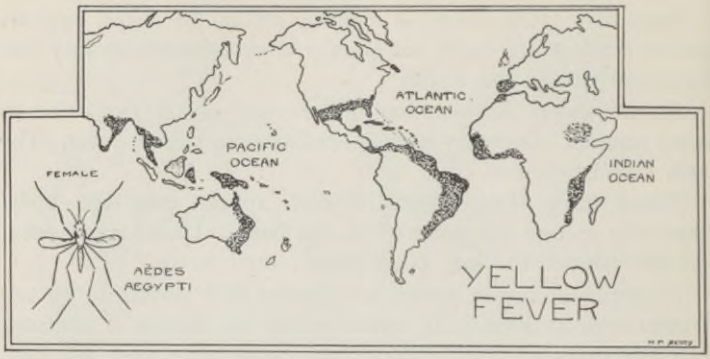
YELLOW FEVER

An acute infectious disease caused by a filterable virus, and transmitted by the mosquito, *Aëdes egypti (Stegomyia fasciata)*. It is found in tropical and subtropical lands.

The most important signs of the disease are: Sudden onset, fever, slow pulse, albumin in the urine, vomiting, jaundice, marked weakness, and hemorrhages from the stomach. The vomited material, which contains blood, looks black.

Incubation Period: The incubation period is two to four days after being bitten by an infected mosquito. The mosquito becomes capable of transmitting the disease about twelve days after it has taken yellow fever virus by sucking blood from a patient.

Distribution: South America, where it is termed "yellow jungle fever," but its manner of transmission has not yet been determined; West Africa, where it occurs endemically; such countries as Boliva, Brazil, Columbia, Venezuela, Peru, and Paraguay. Central America, the islands of the Caribbean, Mexico, and the southern United States.



Prophylaxis: To prevent the introduction of the mosquito into new territory, a quarantine has been established. Passengers must present certificates showing where they came from. Medical inspection of passengers is now made at the port of arrival, and in case of doubt or suspicion, they can be detained by inspectors.

Airplane crews may now be vaccinated against yellow fever, but this procedure is not entirely free from danger, since recently yellow fever has been observed following vaccination.

Fumigation of airplanes is essential, and airports should be kept free from any signs of *Aëdes egypti* mosquitoes. All ships should be quarantined and fumigated also, with inspection of passengers and crew. On land, control may be accomplished by destroying all breeding places of the *Aëdes egypti.*

Treatment: There is no specific treatment for yellow fever. During an attack, no food is given at first; then bland liquids, except milk, are allowed. No laxatives are given for the first seventy-two hours, and only enemas are used. If vomiting occurs, small bits of ice may be sucked. A physician should be in attendance if available. During convalescence food should be resumed very slowly and carefully. No fatty foods are permitted. The patient should remain in bed about seven to fourteen days after the fever first disappears.

DENGUE (Dandy Fever or Breakbone Fever)

Dengue is an acute infectious disease endemic in subtropical and tropical regions, although it may suddenly become epidemic. Symptoms are sudden headache, painful joints with severe muscle pains (breakbone fever), accompanied by fever and occasionally by a skin eruption. There may be a rapid pulse, prostration, and at times mental depression. There is rarely intermission, such as occurs in malaria or undulant fever, but there may be a remission with a sudden fall in temperature and profuse sweating. There also may be a stage of exacerbation, or increase of symptoms. This disease is rarely fatal.

Incubation Period: Two to seven days.

Transmission: By bite of an infected mosquito—*Aëdes albopictus* and *Aëdes egypti.*

Prophylaxis: Control of the mosquitoes. Clean up discarded things, and do not permit stale water to stand about even in flower pots, vases, pails, stagnant toilet bowls, bottles, or pails.

First Aid: Keep the patient in bed, give him a laxative, administer nutritious feeding. Allow cold drinks, sponging, and bathing. A physician should be in attendance if possible.

ANKYLOSTOMIASIS (Hookworm Disease; Egyptian Chlorosis)

This disease is caused by infestation with one of two small nematode worms, *Ankylostoma duodenale,* or *Necator americanus.* It causes gradual but marked and progressive anemia. The white race is most commonly affected.

Distribution: In all warm countries during the rainy seasons.

Transmission: By walking barefoot in polluted soil. The ova, deposited in human stools, hatch in twenty-four to forty-eight hours. The larvae reach the infective stage in about eight days. They enter the body through the skin, and are carried by the blood stream to the lungs. They ascend through the bronchial tubes, and then descend the esophagus to the stomach and small intestines. Here the larvae take about thirty-five days to mature fully and produce the ova which are excreted and blend once more with the soil.

Symptoms: Abnormal appetite, anemia and dizzy spells, chronic weakness, heart palpitation. Microscopic examination of the stool will disclose ova. Usually, there is a history of walking barefoot in places where the disease is found.

Prophylaxis: Construction of sanitary latrines. A rectangular trench can be constructed, and a flat metal frame should be made to cover the excavated area. When not in use, a metal lid can cover the frame for sanitary purposes. No one should be permitted to walk about barefooted, and a good quality shoe should be worn at all times. Persons infested with the worm can be treated with small doses of carbon tetrachloride. Unfortunately, a sufficient concentration to kill the worms may be too great for human tolerance. The optimum dosage depends on the individual reaction and should be determined by a physician.

RINGWORM (Tinea Trichophytosis)

Ringworm is an infection of the skin. It may be localized on any part of the body. The disease is produced by a fungus *(Trichophyton),* which invades the skin surface and the roots of the hair. The infection can readily be transmitted, especially the disease of scalp and feet.

Type of Ringworm: There are a number of different types of this infection:

(1) Ringworm of the body *(tinea circinata):* In this group are skin disease of neck, face, and back of hands. The eruption occurs in small areas. Most commonly the lesions are ringlike in character. These may last for a few days or weeks and gradually disappear. The eruptions are reddish, and appear to be moderately elevated above the surface of the skin. The rings may run together to form enlarged circles, the center of which dries up and fades, leaving small crusts. Sometimes these crusts resemble small watery blebs or vesicles. There may be mild or severe itching.

(2) Barber's itch *(tinea sycosis)* (ringworm of the beard): This form may be transmitted by unsanitary barber shops, or by handling infected horses, cattle, dogs, or cats. In this type of infection the mycelia and spores are embedded in the hair follicles.

(3) Ringworm of the scalp *(tinea tonsurans)*—(scaly mycoses): This condition is most commonly found in children, although adults may be subject to it on rare occasions.

(4) Ringworm of the nails (nail mycoses)—*(tinea unguium):* This is a disease of the nails caused by vegetable parasites.

(5) Athlete's foot (ringworm of the extremities; epidermiphytosis): This condition is contracted by walking about in moist or damp infected surfaces such as swimming pools, bathing beaches, bath houses, bath rooms, and gymnasiums. Contaminated slippers, shoes, socks, or clothing may be another source of infection. The dampness of the tropics may favor this disease if barefooted.

Prophylaxis For Athlete's Foot: Sanitary measures in camps and public institutions should be instituted, such as the use of one per cent sodium hypochlorite in foot baths for shower rooms and swimming pools. These foot baths should be kept far enough away from the showers so that the germicide is not diluted from sprayed water. The use of powder containing twenty per cent sodium thiosulfate protects the feet before putting on socks.

Protective foot coverings should be used at all times when one is exposed to damp infected surfaces. There should not be indiscriminate use of socks, shoes, or slippers. These should be used only by one person.

Treatment for Athlete's Foot: For athlete's foot one of the following formulas should be applied locally after washing the infected parts in sixty-five per cent alcohol:

(1)	Phenol	0.30 grams
	Zinc oxide	30.00 grams
(2)	Sulphur precipitate ..	1.50 grams
	Vaseline	30.00 grams

Prophylaxis for Ringworm of the Body: Wash the infected areas often with a mild soap and water in order to remove the scales, mycelia, and spores. In resistant skin infections tincture of green soap is very helpful. Follow with an application of tincture of iodine, one part, to four parts of grain alcohol. This

should be rubbed in effectively with a thick cotton swab or a soft clean toothbrush. Never use mercury salve and iodine solution at the same time, as severe skin irritation may result. In stubborn cases, x-ray treatments may be required.

Prophylaxis for Ringworn of Groin and Genital Organs: (1) Do not use soiled towels or soiled jock straps. When jock straps are used, these should be frequently laundered. Protective footwear should be used to avoid coming in contact with contaminated floors. (2) Never use strong solutions. (3) Use calamine lotions, with one percent phenol (carbolic acid), or mild dusting powders such as corn starch or boric-acid powder. When the skin area can tolerate it, use mild bichloride of mercury salve, 1/5000. The following solution may also be very helpful:

Sodium Thiosulfate	30.00 grams
Glycerine	4.00 grams
Alcohol (1 oz.)	30.00 cc.
Water Distilled (8 oz.)	240.00 cc.

This makes a good mixture to be applied freely twice a day.

Prophylaxis for Scalp Ringworm: Always use a clean comb and brush. Each person must have *his own comb,* which should be carried on the person at all times, so that no temptations are present to use combs in public places.

Prophylaxis for Barber's Itch: All military barber shops are carefully inspected, so there is no danger of transmission of barber's itch. Some civilian barber shops, however, may be unsanitary, and should be avoided. Whenever a barber makes indiscriminate use of hot face towels, brushes, combs, and a common shaving mug, that barber shop should not be patronized. The treatment of face ringworm is the same as for other parts of the body. Sometimes complete removal of hairs may be necessary, followed by application of a mild lotion, salve, or wash. Towels should be sterilized and kept separate. Facial tissues which can be burned after use are preferable.

Prophylaxis for Ringworm of Nails: Infected nails should be trimmed and fingers soaked in tincture of green soap. Nails, if brittle and dry, may be removed, and a mild solution of 1/5000

bichloride of mercury used for 20-minute soakings, followed by application of bichloride of mercury salve, 1/5000.

HEAT CRAMPS:

Due to excessive heat, the body may suddenly be affected by severe pains or cramps. The muscles of the legs are commonly affected, although the abdominal muscles may also be involved, and the pain may be very severe. Usually, this is a forerunner of heat exhaustion.

Treatment: (1) Mild massage of muscles with application of moderate heat to the extremities and the abdomen. (2) Administration of salt tablets with some water, or a teaspoonful of salt in a glass of water.

SUNSTROKE:

Undue exposure to the sun without adequate protection may lead to the condition commonly known as sunstroke.

Symptoms: The face becomes red, and there is severe headache. No perspiration is present, the skin of the body is dry and feels hot to the touch, and the body temperature is high. The pulse is fast, full, and strong. There may be unconsciousness or semiconsciousness.

First Aid: Lay the body flat, with head elevated, in the shade. Apply cool sponges to the body. After consciousness returns a cool bath may be used. Do not administer any stimulants.

HEAT EXHAUSTION:

Heat exhaustion may be caused either by direct exposure to the sun's rays or from excessive heat indoors.

Symptoms: Usually the face is livid or pale. The body perspires freely, the skin is moist and somewhat cool to the touch, and the body temperature is below normal. The pulse is weak. There is faintness, but usually not unconsciousness. If unconsciousness does occur, it lasts but a few seconds or minutes.

First Aid: Place the body flat, and keep the head below the level of the body. Apply heat to the body. Administer stimulants. Always remember that due to excessive sweating much of the body's salt content has been eliminated. Therefore, always

give some salt—about one teaspoonful to a glass of water. This should be repeated three times a day. (Especially in the case of those who do heavy marching or hard manual work, salt tablets should be taken at regular intervals two to three times daily).

TROPICAL NEURASTHENIA:

This psychologic maladjustment may be caused by excessive work, anxiety over different problems, sexual neuroses, or the inheritance of a poor nervous system. These causes may be aggravated by addiction to alcohol, or by focal infections (as in teeth, tonsils or sinuses). A previous attack of influenza may also have contributed to this condition. A more direct cause may be the existence of low vitality, aggravated by persistent monotony in rainy weather or excessive heat. Further predisposing agencies may exist in diseases such as malaria, dysentery, hookworm, parasites, and advanced constipation.

Those who suffer from tropical neurasthenia have low blood pressure, and are disinclined to work. When they do expend energy, periods of exhaustion follow. Sometimes this picture is made worse by belly cramps, which may be accompanied by nausea, vomiting or diarrhea.

To overcome this condition, one must take a sufficient amount of table salt (sodium chloride). At least ten to fifteen grams of salt daily should be used. If the neurasthenia is marked, foods high in potassium content should be eliminated from the diet. These are apples, apricots, bananas, dates, figs, olives, peaches, prunes, raisins, peanuts, coconuts, almonds, cocoa, mustard, and kidney or lima beans, all types of potatoes, spinach, cabbage (especially the green variant), meat extracts, and dried peas.

It would be wise to use a nasal spray of ephedrine sulfate three or four times a day to help increase the blood pressure. Exercise of limited nature can be done periodically. This will also help to raise the blood pressure. Alcoholic beverages and excessive smoking are to be avoided. Focal infections must be removed.

If these simple steps do not relieve the symptoms of tropical neurasthenia, it would be well to seek the advice of a physician

if one is available. Otherwise, avoid all excesses and have a well-balanced diet for varied vitamin intake. Finally, one must not lose sight of the importance of minerals in the diet. These are important in keeping up body resistance.

SNAKE BITE:

Although poisonous snakes are found in the temperate zones, they generally stay away from inhabited districts, and many Americans have never seen one outside captivity. In the tropics, however, there are numerous dangerous species, and accidents are common. In India, for example, the annual loss of life from snake bite is about 20,000. By taking proper precautions in areas infested with poisonous snakes, most of the risk can be avoided.

Two main classes of poisonous snakes may be distinguished for our purposes—the long-fanged vipers and pit vipers found in both the Old and New Worlds, and the short-fanged cobras and their relatives found chiefly in Australia, India, and Africa. The long-fanged snakes are capable of delivering a bite through several layers of cloth or through thin leather, and heavy clothing protection is necessary. The short-fanged snakes are generally unable to bite through loose-fitting clothing. Among the short-fanged snakes, however, are some of the most deadly species (for example, the Indian black cobra and the king cobra), and they frequently make up in activity and boldness what they lack in offensive armament. Some of them are arboreal in habit (notably the African mamba), and may inflict a bite on the face, hands, or other exposed part of the body which the sluggish ground-ridden viper would be unable to reach.

In any particular locality it is important to know the species of snakes likely to be encountered, to be able to recognize them at sight, and to have a general knowledge of their habits. Such knowledge will enable one to avoid danger in most cases, and to take the necessary steps to save life if an accident occurs.

Poisonous snakes are equipped with perforated or grooved teeth called *fangs,* which inject a powerful venom directly into the tissues. The fangs of a big diamond-back rattlesnake may be

as long as an inch. They are exactly like hypodermic needles, having sharp ends cut on the bias. In the vipers, the fangs fold inward when the snake's mouth is closed, and spring out into position to inflict a stabbing blow when the snake strikes. At the base of each fang is a poison secreting gland which contracts at the instant of the bite and forces venom through the fang into the victim's flesh. As much as a cubic centimeter of the amber-colored fluid may be injected at a single bite.

The venom of different species of snakes reacts differently upon the body: that of the big vipers (rattlesnakes, moccasins, the bushmaster, and fer-de-lance) attacks principally the blood, producing great swelling and destruction of corpuscles; cobra venom attacks the nerve centers, producing paralysis and failure of respiration. A few species secret both kinds of venom; this is particularly true of the tropical rattlesnake or "cascabel," found in Mexico, Central America, and Brazil.

Most snake bites are on the lower part of the leg, and a pair of stiff puttees, preferably of leather, furnishes protection. High shoes with strong leather tops should be worn, and particular care should be taken to ensure that the shoes and puttees overlap at the ankle. Such protection is adequate for tramping through low scrub or tall grass. The following is quoted from the late Dr. Raymond L. Ditmars, world authority on snakes:

> "There is one point to be particularly remembered, however, especially in the southern states, and that is care in stepping over big trunks of fallen trees. There is every chance that the disintegrating trunk may have a hollow on the opposite side or there may be shelf-like patch on matted brush. This would mean that a coiled snake on the opposite side would be well elevated from the ground and might strike one in the thigh. I recall one fatal accident, from a large water moccasin, from this very condition. . . . It is important to bear in mind that while the legs are protected the practice of using the hands in climbing rocky places or getting over a stone fence is dangerous, unless each hand-hold is investigated with due thought of crevices or hollows that may secrete a coiled serpent. Any thick,

brushy place, or pile of leaves, in the wilder country, should be considered a hazard, unless the eye is keen in noting where the hand is directed." [1]

If one is bitten by a poisonous snake, *immediate* action is necessary. The first step is to apply a tourniquet (a rubber ligature is best, but any kind of tight bandage, or even a piece of rope will serve in an emergency) just above the bite. This prevents the poisoned blood from passing freely into the general circulation. The tourniquet should not be too tight to prevent arterial blood from flowing, and should be released for about one minute every fifteen minutes.

After application of the tourniquet, a scalpel or knife blade should be sterilized (by a candle or match flame), and a cross-shaped incision made at the site of each fang mark until free bleeding occurs. Care must be taken not to sever arteries or veins. The cuts should not be deeper than one-fourth inch unless the bite is by a particularly large viper; three-eighths of an inch should be the maximum in any case unless the operation is done by a trained surgeon. If a vein or artery is severed, the poison will be distributed more rapidly.

After incisions have been made to promote bleeding, suction should be applied to the wound. There is no danger in sucking a snake bite by mouth unless there are cuts or sores through which the venom could enter the blood stream. A bulb type suction pump should be included in every snake bite first aid kit.

The bitten person should be kept as quiet as possible so as not to increase the circulation activity. Standing and moving about carries the poison faster to the tissues. If one is alone when bitten, he should make his way toward help with as little exertion as possible *after applying first aid measures.*

In all the large countries where poisonous snakes are a serious problem (notably Brazil, India, and Australia), there are available specific serums for combatting snake bite. These serums or "antivenins" are prepared by immunizing horses with small injections of venom over a long period. For best results, the anti-

[1] Raymond L. Ditmars, *Snakes of the World,* (1936). By permission of The MacMillan Company, publishers.

venin used should be that prepared against the specific venom with which the victim has been innoculated. It is therefore of great importance to *know the species of snake that has done the biting.* So-called "polyvalent" serums are available for use against the venom of various related species, but they are less effective than specific antivenins.

Antivenin treatment for snake bite is highly effective, and every effort should be made to be supplied with tubes of specific serums against the species of snakes one is likely to encounter. The serum is put up in glass tubes of proper dosage, ready to be fitted with a hypodermic needle and plunger for immediate use. The serum is injected under the skin, not in the vicinity of the bite, but in the abdomen or shoulder where it will be quickly absorbed into the general circulation. The needle need not penetrate deeply, but should be thrust in nearly parallel to the skin surface. The serum may be used at any time after the bite, but best results, of course, are secured if it is used immediately.

Some of the most important poisonous snakes and their principal habitats are listed below:

Australia

Black snake *(Pseudechis porphyriacus).* Thin-bodied and graceful; some widening generally noticeable just back of the head where the bones capable of spreading the "hood" lie. Grows to a length of four or five feet, and is often found in swampy places.

Brown snake *(Demansia textilis).* Thin-bodied and whip-like; light brown above and creamy-white on the belly. Grows to a length of five or six feet.

Death adder *(Acanthophis antarticus).* Short and stubby, rarely reaching two feet. Grayish-brown in general color and difficult to see in sandy places. Proportionately large head and fangs. Although a member of the cobra family, and secreting a neurotoxic venom like other cobras, the death adder looks like a typical viper. It is the most poisonous of Australian snakes, and along with the tiger snake, accounts for three-fourths of the snake bite fatalities in that country.

Tiger snake *(Notechis scutatus)*. Grows to a length of five feet, and can usually be identified by the dark bands crossing the lighter brown body, reminiscent of the coloration of the tiger. It is a bold and dangerous snake, and because of its wide distribution is responsible for more deaths than all other Australian snakes taken together. Its venom is powerfully neurotoxic (paralyzing).

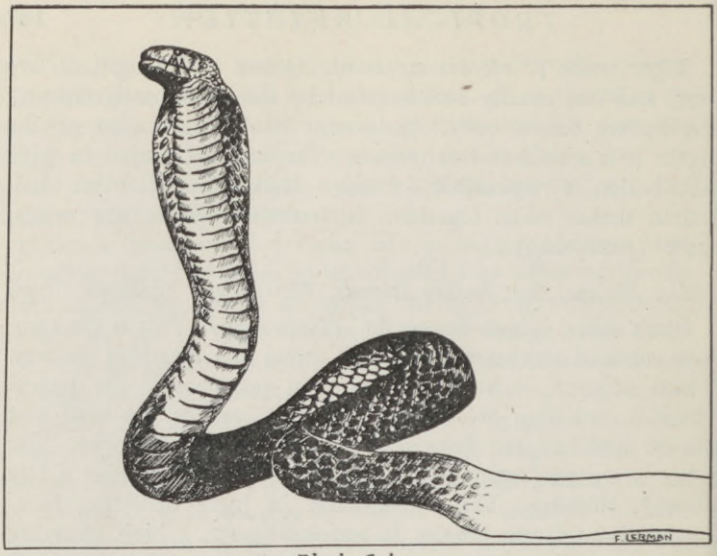
India, Malaya, East Indian Islands, Philippines, Southern China

Black cobra, "cobra-de-capello" *(Naja naja)*. This is the common cobra of southeastern Asia. It grows to a length of six feet. When angered, it habitually rears up and spreads the typical "hood," consisting of folds of skin just back of the head that can be stretched out fanwise by a set of movable bones. The cobra is a short-fanged snake, and is rarely able to inflict a bite through clothing. The native habit in India of going bare-legged through the jungles is responsible for a high mortality rate from the bite of this snake.

