(RESTRICTED)

FLIGHT SURGEON'S HANDBOOK

School of Aviation Medicine
Randolph Field, Texas
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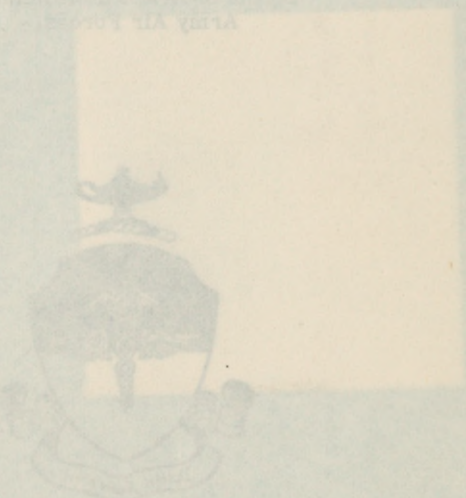
FLIGHT SURGEON'S HANDBOOK

Prepared under the Direction
of the Commandant,
School of Aviation Medicine,
Army Air Forces.

2nd Edition



FOREWORD

One year has passed since the first edition of the Flight Surgeon's Handbook came off the press. During this time progress in Aviation Medicine has been great.

In attempting to include as much recently acquired knowledge as is possible under wartime restrictions, and also to include material involuntarily omitted from the first edition, the new handbook of necessity has grown in size. There are now a total of eleven chapters and an appendix compared to seven chapters in the original volume.

The inclusion of some material may need defense. The chapter on Military Medicine, for example, has been retained and expanded for use by the Flight Surgeon as a Medical Officer. It is a "wartime" inclusion to meet an urgent need for a ready reference to problems which most likely will be met under combat conditions. The same may be said for some other material in the book which has no direct relation to Aviation Medicine. Once the emergency is over it will probably be desirable to delete these subjects from subsequent editions.

More references will be found than in the first edition. Some of these are confidential. The Flight Surgeon may investigate them if he has access to a confidential file. The subject matter of these references obviously could not be included in this manual.

A considerable part of the book's growth is attributable to constructive criticisms submitted by Flight Surgeons and Aviation Medical Examiners on duty with the Army Air Forces all over the world. The Commandant and Faculty of the School extend their gratitude to these Medical Officers and hope that the new edition will evoke as much interest.

As before blank pages have been included so that the Flight Surgeon may enter amendments when necessary.

EUGEN G. REINARTZ,
Brigadier General, A.U.S.,
Commandant.

FLIGHT SURGEON'S HANDBOOK

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CHAPTER I

GENERAL

1. USE. The "Flight Surgeon's Handbook" was created by the Faculty of the School of Aviation Medicine primarily for Flight Surgeons and Aviation Medical Examiners on duty with the Army Air Forces who have previously attended the School. It may be found useful, however, for all physicians engaged in the ever increasing task of selecting and maintaining flying personnel.

2. PURPOSE. To make readily available to the Aviation Medical Examiner and to the Flight Surgeon the following:

a. Tables and normal values of various measurements to which frequent reference must be made in the selection of flying personnel.

b. Outlines of diagnostic procedures and techniques which are used frequently in the physical examination for flying.

c. Supplements to the Army Regulations which apply to the physical examination for flying.

d. Summaries of common problems in the care of the flyer.

e. Data, formulae, and tables on physiological aspects of flying to which reference must frequently be made.

f. Medical training programs.

g. A summary of the procedures to be followed, particularly at the smaller stations of the Army Air Forces, with respect to supply, administration, and sanitation.

h. References on each subject which the reader may consult if more details are needed.

i. An outline of principles of military medicine and surgery most likely to be encountered in combat.

3. PREPARATION. Although this handbook was prepared by the present Faculty of the School of Aviation Medicine, it can in a measure be regarded as a culmination of the painstaking efforts of all previous members of the staff and of all physicians and airmen everywhere who have contributed either directly or indirectly to the progress of Aviation Medicine.

CHAPTER 2
THE ARMY AIR FORCES PHYSICIAN

SECTION I
THE AVIATION MEDICAL EXAMINER

4. ELIGIBLE PERSONNEL. Any medical officer on active duty, subject to restrictions in part, is eligible for the instruction which is prerequisite for the rating of Aviation Medical Examiner.

5. METHOD OF REQUESTING TRAINING FOR RATING. a. Medical officers on duty with the Ground Forces will make application through channels to the Adjutant General for permission to attend the School of Aviation Medicine.

b. Medical officers on duty with the AAF will make application through channels to the Commanding General, AAF, for permission to attend the School.

6. REQUIREMENTS. The applicant must not be over thirty five years of age, should be able to meet the Class 3 standards of par. 3d(3) AR 40-110, should have completed at least three months of previous military duty, and be recommended by his commanding officer as having the professional qualifications, personality, and tact to warrant such assignment.

SECTION II
THE FLIGHT SURGEON

7. ELIGIBLE PERSONNEL. An Aviation Medical Examiner who has served a minimum of one year of active duty with the Army Air Forces after having received such a qualification, and who has demonstrated that he possesses required qualifications, may, under such regulations as the CG, AAF prescribes, be rated as "Flight Surgeon".

8. METHOD OF REQUESTING RATING. Request of an Aviation Medical Examiner for rating as a Flight Surgeon will be initiated by the officer concerned and will be acted upon by his immediate senior flight surgeon and forwarded through command channels to the Air Surgeon.

9. MINIMUM REQUIREMENTS. The request for rating will certify that the following minimum requirements have been completed by the Aviation Medical Examiner:

a. One year's actual service as an Aviation Medical Examiner, in close contact with flying personnel and actually performing physical examinations for flying. The fact that an officer has been qualified as an Aviation Medical Examiner for a period of one year and has served at an Air Forces station for such a period, is not, in itself, sufficient qualification for such a rating.

b. Fifty hours of official flying time in military aircraft.

c. He has read and is familiar with the contents of the following War Department Manuals:

(1) TM 1-705 - Physiological Aspects of Flying, and Maintenance of Physical Fitness.
(2) TM 1-400 - Theory of Flight.
(3) TM 1-231 - Elementary Weather for Pilot Trainees.

(4) FM 1-5 - Employment of Aviation of the Army.
(5) FM 31-15 - Operations in Snow and Extreme Cold.
(6) FM 31-20 - Jungle Warfare.
(7) FM 31-25 - Desert Operations.
(8) FM 8-35 - Transportation of Sick and Wounded.
(9) Outline of Course of Instruction in High Altitude Physiology, Aero Medical Research Unit, Materiel Center, Wright Field, Dayton, Ohio.
(10) Such other manuals or texts as may be prescribed from time to time.

d. An Aviation Medical Examiner assigned to an AAF unit which departs the continental limits of the United States may be rated as a Flight Surgeon, irrespective of the time he has served as an Aviation Medical Examiner, in accordance with regulations issued by the Commanding General, Army Air Forces.

10. RECOMMENDATIONS OF SENIOR FLIGHT SURGEON. The officer forwarding the request will state whether or not the Aviation Medical Examiner has thoroughly demonstrated necessary professional qualifications, personality, tact, etc., to warrant his being given such a rating.

11. PHYSICAL EXAMINATION. The request will be accompanied by a completed WD AGO Form No. 64 (May 20, 1941), Physical Examination for Flying, on the subject individual.

12. REFERENCES.

a. Regulations.
(1) AAF Regulation No. 25-5, WD Hq., AAF, June 17, 1942.
(2) AR 350-500, Army Air Forces Schools, August 11, 1942.

SECTION III
SUGGESTIONS TO FLIGHT SURGEONS ON FLYING STATUS

13. EQUIPMENT. a. Always keep personal flying equipment in good condition. Familiarize yourself with its proper care.

b. It is your responsibility to see that flying equipment is safeguarded. Do not leave your equipment unattended.

c. Wear flight clothing only while on the line or while flying unless specifically authorized to do otherwise.

d. Know how to use all personal equipment. This applies particularly to the parachute, the oxygen equipment, the safety belt, radio headset, and clothing. If you are not thoroughly familiar with their use, ask the pilot or crew chief about them before take-off.

e. Unless you are sure of the type of clothing to wear for any specific mission, ask the pilot. It is always extremely cold at high altitudes. Learn how to dress properly for these extreme temperatures.

14. PRIOR TO TAKE-OFF.

a. Understand the exact time of take-off. Be there 15 minutes ahead of time.

b. Have all equipment adjusted (e.g. your parachute straps) so that you do not cause any delay when you enter the plane.

c. Regulations require that someone familiar with the controls enter the plane first. Ordinarily the pilot will get in the ship first. However, the pilot may direct you to get in first so he may check your safety belt and give you instructions.

d. When riding in a transport airplane with a senior officer, (e.g. a General Officer), all other officers get aboard first and the General Officer gets aboard when he is ready to depart. If the General Officer walks out with the entire group to the waiting ship, he may elect to go aboard first. Upon landing, the General Officer is the first man to leave

the ship.

e. An additional map of the proposed route of the flight may frequently be obtained from the operations office, making it possible to practice simple point to point navigation.

f. If there is any equipment in the ship with which you may be concerned, know how to use it. If it is unfamiliar, ask the pilot or crew chief to explain its functioning.

Equipment and devices with which familiarity must be established:

(1) Safety belt.

(2) Control to raise, lower or turn the seat or release the back rest. (Lower seat on landing and take-off to protect your head should the ship nose over).

(3) Oxygen mask and regulator.

(4) Radio jack for plugging in headset; radio microphone.

(5) Control to shift radio to Interphone (if present); control to vary the radio volume.

(6) Lighting controls for instrument panel (if riding in a ship with a separate instrument panel).

(7) Location of relief tube.

(8) Control for opening the canopy or door to cockpit.

(9) Emergency release for canopy or door and the location of all regular and emergency exits in large planes.

(10) Control on the rudder pedals (to be touched only with permission of the pilot and before take-off) in order to get more room in the cockpit for a long legged man.

(11) Fire extinguisher - location, how removed from its rack and how used.

(12) On long flights in cold weather, a knowledge of the plane's heating system is sometimes very useful.

(13) Read WD Circular posted or hanging in each plane.

g. Carry plenty of cotton for ear plugs, not only for yourself but for other Air Force personnel. They always expect a Flight Surgeon to have a supply. Plug both ears before take-off.

h. Before going on a cross country flight sign "out" at your organization and sign "in" again promptly on your return.

i. If you want to go on a cross country flight, put in your request to the operations officer who will assign both plane and pilot. Many operations officers resent an officer locating a pilot who is willing to make the trip and requesting that this pilot be assigned to a specific trip.

j. Never carry liquor in a plane. It is forbidden by regulations and in case of accident it always causes trouble even though neither the pilot nor passenger has consumed any of it.

15. IN FLIGHT.

a. Never touch the controls unless authorized to do so by the pilot.

b. Do not get into any position which interferes with the free movement of the controls and do not permit any of your baggage to do so.

c. It is dangerous to smoke in airplanes. Do not smoke unless expressly authorized to do so by the pilot. Air currents will frequently blow matches or cigarettes back into the plane when an attempt is made to throw them out.

d. If you have a tendency to get airsick, do not eat a large meal immediately before take-off. Keep your eyes on the horizon, do not look at objects near you. Try to get good ventilation (a hand hooked around the edge of a partially opened wind screen will deflect a cool blast in your face). If the pilot will let you fly the ship, it will help. A dose of one of the barbiturates (Nembutal, Seconal, etc.) prior to take-off may prevent sickness if you are just taking a ride. Do not give it to the pilot or anyone else who must remain alert.

Cellophane sandwich bags or empty ice cream containers make useful emesis basins.

e. If you get sick and regurgitate in the ship, apologies to the pilot are in order, (even if aerobatics caused your fall from grace). In addition, you must either clean the ship yourself or pay the crew chief to clean it. The usual renumeration is a carton of cigarettes or its equivalent.

f. Pay close attention to all instructions from the pilot and carry out promptly and exactly all orders he gives.

g. Radio.

(1) Connect your headset when you enter the plane.
(2) Do not at any time talk over your microphone when the radio switch is turned "radio". If you want to talk to the pilot, be sure the switch is turned to "Interphone"; it is your responsibility to turn it back to "radio" at the end of your conversation.
(3) Do not ask unnecessary questions over the Interphone.
(4) Never use the Interphone when nearing a field, coming in for a landing or during other maneuvers.
(5) Be sure to disconnect your headset before getting up to leave the plane; otherwise it may be damaged.

n. Other instructions.

(1) If you use the relief tube, tell the pilot on returning to the ground. He records this on Form 1. The maintenance crew subsequently washes out the tube.
(2) Keep your safety belt fastened at all times except when expressly authorized by the pilot to do otherwise.
(3) Clear your Eustachian tubes when losing altitude for any reason. Do not go to sleep and awaken with aero-otitis.

i. In the combat zone always wear goggles to protect your eyes in case of fire. Be sure the aeronautical first aid kit is present and the jungle kit if applicable.

j. Use of parachute.

(1) Take good care of your parachute. You may owe your life to it. Never place it pack side down on any surface, because it may absorb moisture. Always place the harness down with the pack side of the parachute up. Do not abuse the harness and do not pull out the rip cord ring. See that the parachute is properly inspected and repacked when necessary. If the harness becomes sweaty or damp hang the 'chute up carefully to dry before putting it away. If the pack becomes damp have the chute repacked immediately.

Let some of the air out of the cushion when flying at high altitudes because the air inside the cushion expands.

(2) Whenever you enter an unfamiliar plane, figure out just how you would get out if the need arose. This may save valuable seconds if you have to "bail out".
(3) If the pilot tells you to jump do so immediately. You must clear the tail surfaces. If you are in the rear cockpit, dive out head first as far down and out as you can and somewhat forward. The plane is moving forward and you will not hit the wing even though you dive right at its trailing edge. If possible, the pilot will pull up into a stall in order to slow the plane as much as possible. When this is done, have your safety belt unfastened, the canopy open and your hands and feet braced so that when he gives the signal you can dive forward, down and out as far as possible. Be sure to go head first - a blow on the feet by the tail surfaces is much less dangerous than a blow on the head.

Use your arms to get yourself clear of the plane. You can grasp your rip cord ring after you are out of the ship. Always be sure you are well away from the ship before you pull the rip cord ring or you may foul your 'chute in the tail surfaces. If you have jumped from a fast moving plane, wait at least ten seconds before opening your parachute unless you are near the ground. This will allow you to slow down to terminal velocity (about 125 M.P.H.) and you will not receive such a severe jolt when your 'chute opens. Hang onto the rip cord ring because it is an old Air Forces custom that the drinks are on the man who drops or loses his ring.

(4) If your plane is in a spin, jump from the side on which the wing is down. (In a right hand spin, jump over the right hand side.)
(5) If shot down in combat do not open your 'chute till near the ground, for the enemy pursuit may machine-gun you. You can tell when you are approaching the ground by the fact that objects look more nearly their usual size and particularly by the fact that the horizon begins to widen out rapidly and you seem to be settling into a bowl.
(6) Stop the oscillation of the 'chute as soon as possible after it opens. This is done by pulling on the riser straps of the parachute. After oscillation has stopped, direction can be controlled somewhat by pulling cautiously on the riser straps on the side in the direction in which you wish to go. You must be careful in doing this maneuver as it causes you to decend more rapidly, by reason of "dumping" the air out of the 'chute.
(7) Before jumping from an altitude over 30,000 feet, place the tube from the emergency

oxygen bottle in your mouth. If you do not have this supply, take a few deep breaths of the oxygen from your regular supply, then hold your breath and jump. By doing this you can avoid losing consciousness. Do not pull your rip cord until you are below 20,000 feet and if there are enemy pursuit ships in the vicinity do not open the 'chute until near the ground. Keep your goggles on to prevent freezing of your eyes.

(8) In landing with a parachute, you will get approximately the jolt or jar you would get in jumping from a height of 10 to 12 feet. Try to land facing the direction you are moving and with your legs slightly bent to take up the shock. Give a sharp pull upward on the riser straps just before landing to decrease the impact. Have the legs relaxed when you land and ease forward to a prone position on the ground. Do not try to get up. In order to prevent being dragged over the ground by wind blowing your parachute, spill the air out of your chute as soon as possible by pulling the bottom riser straps to you until you reach the silk. If the situation warrants, gather in the 'chute and fold it. If you land in the water, have your 'chute straps loosened and slip out of the harness just before you hit the water. This will prevent your being drowned by being fouled in the silk and cords. The seat pad on the 'chute can be ripped off and used to help keep afloat if you are not wearing other flotation gear.

16. MISCELLANEOUS SUGGESTIONS.

a. If a pilot takes you on a trip for your own personal pleasure or business, you should pay his expenses. If you are merely accompanying a pilot on a trip which he would otherwise be making by himself or if it is an official trip, this is not necessary.

b. Never criticize a bad landing or a poorly executed aerial maneuver. This is not your function.

c. Keep posted on current pilot problems so you can discuss them intelligently. On the other hand do not pose as an authority on flying problems. Your information about flying is probably as accurate as the Air Force Officer's information about how to remove a gall bladder.

d. Read the current flight regulations which pertain to you. These are on file in the operations office of your home station.

e. Don't ask foolish questions of pilots. If there is something you want to know about flying problems which should probably be known to you, find out by getting a pilot to discuss the subject or ask the crew chief.

17. REFERENCES.

a. Reports and Technical Orders.

(1) Pinson, E.A., Body Characteristics as Applied to Parachute Jumping - WD AC Materiel Division, Experimental Engineering Section - Serial No. Exp. M-54-670-18, July 13, 1940.

(2) Winfield, B.S.O. and Crichton-Miller, C.: Statistical Report on Parachuting, W.A.M. 101-37, F.P.R.C. 445, 1942.

(3) WD Hq., AAF Technical Order No. 13-5-19, Parachutes - High-Speed Parachute Jumps, August 17, 1942.

b. Manuals.

(1) TM 1-705, Physiological Aspects of Flying, 1941.

c. Texts.

(1) Ruff, S. and Strughold, H.: Grundriss der Luftfahrtmedizin, Leipzig, J. A. Barth, 1939.

(2) Von Diringshofen, H.: Medical Guide to Flying Personnel (translated by V. E. Henderson) U. of Toronto Press, 1940.

d. Pamphlets.

(1) Parachute Sense, Washington, D.C., Training Division, Bureau of Aeronautics, U. S. Navy, 1943.

CHAPTER 3
THE PHYSICAL EXAMINATION FOR FLYING

SECTION I
THE GENERAL EXAMINATION

18. THE MEDICAL HISTORY. a. The collection of medical data from applicants for aeronautical training differs somewhat from the usual clinical history in that its primary purpose is to reveal to the examiner any diseases in the past or present which will disqualify the applicant for flying training. Details of illnesses which are of interest to the clinician such as mode of onset, probable exciting cause, modifying factors, and the like are of no particular value. To this statement there are a few striking exceptions. In deciding whether an applicant did or did not have a disease known to be disqualifying it may be necessary to elicit details. An example is a history of valvular disease of the heart, often too gullibly accepted by the examiner. An applicant will frequently state that he was told he had a "leaky valve" in his heart in childhood. Obviously such a story cannot be accepted as a history of valvular heart disease unless other clinical and laboratory data, collected either in the past or in the present, support this diagnosis. More often than not this proves to have been, on further study, an unexplained (functional) murmur. In this example a record of details would be imperative for reaching a conclusion, and must be included in the history.