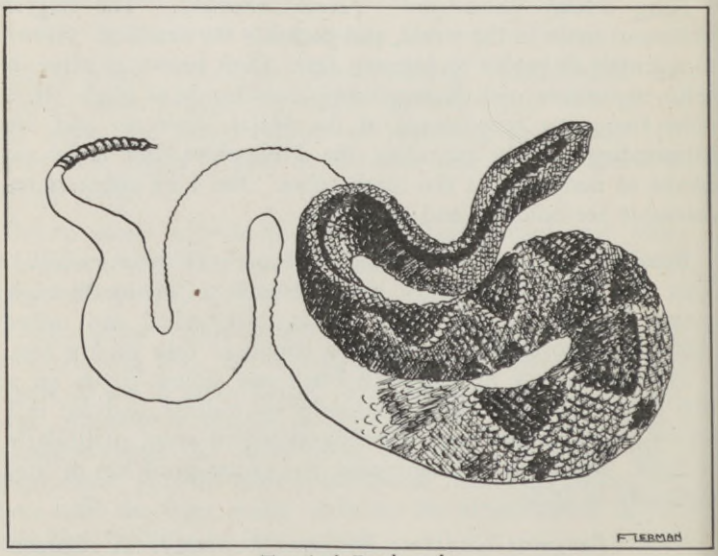
King cobra, "hamadryad" *(Naja hannah)*. The largest poisonous snake in the world, and probably the deadliest. Grows to a length of twelve to fourteen feet. Dark brown or olive in color, sometimes with inconspicuous cross bands of black. It is most frequently encountered in the Malay Peninsula and the surrounding islands, including the Philippines, but is by no means as numerous as the black cobra. The king cobra is remarkable for boldness and agility.

Russell's viper, "tic polonga," "daboia" *(Vipera russelli)*. This is a large long-fanged snake, capable of biting through canvas leggings or thin shoes. It is thick-bodied and rather sluggish in movement. Grows to a length of four or five feet. It is conspicuously marked with black and yellow circles on a rich brown body. It feeds principally on rodents, and for this reason is frequently found prowling in settled areas, particularly at night. Its bite is very dangerous, and causes great loss of life, especially in India.

Krait *(Bungarus candidus; Bungarus fasciatus)*. A common



Black Cobra.



Tropical Rattlesnake.

snake of southeastern Asia. Grows to a length of three or four feet. The color is dark brown or black, with cross-bands of lighter color. Thin-bodied with particularly small head. Kraits have an unpleasant habit of prowling into human habitations in search of food, and are responsible for heavy loss of life. They rarely bite, however, unless actually stepped on or otherwise touched. They are nocturnal in habit, and often are encountered on dusty and sandy roads which retain warmth after the sun goes down.

Tree viper *(Trimeresurus gramineus)*. A medium-sized snake (two to three feet) found throughout southeastern Asis. It is commonly called the bamboo snake, and is much dreaded. Like the palm viper of Central America, this snake is arboreal and is especially dangerous because of the possibility of a man's receiving a bite on the hand or face while making his way through a thicket. Its green color, sometimes modified by lighter markings, makes it difficult to see among foliage.

Africa

Spitting cobra, black-necked cobra *(Naja nigricollis)*. This snake is found throughout tropical Africa, and is remarkable for its ability to eject venom to a distance. It is usually black or brown in color, although there is considerable variety. In the lighter colored examples, there is a noticeable black band across the neck just below the hood. The species grows to six or seven feet in length. When annoyed, this snake rears its head two or three feet from the ground and ejects two thin streams of venom from its fangs. (It may also bite in the conventional manner). The ejected venom is directed accurately for a distance of five feet or more toward the victim's eyes. It produces intense irritation of the eyes upon contact, and may cause permanent blindness. The venom does not attack the skin, however. There are cases on record of men having saved their eyes by instantly closing them upon encountering a spitting cobra, and washing the venom away with water before opening the lids.

African black cobra *(Naja melanoleuca)*. A large cobra of tropical Africa. Grows to a length of seven feet. Distinguished by its shiny, lustrous scales.

Egyptian cobra, "asp" *(Naja haje)*. The common cobra of Egypt and northern Africa generally. Despite its name, however, it is found throughout the continent. It habituates hot and dry places, and its color, generally a dingy brown, blends with its normal surroundings. It grows five feet long.

Black mamba *(Dendraspis angusticeps)*. This snake grows to a length of twelve feet, and is probably the most dangerous reptile of Africa. It is found chiefly in the southern half of the continent. A green variety is considerably smaller than the black, but equally dangerous. Mambas are very thin-bodied, highly active snakes, arboreal in habit. Their movement is a speedy glide, not a crawl. They are frequently found close to human habitations as well as in wild country.

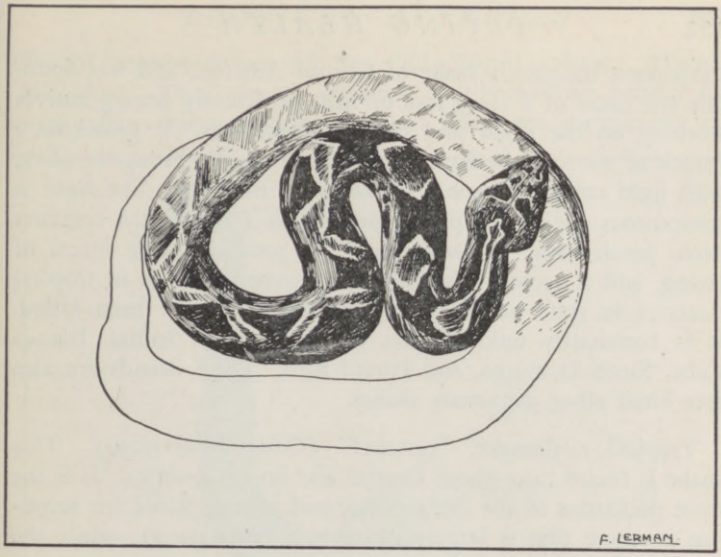
Puff adder *(Bitis arietans)*. A large, thick-bodied, long-fanged viper found throughout the African continent. It has black bars interspersed with yellow markings, and receives its name from its habit of blowing up its body with air and emitting a loud hiss when annoyed. Its bite is very dangerous. Several other thick-bodied vipers related to the puff adder also inhabit Africa, notably the gaboon viper *(Bitis gabonica)* easily distinguished by its sharply marked yellow and brown pattern, and the rhinoceros viper, *(Bitis nasicornus)*, or river jack, which is frequently encountered in wet places. These snakes have heavy, heart-shaped heads and long, highly developed fangs. The rhinoceros viper has two conspicuous horns upon its snout.

In connection with African poisonous snakes, it is interesting to note that there are no dangerous snakes in the large island of Madagascar.

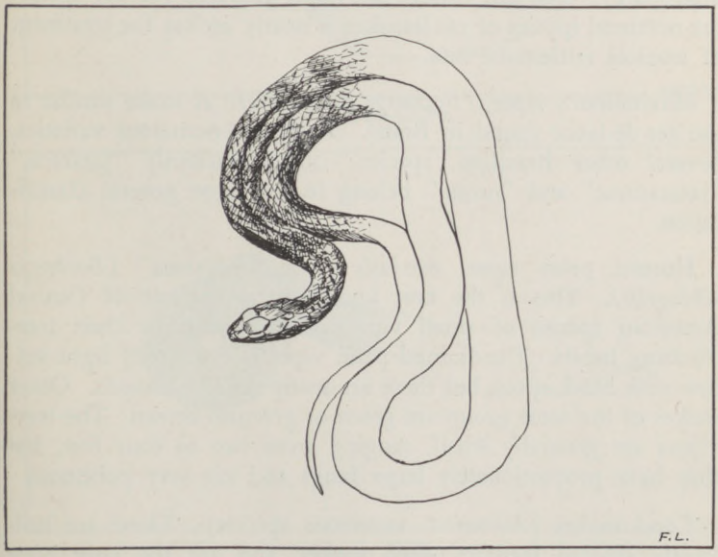
South and Central America

Bushmaster *(Lachesis muta)*. A very large pit viper of tropical America. Specimens twelve feet long have been recorded. It is found in largest number in Panama, Costa Rica, and Nicaragua, but is nowhere a common snake. It is light brown with dark blotches. Its bite is usually fatal.

Fer-de-lance, barba amarilla, *(Bothrops atrox)*. This is the



Maximilian's Viper.



Tiger Snake.

commonest dangerous snake of Central America, and was formerly the cause of a large loss of life, particularly among natives working on the sugar and banana plantations. It grows to a length of six to eight feet. The body is usually brown or olive, with light colored rhombic markings on the back. The head is conspicuous for its sharp triangular form (whence the common name *fer-de-lance,* or *lance-head).* It produces large litters of young, and is accordingly still a very common snake in tropical America in spite of the large numbers that have been killed. It is fortunately unknown on the large West Indian Islands Cuba, Santo Domingo, and Puerto Rico. These islands are also free from other dangerous snakes.

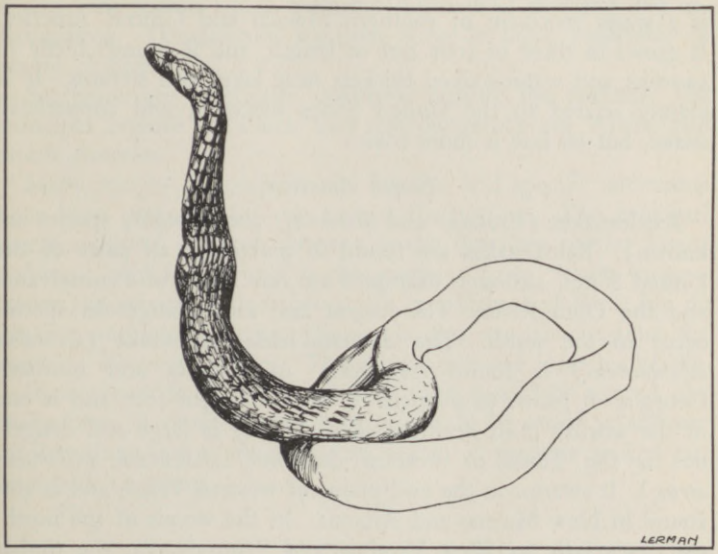
Tropical rattlesnake, "cascabel" *(Crotalus terrificus).* This snake is found throughout Central and South America. It is the most poisonous of the rattlesnakes, and is remarkable for secreting a venom that is largely neurotoxic (paralyzing), while the venom of the North American rattlesnakes is hemolytic (blood-destroying). For this reason, antivenin prepared for use against the northern species of rattlesnakes is nearly useless for treatment of tropical rattlesnake bite.

Maximilian's viper, *(Bothrops neuweidii).* A snake similar to the fer-de-lance found in Brazil. There are numerous varieties. Several other Brazilian species, called variously "jararaca," "jararacucu," and "urutu," belong to the same general classification.

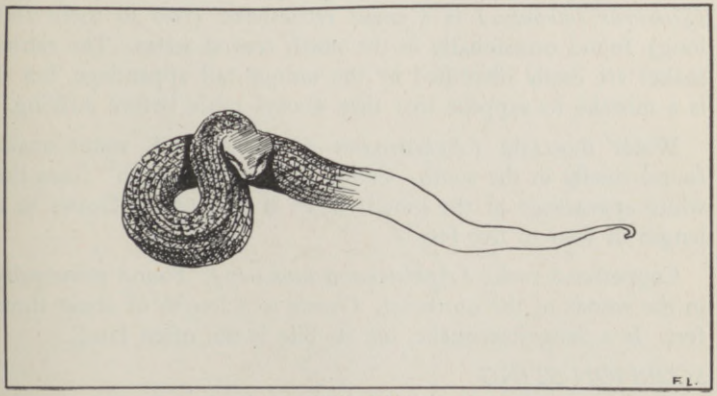
Horned palm viper, eye-lash viper, "bocaraca" *(Bothrops schlegelii).* This is the best known of a number of Central American species of small vipers distinguished by their tree-climbing habits. The horned palm viper is commonly light yellow with black spots, but there are many color variations. Other snakes of the same group are green or greenish-brown. The tree-vipers are generally small, ranging from two to four feet, but they have proportionately large fangs and are very poisonous.

Coral snakes *(Micrurus;* numerous species). These are brilliantly colored medium sized snakes, and are the only New

World representatives of the Old World cobras. (Family *Elapidae*). They are of secretive and borrowing habits, and rarely bite unless actually touched. They are conspicuous for



Egyptian Cobra.



Death Adder.

their bright red, yellow, and black markings, but are easily confused with a number of harmless species of similar coloration.

Tropical moccasin, "cantil" *(Agkistrodon bilineatus)*. This is a water moccasin of southern Mexico and Central America. It grows to three or four feet in length, and is found chiefly in swamps and water-soaked thickets near lakes and streams. It is closely related to the United States moccasin and copperhead snake, but its bite is more toxic.

North America

Rattlesnakes *(Crotalus* and *Sistrurus;* about twenty species are known). Rattlesnakes are found in practically all parts of the United States, although examples are rare north of Pennsylvania and the Ohio River. The largest and most dangerous species occur in the south. The diamond-back rattlesnake *(Crotalus adamanteus)* is found frequently in Florida and southern Georgia. It grows to a length of seven or eight feet, and is one of the world's most deadly snakes. Nearly as large and dangerous is the Texas or western diamond rattlesnake *(Crotalus atrox)*. It swarms in the arid plains of western Texas, and is also found in New Mexico and Arizona. In the woods of the northeast, especially in West Virginia and Pennsylvania, the timber rattlesnake *(Crotalus horridus)* is common. The massasauga *(Sistrurus catenatus)* is a small rattlesnake (two to three feet long) found occasionally in the north central states. The rattlesnakes are easily identified by the unique tail appendage, but it is a mistake to suppose that they always rattle before striking.

Water moccasin *(Agkistrodon piscivorus)*. A water snake found chiefly in the south. Called the "cotton-mouth" from the white appearance of the mouth when it is opened. Grows to a length of four to five feet.

Copperhead snake *(Agkistrodon mokasen)*. Found principally in the woods of the northeast. Grows to a length of about three feet. Is a dangerous snake, but its bite is not often fatal.

SCORPION STING

Scorpions are small, cray fish-like animals belonging to the

spider family. Large specimens are four to seven inches in length. They have no wings. They are equipped with a sharp, horn-like process at the end of the tail (sting), and they secrete a powerful venom which produces much local swelling and inflammation. Occasionally scorpion sting is fatal, especially in young children.

Scorpions are practically unknown outside the tropics. The principal regions in which they are dangerous are Africa and South America.

Many species of scorpions are known, and specific antivenins have been prepared for use against their stings. The principal scorpion found in South America is the Brazilian species *Tityus bahiensis,* which is found in the southern part. Serum to neutralize the venom of this species can be obtained at Para, Rio de Janeiro, and other centers. Serum is also available against the common Egyptian species. The serums are not interchangeable.

If no serum is available, scorpion sting should be treated like snake bite. A cross-shaped incision should be made at the site of the sting, and as much of the venom as possible sucked out by mouth or pump.

XI

Arctic Aviation

WHILE this chapter was being written Capt. Edward Clark and his three companions wrote Arctic aviation history in a U. S. Army Flying Fortress. After crashing in bad weather the occupants of the aircraft narrowly escaped death. Capt. Clark and his three companions, battling the hands of death in an isolated mountain region of Alaska, lived an adventure matching anything in the epic of Homer.

It is today a common thing for fliers to sweep the skies even over lonely arctic zones as they defy the elements moving at high speed. However, since engines are mechanical "by-products" of man's brain, there is always the possibility of "engine failure"; and since the pilot is human there is always a chance of "pilot error." Powerful fortresses may fly with calculated certainty as scientifically accurate instruments on the dashboard are read by the keen eyes of the aviator. But the elements sometimes will seek to dwarf man's great inventions—storms brew out of nowhere. Even a roaring modern plane may fail in the presence of the angry temper of nature—lashing her winds and creating frost as it seeks to intimidate the man at the controls.

When such an accident occurs in the vast stretches of snow-covered land and mountains, the flier must be prepared to fight such enemies as cold, hunger, thirst, exposure and disease.

Arctic Clothes: The best clothes for winter protection is reindeer (caribou) skin. Every Eskimo has learned that this skin

is invaluable for keeping the body comfortable. The total clothing should not weigh more than about *ten pounds*. This is the maximum weight for efficiency of body motions through arctic areas. Complete in Eskimo garb plus protective boots give adequate protection for 50° below zero weather. Though not quite so good as caribou, apparel skins from the polar bear, fox, wolf, beaver, hare, muskrat, and squirrel may also be used for outer apparel. The best material for underwear is the fleecy skin of new born fawn. Coats and trousers may be made of fawn skin 4 to 6 months old.

The inner mittens are made from skin of yearling reindeer as well as from skins of fawn. The best outer mittens are made from leg skins of yearlings or from skins of 2 year old caribou.

Socks are made of the fur of summer yearlings. Slippers which are worn outside the inner socks are made of fawn skin.

Various types of boots can be used for land use.

If one should accidentally fall into a body of arctic water and *is alone*—the first thing to do after getting on land is to roll in cold snow . . . the colder the snow the better. This acts as an absorbing agent and removes most of the moisture from the clothes. It is dangerous to remove clothes without shelter. The body becomes chilled and the clothes become frozen stiff if one does not roll in cold snow. Next is the precaution to *change socks*. This should be done at once, regardless of temperature.

Never attempt to change a wet suit alone in the open. Extreme cold makes the body and hands numb. During a wind, a shelter will be necessary. Winds cause wet clothes to freeze promptly.

Soaked clothing affords a sort of compensation for although the clothes are heavier, they are more windproof than in a dry state.

When lost in a blizzard it is important not to become panicky and to conserve one's energy. The danger of over-exertion is excessive sweating so that the clothes become damp and freeze. There is also the danger of becoming physically exhausted.

Frostbite of the Face: Frostbite of the face can be avoided by placing warm hands against the face at frequent intervals. Best to make grimaces to detect frostbite of the face. When frostbite is detected it is best to be thawed out as soon as possible. The hands can be kept warm if the clothes worn are loose by thrusting them alternately under the outer clothes against the chest.

It is important to be clean-shaven for in the presence of a beard moisture emanating from the breath congeals on the beard. This will produce a face mask which becomes separated from the face by about 1/16 inch air space. If there is freezing underneath the ice mask, one cannot get to his face during frostbite and thaw it out by the use of the warm palm.

Treatment of Frostbite: If any part of the body becomes frozen, the most important caution is to avoid all roughness, attempts at massage, rubbing or squeezing. Rubbing with snow is definitely harmful, and should *never* be done. Friction and exercise of a part *threatened* with frostbite is desirable, and may stimulate circulation and prevent frostbite from developing, but once freezing has occurred (as evidenced by loss of sensation and hardness of the suspected tissue) any mechanical manipulation will be harmful. The frostbitten part should be protected from cold and allowed to thaw *slowly* at a temperature not much above the freezing point. A frozen extremity may be immersed in *cold* water, but never treated with warm water, or thawed by positive heat.

Tents: For camping in northern forests during summer months, any type of standard tent is good. But special steps must be taken against mosquitoes. Windows in tents must be closely covered by mosquito nets.

Winter tents of standard average height are best. If the tent is much higher than 6 feet, it becomes nearly impossible to keep it warm.

In a tent everything is closed up to get warmth. When the outside ice accumulation closes up the tent pores there is danger of carbon dioxide poisoning.

The snow house with a vent-hole at the top solves the problem of avoiding carbon dioxide poisoning, and is more satis-

factory than a tent for winter occupancy. It is warm, well ventilated, and less vulnerable to wind.

In a properly built snow house clothes dry quickly on the body. In a tent the clothes dry too, but during the cooking processes moisture will again form in the garments, as the ventilation of the tent is not as good as the snow house.

At a temperature of —60° to —80° F., the acuity of hearing is increased. One may hear a conversation anywhere from one-half to one mile distance. Footsteps on the ground can be perceived by the human auditory apparatus about 2 miles away; and woodchopping can be heard about 11 miles away.

The vision is clearer and visibility is better provided no condensing moisture is in the air.

At —50° one can see small objects clearly at a distance of two and a half miles as easily as at one mile at 50° above zero. One is likely to misjudge distances even with experience in the arctic zone. Distant objects, such as mountains, do not acquire the purple hue usually associated with distance; nor is the outline blurred. The flier over the arctic has a clear visibility for 40 to 50 miles, and sees that distance as easily as he would see 10 miles if he were flying over the tropics on a clear day One may be confused, therefore, in judging distance even though he may have been living in the arctic region for a long time.

Drinking Water in the Arctic: After having properly protected the body against the severe cold, the next arctic enemies to vanquish are thirst and hunger. During the winter when one is camping on the ice at sea, it is best to use for both drinking and cooking purposes the ice about a year old or more. This can be recognized by the rounded corners caused by rain or thaws of one or several summers.

Salt ice is grey but drinking water ice looks blue. Salt ice is tough and splinters with difficulty. Ice that breaks easily with a knife is probably good water for drinking and cooking purposes.

During the summer months one can usually obtain fresh water at sea by obtaining it from the hallows in old ice as it floats.

Stefansson found on the average of 10 feet of fresh water in an ice mass resting upon the salt water underneath. He has observed that this water remains practically fresh up to the middle of autumn. By November the drifting ice churns up the ocean, and fresh water pockets in the ice are no longer found.

If no fresh water or ice can be found, granular snow can be melted.

Diet in Arctic Zone: The second powerful arctic enemy is hunger. Avoid rabbit meat as the main diet, as it is *fat free.* If rabbit meat is used, it should be balanced with fat of meat from geese, ducks, swans and fish. Fish heads should be boiled. Cod livers are most desirable since they possess a good supply of fat.

In extreme starvation when no food can be obtained, as a last resort, it is best to use new commercially tanned raw hide or cow hides. These may offer sustenance without any harm to the digestive system.

Boiling is the best way to cook food in arctic zone. Frying is not a convenient or good way to prepare food for eating.

Some Indians of the northern wooded sections rather like their mooseheads and caribou heads roasted. Fish should always be boiled. Generally food can be preserved by the cold for as long as 7 months.