Other diseases in which details must be obtained because of the possibility of an originally mistaken diagnosis are encephalitis lethargica, paroxysmal tachycardia, malaria, glomerulonephritis, rheumatic fever, renal calculus, epilepsy, and hay fever.

b. The use of the phrase "usual childhood diseases" is decried on the original examination. Most often it means that the medical officer has simply neglected to question the applicant about them. This may result in overlooking a disease like scarlet fever, complicated by otitis media, nephritis, or cardiac valvular disease, historical facts which would make the subsequent physical examination infinitely easier and more precise. Childhood diseases should be listed but the exact date of each need not be given, the time being indicated simply as "in childhood" (under 12 years of age).

c. Many applicants will have learned before the examination about disqualifying factors. Considerable ingenuity must be used in eliciting a history from these individuals, and resort to circumvention often must be made.

d. The family history in general is of value in strengthening such past or present diagnoses in the applicant as rheumatic fever, tuberculosis, or mental disease. Other remote details, are in general, of little value.

e. The psychological interview can conveniently be carried out at the same time that the medical history is ascertained.

19. THE MEDICAL EXAMINATION. The usual defects are sought in the extremities, heart, lungs, viscera, and genitourinary system that may interfere with flying. Some of

TABLE I - STANDARDS FOR PHYSICAL EXAMINATIONS ARMY AIR FORCES

JANUARY 1, 1943

	EXAMINATIONS OF AVIATION CADET APPLICANTS AND AVIATION CADETS						OFFICER TRAINING IN GRADE		OFFICER CANDIDATE SCHOOL	EXAMINATIONS AND REEXAMINATIONS FOR FLYING RATINGS							APPOINTMENT AUS
	AVIATION CADET APPLICANTS		AVIATION CADETS														
			REPORTING FOR DUTY		COMMISSION												
	AIR CREW	GROUND DUTY	AIR CREW CLASSIFICATION CENTER	GROUND DUTY TECHNICAL SCHOOL	AIR CREW	GROUND DUTY	AIR CREW	GROUND DUTY	ADMINISTRATIVE	AIRPLANE PILOT	SERVICE PILOT	LIAISON PILOT	AIRCRAFT OBSERVER	TECHNICAL OBSERVER	NON-RATED OBSERVER	COMBAT CREW ENLISTED	VARIOUS BRANCHES
INDIVIDUALS ELIGIBLE	ENLISTED MAN OR CIVILIAN	ENLISTED MAN OR CIVILIAN	AVIATION CADET	AVIATION CADET	AVIATION CADET	AVIATION CADET	COMMISSIONED OFFICER	COMMISSIONED OFFICER	ENLISTED MAN	COMMISSIONED OFFICER ENLISTED MAN OR CIVILIAN	COMMISSIONED OFFICER ENLISTED MAN OR CIVILIAN	COMMISSIONED OFFICER ENLISTED MAN OR CIVILIAN	COMMISSIONED OFFICER	COMMISSIONED OFFICER AIR CORPS (RATED)	COMMISSIONED OFFICER NON-RATED BRANCHES OTHER THAN AIR CORPS	ENLISTED MAN	ENLISTED MAN OR CIVILIAN
TYPE OF TRAINING OR RATING	PILOT NAVIGATOR BOMBARDIER	ENGINEERING METEOROLOGY PHOTOGRAPHY COMMUNICATIONS ARMAMENT	PILOT NAVIGATOR BOMBARDIER	ENGINEERING METEOROLOGY PHOTOGRAPHY COMMUNICATIONS ARMAMENT	PILOT NAVIGATOR BOMBARDIER	ENGINEERING METEOROLOGY PHOTOGRAPHY COMMUNICATIONS ARMAMENT	PILOT NAVIGATOR BOMBARDIER	ENGINEERING METEOROLOGY PHOTOGRAPHY COMMUNICATIONS ARMAMENT	ADMINISTRATIVE	PILOT SENIOR PILOT COMMAND PILOT	SERVICE PILOT	LIAISON PILOT	AIRCRAFT OBSERVER	TECHNICAL OBSERVER	NON-RATED OBSERVER	GUNNER ENGINEER RADIOMAN	VARIABLE
DESIGNATED PURPOSE OF EXAMINATION	TRAINING AS AVIATION CADET (TAC) AIR CREW	TRAINING AS AVIATION CADET (TAC) GR. DUTY ENGINEERING ETC.	REPORTING FOR DUTY (A/C) AIR CREW	REPORTING FOR DUTY (A/C) GROUND DUTY ENGINEERING ETC.	COMMISSION AND FLYING RATING PILOT, ETC.	COMMISSION ENGINEERING ETC.	OFFICER TRAINING IN GRADE, PILOT, ETC.	OFFICER TRAINING IN GRADE, ENGINEERING ETC.	OFFICER CANDIDATE SCHOOL ADMINISTRATIVE	AS INDICATED	APPT. OR REEXAMINATION AS SERVICE PILOT	APPOINTMENT OR REEXAMINATION AS LIAISON PILOT	APPOINTMENT OR REEXAMINATION AS AIRCRAFT OBSERVER	APPOINTMENT OR REEXAMINATION AS TECHNICAL OBSERVER	NON-RATED OBSERVER	COMBAT CREW GUNNER, ETC.	APPOINTMENT AUS
FORMS USED	64	63	64	62	64 FINAL TYPE	63 FINAL TYPE	64	63	63 FINAL TYPE	64 ORIG. EXAM. FINAL TYPE	64 ORIG. EXAM. FINAL TYPE	64 ORIG. EXAM. FINAL TYPE	64 ORIG. EXAM. FINAL TYPE	64	64	64	63 FINAL TYPE
COPIES ACCOMPLISHED	2 QUAL. 1 DISQUAL.	2 QUAL. 1 DISQUAL.	3 QUAL. 2 DISQUAL.	3 QUAL. 2 DISQUAL.	3 QUAL. 2 DISQUAL.	3 QUAL. 2 DISQUAL.	3 QUAL. 2 DISQUAL.	3 QUAL. 2 DISQUAL.	2 COPIES ALL EXAMINATIONS	3 COPIES ALL EXAMINATIONS	3 COPIES ALL EXAMINATIONS	3 COPIES ALL EXAMINATIONS	3 COPIES ALL EXAMINATIONS	3 COPIES ALL EXAMINATIONS	3 COPIES ALL EXAMINATIONS	2 COPIES ALL EXAMINATIONS	3 COPIES ALL EXAMINATIONS
EXAMINER	ANY MEDICAL OFFICER	ANY MEDICAL OFFICER	FLIGHT SURGEON AVN. MED. EXAM.	ANY MEDICAL OFFICER	FLIGHT SURGEON AVN. MED. EXAM.	ANY MEDICAL OFFICER	FLIGHT SURGEON AVN. MED. EXAM.	ANY MEDICAL OFFICER	ANY MEDICAL OFFICER	FLIGHT SURGEON AVN. MED. EXAM.	FLIGHT SURGEON AVN. MED. EXAM.	FLIGHT SURGEON AVN. MED. EXAM.	FLIGHT SURGEON AVN. MED. EXAM.	FLIGHT SURGEON AVN. MED. EXAM.	FLIGHT SURGEON AVN. MED. EXAM.	FLIGHT SURGEON AVN. MED. EXAM.	ANY MEDICAL OFFICER
DISPOSITION OF FORMS	QUALIFIED ORIG. - S.C. DUPLICATE AIR SURGEON DISQUALIFIED AIR SURGEON	QUALIFIED ORIG. - S.C. DUPLICATE AIR SURGEON DISQUALIFIED AIR SURGEON	ALL COPIES TO TRAINING CENTER SURGEON	ALL COPIES TO TECHNICAL TRAINING CENTER SURGEON	ALL COPIES TO TRAINING CENTER SURGEON	ALL COPIES TO TECHNICAL TRAINING CENTER SURGEON	ALL COPIES TO AVIATION CADET SECTION, HQ., AAF	ALL COPIES TO AVIATION CADET SECTION, HQ., AAF	ALL COPIES TO CONVENING AUTHORITY	APPL FOR APPT. ALL COPIES WITH BOARD PROCEEDINGS THRU COMMAND CHANNELS OTHER EXAM. AIR SURGEON	APPL. FOR APPT. ALL COPIES WITH BOARD PROCEEDINGS THRU COMMAND CHANNELS OTHER EXAM. AIR SURGEON	APPL. FOR APPT. ALL COPIES WITH BOARD PROCEEDINGS THRU COMMAND CHANNELS OTHER EXAM. AIR SURGEON	ORIG. EXAM. ALL COPIES TO AVIATION CADET SECTION, HQ., AAF OTHER EXAM. AIR SURGEON	ALL COPIES TO AIR SURGEON	ALL COPIES TO AIR SURGEON	ALL COPIES TO SENIOR FLIGHT SURGEON OF EXAMINING STATION	AS DESIGNATED BY AUTHORITY REQUESTING EXAMINATION
REVIEWING AUTHORITY	MEDICAL OFFICER OF EXAMINING BOARD	MEDICAL OFFICER OF EXAMINING BOARD	TRAINING CENTER SURGEON	TECHNICAL TRAINING CENTER SURGEON	TRAINING CENTER SURGEON	TECHNICAL TRAINING CENTER SURGEON	THE AIR SURGEON	THE AIR SURGEON	SENIOR SURGEON OF EXAMINING STATION	THE AIR SURGEON	THE AIR SURGEON	THE AIR SURGEON	THE AIR SURGEON	THE AIR SURGEON	THE AIR SURGEON	SENIOR FLIGHT SURGEON OF EXAMINING STATION	AS DESIGNATED BY ADJUTANT GENERAL
PHYSICAL STANDARDS (WITH EXCEPTIONS AS NOTED BELOW)	AR 40-110 CL. 1	AR 40-105	AR 40-110 PILOT-NOMS. CL. 1 NAVIGATOR CL. 2	AR 40-105	AR 40-110 PILOT-NOMS. CL. 1 NAVIGATOR CL. 2	AR 40-105	AR 40-110 CL. 1	AR 40-105	AR 40-105	AR 40-110 CL. 1-2-3	AR 40-110 CL. 1-2-3	AR 40-110 CL. 1-2	AR 40-110 CL. 1	AR 40-110 CL. 1-2-3	AR 40-110 CL. 1-2-3	AR 40-110 CL. 1 MODIFIED	AR 40-105
AGE OF INDIVIDUALS EXAMINED	18 - 26 INCL.	METEOROLOGY 18 - 30 INCL. ALL OTHERS 18 - 26 INCL.	18 - 27)	METEOROLOGY 18 - 30 INCL. ALL OTHERS 18 - 26 INCL.	DEPENDENT ON AGE ENTERING TRAINING	DEPENDENT ON AGE ENTERING TRAINING	18 - 26 INCL.	METEOROLOGY 18 - 30 INCL. ALL OTHERS 18 - 26 INCL.	18 - 45 INCL.	18 - 64	18 - 64	18 - 64	18 - 64	18 - 64	18 - 64	18 - 64	18 - 64
HEIGHT WEIGHT	PILOT 64" - 76" NON-PILOT 60" - 76"	60" - 78"	PILOT 64" - 76"	60" - 78"	PILOT 64" - 76" NON-PILOT 60" - 76"	60" - 78"	PILOT 64" - 76" NON-PILOT 60" - 76"	60" - 78"	60" - 78"	64" - 76" FIGHTER PILOT 69" 160 LBS.) MAX.	64" - 76"	64" - 76" 170 LBS. MAX.	60" - 78"	64" - 76"	60" - 76"	GUNNER 60" - 72" OTHERS 60" - 76" GUNNER 190 LBS. MAX.	60" - 78"
VISUAL ACUITY	20/20 BILAT. UNCORRECTED MEAR VISION 21	20/100 BILAT. CORRECTED TO 20/20-20/30	PILOT-NOMS. AR 40-110 CL. 1 NAVIGATOR AR 40-110 CL. 2	20/100 BILAT. CORRECTED TO 20/20-20/30	PILOT-NOMS. AR 40-110 CL. 1 NAVIGATOR AR 40-110 CL. 2	20/100 BILAT. CORRECTED TO 20/20-20/30	20/20 BILAT. UNCORRECTED	20/100 BILAT. CORRECTED TO 20/20-20/30	20/200 BILAT. CORRECTED TO 20/40 BILAT.	AR 40-110 CL. 1-2-3	AR 40-110 CL. 1-2-3	AR 40-110 CL. 1-2	AR 40-110 CL. 1	AR 40-110 CL. 1-2-3	AR 40-110 CL. 1-2-3	AR 40-110 CL. 1	DEPENDENT ON BRANCH
COLOR VISION	75% ISHIHARA OR AOC BOOK	DISTINGUISH TRUE RED AND TRUE GREEN	75% ISHIHARA OR AOC BOOK OR COLOR "SAFE"	DISTINGUISH TRUE RED AND TRUE GREEN	75% ISHIHARA OR AOC BOOK OR COLOR "SAFE"	DISTINGUISH TRUE RED AND TRUE GREEN	75% ISHIHARA OR AOC BOOK	DISTINGUISH TRUE RED AND TRUE GREEN	DISTINGUISH TRUE RED AND TRUE GREEN	APPL. FOR APPT. 75% ISHIHARA	APPL. FOR APPT. 75% ISHIHARA	APPL. FOR APPT. 75% ISHIHARA	ORIG. EXAM. 75% ISHIHARA	NOT DONE	75% ISHIHARA OR AOC BOOK	DISTINGUISH TRUE RED AND TRUE GREEN	DISTINGUISH TRUE RED AND TRUE GREEN
X-RAY AND BLOOD SEROLOGY	IF FACILITIES AVAILABLE	IF FACILITIES AVAILABLE	YES	YES	YES	YES	YES	YES	YES	AS INDICATED	ORIG. EXAM.	ORIG. EXAM.	ORIG. EXAM.	NO	NO	NO	YES
OPHTHALMOSCOPIC OR REFRACTION	NO	NO	REFRACTION WHEN INDICATED	NO	NO	NO	YES	NO	NO	ORIG. EXAM. ONLY	NO	NO	ORIG. EXAM. ONLY	NO	NO	NO	NO