Scurvy: Scurvy is a deficiency disease, caused by absence of vitamin C. Salty meats and fish lose some of their vitamin C content from the effect of the salt. A fresh meat diet has adequate vitamin C.

Signs of Scurvy: The individual becomes less optimistic. He also becomes irritable, gloomy and quarrelsome. Finally, there are signs of dizziness. There may be pain in the joints which may be mistaken for rheumatism. The gums bleed very easily, and later become cheesy. There may be bleeding elsewhere in the body. Even the leg may become black from bleeding beneath the skin.

Fresh food taken freely cures scurvy; but one should *never*

over-cook the food. Use of C and D vitamin tablets as adjuncts is essential for expeditions to the arctic.

Aviators who fly over the arctic region should carry C and D vitamin compressed tablets in their first aid kits. They should also be provided with compressed extract food in case of forced landings. It may be necessary to remain in arctic regions for a long time, and food in concentrated form may be one of the life lines of the marooned.

Exercise in the Arctic: During work or exercise in the open in the arctic zone, it is important to avoid excessive sweating as this may cause hoarfrost in the clothes. One should avoid exercise or rapid breathing when the temperature falls below —50°, as the inner breathing mechanism system may become frozen, with chills and signs of lung congestion. There is also a possibility of frost causing windpipe (trachea) irritation and subsequent pneumonia. Many people find it more convenient to breathe through the mouth rather than the nose in extreme cold.

Sudden exposure of the naked body in excessive cold is not harmful provided it is done for only a few moments and there is no wind. In a piercing wind the body then cannot withstand the extreme cold.

Shock to the body produced at 40°F. in an ordinary city dwelling shower bath is greater than the shock produced by exposing the body to an air temperature of 50° below zero.

Arctic Parasitic Insects and Pests: After October insects are rare in arctic regions along the Alaskan Coast, but during the summer they are a major problem. The most common are the mosquito, the house fly, and the beetle. Freezing does not kill the body lice or nits. No fleas are found in the arctic. Mosquitoes and sand flies present the big problem. Mosquito bites cause itching, and sandfly bites cause severe pain. Horseflies, deerbug flies sting like a sharp pointed knife; the skin may bleed profusely. Mosquito netting must be used for protection.

Insect bites should be treated with bacteriacidal medication such as tincture of iodine.

DISEASE IN THE ARCTIC ZONE

Wounds: Small wounds if untreated are always dangerous, but infection of wounds is less common in the arctic than in warmer climates. Cases have been reported of septic poisoning from neglected injury following penetrating wounds by rusty nails and similar objects. It is questionable whether the infection was caused from any bacteria in the arctic zone. More probably the organisms were carried up by the expeditionary group from the temperate zone.

Eye Disease: Promiscuous use of towels among Eskimos is a common cause of eye infections.

Tapeworms: Rare in Alaska, except when contracted from dogs, which are the chief carriers. The treatment is to use hygienic measures when around or handling dogs. The hands must be kept clean and dogs suffering from the disease should be treated.

Common Colds: The common cold is transmitted by contact and close association. Common head colds do not occur in certain isolated communities.

Tuberculosis: Tuberculosis is communicable by contact in the arctic as in any other region. Freezing of the sputum does not kill the tubercular organism. Eskimos have been exposed to tuberculosis, possibly as a result of white man's introduction of the germ.

Measles and Influenza: Both of these diseases exist in the arctic. Early in 1900, a measles epidemic killed 75% of the population in some villages in the arctic zone. From information gathered by Stefansson, it appears that acquired hereditary resistance to the disease plays a large role. Those who have no immunity in the arctic usually die; Europeans or Americans exploring the Arctic rarely, if ever, succumb to these diseases.

Typhoid Fever: Typhoid fever is spread by carriers and infected water in the arctic as elsewhere.

If in doubt about drinking water—BOIL IT.

Arctic Hysteria: Arctic hysteria sometimes occurs during mid-winter darkness. Usually hysteria is due to auto-suggestion or mass hypnosis and may be overcome by proper understanding or approach. This can be accomplished by those who understand human nature. The psychology of fear is the same the world over. When the mind has learned not to be afraid—then fear is overcome.

XII

Forced Landings

WITH long-distance flights now a reality, unforeseen events are sure to necessitate many forced landings. Long-range bombers, traveling several thousand miles, will meet unpredictable changes in the weather, with resulting problems. Bad-weather flying may cause shortage of gasoline, with a forced landing over the wilderness or even on bodies of water.

While a safe landing may be made, the terrain is apt not to be of the best, and an accident—minor or serious—can easily occur. With several crew members aboard, it is likely that one or more may be injured. Every long-range bomber is equipped with first-aid kits and a few crash implements which may have to be used in case of a fire caused by shooting hot oil or sprayed gasoline. Quick thinking may be necessary to save men trapped in the plane.

Airplane Fires: When a plane crashes but does not immediately catch fire, those who are not seriously injured may be able to extricate others who are stuporous or shocked. Every minute is precious, as explosions or fire may occur momentarily, and the injured should be promptly carried or dragged as far as possible from the plane. Removal of the injured is the first step in first aid.

The second step is to find out the nature and extent of the injuries. Although prompt action is essential, it is necessary to be deliberate, as well, in administering first aid.

Injuries may vary from ordinary fractures to lacerated, torn, punctured, or incised wounds, with severe bleeding. There also may be serious gasoline burns or brush burns. Even with small wounds, profuse hemorrhage may ensue which, if not arrested, may produce further shock. If the wounds are not properly dressed, and are exposed to dirt, infection also may result.

Bleeding can be stopped by gauze pads firmly placed over the wounds, after using a cleansing antiseptic. If hemorrhage persists, a tourniquet should be applied. This can be left in place for only 15 minutes, then must be released for one minute, and re-applied for another 15 minute period, continuing intermittent application until bleeding ceases or a doctor is available. The danger in continued bleeding is shock, and this is to be avoided whenever possible.

Shock: Shock is a condition of the body in which the vital processes are markedly depressed. The blood pressure is very low, the body temperature below normal, the pulse is rapid, feeble, and thready, and the face pallid, or ashy in color. The breathing may be irregular, with intermittent gaspings. The injured person may be somewhat listless, totally depressed mentally, or stuporous.

Shock may be due to injury or to sudden fright. It may be so severe as to be fatal, or so mild as to last for only a few minutes.

Physiology of Shock: The central nervous system is so constituted that after a severe injury it reacts markedly, producing low blood pressure, which in turn results in stagnation of blood in the abdominal cavity, since the blood pressure is insufficient to force it back to the heart. Aeration of the blood is reduced, and the entire body, including the brain, suffers from lack of oxygen, which depresses the nervous reaction still further, and deepens the shock. The lack of oxygen accounts for the pallid or livid color.

Treatment of Shock: (1) Application of heat (blankets or warm water in bottles, if obtainable). Avoid exposure to cold. as the body has lost some heat.

(2) Place the patient flat on his back, so that the blood will again seek its level, and reestablish normal blood supply to all parts of the body.

(3) A mild stimulant or a warm drink (tea or coffee) can be administered, but *never give any drink or medication by mouth when a person is unconscious.*

(4) If the nose is broken and there is severe bleeding from nose and mouth, it is best for the patient to sit up. Do not elevate the feet if there are signs of a skull fracture. Rather have the body level under such circumstances with head elevated about six inches.

(5) If bleeding is severe do not give any stimulant (not even coffee) until the hemorrhage has stopped.

(6) If a fractured skull is present, with signs of shock, *never administer any type of stimulant.* It is a dangerous thing to do, since the stimulant increases the blood pressure and a greater flow of blood results.

(7) The most important thing is to stop bleeding first. If shock follows bleeding, and if unconsciousness occurs due to extreme loss of blood, artificial respiration should be performed as the first choice after bleeding is stopped. Be sure to use a blanket to keep the body warm during artificial respiration.

(8) When severe bleeding is present cold water may be administered if the patient is thirsty.

Other Important First-Aid Measures Following a Crash: Look for fractures, dislocations, or severe sprains. They may occur anywhere in the body. For instance, there may be a skull fracture—mild, moderate, or severe, simple or compound (when the bone breaks through the skin), with or without unconsciousness, or intracranial hemorrhage (bleeding within the brain). Fractures of the extremities may be simple, compound, complete, or incomplete (as a green-tick fracture). Also a fracture may be multiple (that is, the bone may be broken in many places at one time). There also may be a fracture or dislocation of the spinal vertebrae.

Dislocations may be mild or severe, and any of the joints

may be involved, from a small digit of the hand, or foot to the shoulder joint, hip, knee, ankle.

Sprains may be so severe as to cause loss of motion of the part and profuse swelling.

All fractures must be treated by a physician, but for first aid a temporary splint made out of ordinary splint board is sufficient. Boards should be carefully padded before applying as gangrene (death of tissue) may follow as a result of too much pressure.

If bleeding occurs in addition to a fracture, the bleeding should be stopped first, preferably by pressure bandages. If this fails, use a tourniquet as explained previously. But be sure to keep the tourniquet visible and accessible if a splint is used. The broken skin should always be dressed in rendering first aid. Tetanus antitoxin can be administered later by a doctor.

If there is shock in addition to a fracture, treat the shock first and then apply temporary splints, in order to avoid further shock during transportation. Do not force parts into place and create additional shock by needless movement.

After the extremities have been properly immobilized, care must be used in transporting the patient. Never push a man with broken bones into an automobile. Irreparable harm may be caused by improper handling of the injured.

Symptoms of Fractured Skull: A severe blow on the head following an aircraft crash may cause concussion of the brain, fracture of the skull, or both. In applying first aid, it does not make any difference whether either or both exist. The main point is to realize that even in the absence of bleeding from nose, throat, or ears, fracture of the skull may be present.

Signs of skull fracture include unequal pupils, a mass on the head, unconsciousness, bleeding from ears, nose or mouth, and rapid and weak pulse in the presence of severe or moderate hemorrhage.

Treatment of Fractured Skull: (1) Elevate the head slightly while the patient is lying down, if the face is flushed or red.

If the face is pallid, or white, the head should be level with the body.

(2) Move the injured only in a lying position. Do not disturb him otherwise.

(3) Keep the patient warm.

(4) *Never give any stimulant to a person who has a fractured skull.*

Treatment of Unconsciousness: When the face is flushed and the pulse is strong, keep the patient flat on his back with head slightly raised, and apply cold compresses to the head. Loosen all tight clothing, but do not administer any stimulants, and keep the patient fairly warm. Transport only in a lying position.

If the face is pallid and the patient is unconscious, with a weak pulse, keep him lying down with head level with the body or slightly lower. Use hot applications. Stimulants may be given by inhalation only, if no bleeding or no head injury is apparent. The patient must be transported lying down, and with care.

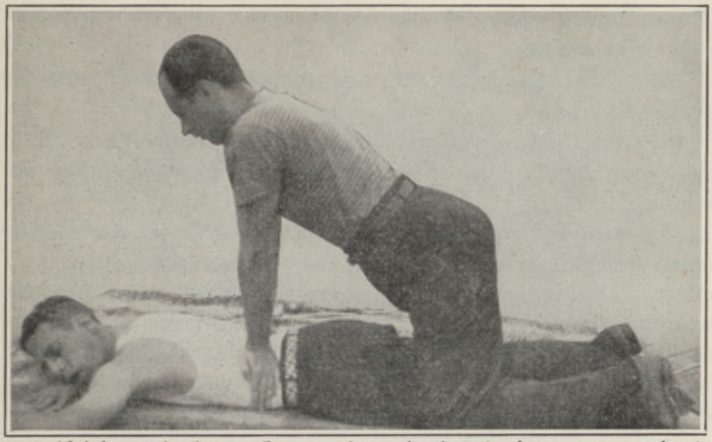
When the face is blue, with unconsciousness, artificial respiration is required which can be applied as follows:

(1) Place the patient flat on his stomach with one arm extended overhead. The other arm is bent at the elbow joint. The face is turned so that it rests on the back of the hand or forearm. This helps to keep the mouth and nose free for breathing.

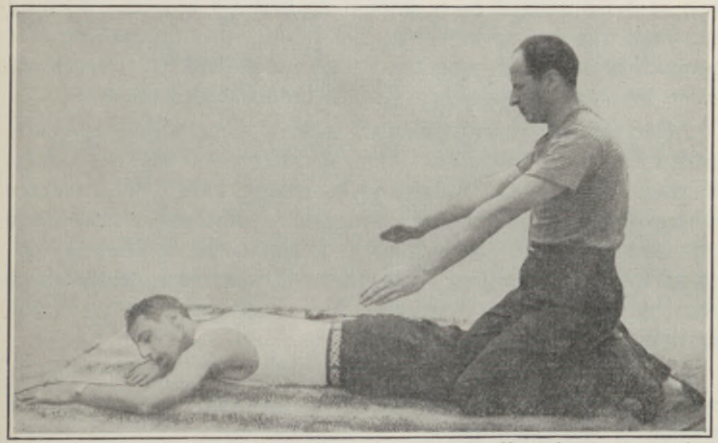
(2) Then kneel, straddling the patient's thighs so that your knees are in a position which will permit you to bend forward at an angle of about 45 degrees.

(3) The palms of the hands are set on the small of the back, with the fingers so placed that they rest on the lower ribs. The little finger touches the rib, the thumb and fingers extended in a natural position. The tips of fingers are not visible to you, and point downwards.

(4) Your arms are held straight, while you slowly push forward so that your body weight brings pressure on the patient.



Artificial respiration. Compression of victim's lungs to expel air. The operator's hands are placed on the victim's lower ribs, just above the hips, and downward pressure is exerted slowly on each side of the small of the back. There is a noticeable "give" in the victim's body as the air is forced out of the lungs.



Artificial respiration. Removal of pressure to allow fresh air to flow back into the lungs. Cycle of compression and release should be repeated every four seconds.

The operator's elbows should not be bent. This operation lasts about two seconds.

(5) Now swing backwards, and remove all pressure from the patient's chest.

(6) After about two seconds, swing forward again. This maneuver is repeated at least twelve or fourteen times per minute.

(7) Artificial respiration is continued without interruption until breathing is started, which may require several hours of effort. During artificial respiration the patient must be kept warm. Never permit one who has been revived to stand up, as the attempt may cause marked shock. Never drag a person who needs artificial respiration too far, as every minute counts. If transportation is necessary, it is best to proceed with artificial respiration at the same time.

Burns: After a plane has cracked up due to a forced landing, there is always a danger of fire from sprayed or spattered gasoline. Fires following crashes are the most important problems confronting engineers, and are as yet unsolved. Regardless of the degree of burn, immediate first aid is vital. Burning clothing can be extinguished by rolling the injured on the ground, or by smothering the flames with blankets. *Never use water on burning gasoline.* This helps to spread the fire.

After the fire is extinguished, remove the clothing as gently and speedily as possible. Use a mixture of oil or sodium bicarbonate paste (½ water and ½ baking soda). The average emergency kit contains picric acid gauze, solution, or salve (five per cent). If the gauze is used, it should be moistened with plain water and applied to the burned areas very gently about four or five layers in thickness. Never apply any such solution as tincture of iodine to a burn.

Use of a sedative is important. Every first-aid kit includes sedative solutions or pills. Shock is invariably present, and is treated as explained above.

If the eyes are burned, lay the patient on his back, then allow a cupful of plain water to run into the inner corner of the eye

and out of the outer corner. Plain vaseline liquid or salve then can be applied directly over the lids and eyeball. This will partially soothe the burned eye. Some first aid kits contain butyn and metaphen eye salve for pain. *Never use a strong acid or strong alkaline chemical for first aid to the eyes.*

After all necessary first aid has been given, do not handle the patient until transportation to a hospital or physician is arranged.

XIII

Life in Altitude

MODERN airplane design has been steadily directed toward raising the flight ceiling, particularly of military aircraft. At the high altitudes now reached, the flier is subjected to various physical stresses against which special precautions must be taken. The low atmospheric pressure at high altitude produces three main physiological effects: (1) Insufficient oxygen, or *anoxia,* perhaps aggravated by carbon monoxide poisoning, (2) Expansion of gases within the cavities of the body as the balancing pressure outside is removed, and (3) Under extreme conditions, formation of bubbles of nitrogen gas in the blood *(aeroembolism).*

Under ordinary conditions at sea level, air contains about 21% oxygen, and exerts a pressure of 760 mm. of mercury (about 15 pounds per square inch). The following table shows the fall of pressure with altitude:

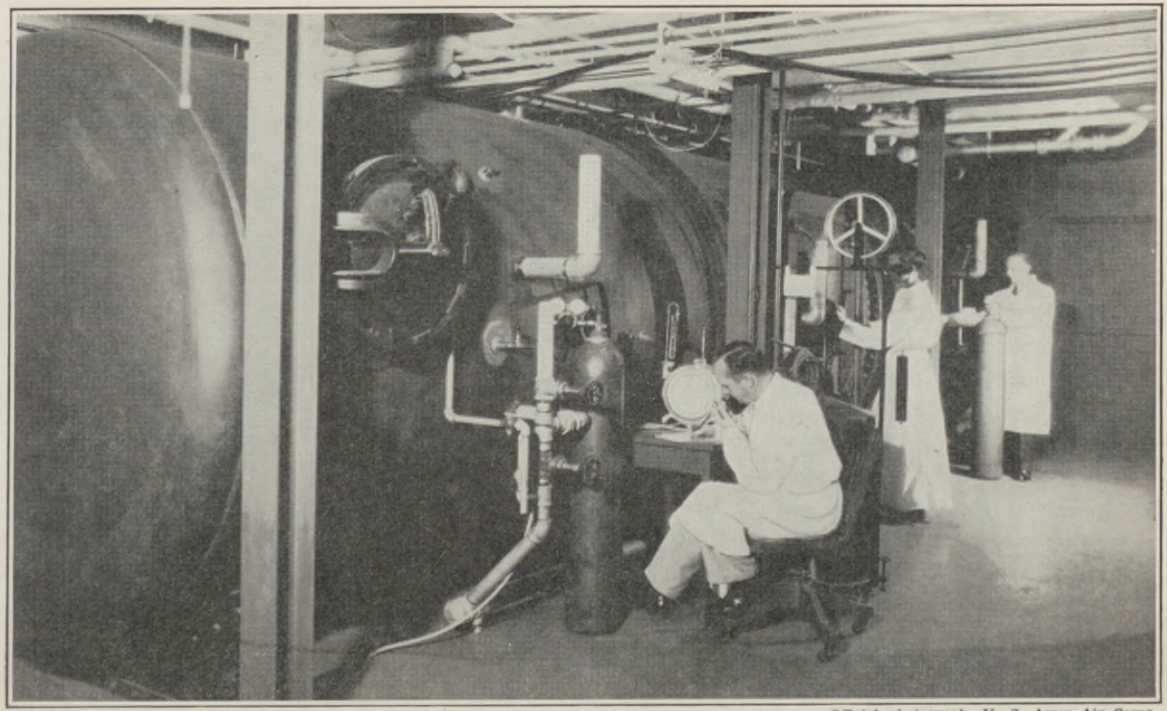
Altitude	*Pressure (Millimeters of mercury)*	*Pressure (% of normal)*
Sea level	760	100%
5,000 ft.	632	83%
10,000 ft.	523	69%
15,000 ft.	429	57%
20,000 ft.	349	46%
25,000 ft.	282	37%
30,000 ft.	226	30%
35,000 ft.	179	24%
40,000 ft.	141	19%

The percentage figures in column 3 indicate the approximate proportion of the normal oxygen supply that is available at the various altitudes. Up to an altitude of about 5,000 feet, the body is able to compensate for the diminished oxygen supply by deeper and more rapid breathing. Between 5,000 and 10,000 feet, the effects of oxygen lack are slight, and unless the flight is prolonged for several hours, it will probably not be necessary to use an artificial supply. Above 10,000 feet the effects become pronounced, and special breathing apparatus is necessary. With increasing altitude more and more oxygen must be added to the breathed air, until at about 30,000 feet, pure oxygen is used. Above 30,000 feet, even when breathing pure oxygen, symptoms of anoxia arise, and this is the maximum altitude that can be endured for any length of time. Some individuals can tolerate altitudes as high as 45,000 feet for short periods with the use of pure oxygen, but for practical purposes the ceiling fixed by the body's oxygen requirement is between 30,000 and 35,000 feet. Higher altitudes can be reached only by the use of pressure cabins or pressure suits.

The apparatus now available for supplying oxygen artificially is highly efficient, and requires only about one-fourth of the oxygen used by the older types of equipment. A regular flow of the gas can be maintained, and flowmeters are supplied which can be set to register the correct amount of oxygen for any given altitude. These meters must be carefully checked and calibrated before flight, particularly to correct any variation in their readings that may arise from changes in barometric pressure.

The United States Army Air Corps Regulations require all personnel to use oxygen at all times in flights above 15,000 feet. Oxygen is to be used also at 12,000 feet for flights lasting 2 hours or more, and at 10,000 feet for flights lasting 6 hours or more. These regulations incorporate the results of long experience and research on high altitude flying.

Anoxia: If oxygen is not used at altitudes above 10,000 feet, symptoms arise which differ with individuals, but may be grave, especially for a pilot at the controls of a plane. The first effect



Official photograph, U. S. Army Air Corps.

High altitude chamber for physiological research, Wright Field, Dayton, Ohio.

is generally an impairment of balanced judgment and dulling of senses similar to that produced by mild alcoholic intoxication. Just as the drunken man frequently fails to realize that he is drunk, so the victim of anoxia is often quite unaware of his condition, and may refuse to admit that anything is wrong. This is the principal reason that army regulations specify that oxygen is to be used at definite altitudes regardless of whether the men in the plane think they need it. Some men foolishly refuse to use oxygen under the influence of false pride and a belief that they can "take it." The author has actually seen such instances in flight.