the special procedures used are elaborated in following paragraphs 22, 24 to 30. In addition, an attempt is made to evaluate the emotional stability of the applicant by the observation of certain physical signs which constitute the syndrome called "vasomotor instability" (see par. 23), and to evaluate his intelligence by the facility with which he follows simple directions (see par. 30).

20. STANDARDS OF THE PHYSICAL EXAMINATION FOR FLYING. (See Table I). a. The general physical requirements for classes 1, 2, and 3 are the same. These classes differ only in the eye and ear requirements. (See Tables X and XIV)

b. Applicants for the W.A.A.F. must meet the class 1 or class 2 standards. The original and two copies of the examination are sent direct to the Air Surgeon. The physical examination must be completed in all cases, and all defects described in detail.

c. Class 1 or class 2 standards apply to rated Flight Officers and to rated Glider Pilots.

21. STANDARDS OF HEIGHT, WEIGHT, AND CHEST MEASUREMENTS. (See Table II).

22. THE SCHNEIDER INDEX. a. Definition. The Schneider Index is a numerical score derived from changes in the pulse rate and blood pressure caused by changes in posture and by exercise. (It is not a test of circulatory efficiency). Individual and psychogenic factors, fatigue, lack of condition, fever, recent ingestion of a large meal, and recent exercise may materially affect the score. The index has three important functions:

(1) In original selection, the individual with signs of "vasomotor instability" and psychological evidence of inadaptability to military aeronautics may show a repeatedly low score.

(2) In original selection the test will occasionally detect postural hypotension or orthostatic syncope.

(3) In flying personnel, all of whom know the relation of the Schneider Index to physical fitness, it is of value because it serves as a stimulus to the examinee for the maintenance of this fitness.

b. Technique.

(1) Subject reclines with eyes closed until pulse becomes stabilized; this usually requires 5 minutes; care should be taken to avoid disturbing or exciting influences.

(2) Heart rate is counted for 20 seconds. When two consecutive 20-second counts are the same, this is multiplied by 3 and recorded.

(3) The systolic pressure is taken by auscultation and recorded. Take two or three readings to be certain.

(4) The subject then rises and stands for 2 minutes to allow the pulse to assume a uniform rate. When two consecutive 15-second counts are the same, multiply by 4 and record. This is the normal standing rate.

(5) The systolic pressure is taken as before and recorded.

(6) Timed by a stop watch, the subject steps upon a stool 18-1/2 inches high five times in 15 seconds. To make this uniform the subject stands with one foot on the stool at the count one. This foot remains on the stool and is not brought to the floor again until after count five. At each "up" count he brings the other foot onto the stool and at the count "down" replaces it on the floor. This should be timed accurately so that at the 15-second mark on the stop watch both feet are on the floor.

(7) Start counting the pulse immediately at the 15-second mark on the stop watch and count for 15 seconds. Multiply by 4 and record.

(8) Continue to take pulse in 15-second counts until the rate has returned to the normal standing rate. Note the number of seconds it takes for this return and record. In computing this return, count from the end of the 15 seconds of exercise to the beginning of the first normal 15-second pulse count. If the pulse has not returned to normal at the end of 2 minutes record the number of beats above normal and discontinue counting.

(9) Check up points and enter final rating, according to d. below.

(10) Enter history of case, including amount of sleep, amount of smoking, kind of work (outdoor or indoor or sedentary, etc.), time since last meal, and any personal worries or pathological condition which might affect the subject.

b. Precautions. The index should not be taken within 2 hours after a meal. The amount of habitual exercise, smoking, and sleep (which affect the index materially) should be

TABLE II
OFFICERS AND OFFICER CANDIDATES, AAF, WD, AGO, FORM 64 OR 63
WEIGHTS ACCORDING TO AGE

Height in Inches	18 - 20			21 - 25			26 - 30			31 - 35			Min. Chest at Expiration
	Min.	Stand.	Max.	Min.	Stand.	Max.	Min.	Stand.	Max.	Min.	Stand.	Max.	
60	105	117	146	108	120	150	110	122	153	110	125	157	29
61	107	119	149	110	122	153	112	124	155	112	127	159	29 1/4
62	109	121	151	112	124	155	113	126	158	113	129	161	29 1/2
63	112	124	155	113	126	158	115	128	160	115	131	164	29 3/4
64	114	127	159	115	128	160	118	131	164	118	134	168	30
65	117	130	163	119	132	165	121	135	169	121	138	173	30
66	120	133	166	122	136	170	125	139	174	125	142	178	30 1/4
67	123	137	171	126	140	175	129	143	179	129	146	183	30 1/2
68	127	141	176	130	144	180	132	147	184	132	150	188	30 3/4
69	130	145	181	133	148	185	136	151	189	136	154	193	31
70	134	149	186	137	152	190	139	155	194	139	158	198	31 1/4
71	138	153	191	140	156	195	143	159	199	143	162	203	31 3/4
72	141	157	196	145	161	201	148	164	205	148	167	209	32 1/4
73	145	161	201	149	166	208	152	169	211	152	172	215	32 3/4
74	148	165	206	154	171	214	157	174	218	157	177	221	33 1/2
75	152	169	211	158	176	220	161	179	224	161	182	228	34 1/4
76	156	173	216	163	181	226	166	184	230	166	187	234	34 3/4
77	159	177	221	167	186	232	170	189	236	170	192	240	35 1/4
78	163	181	226	172	191	239	175	194	242	175	197	246	35 3/4