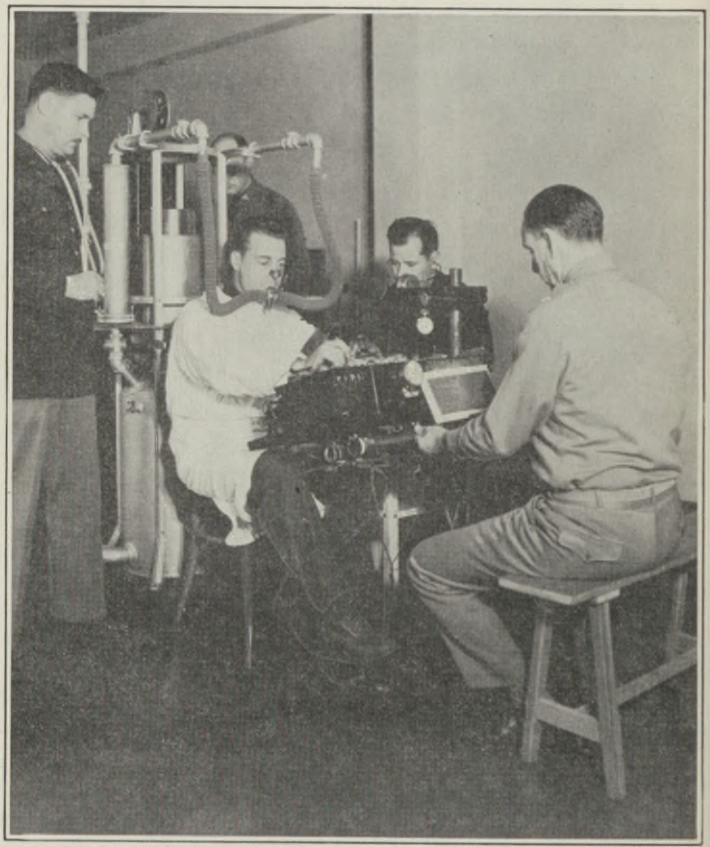
At altitudes above 15,000 feet, the symptoms of anoxia become more pronounced. There is loss of emotional stability, loss of muscular control, and perhaps development of fixed irrational ideas. The victim feels sleepy and slow-witted, is unable to concentrate attention on even a simple task, and may suffer various mental disturbances such as failure of memory. These symptoms become progressively worse with time and increase of altitude. The vision becomes dulled, coordination of the eye muscles fails, and finally, at about 25,000 feet, there is complete collapse and unconsciousness. If oxygen is not quickly supplied, permanent damage to nerve and brain tissue may result in paralysis, blindness, loss of memory, or other serious disability.

One of the greatest dangers of anoxia is its insidious attack. During a recent flight at high altitude a member of a squadron lost his oxygen-tube connection, and continuing the flight ran amuck among the other airplanes of the formation, and escaped a crash only through the ability of the members of the squadron to out-maneuver him. All the time he was totally unaware of his actions, and believed he was doing a masterly job of flying.

The effects of anoxia are not immediately relieved by a return to low altitude, but persist in greater or less degree for several hours. Undoubtedly many landing accidents have been caused by the abnormal condition of the pilot on returning from a high altitude flight during which an artificial oxygen supply was not used.

Prolonged and repeated exposure to anoxia, even if there are no incapacitating symptoms, may produce permanent injury. The lowest price to be expected is premature fatigue, and general lowered efficiency.

Even a mild degree of anoxia is a serious threat in night



Official photograph, U. S. Army Air Corps.

The rebreather. This apparatus tests the effects of various concentrations of oxygen.

flying. At altitudes as low as 5,000 feet, there is a measurable reduction in night visual capacity unless some oxygen is inhaled. At 8500 feet, night visual acuity is lessened about 50%. The sensitivity of the eye to small amounts of light seems to be one of the first physical powers affected when the normal oxygen supply is reduced.

Carbon Monoxide: The possibility of carbon monoxide poisoning makes the general problem of anoxia more serious. The effect of carbon monoxide in breathed air is to reduce the blood's ability to absorb oxygen. For this reason a man on the ground can tolerate a somewhat higher concentration of the poison than a pilot flying at an altitude of some thousands of feet where the oxygen supply is already below normal as a consequence of reduced pressure. A very small amount of carbon monoxide in the cabin will produce symptoms of anoxia at an altitude that would otherwise be easily tolerated.

Carbon monoxide is an *odorless* gas, and is produced whenever carbon or one of its compounds is burned with restricted air supply. It is found in the exhaust vapors of internal combustion engines in a concentration as high as 3%. In the open air carbon monoxide is quickly diluted to negligible concentration, but in an enclosed cabin a small leakage of exhaust gases may build up a very dangerous amount. Even a few hundredths of one per cent is dangerous if breathed for any length of time. The oxygen carrying power of the blood falls and anoxia is produced. Carbon monoxide has a natural chemical attraction for the hemoglobin (red coloring matter) of the blood, and in combining with hemoglobin is about 300 times as active as oxygen. Consequently an atmosphere containing 1 part of carbon monoxide to 300 parts of oxygen (a concentration in ordinary air of .07%) may reduce the oxygen carrying capacity of the blood by as much as 50% if the poison is breathed for a long enough time. A percentage of .01% (1 part in 10,000) is about as effective in producing anoxia as an altitude rise of 5,000 feet.

The early symptoms of carbon monoxide poisoning are prac-

tically the same as those of ordinary anoxia caused by altitude. Poor concentration, sleepiness, muscular incoordination, mental depression, inattentiveness, and general weakness are most common.

The effects of carbon monoxide poisoning are more persistent than those of ordinary anoxia because an actual chemical change has taken place in the blood. Very small amounts breathed repeatedly or for long periods without adequate time for recovery in the intervals can produce *chronic carbon monoxide poisoning,* a condition in which some of the blood cells are continually out of action because of absorption of poison. Nervousness, headache, dizzy spells, pains around muscles and joints, digestive disturbances, shortness of breath, and mental anxieties are common symptoms.

Carbon monoxide poisoning occurs gradually, and precautions can be taken to avoid it. The most reliable method is periodic testing of samples of air in the cabin. .003% is the minimal concentration that can be detected with available apparatus. This is fortunately below the seriously toxic level, and may conveniently be taken as the highest amount of the gas permitted in the aircraft. If the test shows any substantially higher concentration, steps must be taken to secure ventilation of the plane.

Tests are available for determining the amount of carbon monoxide absorption by the blood, and in cases of suspicion the Flight Surgeon may take a sample of the blood for examination. For accurate results, the blood specimen must be taken and examined at once, as the carbon monoxide concentration may be diluted as much as 50% in the first hour of fresh air breathing.

Resistance to Anoxia: Sensitivity to anoxia varies with individuals, and undoubtedly some persons are constitutionally unfit to endure high altitude flying. One important factor is the count of red blood cells. Persons with a low red cell count are quickly incapacitated by lowered oxygen supply; persons with a high red cell count show greater power of resistance. It is worth noting that those who have lived all their lives in

mountain altitudes of 5,000 to 10,000 feet are much more resistant to anoxia than those whose lives have been spent near sea level. Their bodies have become adjusted to the lower oxygen pressure of their regular habitat mainly by producing more red blood cells to increase their oxygen absorbing capacity.

Attempts to acclimate fliers by exposing them gradually to diminished oxygen pressure have not been successful. It apparently requires months or years for the body to develop the necessary compensations. In one experiment men were exposed to an altitude pressure of 12,000 feet for 7 hours daily for 27 days. All the subjects developed difficulty in mental concentration, memory retention, and reasoning; in addition there was loss of appetite, nausea, indigestion, and dizziness. For periods up to at least two months, and perhaps much longer, the effects of oxygen-want are cumulative, and the total time spent at anoxia levels is the main factor in determining resistance.

High mountain climbers, like fliers, are subject to the effects of anoxia, and there is a considerable literature dealing with their experiences. The flier, however, must face more difficult conditions than the mountain climber. Not only is the mental dullness associated with anoxia more serious for the flier, but he habitually reaches much higher altitudes, and, above all, is subjected to rapid *changes* which do not give his body time for compensatory adjustment.

The general bodily health is the most important single factor in warding off the dangers of anoxia. All the care taken for a balanced and vitamin-rich diet, for enough but not too much exercise, for proper periods of relaxation and rebuilding of the tired body is more than repaid by the increased stamina and resilience that result. The excessive use of alcohol or tobacco very markedly reduces altitude tolerance. Lack of sufficient sleep will also weaken a man's resistance. It is necessary for the pilot, more than ordinary men, to maintain himself in top physical condition. Even with every artificial aid, the stresses his body must endure are greater than those of any other profession.

Oxygen in Emergency Bail-outs: The danger of fatal anoxia

in an emergency bail-out at high altitude requires special precautions. The sudden removal of oxygen supply at 30,000 feet produces gross physical and mental incapacity in from 30 to 60 seconds, and induces complete unconsciousness in from 60 to 90 seconds. Such unconsciousness would render the parachutist unable to pull the release on his parachute, and death would be almost certain to result. It is therefore imperative, in the event of such an emergency, to attach the emergency oxygen mouthpiece before attempting the jump. If for any reason this cannot be done, the flier should inhale oxygen deeply from his regular supply up to the very last second, and then *hold his breath* for as long a period of free fall as possible. If the parachute is opened at any height above 20,000 feet, unconsciousness or death would probably occur before the relatively slow descent carried the flier to an altitude capable of maintaining life. A descent with parachute open from 30,000 feet to 20,000 feet requires about 8 minutes, during which time oxygen starvation would certainly bring on unconsciousness and perhaps death. On the other hand, a free fall from 30,000 feet to 20,000 feet would require only about 1 minute, and unconsciousness might be avoided.

Oxygen Poisoning: The use of oxygen for high altitude flying is indispensable, yet under certain circumstances is attended with danger in itself. Toxic symptoms are produced by prolonged over-use of oxygen. Controlled experiments indicate that an atmosphere of 90% oxygen can be breathed for a full day without ill effects, but on the second day may produce nervousness, irregular heart beat, lowered energy, and vomiting. There may also be signs of bronchial cough associated with fever. These symptoms last for about 7 days following exposure.

In a simulated altitude of 29,000 feet, exposure to an atmosphere of 99% oxygen produced no symptoms in six hours.

These experiments indicate that under the ordinary conditions of flight, there is no danger of oxygen poisoning. The case is different, however, when pure oxygen is inhaled suddenly after severe anoxia has developed. Instead of relieving the symptoms,

the sudden supply of oxygen may actually aggravate them. Convulsions and other disturbances of the nervous system may result. It is therefore important to remember that oxygen should be taken gradually, and the supply built up by small doses, especially if the body is already suffering from oxygen lack.

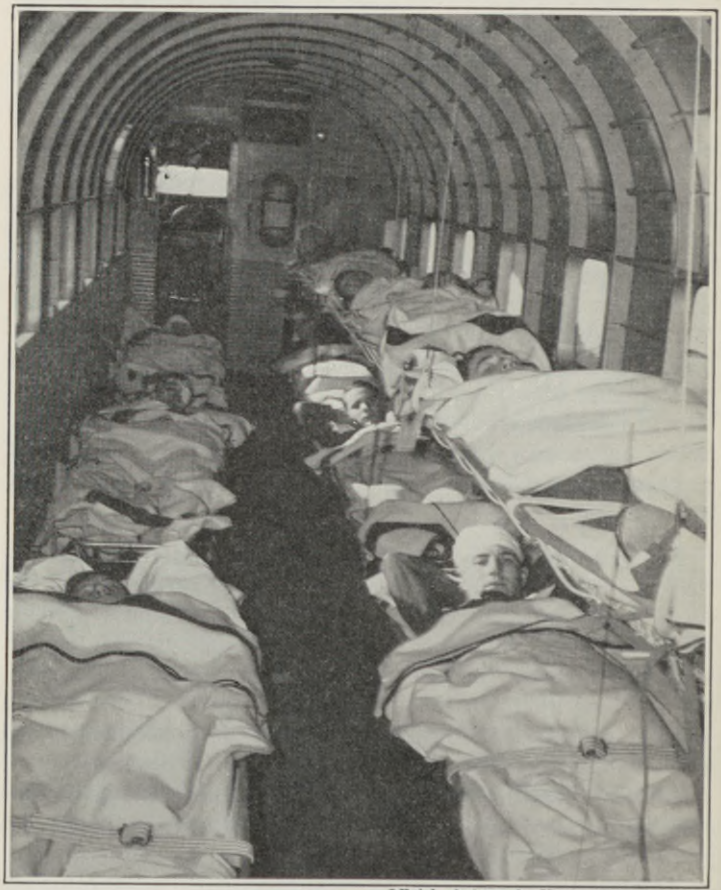
Prolonged flights at high altitudes using a high concentration of oxgen may produce symptoms of oxygen poisoning, particularly bronchial irritation or infection. If such a condition develops, the flier must avoid high concentrations of oxygen until recovery is complete.

Fire Hazard: Whenever oxygen is used, the danger of fire must be kept in mind. Oxygen supports combustion far more vigorously than ordinary air, and materials that are nearly fireproof in air may burn fiercely in oxygen. Oils and greases may take fire spontaneously if exposed to oxygen, and they can never be used for sealing the valves and fittings of oxygen equipment. When any kind of oxygen equipment is being used, smoking, of course, is absolutely forbidden. A glowing spark at the end of a splinter of wood will burst into bright flame if introduced into an atmosphere of oxygen, or blown upon by an oxygen jet. When oxygen-tent equipment is used in hospitals, the greatest precautions are taken to prevent any spark or flame from being brought near.

The Air Ambulance: A recent development of military aviation has been the air ambulance. The type now used by the medical division of the R. A. F. consists of a complete portable operating room with all equipment, including portable emergency lights, ready for instant use. This may be flown to an isolated area where a field hospital cannot be set up. A trained surgical personnel, consisting of a surgeon, an anesthetist, and two or three operating room assistants, is carried by the air ambulance. Transfusion teams for emergency blood transfusions may also be carried. Under certain circumstances, an operation may actually be performed during flight.

The pilot may also be called upon to evacuate battle casualties to hospitals far back from the theatre of war. How important

a part of modern warfare this may become is shown by the fact that the Germans, up to August, 1942, had evacuated 280,000 wounded from the Russian and Lybian fronts by this method. By air transportation of seriously wounded cases, many valuable lives may be saved.



Official photograph, U. S. Army Air Corps.

Transportation of wounded in air ambulance.

In emergency cases, the pilot may be called upon to use his own knowledge in providing for the comfort and first aid treatment of his injured passengers. Perhaps the most important thing for him to remember is that wounded men will suffer anoxia at a much lower altitude than men who are physically fit. This is particularly true of those who have head injuries of any kind. The pilot should therefore keep the plane at as low an altitude as possible, and should try to arrange for oxygen administration to the serious cases.

Supportive oxygen treatment is especially valuable for those who have lost much blood, as well as for the head injury cases.

Body Gas Expansion: Less serious than lack of oxygen, but nevertheless capable of producing painful symptoms, is the expansion of gases contained in the various cavities of the body as the balancing pressure of the air outside is reduced. The stomach, the intestines, the paranasal sinuses, and the middle ears are the body parts most affected. Under ordinary conditions at sea level, these cavities contain gas at a pressure equal to that of the air outside, about 15 pounds per square inch. At 18,000 feet altitude, where the atmospheric pressure is only one-half normal, these gases push outward against their enclosing walls with a pressure (assuming no expansion nor escape of gas) of 7½ pounds per square inch. This pressure may cause severe pain and disability.

The severity of the symptoms caused by internal gas pressure depends mainly upon three factors, (1) the original quantity of gas in the cavities, (2) the elasticity of the containing walls, and (3) the ability of the imprisoned gas to escape. All three of these factors are considerably affected by the physical condition of the aviator. There are great differences in individual reactions. One man may suffer pain and disability at an altitude where another may be scarcely affected.

At physical examinations the Flight Surgeon carefully observes the nose and throat. He pays particular attention to the sinuses, especially if the flier gives a history of nasal obstruction and nasal discharges. In high altitude flying, the mucous lining of

the nasal cavities and sinuses may become swollen and prevent any ventilation, and with change of altitude, either ascent or descent, unequal pressure develops which may cause excruciating pain. There may also be dizzy spells and severe nausea. These symptoms may become so serious as to interfere with the control of the plane or even force a landing.

A similar difficulty may arise in the middle ear. As has been previously explained (Chapter VII), the middle ear cavity is connected with the throat and thus with the outside air by the Eustachian tube. This tube acts much like a flap-valve, allowing air to pass rather freely from the middle ear to the pharynx or throat, but preventing a return flow. Under ordinary circumstances, the tube can be momentarily opened by the act of swallowing or yawning.

With this mechanism in mind, it is easy to see why symptoms are not often experienced in the middle ear during *ascent,* but may become severe during rapid *descent.* As the flier ascends to high altitude, the expanding air in the middle ear passes back through the Eustachian tube to the pharynx, and the air pressure behind the drum remains equal, or nearly equal, to that outside. But with a sudden descent, the Eustachian tube remains closed, a partial vacuum develops in the middle ear, and the ear-drum is forced in an inward direction by the outside pressure. The pain may be violent, and the pressure sufficient to cause rupture of the drum with bleeding. With a rapid descent of 4,000 feet or so, the drum may be markedly retracted.

These symptoms can be greatly alleviated if the flier practices voluntary swallowing and yawning during descent. This opens the Eustachian tube and helps to equalize the pressure. It is effective, however, only if done frequently from the beginning of the descent, for if any substantial difference in pressure is allowed to develop between the middle ear and the outside air, the muscles will be too weak to get the tube open. In such cases, the ear is said to be "trapped."

In the presence of head colds, sinus disease, or sore throat, the pilot should not attempt high altitude flight. Such ailments may keep the Eustachian tube closed entirely, and the flier may

suffer from symptoms during *ascent,* because of inside pressure. Or he may find swallowing and yawning ineffective to keep the tube open during descent, and suffer rupture of the ear drum with dizziness, nausea, pain, and severe vomiting spells. Even if no disease is present in ear, nose, or throat, some difficulties may be experienced.

An obvious method of correcting unequal pressure after a rapid descent is to return to a high altitude. Under ordinary circumstances, this will afford complete relief. But during combat this method may not be possible, and the pilot must do the best he can to keep the air passages open by repeated swallowing. It is a good idea to chew gum to stimulate the flow of saliva and make swallowing easier.

Expansion of gases in the abdominal cavities creates another problem in high altitude flying. Under normal circumstances at sea level, the stomach and the intestinal canal contain a certain amount of gas, depending upon the foods recently eaten and the state of digestion. Constipation affects the gas content of the bowels. These gases expand as atmospheric pressure diminishes with mounting altitude.

The more rapid the ascent, the more marked will be the symptoms of intestinal gas expansion. The pains may be so severe as to cause complete prostration. In rapid ascents there is a tendency for the gas to collect within small folds and crevices in the intestinal walls and cause sharp, excruciatingly painful sensations.

Many attempts have been made to relieve this distressing symptom. Some relief results from the escape of imprisoned gas from the rectum, and by belching from the stomach. The only thoroughly effective treatment is to decrease altitude. If it is necessary to remain at high altitude because of combat missions or dog-fights, vigorous massage of the abdominal wall may relieve the disconcerting pain.

Much can be done by way of prevention. Certain foods, notably vegetables of the cabbage family, cauliflower, okra, asparagus, or cabbage, tend to develop substantial amounts of gas in the intestines, and should definitely be avoided before a flight

that is likely to reach an altitude above 10,000 feet. Constipation and fullness of bowels must also be avoided. This can be done by the development of regular habits of bowel emptying. Laxatives must not be used before flight.

Gas expansion in the abdominal cavities may be an aggravating factor in the development of anoxia. The gases in the stomach and intestines press upward against the diaphragm and increase the difficulty of breathing. The lungs cannot take in as much air with each breath as normally, and the surfaces available for the transfer of oxygen to the blood are reduced.

Aeroembolism: Lack of oxygen at high altitudes can be remedied by arranging for artificial supply; internal gas expansion while it sometimes gives rise to disagreeable symptoms, is rarely serious, and can be greatly mitigated by attention to simple measures of hygiene. The third major problem of high altitude flight, aeroembolism, decompression sickness, or "bends," has no easy solution. Fortunately its symptoms do not usually manifest themselves at altitudes below 30,000 feet, so that in most routine flying it is not a source of difficulty.

Aeroembolism is the formation of bubbles of gas, chiefly nitrogen, in the blood and other body fluids when pressure is reduced. The mechanism of this gas formation has been observed by everyone who has taken the cap off a bottle of ginger ale or other carbonated beverage. Under pressure inside the bottle, the ginger ale contains carbon dioxide gas in solution. When the pressure is removed by taking off the cap, the dissolved gas forms bubbles in the liquid and escapes. A similar thing happens in the human body when it is exposed to a pressure of about 0.3 atmosphere, such as prevails at 30,000 feet.

At lower altitudes, some symptoms of aeroembolism may be present, but except in susceptible subjects, they are rarely severe. Experimental work by Armstrong and others has shown that there is no formation of bubbles until the pressure has been reduced to half an atmosphere (about 18,000 feet altitude), and then the bubbles form only in the spinal fluid where they produce no noticeable symptoms. If ascent above 18,000 feet is

slow, a considerable amount of the nitrogen contained in the blood is eliminated through the lungs without the formation of actual bubbles of gas until a height of 30,000 to 35,000 feet is reached. Above this altitude, most men suffer marked symptoms.

The first signs of aeroembolism are usually itching and tingling in the skin, accompanied perhaps by alternate hot and cold sensations. Severe pain then develops in muscles and joints, particularly shoulders, elbows, knees, and ankles. Any scar tissue on the body is likely to throb painfully. If exposure to low pressure continues, there may be impairment of visual and auditory functions, profuse sweating, and finally paralysis and unconsciousness. Death may result from failure of circulation.

Aeroembolism is identical with the "bends," long familiar to deep-sea divers and others whose work exposes them to high pressure. In the case of the deep-sea diver, the "bends" may develop if he comes too rapidly to the surface after spending some time below where the pressure is above normal. The high pressure causes his blood to dissolve a more than normal amount of nitrogen, and this forms bubbles when the pressure is reduced.