Height in Inches	36 - 40			41 - 45			46 - 50			51 - 64			Min. Chest at Expiration
	Min.	Stand.	Max.	Min.	Stand.	Max.	Min.	Stand.	Max.	Min.	Stand.	Max.	
60	110	128	160	110	131	164	110	133	166	110	135	169	29
61	112	130	163	112	133	166	112	135	169	112	137	171	29 1/4
62	113	132	165	113	135	169	113	137	171	113	139	174	29 1/2
63	115	134	168	115	137	171	115	139	174	115	141	176	29 3/4
64	118	137	171	118	140	175	118	142	178	118	144	180	30
65	121	141	176	121	144	180	121	146	183	121	148	185	30
66	125	145	181	125	148	185	125	150	188	125	152	190	30 1/4
67	129	149	186	129	152	190	129	154	193	129	156	195	30 1/2
68	132	153	191	132	156	195	132	158	198	132	160	200	30 3/4
69	136	157	196	136	160	200	136	162	203	136	164	205	31
70	139	161	201	139	164	205	139	166	208	139	168	210	31 1/4
71	143	165	206	143	168	210	143	170	213	143	172	215	31 3/4
72	148	170	213	148	173	216	148	175	219	148	177	221	32 1/4
73	152	175	219	152	178	223	152	180	225	152	182	228	32 3/4
74	157	180	225	157	183	229	157	185	231	157	187	234	33 1/2
75	161	185	231	161	188	235	161	190	238	161	192	240	34 1/4
76	166	190	238	166	193	241	166	195	244	166	197	246	34 3/4
77	170	195	244	170	198	248	170	200	250	170	202	253	35 1/4
78	175	200	250	175	203	254	175	205	256	175	207	259	35 3/4

NOTE: 1. The weight for each height for the age group 26-30 is the ideal one to maintain thereafter. For age after this age group a minimal allowance of not more than 10 per cent below ideal will be acceptable.

2. A candidate whose weight falls at the extremes of either the minimum or maximum range is acceptable only when he is obviously active, of firm musculature, and evidently vigorous and healthy.

3. A minimum chest expansion of 2 inches will be required.

4. For flying training no candidate will be considered whose weight is above 200 pounds.

taken into consideration in interpreting the findings. The presence of intercurrent mild respiratory infections (colds, etc.) may also materially lower the index. There are several common sources of error in the test:

(1) In the performance of the exercise, one foot is placed on the stool at the start. It is kept there until the completion of the last count when both feet are placed on the floor.

(2) The pulse should be counted for the 15 seconds period that immediately follows the exercise. In order that this count may begin precisely at the end of the exercise period, the examiner should grasp the subject's wrist either at the beginning of the exercise period, or just before the exercise is completed.

(3) If the blood pressure is varying a good deal while making several readings, it would seem most desirable to take an average of several determinations.

c. Interpretation. A candidate will never be disqualified on the index alone, but an index persistently less than 8 means a poor pulse response to exercise and posture, a cause for which should be sought by the examiner.

d. Scoring. (See Table III).

23. VASOMOTOR INSTABILITY. a. Definition. The term is used to describe a group of signs probably resulting from unusual activity of the sympathetic nervous system, or imbalance of the autonomic nervous system, in response to an emotional stimulus. In the case of original applicants the emotional stimulus is the strange environment of the Flight Surgeon's office. The manifestations listed below are probably present in some degree in all individuals depending upon the intensity of the emotional stimulus. If it is persistently present in marked degree in the original applicant for flying training he is disqualified. The reason for this is that these individuals show a variable degree of psychomotor tension. When confronted by the strange environment of the airplane cockpit and exposed to the additional uncertainty of loss of reference to the ground, they do not learn to fly or learn to fly with difficulty because of the tenseness associated with these emotional stimuli.

b. Manifestations.

(1) Labile pulse, often rapid.
(2) Labile blood pressure; frequently high systolic.
(3) Persistently low Schneider Index.
(4) Cold, clammy, cyanotic, mottled extremities (excessive vasoconstriction).
(5) Palmar, plantar, and axillary sweating.
(6) Tremors of hands, closed eyelids, muscles of face, and lips.

24. HEART SOUNDS. a. Normal heart sounds, Table IV and Figure I.

b. Terms to be used in describing heart sounds and murmurs, Table V.

25. CRITERIA FOR THE DIAGNOSIS OF COMMON CARDIAC VALVULAR DEFORMITIES.*

a. Aortic Insufficiency. The diagnosis should be made only in the presence of a characteristic murmur. The signs are:

(1) Diastolic murmur, blowing or musical in quality, and of a pitch higher than that of the usual first heart sound. It may be very faint, often better heard with the ear directly applied to the chest than with the stethoscope. It is loudest (a) in the third or fourth interspace at the left border of the sternum, or (b) over the sternum itself at this level, of (c) in the second or third interspace at the right border of the sternum, or (d) rarely at other sites. The murmur is best heard with a relatively slow heart rate, with the breath held in expiration and with the patient erect or bent forward.

(2) Enlargement of the heart, mainly of the left ventricle.

(3) Collapsing (Corrigan) pulse.

(4) Large pulse pressure, with lowered diastolic and elevated systolic pressure. This sign, as well as the collapsing (Corrigan) pulse, may be absent when there is accompanying stenosis of the orifice.

* From Nomenclature and Criteria for Diagnosis of Diseases of the Heart, 4th Ed., 1940.

A. Reclining pulse rate		B. Pulse rate increase on standing				
		0-10 beats	11-18 beats	19-26 beats	27-34 beats	35-42 beats
	Points	*Points*	*Points*	*Points*	*Points*	*Points*
50–60	3	3	3	2	1	0
61–70	3	3	2	1	0	−1
71–80	2	3	2	0	−1	−2
81–90	1	2	1	−1	−2	−3
91–100	0	1	0	−2	−3	−3
101–110	−1	0	−1	−3	−3	−3

C. Standing pulse rate		D. Pulse rate increase immediately after exercise				
		0-10 beats	11-20 beats	21-30 beats	31-40 beats	41-50 beats
	Points	*Points*	*Points*	*Points*	*Points*	*Points*
60–70	3	3	3	2	1	0
71–80	3	3	2	1	0	0
81–90	2	3	2	1	0	−1
91–100	1	2	1	0	−1	−2
101–110	1	1	0	−1	−2	−3
111–120	0	1	−1	−2	−3	−3
121–130	0	0	−2	−3	−3	−3
131–140	−1	0	−3	−3	−3	−3

E. Return of pulse rate to standing normal after exercise		F. Systolic pressure standing compared with reclining	
Seconds	*Points*	*Change in m m*	*Points*
0–30	3	Rise of 8 or more	3
31–60	2	Rise of 2-7	2
61–90	1	No rise	1
91–120	0	Fall of 2-5	0
After 120: 2-10 beats above normal	−1	Fall of 6 or more	−1
After 120: 11-30 beats above normal	−2		

TABLE III.

TABLE IV. - SUMMARY OF NORMAL HEART SOUNDS

SOUND		FIRST	SECOND	THIRD	FOURTH
Origin		From each ventricle: (1) Muscular (2) Valvular (3) Vascular (basal vessels) and (4) Auricular (see 4th heart sound) components. From both ventricles: (5) Contact with chest wall	Closure of semilunar valves	Vibration of ventricular walls, valves, and chordae tendineae as a result of sudden rush of blood into ventricles in early diastole	(1) Tension and contraction of auricular walls (2) Flow of blood through A-V orifices (3) Distention of ventricles (4) Friction of auricles against other structures
Components		(1) Isometric phase (components 1, 2 and 5 above) (2) Ejection phase (component 3 above)	(1) Aortic (2) Pulmonic	--	Three groups resulting from: (1) Auricular contraction (2) Distention of ventricles (3) Incomplete closure of A-V valves (same as auricular component of first sound)
Auditory characteristics		(1) Prolonged (2) Low pitch (3) Variable intensity (4) Heard best at apex	(1) Short (2) High pitch (3) Variable intensity; relation of A_2 to P_2 changes with age (4) Heard best at base	(1) Short (2) Low pitch (3) Low intensity-best heard in adolescents and in youth (4) Heard best in left lateral supine position at apex	(1) Each group short (2) Lowest pitch (3) Usually inaudible (recorded best in mesocardiac area. Heard in this area in A-V block).
Graphic relations	E.K.G.	Just after peak of R (auricular component precedes peak of R wave)	End of T wave	0.14 to 0.16 sec. after end of T wave	Variable relation to P wave (0.08 to 0.30 sec. after beginning)
	Jugular Phlebogram	Before rise of C wave	0.11 sec. before peak of V wave	Lowest portion of descending limb of V wave	Usually afer the rise of the A wave
	Carotid Arteriogram	.04 to .10 sec. before rise of carotid pulse	Incisura (dicrotic notch)	0.14 to 0.16 sec. after incisura	--
Physiologic variations due to	Cardiac factors	(1) Rate of rise of intraventricular pressure (2) Duration of P-R interval	(1) Relative intra-aortic and intra-pulmonic pressures (2) Differences in pressure between chamber and vessels	Suddenness of ventricular filling	Increased venous return to the heart
	Extra cardiac factors	Common to all. Variations in intensity due to variations in thickness of thoracic wall, shape of chest, size of lungs, etc.			