The only way to relieve aeroembolism when it has developed is to raise the air pressure so as to force the nitrogen bubbles in the blood back into solution. If, in an emergency, a diver has to be pulled suddenly to the surface, he is immediately rushed into a compression chamber, where the transition from high to low pressure can be made gradually. Such treatment is not available to the flier. His only recourse is a descent to lower altitude. If symptoms of aeroembolism develop at any height above 25,000 feet, an immediate descent is necessary to prevent complete incapacitation. The symptoms usually quickly abate at altitudes below 20,000 feet. Some headache and visual disturbance may remain for several hours. In severe cases it will be necessary to descend to sea level where the victim should be immediately treated in a pressure chamber. Permanent disability or death may result from delay.

Research directed to combatting aeroembolism is now going on along three general lines. (1) Tests to determine susceptibility. Certain men are found to be able to tolerate lower

pressures and longer exposures than others. (2) denitrogenization before flight has been attempted by various means. If a flier lives and exercises in a nitrogen-free atmosphere for some hours before a high altitude flight, much of the nitrogen in his blood will be eliminated and he can endure higher altitudes for longer times without the development of symptoms. Unfortunately, the time required for adequate denitrogenization is so great as to render it generally out of the question in military operations. (3) Pressure cabins and pressure suits are theoretically perfect solutions to the problem of aeroembolism as well as the problem of anoxia. There are, however, great technical difficulties in the design of suitable equipment, particularly for military flying.

Airsickness: Nearly every experienced aviator has at one time or another suffered from airsickness. Airsickness is produced by the roll, pitch, and stagger of the airplane as it passes through "bumpy" air, or as it makes turns and dives in ordinary maneuvers. Airsickness is entirely distinct from "altitude sickness," or anoxia, which we have already discussed. Airsickness is the aviation analogue to seasickness, with which most people are familiar.

Airsickness arises from a disturbance of the sense of equilibrium controlled by the semi-circular canals of the internal ear. Among its symptoms are fear, dizzy spells, nausea, nervous sweats, and occasionally collapse. All degrees of mildness and severity occur.

It is a matter of common knowledge that susceptibility to seasickness varies greatly with individuals. Nervous and emotional people are more susceptible than stolid, phlegmatic types. Inexperience is also an important factor. The veteran pilot, like the veteran seaman, has learned to disregard the sometimes contradictory sense impressions that are produced by the unnatural movements of the plane. The trainee, on the other hand, still carries with him his reflexes and dependence on sense impressions developed in life on the ground, and is likely to become an easy victim.

The neurotic rarely is able to adapt himself to air flight. He becomes airsick frequently. It may be that in some cases airsickness is an escape mechanism adopted by the subconscious mind unable to face danger and difficulty. This however does not mean that the airsick man is not "really sick," and should be shamed or ridiculed out of his imaginary illness. Such treatment, as a matter of fact, is the very worst thing that can be done. The normal person who is sympathetically approached and understandingly handled will develop resistance to airsickness; if he is treated with ridicule, his susceptibility may increase.

Anoxia, particularly anoxia produced by carbon monoxide poisoning, may aggravate an attack of airsickness. Other conditions that greatly increase susceptibility are sluggish digestion, constipation, and over-filled stomach. Heavy drinking and subsequent hangovers are obviously bad, and to a somewhat less degree, excessive use of tobacco. Any upset in the efficient functioning of the body is conducive to an attack.

The first step in overcoming airsickness is to avoid these predisposing conditions. It is better to under-eat before a flight than to eat too much. Fresh air admitted into the cockpit or cabin will help ward off an attack. Some relief may be obtained by sipping small amounts of ginger ale or plain vichy. Support of the abdominal muscles is sometimes effective. To avoid the mental confusion arising from contradictory sense impressions, it is important to keep the vision from shifting with every movement of the plane. This can be accomplished by picking a distant point of reference for spatial orientation and not confining attention to some part of the plane such as a wing tip.

These measures are precautionary, and should reduce the incidence of airsickness. Actually there is no known method of preventing it entirely.

One suffering from airsickness should be made to lie on his side. This position helps to settle the motions of the stomach muscles. After landing, the airsick patient should be permitted to rest for a few hours.

Airsickness is not a condition dangerous to life, although its temporary symptoms may be severe.

Centrifugal Force and Blackout: Airsickness is caused by comparatively slight irregularities in the motion of the plane, and usually requires a considerable time to make itself felt. Another effect arises in diving and rapid turning maneuvers. This is the displacement of blood and other body fluids by centrifugal force. The effect is immediate and may cause complete disability.

The force of gravity applies to the aircraft and its passengers along the same axis and to the same degree of magnitude as it does when the plane is on the ground. When the aircraft pulls out from a power dive or makes a quick turn, a new force is superimposed upon the normal gravity force. This centrifugal force may have any direction, and may be several times as great at gravity. It applies, like gravity, to every particle of matter within the plane, including the blood and tissues of the pilot's body.

Centrifugal force is measured in terms of the unit force of gravity, *"g."* In stating the force, gravity is included, so that a force of 1 *g* in a downward direction means merely that no centrifugal force is acting. In making a loop turn, the force of gravity may be exactly balanced by the centrifugal force, and the total force acting is zero. In a push-down at the start of a power dive, centrifugal force acts in an upward direction against the force of gravity. If this centrifugal force is greater than gravity, the total effect is an upward force, conventionally called a *negative* acceleration. In the pull-out at the end of a power dive, the centrifugal force is added to gravity (*positive* acceleration). The effect of negative acceleration is to force blood toward the head. A negative acceleration of —1 *g* produces the same effect as hanging the body head downward. There is a rush of blood to the head and a feeling of displacement among the organs of the body. A positive acceleration of 2 *g* or more causes blood to drain away from the head, and forces the body tightly into the seat. Transverse forces also occur, but in most maneuvers they are not great enough to be physiologically serious.

Centrifugal forces produce the phenomena of "blackout," and "reddening." These are disturbances of vision caused by irregular blood supply to the brain. During "blackout" the blood

supply is depleted from the cerebral region. Much experimentation and research has been done by aviation physiologists (notably Armstrong in the United States and Livingston in Great Britain) to discover the exact sequence of physiological changes that lead up to the "blackout." The subjective symptom is a progressive diminution of visual acuity which may vary from slight darkening or blurring to temporary total loss of sight. If the force draining the blood from the brain continues, total unconsciousness and death may ensue. If the centrifugal force stops within a few seconds, however, normal vision usually returns quickly. There may be a short period when the victim is slightly confused.

"Reddening" occurs under precisely the opposite circumstances as "blackout." In "reddening" there is too much blood forced to the brain as a consequence of high negative acceleration. The visual field assumes a reddish hue. Unconsciousness does not occur, but there is a pounding pressure in the head, and a senation that the eyes are being forced out of their sockets. These symptoms are very unpleasant when the negative acceleration is—2 *g*, and extremely severe at —3 *g*. At higher negative accelerations the pressure may rupture blood vessels in the brain and produce death. The after effects of negative acceleration are more lasting and serious than the after effects of 'blackout." Prolonged mental confusion, severe headache, and possibly delayed cerebral hemorrhage may occur. For these reasons, forces of —2½ *g* are regarded as the upper safe limit of toleration.

The body can stand much higher positive accelerations. Up to 3 to 4 *g* the only important effect is a fixing of the body to the seat. Symptoms of "blackout" may begin at 4 *g*, and complete loss of vision may occur at about 6 *g*. Besides the magnitude of the force, the time factor is of great importance. A force of 7 to 8 *g* can be endured for one or two seconds, while a force of 5 *g* may result in blackout if continued for more than four seconds. There is a lag of two or three seconds between the application of the force and the physiological effects, so that the blackout is usually experienced by the pilot *after* he has completed the pull-out or other maneuver that causes it.

With rapid twists and turns playing an ever greater part in combat aviation, research to solve the problems of "reddening" and "blackout" is most important. Certain simple measures are now being advised to decrease the intensity of the effects. The principle of these measures is to shorten the column of blood upon which the centrifugal force acts by changing the axis of the body from the direction of the force, thus converting the force to a transverse force, which is more easily endured. If the body is bent forward during the pull-out from the dive maneuver, the drain of blood from the brain is decreased. The blood can also be pumped more easily by the heart.

Protective Flying Clothing Against Cold in Altitude: The body is equipped with an elaborate mechanism for heat regulation, and is capable of compensating for changes in temperature in different environments. But how much change can the body stand? Can a flier accommodate himself to all sorts of radical weather changes and not expose himself to definite dangers?

Heat production and heat decrement can be maintained only up to a certain limit. Beyond that, mental, physiologic and physical upsets will take place. Proper clothing is therefore essential for protection. This will supply the thermal insulation necessary for maintaining heat regulation. Yet at very high altitudes even the best clothing may be inadequate for retaining warmth. Temperature diminishes with altitude at the approximate rate of 3.4 degrees F. for every thousand feet rise. At an altitude of 30,000 to 35,000 feet, the temperature will be about —67°F (—55°C.).

Furthermore, the ground temperatures may vary too. In the Arctic zone the sea level temperature may be —60°F., and in tropical regions the ground temperature may reach as high as 120°F. The temperature inside the aircraft cabin may reach a level of 140°F., because of absorbed heat. The flier must start out in such a hot temperature, clad in heavy protective clothing to be ready to cope with a temperature down to —50°F. Protection must be maintained for the hands and feet as well as the

rest of the body. The gunner must have proper protective clothing for his body, feet, and hands while working near the turret. Exposure due to inadequate clothes and insufficient thermal protection of the hands often is a forerunner of premature fatigue. This in turn, affects the accuracy of the gunner during combat. The higher the altitude, the more intense is the cold, and the more important is the problem of exposure and frostbite. Failure to provide proper protection of the hands may lead to frostbite of the fingers as was experienced by the Royal Canadian Air Force during the winter of 1941-42. The R.A.F., New Zealand, Australian and American air forces, particularly men from the Southern States, also suffered from exposure to the ears, hands and feet.

It should be noted, however, that if too much protection is given the hands and feet against cold, excessive sweating of the entire body may take place which creates heat loss with subsequent production of fatigue. Flying gloves and flying boots must be of the type which will not cause overheating of the body.

There is a tendency to remove the heavy flying gloves to execute certain duties during flight. Even a few minutes of exposure of this nature at a temperature of —25°F. will be sufficient to create frostbite. If gloves are too heavy for carrying out special duties during flight, it is best to wear a pair of light protective gloves under the heavy ones. Perhaps the Eskimo's idea of having special fawn material for inner and outer mittens will solve this problem. In any event the mittens and gloves must be of light material and at the same time sufficiently protective against frostbite of the hand and fingers. Perhaps as time goes on research will find light enough clothing which will give thermal protection against excessive cold in high altitudes.

XIV

Parachute Jumps

IN the past few years several countries have developed the use of parachutes in military tactical aviation. Paratroops are essential in today's warfare, and parachute jumping has become an art. Research is being done along this line all over the world. Before the inception of parachute jumping as a training in aviation tactical work, not too much was known about the art. Now every nation has paratroops and the training for these troops has become highly specialized.

It is compulsory for fliers and their personnel to wear parachutes in military aircraft. The most common type used is the free seat parachute. The diameters of these parachutes vary from 24 to 28 feet, depending upon the weight of the individual. For a person weighing not over 185 pounds, the 24 foot canopy type is most suitable. For one heavier than 185 pounds, the 28 foot canopy is the best.

When to use a parachute depends entirely upon the situation. Some pilots who have had over 3,000 hours flying experience have never had the occasion or emergency to use a parachute. On the other hand, there are cases of fliers with less than 1,000 hours flying time who have been compelled to use a parachute more than once.

Injuries may occur in the emergency use of a parachute. It is important to leave the plane head first and not feet first. One must guard against pulling the ripcord too soon after leaving the aircraft as he may receive an impact from the propeller or

other part of the plane. Sometimes, on leaving the plane, the blasts of wind may force the jumper against the stabilizer and cause a fatal accident. The most important maneuver for the jumper is to pull the ripcord when he is totally clear from his plane. Pulling the ripcord too soon may entangle the parachute canopy in the tail of the plane, with fatal results.

Generally, the lowest altitude a parachute jump should be attempted is 500 feet, although successful landings have been made from heights as low as 350 feet.

If one jumps from an airplane traveling at 300 miles per hour the sudden opening of the parachute may create a pull equivalent to 5,000 pounds shock load; at 325 miles per hour there would be a shock load of 6,000 pounds. For this reason, when a parachute opens after leaving a plane at high speed there is apt to be serious injury to the body. Even if the plane is going at the rate of 200 miles per hour, a parachute suddenly opened up after a jump would create a shock load of 2,400 pounds. The faster the body travels before the parachute is opened, the greater will be the shock load on the body.

Experiments have shown that a man jumping from an airplane with a closed parachute pack reaches a certain maximum speed within a few seconds. Air resistance balances the acceleration of gravity. If the body falls straight, with arms and legs held together and without rotation in the air, the rate of speed attained is about 175 feet per second (119 miles per hour). If the body tumbles, and falls turning with arms and legs spread out, the resistance offered by the air is greater, and the final speed attained will probably not be greater than 160 feet per second (109 miles per hour). In addition to the downward pull of gravity, the body will have a component of velocity equal to and in the direction of that of the airplane at the moment of the jump. However, within 6 or 7 seconds, during which time the body would fall toward the earth about 700 feet, most of the motion due to the original motion of the airplane will have been damped out through air resistance. These figures are rough approximations for comparatively low altitudes—say up to 10,000 feet. In high altitudes, air resistance is substantially lower, and speeds

attained are accordingly higher. However, as one falls from the rarified upper atmosphere into the denser air below, resistance increases and the speed drops off.

If it becomes necessary to jump with a parachute from an altitude of from 30,000 to 35,000 feet, the jumper should partake of oxygen up to the last minute and try to keep from pulling the ripcord until a descent of a great distance, as the rarified air may produce unconsciousness when the parachute opens up in the higher altitude. (See Chapter XIII.)

In time of combat a man with an open parachute descending from high altitude over enemy terrain will make himself an easy target for attack. Therefore, it is best to pull the ripcord at a low altitude.

The parachute must be fastened to the body of the flier or passenger at all times and should be in readiness for prompt use. The modern parachute is a piece of trustworthy equipment, and has been the means of saving many lives under adverse conditions such as wing collapse, collision, control failure—even in altitudes as low as 150 feet. The parachute has helped as a rescuer in engine failure during flight at night without any landing area available. In nose dives and in spins the chute has been valuable as a lifesaver. The parachute has enabled many fliers to escape death and at the same time engineers were able to get valuable information of certain structural defects which otherwise could not have been obtained.

In a case where inexperienced passengers of a plane must make a jump, they must be told to delay opening the parachute.

Presently available data indicates that when one jumps from a plane in altitude, the mind remains clear; if any fear existed prior to the jump it disappears when the actual falling begins in the air. In falling from high altitude there are no visual disturbances. All objects are made out fairly well. The general body condition is not affected.

No harmful effects are caused to the eyes nor is there any pressure of air felt about the parachute jumpers' body.

XV

Air Accidents

THE chief aim of aviation medicine is to help prevent some of the aeronautical disasters which result in loss of valuable life. During the past half century, with daring plus applied science, aviation has made remarkable strides, even though at a great price, from both the engineering and the physical, physiologic, and medical standpoints.

There have been a host of pioneers in general medicine and surgery, starting with the father of ancient medicine, Hippocrates, and marching forward to Sir William Osler, father of modern medicine, and the Mayo Brothers, who opened the doors to new wonders of surgery. Pathfinders in aviation medicine, such as Bert, Haldane, Flack, Bazett, Boothby, Schneider, Drinker, and many others, have paved the way for other research men to follow. This is being capably done by such men as Lieut. Colonel Harry Armstrong, who has added much to the advancement of the newer phases of aviation medicine.

Although rapid strides have been made in aviation safety, there are still aeronautical catastrophes sorrowfully scrawled on the pages of the growing volume, "Modern Aviation."

An aircraft accident may be defined as an unforeseen occurrence resulting in injury or death of one or more persons while an airplane is being operated. In addition, the plane may sustain damage through external forces or through fire. An airplane is considered as being operated from the time the propeller is rotated to start the engine until it ceases to rotate, and the

plane comes to a stop. A glider is considered as being operated from the time it begins moving, or the winch or other launching mechanism begins operation, until the glider comes to a stop.

Accidents are classified by the C.A.A. in two main groups: (1) Accidents in air-carrier services. This group includes domestic operations such as mail carriers, passenger service, and express service within the territorial possessions of the United States. (2) Accidents in miscellaneous flying. This is an important group and he subdivided as follows: student instruction, experimental flying, commercial flying, and pleasure flying.

The causes of air accidents are classified by the C.A.A. under the following heads: Personnel, material—(power-plant failures, structural failures, handling qualities, instruments), miscellaneous, and undetermined or doubtful.

The old axiom, "to err is human," cannot be applied to aviation without involving many lives and valuable property. Yet not a year passes in which "errors of the pilot" as a cause of air mishaps do not reach a high percentage in the annual statistics on airplane accidents (In 1939, pilot errors amounted to 62.13 percent). Several factors are involved in failure of the pilot—poor technique, disobedience to orders, carelessness or negligence. Mistakes may also be made by navigators, maintenance crew, operations officers, dispatchers, tower-control men, or meteorological and communications personnel.

The second main group of accidents is attributed to material. In this class are all accidents arising from failure of the airplane structure, power plant, accessories, launching and arresting devices, whether traceable to material, design, construction, modification, overhaul, or inspection.

In the miscellaneous group are placed such causes of air accidents as bad weather, darkness, various conditions of the airport or terrain, and other external conditions.

Finally, there may be undetermined causes.

The most important cause of air accidents is error of the pilot. The principal reasons for his failure are listed by the C.A.A. as follows:

(1) Lack of experience.

(2) Physical and psychological causes of accidents. Under this head may be mentioned inherent disease or defects not susceptible to remedy within a reasonable period, such as defective vision or judgment of distance, unconciousness, a hysterical or epileptic tendency, chronic air sickness, inability to withstand altitude, etc. Any of these may lead to overshooting a field, faulty landing, or collision. The history of an individual is often essential to determine whether a disease or defect is inherent. There may also be a temporary disease or defect which is remediable and is not likely to repeat itself with undue frequency, such as temporary illness, incomplete convalescence, or various degrees of poor reaction on the part of the pilot.

In considering the underlying causes of accidents, inquiry should be made to discover whether the instruction of the pilot was faulty. To be considered, too, is the possibility of faulty maintenance inspection or defective materials in the plane.

Types of accidents may be classified as follows: Collisions in full flight with other aircraft, collisions in full flight with objects other than aircraft, spins or stalls following engine failure; spins and stalls without engine failure; forced landings; landing accidents; take-off accidents; taxi-ing accidents; fires; carrier, platform, and arresting-gear accidents; landing-gear accidents; structural failure; miscellaneous, including accidents the nature of which is known but which do not fall into any of the above classifications; undetermined, including all accidents concerning the nature of which so little is known that no other classification can be intelligently made.

From 1928 to 1937 there were a total of 17,050 air accidents. In analyzing the accidents over these years it was found that the majority, or *53 percent, were due to "pilot error."* The next most frequent cause was power-plant failure, 17 percent. The miscellaneous group, airport, weather conditions, etc., were responsible for 16 percent. Structural failure took next place, with 9 percent of all accident causes. The undetermined causes of accidents aggregated 2 percent, and other personnel errors were responsible for 1 percent of the accidents.

Figures under the miscellaneous group were interesting: Pleas-

ure flying accounted for 47 percent of all accidents, commercial flying for 26 percent, and instructional flying 24 percent.

The most significant of these figures for our purposes is the 53 percent of accidents caused by pilot errors. There is no question that this large loss of life can be substantially cut down by effective cooperation between pilots and their Flight Surgeons.

The following table shows the fatal accident trend in private flying operations in recent years:

Year	*Total Miles Flown*	*Number of Fatal Accidents*	*Miles Flown per Fatal Accident*
1932	78,179,000	208	376,000
1933	71,223,000	182	391,000
1934	75,602,000	186	406,000
1935	84,756,000	164	517,000
1936	93,320,000	159	587,000
1937	103,196,000	185	558,000
1938	129,359,000	172	752,000
1939	177,868,000	194	917,000
1940	265,000,000	208	1,269,000
Total	1,078,503,000	1,658	655,000

The total number of deaths in private flying aircraft accidents during this period was 2,650; of these, 1,080 were passengers, 1,380 were pilots, 170 were co-pilots or other members of the aircraft crew, and 20 were ground crew members or other persons not in the plane.

It is interesting to compare fatal automobile accidents with fatal airplane accidents. In the nine year period from January, 1932 to December, 1940 there were about 313,000 people killed by automobiles in the United States. Accurate figures of the number of passenger miles driven by automobile are not available, but on plausible assumptions it is estimated as about 2,500,000,000,000 for this period. This works out to about 1 fatality per 8,000,000 passenger miles. This compares with approximately 1 fatality per 2,000,000 passenger miles in private

flying during the best year (1940). In regular scheduled commercial flights, the record is much better. In 1940, there was 1 passenger fatality per 33,000,000 passenger miles, while the average for the period 1935-1940 inclusive was 1 passenger fatality per 21,000,000 passenger miles. It thus appears that automobile riding is about two and one half times as dangerous as regular scheduled airline travel, and about one quarter as dangerous as private flying.

Fires: Following an airplane crash there is always a possibility that some of the occupants may be burned, especially if the gasoline tank cracks and gasoline is sprayed or spattered. An aircraft may catch fire also while actively engaged in combat duty.

To aid in reduction of fires during refueling, special precautions have been suggested. Friction of air over the surfaces of a plane tends to generate a static charge which is not always liberated on contact with the ground, as the airplane may have a rubber tail-wheel tire which insulates the plane. The aircraft, also might have a tail skid, so that the entire plane might not be united with the fuselage, and static might not be discharged from a portion of the plane. It is important to release this static charge before the plane is refueled.