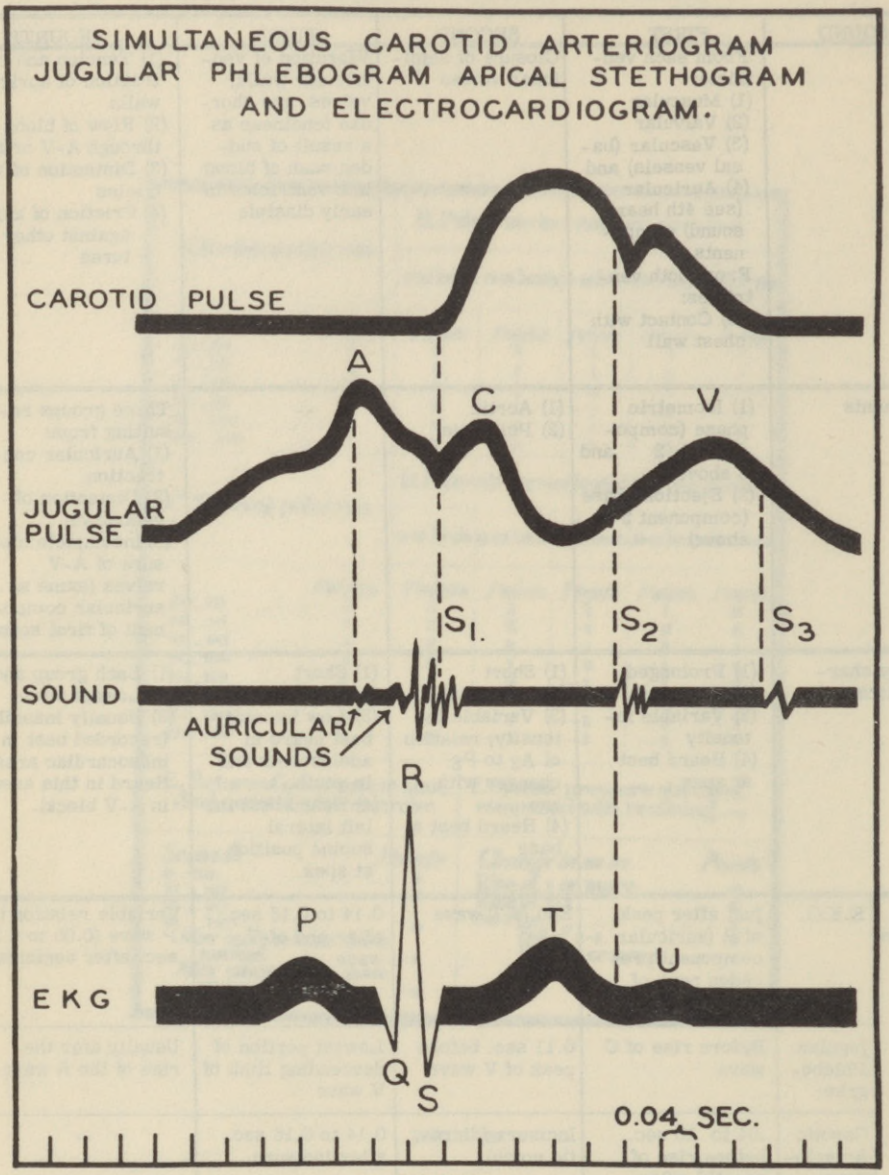

SIMULTANEOUS CAROTID ARTERIOGRAM
JUGULAR PHLEBOGRAM APICAL STETHOGRAM
AND ELECTROCARDIOGRAM.
CAROTID PULSE
A
C
V
JUGULAR
PULSE
S1.
S2
S3
SOUND
AURICULAR
SOUNDS
R
P
T
U
EKG
Q
S
0.04 SEC.

FIGURE 1

TABLE V. TERMS TO BE USED IN DESCRIBING HEART SOUNDS AND MURMURS

(TERMS IN CAPITALS PREFERRED)*

HEART SOUNDS

INTENSITY	PITCH	QUALITY	DURATION	TIME
NORMAL	HIGH	NORMAL	NORMAL	
FAINT		SHARP	SHORT	
Weak		Snapping		
Distant		Valvular		
Muffled				
LOUD	LOW	BOOMING	PROLONGED	
Accentuated		Muscular		
Increased				
ABSENT		SPLIT		
Replaced by a murmur		RINGING		
		Metallic		
		Bell-like		
		Tambour		
		Hollow		

MURMURS

FAINT	HIGH	BLOWING	SHORT	SYSTOLIC
Soft				
MODERATE	MEDIUM	HARSH	MODERATE	EARLY SYSTOLIC
		Rough		
		Coarse		
LOUD	LOW	MUSICAL	LONG	LATE SYSTOLIC
		RUMBLING		DIASTOLIC
		CRESCENDO		EARLY DIASTOLIC
		DECRESCENDO		MID-DIASTOLIC
				PRESYSTOLIC (Late Diastolic)

*From Nomenclature and Criteria for Diagnosis of Diseases of the Heart, 4th Edition, 1939.

b. Aortic stenosis. The diagnosis of aortic stenosis should be made with caution if the murmur of aortic insufficiency is absent. However, it is not unusual for aortic stenosis to exist without aortic insufficiency. Syncope is a common symptom. The signs are:

(1) Loud, harsh systolic murmur in the second right interspace close to the sternum, usually transmitted upward.

(2) Systolic thrill, best felt in the second right interspace close to the sternum. It is elicited more readily with the breath held in expiration and the patient bending forward.

(3) Anacrotic pulse, with slow rise and broad summit.

(4) Faint or absent aortic second sound.

(5) Enlargement of the heart, especially of left ventricle.

(6) Low systolic and small pulse pressure.

c. Mitral insufficiency. Not all precordial and apical systolic murmurs denote mitral valvular deformity. Sometimes the murmur is evidence of incompetence of the valve ring resulting from myocardial disease. Occasionally it is due to a congenital anomaly or may be of pulmonary or other extracardiac origin.

With a history of rheumatic infection and especially when associated with murmurs due to disease of other valves or with cardiac enlargement, the murmur is likely to indicate mitral valve deformity with insufficiency.

The systolic murmur of mitral insufficiency may be inconstant or of variable intensity during the period of observation. The signs are

(1) Systolic murmur, best heard at or just outside the region of the cardiac apex, either following or merging with the first heart sound and usually transmitted to the left axilla. Its quality may be blowing, harsh or musical, with relatively high pitch. A systolic thrill is occasionally palpable.

(2) Enlargement of the heart may be slight and recognizable only on radiography, but without it deformity of the mitral valve should not be diagnosed.

d. Mitral stenosis. The diagnosis should be made only in the presence of a characteristic murmur.

In some cases of aortic insufficiency the diastolic murmur at the apex (Austin Flint murmur) cannot be differentiated by its characteristics from that due to organic mitral stenosis. If aortic insufficiency is of rheumatic etiology, a rumbling diastolic murmur at the apex is likely to be due to mitral stenosis. If there is a sharp first heart sound, the diagnosis of mitral stenosis is more probable. If, on the other hand, the aortic insufficiency is syphilitic, it is fair to assume that the mitral valve is anatomically intact and that it is a Flint murmur which is heard. Often the final differentiation can only be made radiographically, whereby enlargement of the left auricle or the right ventricle, or both, should be demonstrable if the murmur is due to mitral stenosis. The signs are:

(1) The characteristic murmur of mitral stenosis is a low-pitched, diastolic rumble, localized at the cardiac apex with or without presystolic accentuation. In the presence of auricular fibrillation it is often heard only during early diastole, becomes faint or may disappear completely. It can sometimes be heard only with the patient lying on his back or left side and is almost always louder in these positions than when erect. Acceleration of the heart rate by exercise will frequently make definite a murmur which is otherwise inaudible.

(2) Accentuated, snapping first sound at the apex. The presence of such a sound, together with the murmur of mitral insufficiency, should arouse suspicion of narrowing of the mitral orifice.

(3) Accentuated secondsound at the pulmonic area.

(4) Enlargement of left auricle best observed radiologically in the right oblique position.**

(5) Enlargement of the right ventricle and pulmonary artery observed radiologically.**

(6) Right axis deviation of the QRS group of the electrocardiogram especially with notched, broad P waves.

** When these radiologic phenomena are present in well-marked degree, along with the murmur of mitral insufficiency, the presence of mitral stenosis may be suspected.

26. BLOOD PRESSURE. a. Blood pressure determinations.***(1) The blood pressure equipment to be used, whether mercurial or anaeroid, should be in good condition and calibrated at yearly intervals. In the mercurial type the level of the mercury at rest should be exactly at the zero mark. The small air vent at the top of the glass tubing must always be patent to prevent lag in the instrument. The appartus must be on a level surface, for tilting gives rise to errors of considerable magnitude. All valves and rubber parts should be free from leakage. The armlet for an adult should be 12 to 13 cm. wide and 23 cm. long. The cloth covering should be of inextensible material of such nature that an even pressure is exerted throughout the width of the cuff, it should extend as a band 15 cm. wide for 60 cm. beyond the edge of the rubber cuff, and taper gradually for an additional 30 cm. For measuring blood presuure in the leg, the rubber bag should be 15 cm. wide, and its covering 17 cm. wide and 120 cm. long.

(2) The patient should be comfortably seated or in a sitting position, with the arms slightly flexed and the whole forearm supported on a smooth surface at the level of the heart. If readings are taken in any other position, a notation of that fact should be made. The patient should be allowed time to recover from any recent exercise or excitement. The arm used should be free of constricting clothing.

(3) A completely deflated cuff should be applied snugly and evenly around the arm with the lower edge about 1 inch above the antecubital space, and with the rubber bag applied over the inner aspect of the arm. The cuff should be of such type and applied in such manner that inflation causes neither bulging or displacement.

(4) The stethoscope should be placed over the previously palpated brachial artery in the antecubital space, not in contact with the cuff, and held in place with a minimum of pressure on the skin. The hand may be pronated or supinated, depending upon which position yields the clearest brachial pulse.

(5) In the determination of the systolic pressure only the auscultatory method is to be used. The cuff should be rapidly inflated, then slowly deflated at a rate of 2 to 3 mm of Hg per second. The level at which the first sound regularly appears should be considered the systolic pressure.

(6) In the determination of the diastolic pressure, with continued deflation of the cuff, the point at which the sounds suddenly become dull and muffled should be known as the diastolic pressure.

(7) With premature beats the higher systolic pressures of the beats which terminate compensatory pauses should be ignored. With auricular fibrillation only approximations of the systolic and diastolic pressures can be made. It is recommended that systolic pressure be calculated as an average of the highest pressure at which sounds come through and the pressure at which the sound for each beat is detectable. The diastolic pressure is obtained by taking the average of several readings. With pulsus alternans both systolic pressures should be recorded. In hypertensive subjects care must be exerted to avoid errors that may be introduced by the zone of silence occasionally encountered between systolic and diastolic pressure, known as the auscultatory gap.

b. Blood pressure requirements (see AR 40-105, par. 36f and 39e and f, AR 40-110, par. 20e(1)).