The C.A.A. advises the following precautions: (1) Find out if gas tanks it satisfactorily grounded. (2) Make provision for wire between gas wagon and plane. (3) Keep handy a hose nozzle with ground wire, one part of which is carefully attached to hose nozzle and the other end clipped to some desirable place on the airplane structure. (4) Have fire extinguisher handy and, as a further precaution, touch any part of plane or hose nozzle before filler cap is taken off.

The "Pilot's fifteen Commandments" (as given by the C.A.A. Bulletin) should be fixed in the memory and kept there for safe flying. These fifteen fundamental rules are:

(1) "Keep that nose down.

(2) "During power-off turns, lower the nose beyond the angle

necessary in a normal glide; the steeper the bank, the lower the nose.

(3) "Keep a good margin above stalling speed when flying in gusty air.

(4) "Flat turns invite stalls and spins.

(5) "Do not be fooled by the increase in the ground speed resulting from a downwind turn.

(6) "Maintain a safe margin of altitude when flying over a mountainous region, particularly in low-powered aircraft. Downdrafts can be dangerous.

(7) "Acrobatics started near the ground may be completed six feet under the ground.

(8) "When the engine quits on the take-off, land straight ahead.

(9) "Check your gas before each take-off, and anticipate an ample margin of safety.

(10) "An aircraft with a misbehaving engine should be kept on the ground.

(11) "Local traffic regulations are usually designed to safeguard flying.

(12) "Instrument flying during adverse weather conditions should be attempted only by those adequately trained in this type of flying.

(13) "Safety belts on aircraft are installed for use.

(14) "Be certain. 'I think I can make it,' belongs to a list of famous words.

(15) "Don't try to fly before you have had instruction."

Pilot error still is the big factor in air accidents. Pilots tend to be secretive about certain physical or mental ailments, and do not report them to the flight surgeon. It may be that this is due to a fear of being grounded, with loss of flying pay.

Perhaps, if pilots were to receive flying pay regardless of whether grounded or not, pilot-error disasters would be markedly decreased. If the flier knew that his pay would not be affected, he might report his physical or mental deficiencies early

to his Flight Surgeon. This would probably help to some extent in decreasing the number of pilot-error accidents.

The chief purpose of this book is to call the attention of the pilot to the essential steps in decreasing the high percentage of pilot errors. If, by reading FLYING HEALTH, the flier has been reminded of some of his own shortcomings and adjusts his routine to better health habits, the author will have been immeasurably rewarded for his efforts.

XVI

Diseases the Pilot Should Know

THIS chapter contains a list of some of the common ailments to which the human animal is subject. It is given here not to encourage self-diagnosis or self-treatment, but to make the pilot as intelligently aware as possible of the hazards to which he, as well as other men, is exposed. By knowing the outstanding symptoms of the common diseases, and by knowing as well the dangers of neglect, the pilot will learn to cooperate more effectively with his Flight Surgeon.

Acne: Acne is a disease of the sebaceous (oil-secreting) glands of the skin. It is characterized by disfiguring pimples and blackheads. The oily secretion remains in the hair follicles and produces local inflammation. In severe cases, some follicles become enlarged through engorgement with sebaceous material and form closed sacs, or cysts, under the skin surface. The malady is of chronic nature, often lasting for many years and sometimes throughout life. Adolescents are the most frequent victims, but adults and even the senile are also subject.

The common locations of the eruption are the face, neck, chest, and back. Athletes often develop acne on the back and thighs.

No specific cause for acne is known. Constipation seems to

be a predisposing factor, but many constipated persons do not have acne, and acne frequently appears in those who are unconstipated. Excessive sweets and starches in the diet are also blamed for acne. In some cases outbreaks have followed the prolonged use of certain drugs, notably potassium bromide and iodide. Excessive use of alcohol, tea, coffee, or cocoa may produce or aggravate acne.

The treatment of acne includes measures to raise the general body tone—simple diet with plenty of fruits and vegetables, adequate drinking water, and exercise in the open air—and local hygiene. Washing the skin carefully with tincture of green soap and rinsing with clean warm water is helpful in some cases. Moderate exposure to ultra-violet light, preferably in the natural form of sunlight, may also abate or clear up the disease. *Pimples should never be squeezed,* as inflammation ultimately leading to general blood poisoning may result.

Some success in the treatment of acne has followed the use of autogenous vaccines.

Appendicitis: Appendicitis—inflammation of the appendix—may be acute or chronic. It is the most frequent and most important abdominal disease. There have been many conjectures as to the function of the appendix. Most authorities today feel that it is a vestigial organ which thousands of years ago played some useful role, but in civilized man is non-essential. When it is removed, people get along perfectly well without it.

The appendix is connected with the alimentary tract, and under certain circumstances, partially digested food may find its way into the organ. Appendicitis usually arises when small folds or kinks in the appendix retain minute particles of food which serve as a culture medium for some germ, such as the *Bacillus coli,* which normally is present in the intestine in large number, or other less common organisms. Chronic constipation and hasty eating habits may predispose to appendicitis.

Signs of appendicitis: Sudden pain, mild or severe, occurring in the lower part of the abdomen and radiating toward the navel is the most characteristic symptom. The pain and tenderness

may be greatest in the lower right quarter of the abdomen, and is temporarily relieved when the legs are drawn up. The pain usually becomes progressively worse, but one should be on guard against acute pain which suddenly disappears. This suggests rupture of the appendix, leading to acute peritonitis. After the appearance of the pain, there is generally vomiting and nausea. There is localized tenderness in the area between the navel and the crest of the hipbone. Fever is common, but does not appear in all cases.

Appendicitis demands immediate medical care and hospitalization. Under normal conditions, the operation for removal of the appendix gives consistently good results, but if the appendix is allowed to become ruptured, or other complications arise through neglect, the gravest consequences are to be expected.

In the presence of the above signs and symptoms *no food should be eaten and cathartic or laxative drugs must be avoided.* Many deaths have been caused by the reckless use of cathartics when cases of appendicitis have been confused with so-called "indigestion" or "upset stomach." In cases of abdominal pain simulating appendicitis, a doctor should be summoned at once.

If trained assistance is not immediately available, an attack of appendicitis may be eased by ice-cold compresses applied to the painful area. Ice-bags and compresses, however, should not be left on for more than 15 minutes at a time. After a fifteen minute application, they should be removed for from twenty minutes to half an hour and then replaced.

In *chronic appendicitis,* there are mild repeated attacks over a long period. At any time, however, chronic appendicitis may flare up in an acute form, and one with chronic appendicitis takes grave risks, especially if he goes anywhere where medical assistance is not at hand. Over a long period, chronic appendicitis causes the formation of scar tissue, commonly known as adhesions, resulting in pain and various troublesome intestinal symtoms.

A pilot who does not report abdominal pain to his medical officer shows serious disregard, not only for his own safety, but

for the lives of others entrusted to his care. With proper medical attention, appendicitis can be controlled and conquered.

Bronchitis: A harmful, nonproductive cough may be caused by inflammation of the tonsils, pharynx, larynx, or bronchial tubes (wind-pipes). A mass pressing upon the wind-pipes or lung tissues will produce a harassing, dry cough, while heart infections and tuberculosis also have coughing as a symptom. Excessive smoking of tobacco produces a tickling of the pharynx and larynx. A cough can even be initiated by autosuggestion, a forceful cough being produced to relieve an annoying sensation of tickling. If uncorrected, a cough can persist for months or even years. If bronchitis is not cleared up after three to four weeks, it is said to be chronic, and chronic bronchitis may continue for many years.

Those who use excessive amounts of tobacco should discontinue it to help abate the coughing. At night, during cold weather, if one is coughing, the bed should be warmed before getting into it. Harmful results may occur if one persists in straining during the act of coughing.

In chronic productive bronchitis sputum is brought up with each coughing spell. But this condition is not due to tuberculosis, pneumonia, or cancer of the lung. The coughing is worse in colder climates, and ceases or decreases during the warmer months. There may be shortness of breath during these coughing spells.

Occupational acute bronchitis is caused by inhaling irritating chemicals such as ammonia, gasoline fumes from the airplane motors, chlorine, magnesium, phosphorus, and dust from various sources. The cough may first be dry, with expectoration of mucus later. If inflammation persists, some slight tinge of blood may be noted following a coughing spell, associated with pain in the chest. When inflammation extends farther down, the lining of the lung may become involved, with development of pleurisy.

Capillary bronchitis, (broncho-pneumonia) usually follows a neglected influenza or acute attack of bronchitis. To prevent serious complications, medical care should be sought promptly. Neg-

ligence in any of the bronchial infections may lead to serious consequences, and certainly, valuable time is lost by a long-drawn-out illness. The long-neglected bronchial infections sometimes turn out to be tuberculosis. The doctor will always use the X-ray as well as smears and cultures in order to ascertain the actual condition.

Boils: Boils may occur in those who are run down and suffer from general debility, they may be a forerunner of some disease such as diabetes, or kidney infection, or they can be caused by focal infection in the nose or throat. When body resistance is very low, a carbuncle (multiple boils in one circumscribed area) may occur. Whatever the cause of the boil or carbuncle, it is best for the pilot to inform his doctor about his condition and have prompt treatment.

No matter how inviting it may be to squeeze a boil or early carbuncle, this should *never be done* as it sometimes results in generalized blood poisoning. Boils around the neck, face, or forehead, especially, *should never be squeezed.* It may even lead to fatal results. Let your physician handle your skin infection.

If boils are present and medical care is not at hand, warm Epsom salt compresses applied gently are best.

Cancer: Cancer is a malignant disease which may attack any external surface or internal part of the body. It may appear as a slow-healing resistant ulcer, or as a tumor which grows in size and presses on adjoining normal structures. It is a disease of middle and old age, rarely appearing before the age of 35. The cause is as yet undetermined. The disease is not contagious, and there is little evidence that a disposition to cancer is hereditary. Long continued irritation undoubtedly plays a part in the starting of a cancer. In the case of cancer of the stomach, there is statistical evidence that chronic gastric ulcer may cause, or is at least often associated with cancer.

In its early stage, cancer usually causes no pain, and internal cancers especially, are often not noticed until they have grown to large size and have invaded much surrounding tissue. Remedial

measures are by this time too late. Cancers that are detected early can be cured by surgery or radiotherapy.

Because of the great importance of early diagnosis, any ulcer, lump, or growth should be regarded suspiciously and submitted to a skilled physician. Much of the fear inspired by cancer would be avoided if the public were aware of the recent advances in diagnosis and treatment.

The Common Cold: The common cold is without doubt responsible for more lowered efficiency and general loss of time and energy than any other known disease. In itself it is not a serious condition, but it frequently leads to complications, and is always a destroyer of the joy of living.

Although much research has been devoted to the problem, the specific cause of the common cold is as yet undertermined, and suggestions for prevention and treatment are still largely empirical. There is considerable evidence that colds are caused by a filter-passing virus, and there is no doubt that they are both infectious and contagious—that is, they may be transmitted both by actual contact or through air and perhaps food and water. Normally the body seems to have a fairly high resistance to cold infection, but becomes highly susceptible when in a state of fatigue or lowered vitality due to diet deficiency, lack of sleep, constipation, or other upsetting condition. Exposure to dampness and cold appears to act as a kind of trigger in starting the infection when other predisposing conditions are present, but colds often occur without any exposure to dampness or chilling, and healthy people can be subjected to all sorts of exposure without acquiring a cold. It is possible that the specific agent of the cold, whether virus or ultra-microscopic organism, is present at practically all times in the human body, but becomes active only when body resistance is lowered.

The first step in avoiding colds, therefore, is attention to the general health, particularly attention to adequate rest, balanced and vitamin-rich diet, and regularity of elimination.

Most colds begin in the head and later invade the throat and bronchial tubes. Persons with adenoid obstruction or with en-

larged or infected tonsils suffer a high incidence of colds, and if examination shows these conditions, they should be surgically corrected. Bad teeth often cause inflamed pharynx and larynx, and may predispose to colds by lowering resistance.

It is a matter of common observation that colds are more frequent in winter than in summer. This may be due in part to exposure to cold and wetness, but is apparently much more largely due to poor ventilation in artificially heated places where people, some of whom are infected with active colds, congregate. Theatres, crowded stores, and trains are often poorly ventilated, and are no doubt the transmission places of many thousands of colds. Steam-heated homes are commonly kept at too high a temperature and the air is insufficiently moist; this condition dries and irritates the mucous linings of the nose and throat and may predispose to colds. Room temperature should be kept at around 68°, and radiators should be supplied with water pans to secure adequate moisture in the air. If the air is moist, it will be found that a temperature of 65° to 68° is perfectly comfortable, while dry air feels chilly even at 75°.

Another cause of the greater prevalance of colds during the winter season is probably the relative lack of sunlight. There appears to be a close relationship between the incidence of colds and deficiency of vitamin D. Although adequate statistical evidence is lacking, there is reason to suppose that those who are getting adequate vitamin D rarely take cold. Moderate exposure to sunlight in summer, and the careful use of the ultraviolet lamp in winter, with selection of vitamin D-rich foods, are therefore indicated as cold-preventing measures.

Much experimentation has been undertaken to find a satisfactory vaccine to immunize the body against the common cold. In some cases these vaccines have proved to be effective, but in the majority of cases the incidence of colds has not been substantially reduced. The severity and duration of colds, however, has been markedly reduced in many cases, and there is a measurable increase in immunity to pneumonia, influenza, and sinus complications. Cold vaccines are therefore of considerable value,

even though they have not yet proved a final answer to the cold problem.

There is no specific treatment for cold infection. Most colds clear up in a week to ten days with rest and attention to the general hygiene. Various preparations and remedies to "knock out" a cold have been handed down from generation to generation, but they are of utility only in so far as most of them involve getting the patient to bed and assisting the eliminative processes. Undoubtedly the best thing to do with a cold is to take it to bed, and this should *always* be done if there is fever. Two or three nights with ten to twelve hours sleep will usually do wonders in clearing up a ragging, debilitating cold.

In connection with the common cold, a few words regarding the sanitation of swimming pools may be appropriate. Pools that are not properly kept can transmit infection through polluted water. Such conditions as sinusitis, inflamed tonsils, streptococcic sore throat, pink eye, infection of the ears, inflammation of the mastoid bone, colds and influenza are among the diseases that may be spread in this way.

Most swimming pools in large cities are under the strict supervision of the health department. Those that are properly regulated have purification systems similar to those used for drinking water. Weekly inspection, with bacteriological examination of water samples is usually required by law. If these regulations are properly carried out, the danger of infection is reduced to a minimum.

In private pools where water is not regularly purified by chlorination or filtration, dangerous concentrations of bacteria may develop.

No one should use a swimming pool when suffering from any communicable disease. Normal and healthy persons should take a shower bath with free use of soap before entering the pool. People in street attire should not be permitted to enter the pool, since they may bear disease-causing germs on their clothing.

Constipation: Few things are more important in maintaining good health than the efficient operation of the eliminative sys-

tem. Nearly everyone has experienced the symptoms of constipation from time to time—lack of energy and "pep," feeling of sleepiness, poor appetite, dull headache, feeling of heaviness and fullness in the abdominal region. These symptoms are not only unpleasant in themselves, and destructive to efficiency and morale, but the constipated person is in a state of lowered resistance and often falls a prey to colds and other common infectious diseases.

Fortunately, nearly all cases of constipation can be entirely cured by the practice of simple hygienic measures. The first precaution is to establish a regular toilet habit. This can be done by two or three weeks of conscious effort. A convenient hour, preferably before breakfast, is selected, and an attempt is made every morning at the same time. Perhaps on the first two or three days an enema of plain warm water or warm water and soapsuds will be necessary to secure results in bad cases of constipation. Within a very few days, however, this artificial aid can be dispensed with. Once the habit is established it becomes automatic, and no more conscious thought or effort is necessary.

The second preventive measure for constipation is attention to diet. Plenty of water should be drunk during the day. One or two glasses of cold water immediately upon arising in the morning is a good habit. Besides fluids, the constipated individual should eat plenty of fruits and vegetables, and should be moderate in his consumption of fried foods, concentrated sweets, and bread made of refined flour. Whole-wheat bread, such fruits as apples, peaches, oranges, prunes, grapefruit, dates, and figs, such vegetables as carrots, tomatoes, beets, and spinach are all helpful in giving work to a lazy colon. Muffins, breads, and breakfast foods containing bran supply bulk which stimulates the intestinal muscles, but large amounts of bran are not recommended, as it is an indigestible substance and may irritate the delicate intestinal walls. Such vegetables as cabbage, okra, cauliflower, onions, and asparagus are gas-producing, and should be avoided if any high altitude flying is in prospect.

Moderate exercise, particularly in the open air, is an important

aid in overcoming a disposition to constipation. Exercise stimulates the rhythmical dilation and contraction of the intestinal wall called *peristalsis,* which pushes waste matter down the intestine to the colon. If regular exercise cannot conveniently be taken, massage of the abdominal wall is often helpful.

If chronic constipation is permitted to go unchecked, more distressing conditions may result, such as acute dilation of the stomach, disease of the heart or blood vessels, kidney, gall bladder, or liver disorders, hardening of the arteries, or hemorrhoids.

The worst way to deal with constipation is to use cathartic drugs habitually. While temporary relief can be obtained in this way, the repeated overstimulation of the digestive system makes it progressively less able to function normally, and in the long run aggravates the constipated condition. A mild laxative such as mineral oil does less harm than powerful internal stimulants such as phenolphthalein or Epsom salts. A plain water enema is the best way of relieving temporary constipation.

Diabetes (Diabetes mellitus): Diabetes is a disease preventing proper absorption and utilization of sugar by the body. One of the glands of internal secretion, the pancreas, normally produces a substance called *insulin* which is necessary for the conversion of sugar. When the pancreas becomes diseased, there is insufficient secretion of insulin, and unconverted sugar is absorbed into the blood. Sugar appears also in the urine, and this is the characteristic diagnostic sign.

The subjective symptoms of diabetes mellitus are unusual hunger and thirst only temporarily allayed by food and drink; progressive deterioration of strength and energy, with loss of weight, and extreme fatigue; excessive passage of urine as a result of the great quantities of water drunk; shortness of breath, headache and dizzy spells, itching and numbness, particularly around the thighs and legs, and perhaps pains simulating neuritis in joints and muscles. If the disease is not recognized and treated, the symptoms of fatigue become excessive and eventually unconsciousness and death supervene.

Overeating of sweets and starches predisposes to the disease. Heredity also plays a part. The disease appears more frequently in the overweight, perhaps because they are generally in the habit of eating sweets. Such persons should carefully guard their weight and diet, especially after the age of thirty. If there is any suspicion of diabetes, a urinalysis should be made at once, and if the disease is present, the program of treatment should be carefully worked out and religiously adhered to.

Diabetes is a serious condition, requiring careful management and control. Less than twenty-five years ago medical science could do little to arrest it. Today, as a result of long and careful research, the life of the diabetic patient can be prolonged almost to its normal expectancy, provided he cooperates with his physician.

When diabetes is present, a balanced calculated diet is prescribed, designed to give the maximum of nourishment with a minimum of sugar and starch. In many cases, this is sufficient to maintain the patient's health. If his own insulin supply is sufficient to take care of a minimum of carbohydrate, he may lead a useful and active life for many years by simply keeping within that minimum. If he "cheats" on the diet, however, he will find his symptoms returning, and may find too that he has so damaged his sugar conversion capacity that the calculated diet will no longer be possible for him.

In severe diabetes, the sufferer is unable to digest even the minimal amount of sugar in the rigidly calculated diet. It is possible in this case to supply insulin artificially by injection. However, insulin is not ordinarily prescribed unless it is really necessary, as the injection procedure is troublesome, there is danger of infection unless full precautions are observed, and the use of the insulin must ordinarily be continued throughout the patient's life.

Every case of diabetes should be thoroughly studied by the physician, the exact tolerance of sugar worked out, and the diet calculated after taking into account the patient's weight, type of work, age, and other individual factors. After the regimen has been established, regular examinations of the urine should be

made to make certain that the condition remains under control.

Eczema: A chronic, non-contagious inflammation of the skin, extremely resistant to treatment. Eczemas usually start with a simple itching or local irritation which may come and go over a period of weeks. Later there is a formation of minute blebs or blisters on the skin which break down with exudation of moisture, whence the common term "weeping." The weeping eczema may eventually dry up with the formation of thin crusts or scales, and when the crusts are pulled off accidentally, minute hemorrhages appear which may again become infected. Often eczema seems to clear up entirely, only to reappear weeks or months later. In the acute stage, itching and inflammation may be intense.

Eczema occurs in all ages, and men and women are equally susceptible. Those with fair complexions and delicate skins are most likely to be attacked.

Eczema seems to be most commonly caused by irritation of the skin, mechanical or chemical. Friction by clothing, rubbing or scratching an irritated area, soaps containing free alkali, and various chemicals associated with special occupations may be the responsible agents. Occasionally eczema develops from sensitivity to certain dyes used in clothing. Eczema seems also to be caused by faulty diet and metabolic disturbances, and by foci of infection in teeth, tonsils, sinuses or other centers.

Of particular interest to the airman is eczema caused by irritation of the skin by tetra ethyl lead used in high test gasoline. Gasoline containing lead should never be used for cleaning, nor should it be allowed to dry on the skin if accidentally spilled. It should be washed off at once with kerosene, non-leaded gasoline, or alcohol, or if these are unavailable, with plain soap and water. If high test gasoline should be spilled on the clothing, the same precautions should be taken.

If eczema develops, effort should be made to keep the affected skin surface from irritation. *Washing with soap and water* is generally harmful. If it is necessary, a super-fatted mild soap is best, and the soap should be thoroughly rinsed off and the

skin carefully dried by padding or blotting with sterile gauze. Moist skin surfaces around the eczema tend to aggravate the irritation. Dry powders such as zinc stearate, borated talc, or plain starch may be used to absorb moisture and promote healing. Salves and ointments should not be used.

A careful study of the diet should be made, since there are types of eczemas that resemble allergic reactions and respond to the elimination of certain irritating food. Careful balance of vitamins and minerals is also important. Some chronic eczemas respond to X-ray treatment. Dusting the area with calomel powder is also successful in certain cases, but these treatments should be undertaken only by a physician, as they are dangerous in unskilled hands.

Gonorrhea: (See Chapter VIII).

Hay Fever: Because of the constant traveling associated with his occupation, the pilot may be confronted with the problem of hay fever at any time of the year. The most active agent in hay fever is the wind-borne pollen. Pollen may be blown thousands of miles from the point of origin, and the aviator may suddenly be subjected in his many travels to the symptoms of this annoying disease.

If the flier arrives in an area where there is a pollen to which he is individually sensitive, the following sequence of symptoms will appear: He begins to sneeze violently. His eyes water and become red. His nose becomes stuffed, accompanied by an itchy sensation. Soon this crawling, tickling feeling in nose and throat stimulates more explosive sneezes. As the condition develops, his eyes become hyper-sensitive to light. A watery nasal flow, heaviness in the front part of the head, clogged ears, and perhaps a headache, add to these disagreeable symptoms.

Soon he develops a mild cough. Sometimes asthmatic attacks will follow. All these disturbances may lead to sleeplessness, stomach upsets, and nervous irritability. The attacks cease during damp or rainy weather.

Frequently the disease comes on during the summer months

when the pollens of grasses such as timothy, June grass, orchard grass, Johnson grass, red top, sweet vernal, and Bermuda grass are prevalent. Some people are affected by the spring tree-pollens such as oak, birch, maple, elm, hickory, and cottonwood, while those of the fall season are generally of the chenapod and ragweed group. In the Rocky Mountain and Pacific states the wormwood type of pollen is prevalent. As already discussed in another chapter, there are specific types of foreign proteins which may cause allergic reactions throughout the entire year if the offending substance is not removed.

Hay fever occurs less frequently in South America, Central America, Australia, and South Africa, but is very frequently encountered in the United States and in different parts of the British Isles and Europe.

Besides sensitivity to pollens, there are other undermining causes such as a peculiar lowered resistance caused by advanced fatigue. There are other indirect causes such as exposure to pungent odors, cross drafts, or dust.

When at a great distance from one's post, it is difficult to get relief, so that it is essential to consult a medical officer when he is available. At the home air base, skin tests can be undertaken, which help to identify the allergic agent.

Some doctors use prophylactic or preventive measures, while others use desensitization by injections. In any event, should a flier suddenly be attacked by hay fever, some relief can be obtained by using a solution of ephedrine, preferably of an oily nature, or a jelly containing ephedrine. These can be purchased at a chemists shop, but for diagnosis and treatment a physician must be consulted.

Hiccup: Hiccup is a spasmodic contraction of the diaphragm with blockage of air intake. The immediate cause is irritation of the phrenic nerve. Indirectly, hiccup may be caused by overuse of alcoholic beverages, by excessively hot or cold food, which irritates the lining of the tube connecting with the stomach (esophagus), by high seasoning of foods with pepper or spices, by dyspepsia (upset or irritated stomach), or even

by swallowing of air. In rare cases hiccup may be due to diseases such as dysentery, chronic appendicitis, hernia, or kidney disorder.

When medical aid cannot be obtained, repeated swallowing of small amounts of drinking water may help to clear the esophagus and relieve irritation. If this fails, bicarbonate of soda may be tried—one teaspoonful in a half glass of water. Breathing deeply and quickly, from forty-five to fifty times per minute, or holding the breath as long as possible may be helpful. In persistent hiccup, medical aid should be sought.

Headache: The common causes of headache are constipation, hunger, defective vision, colds with nasal congestion, sinus infection, and hay fever. The airman may suffer from various types of headache peculiar to his profession. Anoxia, particularly if caused by carbon monoxide poisoning, airsickness, and unequal pressure in air chambers in the head caused by rapid changes of altitude may produce headache. (See Chapter XIII). Less common causes of headache are abscess of the nasal septum, mastoid infection, high blood pressure, wax blockage of the external ear canal, kidney disease, and injuries to the skull or brain.

Headache is a symptom, not (except possibly the migraine type) a disease in itself, and the medical officer should be consulted for proper diagnosis and treatment. Headache may be the first danger signal of some potentially serious condition which if treated in good time may be cleared up, and accordingly it should not be regarded lightly unless the cause is known.

A particular type of periodic sick headache occurring on one side of the head is known as migraine. As yet no specific cause has been discovered, and the patient is generally in good health in all other respects. Some observers believe that a temporary swelling takes place in the lining of the brain. There is some evidence that the trouble is hereditary. In some cases the migraine headache appears to be akin to an allergic reaction, as the elimination of certain foods from the diet leads to improvement. The most common foods that seem to be respon-

sible are milk, chocolate, wheat, eggs, potatoes, peas, tomatoes, and oranges.

Recent studies have shown that migraine headache can be completely relieved in about 40% of cases by the inhalation of pure oxygen. An additional 40% of cases are partially relieved. Oxygen is not so effective in relieving headaches of other types, but gives favorable results in about 33% of cases.

Hemorrhoids (Piles): Hemorrhoids are varicose or dilated veins located at or just inside the anus. Constriction and pressure produced by constipation, sedentary habits, and straining during evacuation are the main causes. The vein walls become distended and may rupture with profuse bleeding and chronic ulceration. Severe pain may be caused by a part of the vein becoming pinched by the sphincter muscle of the anus. If the vein wall becomes ruptured, persistent bleeding may lead to anemia. Kinks of vein may push out through the anus, especially during evacuation.

Hygienic measures for avoiding hemorrhoids are identical with those suggested under constipation. If hemorrhoids develop in spite of preventive measures they should be treated by a physician. Careful cleansing, warm and cold applications, soothing salves, and astringent lotions are useful in controlling pain and bleeding. In severe or neglected cases an operation may be necessary.

Hernia: Hernia is a protrusion of any of the internal organs through their containing body walls. Most commonly the term applies to the protrusion of a loop or kink of intestine at a weakened spot in the abdominal wall. The weakness may have been present from birth, or may have developed as a result of strain.

In men, the most common location of a hernia is the groin. After a violent exertion, pain may be felt in the groin, and upon examination a swelling or bulging of the skin will be observed. The swelling may be no larger than a marble, or it may attain great size. It is sometimes very tender and painful, and sometimes scarcely noticeable. Sometimes the protrusion

can be pushed back easily to its normal position (in which case, the hernia is said to be *reducible*), and sometimes it cannot be replaced (irreducible hernia).

The chief danger in hernia is the possibility of the protruding loop of gut becoming pinched or *strangulated,* like a paper bag filled with air and held tightly at the neck. Such pinching prevents the flow of blood to the tissues and quickly results in mortification, with breaking open of the intestinal walls and spilling of the intestinal contents into the abdominal cavity. Peritonitis and death are the usual consequences. Even if the intestine does not break, the tissues may become gangrened as a result of strangulation with ultimately fatal result.

When a rupture is tense, tender, and irreducible, or when there is local abdominal pain or vomiting, the hernia is probably strangulated or obstructed, and an *immediate* operation is necessary. A delay of only a few hours may have grave consequences. No attempt should be made to treat the condition with palliative measures. Only the most gentle manipulation to attempt to replace the hernia is permissible, as the intestinal wall may be broken in its distended condition.

If an operation is performed early, the results are generally good. The abdominal wall can be opened, the intestinal loop replaced, and the area sutured up to reconstruct the wall and prevent recurrence.

A reducible hernia may be held in by a truss or sponge pad. There is always danger, however, of the hernia's becoming strangulated, and in any case, the truss is a palliative, not a curative measure. When it is considered that the curative operation in competent hands is attended with virtually no danger, there is no sound argument for delaying an operation and attempting to get along with a truss.

Impetigo: A contagious skin disease characterized by an acute inflammatory stage. It begins with watery blebs or vesicles on the skin surface; later pustules form with small crusts or scabs.

The disease is less common in adults than in children.

It is commonly transmitted by infected towels, clothing, or other contact.

The usual sites are the face, lips, scalp and hands, although it may appear anywhere on the body. The condition may last from one to two weeks.

Impetigo should be treated by cleanliness and antiseptic measures. The crusts must first be removed and the area thoroughly washed with soap and water. Ammoniated mercury salve (5% to 10%) may be applied to destroy the causative organisms. Since the disease is contagious, it is best to boil all shaving utensils when the face is involved. All dressing coming from skin surface should be burned. The patient's clothes should be sterilized and kept separate to prevent transmission of the disease.

Ingrown Toenails: Pressure of the toenails into the surrounding soft tissues sometimes produces a swelling and forces the adjoining tissue over the margin of the nail. The skin is broken, providing an entrance for bacteria, and eventually there results an infection with pain, tenderness, and ulceration. If neglected, ingrown toenails may result in serious blood poisoning.

Ingrown toenails are usually caused by pressure from overtight or poorly fitted shoes. If the nails are pared too short, they may press into the toe. If they are allowed to grow out to the end of the toe, the skin there is usually tough enough to prevent penetration.

A fully developed ingrown toenail should be treated by a surgeon. By a minor operation under local anesthesia, the nail can be split and partially removed, and the tissues given a chance to repair themselves. Such an operation, however, should be carried out under strictly aseptic conditions, preferably in a hospital.

Jaundice: Simple jaundice is generally due to obstruction of the bile duct and may be secondarily caused by inflammation of the small intestine. Under these circumstances, the eyes and skin become deep lemon color, and the patient feels sluggish, and may or may not have some fever.

When this condition is present, a medical officer should im-

mediately be notified, since complete rest and some mild medical treatment—such as calomel followed by a cathartic in the morning—will return the flier to his duties in the shortest possible time if no complications set in.

During the first day of an attack of jaundice, no food should be eaten, but water may be taken. After twenty-four hours, tea and toast are allowed, followed by thin broths, soft-boiled eggs, and milk shakes.

Kidney and Bladder Diseases: Kidney colic—stone in the kidney—can come on at any time during the day or night. Excruciating pain attacks with lightning speed and is often associated with urinary disturbances. When urine is passed it may contain blood. The pain is localized in the small of the back, and is knifelike in sharpness.

This condition arises as the result of a stone or *calculus* being formed in the kidney and becoming blocked (usually in the ureter, the narrow tube that connects the kidney and the urinary bladder). The pain is produced by the sharp edges of the stone cutting the walls of the ureter, or by pressure from the stone and blocked fluid.

The primary cause of kidney stone formation is over-saturation of the urine with crystal-forming solutes. Under certain conditions these solutes precipitate out of the urine, perhaps around a microscopic nucleus, and form bits of grit or gravel. As long as they are smaller than any of the tubes or canals through which the urine passes, they may be carried out of the body without trouble, but if a particle becomes lodged, it will grow by accretion of deposit, and sooner or later will give rise to the characteristic severe symptoms.

Sometimes a particle will form in the kidney, pass safely into the bladder, and there grow to considerable size. In the bladder the stone causes little pain, but if it is sharp-edged it may cut the delicate lining and cause blood in the urine. It may also block the escape of urine.

Predisposing causes for kidney stone formation include an improperly balanced diet with absence of vitamin A; focal in-

fection in the tonsils, teeth, sinuses, ears, or gall bladder; abnormal concentration of solids in the urine, which in turn may be caused by insufficient water-drinking. Overuse of bicarbonate of soda or magnesia may give the urine a persistently alkaline reaction, which favors the formation of precipitated crystals. Over-concentration of urine may arise from excessive intake of nitrogenous (protein) food. Marked enlargement of the prostate gland may narrow the urinary duct leading from the bladder and thus cause the retention of minute particles which later grow into stones.

The treatment of kidney or bladder stone should certainly be placed in the hands of a doctor. Self-treatment is dangerous. When back pains occur, it is good judgment to ask for a urine check-up, as sometimes tiny bits of gravel will be found, and the medical officer can administer early prophylactic treatment by corrective diet and medication.

Bright's Disease *(nephritis):* Bright's disease is a general term for several kidney disorders. It may be acute or chronic. Acute kidney disease frequently follows some other infection as an aftermath. Backache, loss of appetite, and puffiness of the face, particularly under the eyes, are the first symptoms. There may be headache accompanied by nausea and vomiting. The urine is scanty in amount, and may contain blood. In severe cases, there is complete suppression of urine, accompanied by swelling of the legs and body due to retention of fluid. Moderate fever is usually a feature.

Chronic Bright's disease may result from an acute attack of Bright's disease which never healed, or it may arise from repeated upper respiratory infections, from syphilis, tuberculosis, or untreated focal infection in teeth, tonsils, or sinuses. It is a common disease after the age of forty, and frequently reflects an unhygienic life on the part of the patient. Chronic intoxication, either dietary or alcoholic, may be the real reason why the acute or sub-acute attack of Bright's disease refuses to heal.

There is a close relation between Bright's disease and high blood pressure, and blood pressure readings are accordingly an important diagnostic sign. Urinalysis discloses the presence of

albumin in the urine. There may also be swelling of different parts of the body, particularly the ankles. Uremia (poisoning of the blood by waste products normally eliminated in the urine) finally sets in with possibly fatal result. With proper treatment undertaken as soon as diagnosis reveals the condition, Bright's disease may be controlled, and the patient's life expectancy greatly increased.

Mouth Diseases: The mouth is the portal through which many disease germs enter. Infected teeth often cause acute or chronic diseases of the tonsils, pharynx, larynx, and bronchial tubes. At times an infected mouth is responsible for ulcers of the stomach or chronic intestinal or stomach upsets.

Rough-edged teeth may cause ulcers of the tongue, as well as of the inner lining of the cheek. Sharp teeth may wear down the edges of pipe stems. When these rough-stemmed pipes are smoked very often, chronic irritation of the tongue may ultimately lead to cancer of the mouth.

Dead teeth are a constant menace in the mouth, and require frequent observation by the dental officer. It is best to remove them, since infection may set in without warning because the nerve has been removed and pain is not felt.

Small cavities should be carefully cleansed, and filled by the dentist. The teeth should be cleaned by a dentist or oral technician, two or three times per year. Tartar accumulates more rapidly in some people than in others, and there is no reason why prophylactic cleanings should not be done whenever needed. The enamel of teeth is not injured by cleaning, even three times a year.

A toothbrush should be used twice each day—before breakfast and at night before retiring. Cleansing following each meal is a good practice. It does not matter whether one uses paste or powder or plain water as a dentrifice, so long as the gums are massaged thoroughly with an up and down motion. The use of a brush and a dentrifice does not prevent decay of teeth. By stimulating blood supply to the gums, brushing does increase resistance to disease.

Sound teeth have their source in a sound and healthy body. Proper and regular meals well balanced in vitamins, minerals, and calories really do the caretaker's job for the teeth. Milk taken in sufficient quantities gives the balanced mineral intake otherwise lacking in hasty diets.

It is a mistake to use bleaching agents for whitening teeth. Whenever an accumulation of greenish discoloration appears on the margins of the gums, it is best to remove it with antiseptic solution, as pathogenic bacteria thrive in such an ideal medium for growth. A good and inexpensive mouth wash is composed of one teaspoonful each of sodium bicarbonate and sodium chloride (table salt) in a glass of warm water. This solution can be used twice each day—morning and night.

Toothbrushes should have bristles of medium hardness; a small-head toothbrush is most convenient for reaching all parts of the teeth.

Any removable dental plates should be carefully scrubbed every night with a toothbrush and antiseptic solution. Improperly fitted plates should be corrected without loss of time, as they may cause ulcers and infections of the hard or soft palate, as well as the tongue.

Halitosis (offensive breath) is usually due to an unclean mouth, with infected teeth, or it may be caused by poorly treated fillings and badly fitted crowns or bridges. Other conditions, such as trench mouth, ulcers of mouth or tongue, pyorrhea, infected tonsils, sinus disease, and nasal drippings, may be the cause of foul breath. More remote causes may be diseases of the lungs or chronic infections of the stomach or intestines. In any case, the condition cannot be eradicated unless a diagnosis is made and proper treatment is instituted early.

Extraction of teeth should not be done after a long illness, in extreme weakness, or after a profuse hemorrhage from another type of injury. Hostesses on planes should not permit a tooth extraction immediately preceding, during, or a few days following the menses. The dentist should always be informed about previous loss of blood prior to any dental surgery.

Erosion of teeth should be watched, since the wearing away

of the surface of teeth may injure the gums when the process reaches the gum margin.

Following extraction, shifting may occur of teeth, either adjoining teeth or opposing teeth, due to the loss of contact. This will create disturbances in balance of the jaw structure. In turn, the gum margins, as well as the shape of the jaw, and the teeth themselves, are later affected.

The habit of chewing food on a favored side of the mouth is not particularly harmful, but it is better to give both sides a chance to exercise the facial muscles. This also tones the teeth themselves, since chewing hard food has some definite massage effect upon the gums and the pulp of the teeth.

Neuralgia: Neuralgia is characterized by acute paroxysmal pain, lasting anywhere from a few minutes to several hours. Sensory nerves are involved, but there is little if any evidence of structural change or inflammation in the neurons, as there is in neuritis. There seems to be some hyper-irritability in the sensory neuron produced by local infection, perhaps of a tooth, a joint, or the heart; or by direct involvement of nerve trunks, injury to a part, growths, healed broken bones, pus conditions of soft tissues, the presence of shingles, anemia or fatigue. Neuralgia may be indirectly brought about by exposure to cold.

In neuritis there is a sensation of numbness along the course of the nerve, whereas in neuralgia no anesthesia is felt. The muscles are never tender in neuralgia while in neuritis there is tenderness over the muscles.

It is of great importance to search for the cause. Anemia can be detected by a blood count. X-Rays of the teeth may show infection. Other foci of infection should be looked for and if present should be removed. The existence of such conditions as diabetes, syphilis, or kidney disease may be the cause of persistent neuralgic pains.

The doctor may suggest such forms of treatment as ultra-violet radiation, massage, local applications of linaments, and internal use of tonics.

Neuritis: Neuritis is an inflammation of a nerve or group of

nerves. When many nerves are involved, it is termed multiple neuritis. If sensory nerves are affected pain is felt along the nerve. Neuritis of motor nerves may produce paralysis and atrophy (shrinking up of muscles).

Neuritis may be caused by mechanical injuries; excessive use of alcoholic beverages; poisoning by lead, arsenic, sulphur, mercury, carbon monoxide; nutritional deficiencies, especially lack of vitamin B_1; infections, either general or local; exposure to dampness and cold; finally, certain metabolic diseases, such as diabetes or gout.

Pain may be limited to surface nerves, and under these circumstances the pain radiates upwards and at times may be felt on the nerves of the opposite side of the body. Motion of the affected part may aggravate the pain to an unbearable degree. The pain may be of a stinging, penetrating or cutting type. Slight pressure of the part affected may be very painful. In severe types, anesthesia or numbness may be produced over the involved area.

Paralysis of motor nerves may develop and, in time, atrophy of the involved muscles may take place. The skin over affected parts may show variable changes in color and may be swollen, red and tender. Symptoms may last for a short time (as a few days) to many months.

To treat neuritis properly, the cause must be determined by a thorough examination. Generally, a well-balanced diet should be followed. The affected parts should be rested and kept warm. Pain may be allayed by use of analgesic drugs, such as aspirin, (10 grains, three times a day). One who exposes himself to the occupational chemicals should change his environment or take precautions to protect himself against the fumes of chemicals. Those using lead, or other cumulative poisons, must wash their hands before eating. Gloves should be worn to avoid the local poisoning from drugs or chemicals.

Exposure to cold and dampness should be avoided. The resistance of the body to disease should be increased, and chronic fatigue should be avoided.

Pneumonia: Pneumonia is an inflammation of the lung substance. It is caused by one or more of a group of specific miscroorganisms, usually the *Diplococcus pneumoniae.* Often the invasion of the lung tissue is preceded by a neglected cold or influenza. It has been estimated that about 80% of pneumonia cases arise when the body resistance has been weakened by a cold. Other predisposing causes are excessive use of alcohol, fatigue with exposure to cold and wetness, and weakness due to undernourishment. The inhalation of noxious fumes and dust may irritate the lung and create small lesions for the entrance of the pneumonia microbe. Irritation caused by long continued breathing of rock dust, fine sand, and ground glass (silicosis) may predispose to pneumonia, as well as to tuberculosis and other diseases. A special type of pneumonia sometimes arises as an aftermath to a major operation with prolonged anesthesia and shock.

Pneumonia rarely occurs in summer, but is frequently encountered in fall or winter. Exposure to cold undoubtedly increases susceptibility.

The time between infection and onset of the disease is not definitely known, but appears to be about two days. The first sign is a marked chill, ushered in rather dramatically, with shivering and rapid rise of fever. The attack may come at any time or place. There may be more or less severe pain in the chest. Fever may rise to 104° or even higher. A crisis usually occurs within nine days after the onset.

In a typical crisis, the temperature suddenly falls, perhaps several degrees in a few hours, leaving the patient soaking in perspiration and extremely weak. If the patient gets through the crisis without heart or respiratory failure, he will almost surely recover if he is given careful nursing and allowed to build his strength back slowly.

The doctor called to treat a case of pneumonia first makes a complete physical examination. Specimens of sputum and blood are sent to the laboratory to learn which type of germ is responsible, since anti-pneumonic serums are available for certain types of the disease. Great advances have been made in the last few

years in treatment of pneumonia through the use of the sulfa drugs, but good nursing remains the most reliable means of control. As the crisis develops, oxygen may be administered to prevent respiratory failure.

Pneumonia patients are particularly liable to complications, and it is in preventing these that good nursing management is essential.

Since pneumonia most frequently arises from a neglected common cold, the most important preventive measure is to avoid colds and treat them speedily if they occur (see common colds, above). In the presence of a case of pneumonia, precautions to avoid infection are most necessary. Dishes, utensils, gowns, and linens should be carefully sterilized. Excreta must be properly disposed of. Those who must be around pneumonia patients should wear gauze masks. The hands should be thoroughly washed with soap and warm water whenever any contaminated utensils are handled.