(1) Air Crew training (TAC-pilot, bombardier, or navigator - Form AGO, WD No. 64)

Systolic - 100 minimum
134 maximum
Diastolic- 89 maximum

(2) Ground duty training (armament, meteorology, communications, engineering, photography - Form AGO, WD, No. 63).

(a) Less than 25 years of age.

Systolic - 100 minimum
139 maximum
Diastolic- 89 maximum

(b) Over 25 years of age.

Systolic - 100 minimum
149 maximum
Diastolic- 94 maximum

*** Modified from Standardization of Blood Pressure Readings (J.A.M.A., 113:249, 1939).

(3) Other applicants for flying training (officer training in grade, liaison pilot).

(a) Same as for Air Crew training, par. 22b. (1).

(4) Other flying personnel (civilian flying instructor; rated and non-rated observer; combat crew (enlisted); annual, semi-annual, and special examinations on rated flying personnel).

(a) 25 years of age or under.

Systolic - 100 minimum
140 maximum
Diastolic- 94 maximum

(b) Over 25 years of age.

Systolic - 100 minimum
149 maximum
Diastolic- 94 maximum

27. THE ELECTROCARDIOGRAM. a. Criteria for the Normal Standard Leads (Figure 2). The normal electrocardiogram consists of a group of summits and depressions. There may be as many as 7 of these (P, Ta, Q, R, S, T, and U), but the P, R, and T are always present, normally.

The P wave and Ta wave comprise the auricular complex. The ventricular complex consists of initial (QRS) and final (RS - T and T) deflections.

(1) Auricular Complex. The P wave results from electrical excitation or depolarization of the auricular muscle. In the normal it is upright in leads I and II and is not more than 0.25 or less than 0.05 millivolt in height. Its width, at its base, it 0.1 second or less. It is rounded or pointed, and often notched. The electrocardiogram is said to display a high voltage P wave if this deflection is more than 0.25 mv. in any standard lead, and a low voltage P wave if this deflection is less than 0.05 mv. in all three standard leads.

The Ta wave is a gradual depression occurring immediately after the P wave which usually is slight and rarely exceeds 0.1 mv. It represents electrical recovery or repolarization of the auricular muscle.

(2) Ventricular complex. The initial ventricular deflections, Q, R, and S, are written during electrical excitation or depolarization of the ventricular muscle.

The Q wave may be normally absent. It is an initial downward ventricular deflection which is neither slurred nor splintered, and which has a maximum absolute and relative size in the three leads as follows:

Lead	Absolute size in millivolts	Percent of largest QRS deflection in the 3 leads
I	0.20	15%
II	0.25	20%
III	0.30	25%

These criteria are not applicable in any lead to curves showing a high voltage of QRS, or in leads II and III if there is right deviation of the electrical axis.

A normal R wave is an upward deflection varying in size from 0.15 to 2.0. mv. It is not unusually slurred, notched, or splintered.

A normal S wave is a depression preceded by a summit. It does not exceed 0.6 mv. in depth, and is not unusually slurred, splintered, or notched.

When any QRS deflection in the 3 leads, measured in either direction from the baseline, exceeds 2.0 mv., the electrocardiogram is said to show high voltage of QRS or simply high voltage. When the largest QRS deflection is less than 0.5 mv., similarly measured, the curve is said to show low voltage.

The final ventricular deflections, S-T and T, are written during electrical recovery or repolarization of the ventricular muscle.

THE NORMAL ELECTROCARDIOGRAM

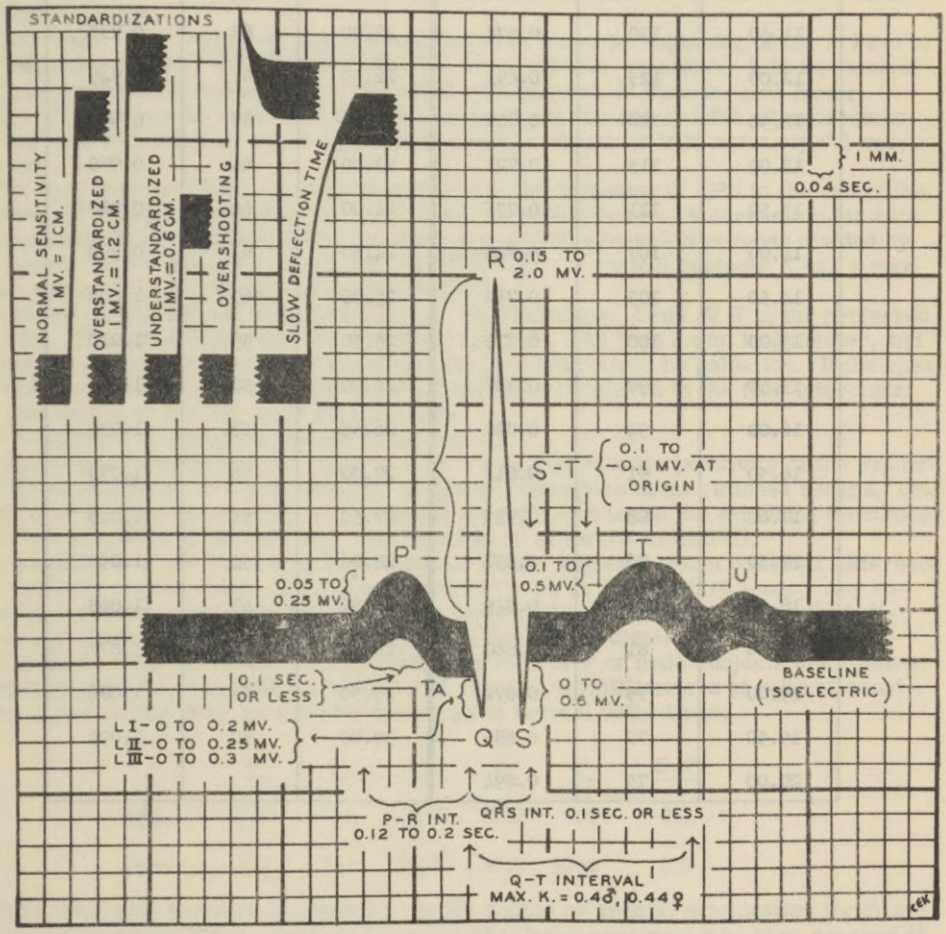


TABLE VI. - Table for calculating rate and the systolic index $(Q - T/\sqrt{R - R})$ in the electrocardiogram. R - R is the cycle length or the distance between 2 R waves.

R - R in 0.04 Sec.	Rate per Minute	$\sqrt{R - R}$ in Sec.	R - R in 0.04 Sec.	Rate per Minute	$\sqrt{R - R}$ in Sec.
10.00	150	0.633	20.50	73	0.906
10.50	143	0.648	21.00	71	0.917
11.00	136	0.663	21.50	70	0.927
11.50	130	0.678	22.00	68	0.938
12.00	125	0.693	22.50	67	0.949
12.50	120	0.707	23.00	65	0.959
13.00	115	0.721	23.50	64	0.970
13.50	111	0.735	24.00	62	0.980
14.00	107	0.748	24.50	61	0.990
14.50	103	0.762	25.00	60	1.000
15.00	100	0.775	25.50	59	1.010
15.50	97	0.787	26.00	58	1.020
16.00	94	0.800	26.50	57	1.030
16.50	91	0.812	27.00	56	1.039
17.00	88	0.825	27.50	55	1.049
17.50	86	0.837	28.00	54	1.058
18.00	83	0.849	28.50	53	1.068
18.50	81	0.860	29.00	52	1.077
19.00	79	0.872	29.50	51	1.086
19.50	77	0.883	30.00	50	1.095
20.00	75	0.894			

The normal S-T (R-T, RS-T) segment is that portion of the curve between the end of QRS and the beginning of T. It is not displaced at its origin by more than 0.1 mv. in either direction from the baseline. It usually inclines upward slightly as it approaches the T wave.

The normal T wave is upright in leads I and II. Occasionally it may be inverted in leads II and III, especially in hyposthenic subjects when sitting, but becomes upright in lead II or in leads II and III when the electrocardiogram is recorded with these subjects recumbent.

The normal T wave varies in size from 0.1 to 0.5 mv. The electrocardiogram is said to show a high voltage T wave if this deflection is more than 0.5 mv. in any standard lead, and a low voltage T wave if this deflection is less than 0.1 mv. in the three standard leads.

The U wave is a small deflection which occurs inconstantly after the T wave. It is normally upright.

(3) Intervals. The P-R (P-Q) interval is measured from the beginning of the P wave to the beginning of QRS. Its normal value is 0.12 to 0.20 sec. in adults. It is an index of auriculoventricular conduction. It normally gets shorter as the rate gets faster.

The QRS interval is measured from the beginning to the end of QRS. It represents the duration of excitation of the ventricular muscle. In adults it is normally 0.1 sec. or less.

The Q-T interval (Table VI) is measured from the beginning of QRS to the end of the T wave. It normally gets shorter as the heart rate gets faster. A correction for rate is expressed in the systolic index, K, which is the Q-T interval in seconds divided by the square root of the cycle length ($K = Q\text{-}T\sqrt{R - R}$). In normal subjects K has a maximum value of 0.4 in males, and 0.44 in females.

b. Criteria for the normal precordial leads. (1) Technique. Lead IV F is the preferred chest lead. The exploring electrode should be circular, less than 3 cm in diameter, and placed at the outer border of the apex of the heart as determined by palpation. It the apex beat cannot be located satisfactorily, the electrode may be placed in the fifth intercostal space just lateral to the left midclavicular line.

The indifferent electrode is placed on the left leg.