Poison Ivy: Poison ivy is a shrub-like climbing plant found throughout the United States. It is common in woodland areas. The leaves are pointed and appear in groups of three, and are noticeable for their shiny, lustrous surface. An oily substance is secreted by the ivy plant which produces severe irritation when it comes in contact with the skin. The reaction may be delayed for two or three days, or may arise within a few minutes. The skin turns red and swollen, small blister-like weals appear, and there is usually intense itching. Sometimes the poisoning is spread over a large area by scratching and rubbing.

The severe itching may last for two or three days, but it may be weeks before all effects have disappeared. A bad case of ivy poisoning is one of the most unpleasant experiences that can be undergone.

Poison oak is a plant very similar to poison ivy, but has somewhat larger, more deeply notched leaves. Poison sumac is a shrub or small tree characterized by drooping clusters of white berries. Both these plants secrete a poison similar to that of poison ivy.

Individual sensitivity to poison ivy varies greatly, some persons appearing to be little, if at all, affected. Sensitive persons may be poisoned by slight contact, or even by smoke from fires in which the plant is burned.

Thorough washing with soap and warm water is the best treatment after exposure to poison ivy. Brushing or hard rubbing should not be used, however. After careful washing, the skin surface may be swabbed with alcohol, and finally rinsed with water and carefully dried. Calamine lotion with 1-2 percent carbolic acid may be applied to abate the intense itching.

A product has recently been placed on the market which appears to give immunity to poison ivy when used as a preventive injection.

Psoriasis: Psoriasis is a chronic disease of the surface of the skin. It is characterized by silvery-white patches with scaly crusts appearing on various parts of the body, but most commonly on elbows and knees. The patches vary from pinhead size to irregular areas of one or two square inches. When the scaly crusts are removed, there is often slight bleeding from the underlying tissues. There is rarely any pain or itching.

Psoriasis occurs most frequently in those between 18 and 45 years of age. It is not contagious, but is disfiguring, and may be a serious social disadvantage. The cause is as yet unknown. In some cases heredity seems to be responsible.

There is no specific treatment that will give results in all cases. Abstinence from coffee, tea, and alcoholic beverages is effective in some cases. Sun bathing and artificial ultra violet light treatment are also of value. The scales can be softened and easily removed by mild salves and cold cream. The condition often waxes and wanes without apparent cause.

Sciatica: Sciatica is an inflammation of the long nerve of the thigh and leg. It is characterized by pain in the hip and thigh, which may be quite severe and aggravated by motion. Sciatica is not a disease in itself, but is a symptom of disorder in some other function of the body, perhaps apparently remote from the localized pain. Possible causes are numerous. They

include focal infections of teeth, tonsils, sinuses, prostate, or gall bladder, chronic appendicitis, syphilis, malaria, diabetes, injury to the hip-joint, pelvis, or back, pressure on the sciatic nerve from long continued sitting on hard-edged seats or benches, and internal tumors or growths pressing on the nerve.

When sciatica exists, a thorough examination to determine the cause is in order. Intelligent treatment is impossible until the cause is found. Rest, heat, balanced diet, and immobilization of the leg may furnish relief, but these measures are ordinarily palliative rather than curative.

Stomach Disorders: Digestive disturbances are commonly the result of improper diet and eating habits. Much discussed among pilots is the so-called "sour stomach." There may be a burning sensation in the stomach, accompanied by belching of sour-tasting gas and perhaps slight vomiting. The contents of the stomach are sharply acid. There is often a characteristic sour-bitter taste in the mouth, sometimes called a "dark brown taste."

One common cause of sour stomach is overindulgence in alcohol. One of the products of alcohol elimination in the body is butyric acid, the chemical that gives the characteristic taste and odor to rancid butter. The typical "hangover" is largely the result of butyric acid in the stomach.

Sour stomach may also arise from fermentation of food producing lactic acid (the acid of sour milk) and from over-secretion of hydrochloric acid, which is normally present in the stomach digestive fluids in a concentration of about one part in five hundred.

Occasional sour stomach following indiscretion in eating is not serious. It may be relieved by a teaspoonful of bicarbonate of soda in a glass of water, or by a moderate dose of milk of magnesia. Frequently recurring or habitual sour stomach, however, may point to some chronic disease, and it is most important that the cause be sought out and cured. Neglect of digestive disturbances may lead to gastric ulcers, disabling and difficult to cure.

Ulcers of the stomach and small intestine are responsible for a great amount of suffering, loss of efficiency, and incapacity. Neglected stomach ulcers may become *perforated,* with flow of blood and stomach contents into the abdominal cavity. This produces acute peritonitis with frequently fatal results.

Stomach ulcers are approximately three times as frequent in men as in women; it is estimated that about 1,800,000 people in the United States suffer from the disease.

The characteristic symptom of stomach ulcer is pain and burning in the stomach before meals, which may be largely relieved by the ingestion of food, but which appears again as the digestive process gets well under way. There may be nausea and tenderness over the upper part of the abdomen. Vomited material may contain brownish granules which look like coffee grounds, but which are really coagulated blood. Blood may or may not appear in the stool. If the ulcer is in the duodenum or small intestine, the pain symptoms may not arise until two hours or so after a meal.

The symptoms of stomach ulcer may simulate other conditions such as chronic appendicitis, or gall bladder disease. Vague abdominal pains should always be carefully investigated. Flouroscopic and X-ray examination with the use of a "bismuth meal" to enable the digestive process to be followed on the X-ray film, may be necessary to settle the exact cause.

There are many possible causes of stomach ulcers, but no definite cause for all cases. Undoubtedly the inordinate use of tobacco, alcohol, and highly seasoned foods are likely to produce ulcers. Emotional instability, worry, and nervous strain produce an excessive flow of gastric juices, and unquestionably stomach ulcers are much more frequent in persons who worry excessively. The hydrochloric acid of the stomach is highly irritating to the ulcer, and worry will aggravate an already existing ulcer, even if it cannot be said that worry caused the ulcer in the first instance.

Stomach ulcers are treated by diet, rest, and hygiene, and in serious cases by operation. If the ulcer bleeds and threatens to become perforated, an operation is urgently necessary.

Syphilis: (See Chapter VIII).

Trichinosis: Trichinosis is a severe, chronic inflammation of the muscles caused by a specific parasite *Trinchinella spiralis.* It is generally acquired by eating infected meat, especially pork. In countries where raw or slightly cooked meat is habitually eaten, particularly Germany and Italy, there has been in the past a high incidence of this disease. Elaborate inspection of meat has been effective in reducing the number of cases.

There is no satisfactory treatment for trichinosis. Its symptoms are severe and disabling and may go on for many years, terminating fatally. It is therefore of the last importance to avoid infection.

The pig is the chief animal carrier of the disease. To prevent infection, swine should never be fed uncooked garbage, and adequate rat control measures should be instituted where pigs are raised. Unless it is known that pork has been adequately inspected, it should not be eaten except after thorough cooking. Mere frying or broiling, although it may brown the external surface, is not sufficient, as the parasite may continue to live in the center that was not sufficiently heated. To be safe, the meat must be cooked all the way through.

Tuberculosis: There has been a steady decline of tuberculosis in the past twenty years. In 1920, the mortality rate was about 100 per 100,000 population in the United States. By 1940, thanks to public educational efforts, and to improved methods of diagnosis and treatment, this mortality has declined to about 50 per 100,000 population. Nevertheless, tuberculosis remains a very serious menace, and is responsible for great suffering and economic loss.

The causative agent of tuberculosis is a specific microbe, *tubercule bacillus.* It may exist for a long time in the body without causing any symptoms, as the body defenses may prevent it from becoming active. Active tuberculosis may be "endogenous"—arising from within the body—when as a consequence of lowered resistance, already existing bacilli begin to multiply and attack the tissues, or "exogenous"—arising from

outside the body—when the infection is believed to have been transmitted directly from another person suffering from the disease.

Tuberculosis may attack various parts of the body, such as the bones or intestinal tract, but its most common place of attack is the lungs. Malnutrition, chronic fatigue, and neglect of general health predispose to the disease.

If tuberculosis exists, it is necessary to give up all thought of trying to carry on ordinary activities until cure is complete. Prolonged rest, perhaps in bed, plenty of fresh air, and strength-building diet are necessary. As a last resort, surgery may be used to collapse one lung at a time to give a chance for the lesions to heal.

Any long continued cough, chronic fever, or marked loss of weight is suggestive of possible tuberculosis, and careful examination should be made. Analysis of sputum, X-rays of the chest, and other special diagnostic techniques may be required. The earlier the disease is recognized, the better is the chance for a complete cure.

Tularemia: Pilots who are forced down in out of the way places may find it necessary to subsist for a time on such food as can be procured by hunting and fishing. If rabbits are among the game caught, care should be exercised to avoid contracting tularemia, or rabbit fever. This is a specific infection transmitted by the organism *Pasteurella tularensis,* which lives in the tissues of rabbits. The slightest break in the skin may afford an entry for this microbe while one is skinning a rabbit or handling the raw bone or flesh.

A few days after infection a small bleb or ulcer appears at the site of the injury. Later there is fever, enlarged lymph nodes, and perhaps infection of the eyes.

If rabbit fever is contracted, complete rest in bed with efforts to build up the patient's strength by diet is necessary. A serum to combat the disease is available, but is likely to be on hand only in large centers of medicine.

Besides direct infection from rabbits, rabbit fever can be transmitted by the bite of certain ticks and flies.

Varicose Veins (Dilated Veins): Varicose veins are usually superficial thigh, leg, and foot veins that are engorged, tortuous, and distended. The condition is rare in youth, but is fairly common in middle and later age.

Varicose veins are directly caused by the failure of the contraction and valve system that forces blood through the vein. The common indirect causes are long hours of standing, heavy lifting, weakness arising from illness, especially from acute infectious fever, such as typhoid, and constriction of the circulation system by tight garters or other clothing. In women, varicose veins occur frequently as an aftermath of pregnancy.

In their early stage of development, varicose veins can be arrested by removing the cause, such as long standing periods, and by furnishing support to the superficial veins by elastic stockings or bandages. In advanced cases where the veins are widely stretched and kinky lumps of veins are raised noticeably above the skin surface, injection or operative treatment may be necessary. If untreated, advanced varicose veins may break down into ugly ulcers that are resistant to treatment.

Varicose ulcers are likely to become infected. There is also danger of hemorrhage, and the sufferer is incapacitated for active work. The doctor usually orders the patient to bed, and treats the ulcer with boric acid compresses, pressure bandages, and soothing salves. Sometimes many weeks are required.

The radical operation for the cure of varicose veins involves the cutting away of the large vein. This procedure gives good results if the varicosity is localized.

When varicose veins show signs of developing, the Flight Surgeon should be consulted. He can best decide, after examination, whether to recommend palliative treatment, reduction by injection, or operation.

Venereal Diseases: (See Chapter VIII).

Warts: Warts are small growths on the superficial layer of the skin. Their cause is not definitely known, but it is believed that irritation plays a part in creating them. They occur in children as well as in adults and may be found anywhere on

the surface of the skin. Most commonly they appear on the skin of the hands.

The typical wart may attain a size of 1/8 of an inch in height and have a diameter of from 1/16 to 1/4 of an inch. The top of the growth is flat and has cleftlike nodules which can be seen arising between other growing points. Warts are never painful except when they become infected or irritated around the margin of the growth.

Warts may be confused with cancer growths on the skin. It is important that a physician be consulted when any question arises as to the real nature of any skin growth.

Venereal warts are small papilla-like tumors arising near the margin of the anus or near the genital openings. There is no hardening around the margin. Under pressure, slight bleeding occurs.

Warts may be removed by cauterization either by chemicals or by the electric needle. Such removal, however, should be done under the supervision of a competent physician and never by a barber, manicurist, or at home. If a wart is not removed, it should be left *severely alone*—never scratched, squeezed or prodded.

Appendix

Medical Requirements for Military Fliers

This appendix gives a summary of the qualifications prescribed for military pilots by the United States Army. The technical data can be interpreted by any competent physician. It is suggested that those who contemplate flying as a career submit this summary to their personal physicians as a guide in a preliminary examination.

Those who fail to pass the physical examination prescribed in A. R. 40-110 U. S. Army will be relieved from flight duty and cannot be restored to such duty until they pass that examination, unless they receive waivers for their physical defects.

REQUIREMENTS FOR EYE EXAMINATION

For Class 1, the minimal requirement for visual acuity for each eye is 20/20 (100% visual efficiency) without correction.

For Class 2, the minimal requirement for visual acuity without correction for each eye is 20/40—provided it is correctible for each eye to 20/20 and that such corrections are worn when flying.

For Class 3, the minimal requirement for visual acuity without correction is 20/100 provided it is correctible to 20/20 and that such correction is worn when flying.

Depth Perception: For Class 1, an average error of more than 30 millimeters disqualifies.

For Class 2, an average error of 35 millimeters disqualifies.

Condition of Extraocular Muscles: The condition of the extraocular muscles must be such as to meet the requirements of the A.R. 40-110.

For Class 1 and 2: Esophoria of more than 4 diopters if associated with prism divergence of less than 4 diopters disqualifies.

Esophoria of more than 10 diopters disqualifies even if not associated with a prism divergence deficiency.

Exophoria of more than 5 diopters disqualifies one.

Hyperphoria of more than 1 diopter disqualifies.

For Class 3: Esophoria of more than 12 diopters disqualify.

Exophoria of more than 7 diopters disqualifies.

Hyperphoria of more than 2 diopters disqualifies.

Heterophoria (squint) of any variety disqualifies all classes.

Prism Divergence Test: Prism divergence test must be normal. Prism divergence of more than 15 diopters or less than 3 diopters disqualifies.

Diplopia (double vision): Class 1 and 2: The existence of diplopia (double vision) within 50 centimeters in any meridian disqualifies.

In command pilots: If diplopia exists within 27-30 centimeters in any meridian he is disqualified.

Diseases of the Eye: 1. Large stye of eye temporarily disqualifies until cured. (This may be a forerunner of poor eyesight and a refraction may have to be done to get correct lenses.)

2. Any growth which encroaches on the cornea should be removed.

3. Any decrease in intraocular tension when found by the Flight Surgeon disqualifies, or any decrease below normal limits in intraocular pressure disqualifies when found by the medical officer. Also chronic eye disease or chronic infection of eyeball.

4. True nystagmus (abnormal movements of the eyeball) disqualifies.

5. Any defect, disease or abnormality that actually materially interferes with the normal ocular function disqualifies for all three classes.

6. A history of iritis (infection of iris of eye)—may be associated with pre-existing syphilis, rheumatic fever, or there may be focal infections present in the body. The existence of iritis disqualifies, as well as the presence of syphilis, rheumatic fever or focal infections associated with iritis.

Deficiency of Accommodation of Eyes: If the accommodation falls more than 3 diopters below the mean for the examinee's age he is disqualified. (In this case, the accommodation tests must be done on 3 successive days and if he fails in these tests, he is disqualified.)

Low accommodation, however, may be due to accumulated fatigue; staleness; or, debilitating condition of the body, either of transient or permanent nature.

Accommodation below 6.5 diopters disqualifies for Class 1 on the original examination, regardless of the age.

An examinee is disqualified in Class 2 if his accommodation falls more than 3 diopters below the mean of his age, provided it is not less than 3 diopters.

For Class 3, examinees are qualified with accommodation below 3 diopters regardless of age, provided they actually wear their correction for near vision while flying and their correction while worn enables them to read the test card held at 50 centimeters.

TABLE OF MEAN VALUE OF ACCOMMODATION POWER

(Duane)

Age	*Diopters*	*Age*	*Diopters*
18	11.9	30	8.9
19	11.7	31	8.6
20	11.5	32	8.3
21	11.2	33	8.0
22	10.9	34	7.7
23	10.6	35	7.3
24	10.4	36	7.1
25	10.2	37	6.8
26	9.9	38	6.5
27	9.6	39	6.2
28	9.4	40	5.9
29	9.2	45	3.7
		50	2.0

Angle of Convergence: For Class 1 and Class 2 an angle of convergence of less than 40 degrees disqualifies.

Color Vision: This test is omitted on all examinations subsequent to the original unless there is reason to believe that defect of color perception has developed due to extraneous factors.

Field of Vision for Form: Pathological changes of the visual field disqualify for flying (nasal contraction, scatoma, etc.). This test is done once per year for fliers.

Refraction: On the original examination, the flier is disqualified if he requires more than 1.5 diopters correction in any meridian in order to read 20/20 each eye, with accommodation paralyzed, or if he requires a cylinderical correction of more than 0.50 diopters in any meridian, whether plus or minus, in order to read 20/20 with accommodation paralyzed.

Examination of Inner Part of Eyeball: Any abnormality discovered by the ophthalmoscope (instrument for looking into inner part of the eye) that materially interferes with the normal ocular function disqualifies for all three classes. When disease of the retina or choroid exists it is an indication of extraocular or systemic pathology.

The existence of dental infections, arteriosclerosis, rheumatic fever, chronic diseases of the nasal sinuses, or injuries to skull—as skull fracture of concussion of the brain—disqualifies the pilot.

EAR EXAMINATION

Whispered voice: Class 1 should have 20/20 each ear.

Class 2-3, the hearing must be at least 8/20 each ear.

Ear Diseases: The following disqualifies: (1) Operation—mastoidectomy—until cleared up and free from any vestibular or hearing deficiencies. (2) Middle ear infection (temporary disqualification). Discharging ear—acute or chronic. (3) Chronic retraction of ear drum associated with obstruction of Eustachian tubes. (4) Constant noises in ears if associated with some demonstrable ear disease. (5) Perforation of ear drum.

(Applicants for flying training—a history of a simple mastoidectomy disqualifies unless a five year period has elapsed from the time of operation. Radical operation on mastoid bone disqualifies.)

Audiometer: Class 1—more than 15% loss of hearing disqualifies.

NOSE AND THROAT

Nasal polyps when associated with chronic disease of the accessory nasal sinuses (permanent disqualification).

The following are cause for temporary disqualification:

(1) Acute or chronic tonsillitis. (2) Deviation of the nasal septum resulting in an estimated 50% or more obstruction. (3) Septal spur formations which interfere with breathing or with normal drainage of the accessary sinuses. (4) Occlusion of one or both Eustachian tubes. (5) Acute and chronic sinusitis. (6) Ulcerated conditions of nasal lining membrane. (7) Any acute infection or condition of the nose, nasopharynx, mouth, tongue or larynx that seriously interferes with normal function.

EQUILIBRIUM

The following are disqualifying when present on the rotation tests: (1) Marked increase in pulse and systolic blood pressure. (30 or more systolic rise). (2) Marked fall in diastolic pressure (10 or more points). (3) Any marked signs of emotional instability as marked signs of tremors of eye lids, tongue, fingers, unsteadiness, marked dizziness, etc.

GENERAL PHYSICAL EXAMINATION

History of the following conditions disqualify in subsequent examination of pilots: (1) Encephalitis, lethargica, or any illness accompanied by double vision (diplopia) or lethargy. (2) Syphilis. (3) Repeated attacks of asthma or hay fever. (4) Recent attacks of dysentery, malaria or black water fever. (5) Paroxysmal tachycardia. (6) Organic heart disease. (7) Recurrent attacks of rheumatic fever. (8) Recent attacks of kidney stones.

Weight: Any excessive increase in weight or marked loss in body weight temporarily disqualifies until corrected to accepted standards. (See weight charts Chapter V.)

Blood Pressure: The following disqualify: (1) A systolic blood pressure persistently above 140 millimeters. (2) A Systolic blood pressure persistently below 105. (3) A diastolic blood

pressure of 100 millimeters or more. (4) Heart failure or heart disease.

(In applicants for flying training a persistent systolic pressure of 135 millimeters or more disqualifies as does also a persistent diastolic pressure of 90 millimeters or more. Also disqualifying is an unstable blood pressure.)

Respiratory Disturbances: The following disqualify: (1) Tuberculosis of the chest, associated with or without pleural infection within two year periods. (2) Persistent winter colds and bronchitis.

Serious Injury or Illness: The following may require absence from flying duties for a period of over a month: (1) Fractures involving the skull or vertebral column. (2) Injuries of the eye which will interfere with function or will cause infection of the eye. (3) Neurologic, mental neuropsychiatric conditions. (4) Organic heart disease. (5) Organic kidney disease. (6) Sleeping sickness (or any condition of double vision with lethargy.) (7) Syphilis, malaria, yellow fever, typhoid fever, pneumonia and other debilitating diseases.

Schneider Index (Circulatory Efficiency tests): An index below 8 will require another examination.

If accumulative fatigue (staleness) is present, it temporarily disqualifies.

Gastro-Intestinal (Stomach and Intestines) Abdominal Conditions: The following disqualify: (1) Evidence of peptic or duodenal ulcers. (2) Existence of stones in the gall bladder, kidney or urinary bladder. (3) Signs of chronic indigestion of the nervous type.

NEUROLOGIC AND PSYCHOLOGIC EXAMINATION

The following disqualify: (1) Tics of organic or inorganic nature demand a thorough examination, if these tics interfere with rated pilot's duties; (2) Presence of thyroid disease with marked tremors of hands; (3) Evidence of symptoms of syphilis in any of the three stages; (4) Loss of speech or chronic laryngitis; (5) Dizziness (persistent type); (6) Exaggerated state of psychomoter tension with signs of staleness (accumu-

lative fatigue); (7) Sleep disturbance persistent in nature (insomnia); (8) Excessive and chronic use of alcoholic beverages; (9) Sleepwalking (somnambulism); (10) Migraine and chronic severe persistent headaches; (11) Unexplainable fainting spells (except when caused by severe pain following injury or following convalescence after a serious illness); (12) Amnesia (loss of memory) following severe head injury. (Must be disqualified unless he requests a waiver. In a student flier severe head injury accompanied by amnesia disqualifies); (13) Epilepsy; (14) Persistence of phobias (fears) and obsessions (domination of mind by one idea); (15) Irritability, apathy, elation and depression as affecting the temperament of an individual; (May be cause for grounding and if observation discloses further proof may lead to permanent disqualification); (16) Anxiety neurosis (may disqualify temporarily); (17) Instability of nervous emotional, mental, or cardiovascular character.

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