Galvanometer connections are made in such a way that relative positivity of the exploring or apical electrode is represented by an upward deflection in the finished record. One method by which this can be done is to connect the left leg wire to the exploring electrode and the left arm wire to the left leg. The lead switch is turned to lead III.

The sensitivity of the recording device should be so adjusted that a potential difference of one millivolt causes a deflection of one centimeter as in the standard leads. Any reduction in sensitivity made necessary by very large deflections should be clearly indicated on the curve, preferably by photographying the standardization.

(2) Criteria. Data on the normal deflections in lead IV F of male subjects are limited. Tentatively the following values in tenths of a millivolt (millimeters at normal sensitivity of the string) may be used for the range of normal deflections:

	P	Q	R	S	T	S-T
Min.	-1.0	0	3.0	1.0	0.5	-0.5
Max.	1.5	3.0	30.0	35.0	13.0	2.0

c. When electrocardiogram is required. In the annual or special examination for flying an electrocardiogram will be made on all rated Air Corps personnel who have reached 40 years of age. In addition it may be used in any examination when such diagnostic aid is needed. In applicants for commission it is to be recorded routinely if the applicant is 50 years of age or over, or if his pulse rate is 50 beats per minute or less.

28. CARDIAC RADIOGRAPHY. The principal methods of examining the heart radiographically are: fluoroscopy, teleroentgenography, orthodiagraphy, kymoroentgenography, and angiography. In general, the fluoroscopic method is perhaps the best because good ob-

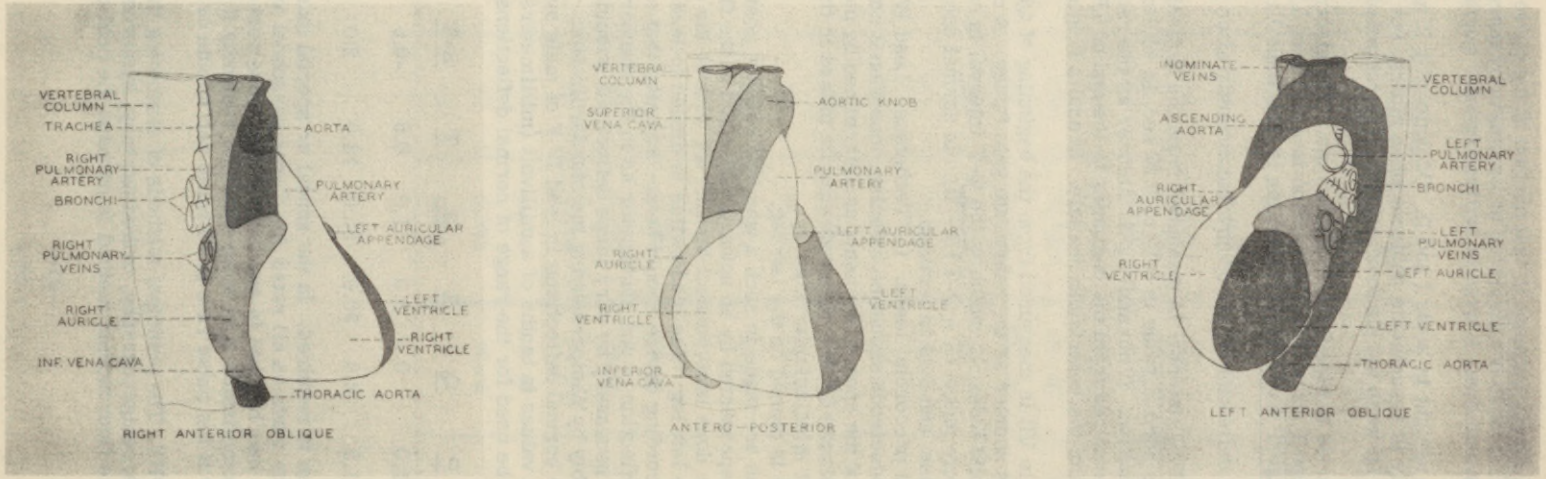
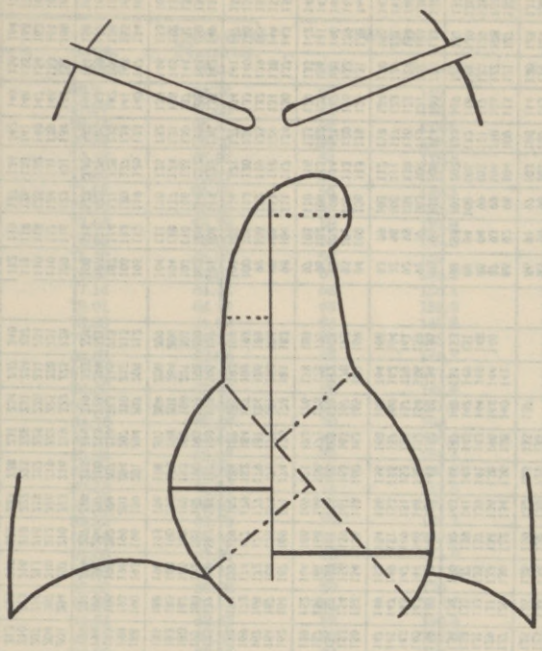

VERTEBRAL COLUMN
TRACHEA
RIGHT PULMONARY ARTERY
BRONCHI
RIGHT PULMONARY VEINS
RIGHT AURICLE
INF. VENA CAVA
AORTA
PULMONARY ARTERY
LEFT AURICULAR APPENDAGE
LEFT VENTRICLE
RIGHT VENTRICLE
THORACIC AORTA
RIGHT ANTERIOR OBLIQUE
VERTEBRAL COLUMN
SUPERIOR VENA CAVA
RIGHT AURICLE
RIGHT VENTRICLE
INFERIOR VENA CAVA
AORTIC KNOB
PULMONARY ARTERY
LEFT AURICULAR APPENDAGE
LEFT VENTRICLE
ANTERO-POSTERIOR
INOMINATE VEINS
ASCENDING AORTA
RIGHT AURICULAR APPENDAGE
RIGHT VENTRICLE
VERTEBRAL COLUMN
LEFT PULMONARY ARTERY
BRONCHI
LEFT PULMONARY VEINS
LEFT AURICLE
LEFT VENTRICLE
THORACIC AORTA
LEFT ANTERIOR OBLIQUE

FIGURE 3.

MEASUREMENTS OF THE HEART ON THE RADIOGRAPH



TRANVERSE DIAMETER

BROAD DIAMETER

LONG (OBLIQUE) DIAMETER

AORTIC WIDTH

FIGURE 4

TABLE VII. - Theoretical Transverse Diameters of Heart Silhouette for Various Heights and Weights

T. D. of Heart	HEIGHT 5'0"	1"	2"	3"	4"	5"	6"	7"	8"	9"	10"	11"	6'0"	1"	2"	3"	4"	5"	6"
100 mm	83	85	86	87	89	90	92												
101 "	85	86	88	89	91	92	93	95											
102 "	87	88	90	91	92	94	95	97											
103 "	88	90	92	93	94	96	97	99	100										
104 "	90	92	93	95	96	98	99	101	102										
105 "	92	93	95	96	98	99	101	103	104	106									
106 "	94	95	97	98	100	101	103	104	106	108									
107 "	95	97	99	100	102	103	105	106	108	110	111								
108 "	97	99	100	102	104	105	107	108	110	112	113								
109 "	99	101	102	104	106	107	109	110	112	114	115	117							
110 "	101	102	104	106	108	109	111	113	114	116	118	119	121						
111 "	103	104	106	108	109	111	113	115	116	118	120	121	123	125					
112 "	105	106	108	110	111	113	115	117	118	120	122	124	125	127	129				
113 "	106	108	110	112	113	115	117	119	121	123	124	126	128	129	131	133			
114 "	108	110	112	114	115	117	119	121	123	125	126	128	130	132	133	135	137		
115 "	110	112	114	116	117	119	121	123	125	127	129	130	132	134	136	138	140	141	
116 "	112	114	116	118	120	121	123	125	127	129	131	133	134	136	138	140	142	144	146
117 "	114	116	118	120	122	124	125	127	129	131	133	135	137	139	141	143	144	146	148
118 "	116	118	120	122	124	126	128	129	131	133	135	137	139	141	143	145	147	149	151
119 "	118	120	122	124	126	128	130	132	134	136	138	140	142	143	145	147	149	151	153
120 "	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156
121 "	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	159
122 "	124	126	128	130	132	134	136	138	140	143	145	147	149	151	153	155	157	159	161
123 "	126	128	130	132	134	136	139	141	143	145	147	149	151	153	155	157	160	162	164
124 "	128	130	132	134	137	139	141	143	145	147	149	152	154	156	158	160	162	164	166
125 "	130	132	134	137	139	141	143	145	147	150	152	154	156	158	160	163	165	167	169
126 "	132	134	137	139	141	143	145	148	150	152	154	156	159	161	163	165	167	170	172
127 "	134	137	139	141	143	146	148	150	152	154	157	159	161	163	166	168	170	172	175
128 "	136	139	141	143	146	148	150	152	155	157	159	161	164	166	168	171	173	175	177
129 "	139	141	143	146	148	150	152	155	157	159	152	164	166	169	171	173	176	178	180
130 "	141	143	145	148	150	152	155	157	160	162	164	167	169	171	174	176	178	181	183
131 "	143	145	148	150	152	155	157	160	162	164	167	169	172	174	176	179	181	183	186
132 "	145	148	150	152	155	157	160	162	164	167	169	172	174	177	179	181	184	186	189
133 "	147	150	152	155	157	160	162	165	167	169	172	174	177	179	182	184	187	189	192
134 "	150	152	155	157	160	162	164	167	169	172	174	177	179	182	184	187	189	192	194
135 "	152	154	157	159	162	164	167	169	172	175	177	180	182	185	187	190	192	195	197
136 "	154	157	159	162	164	167	169	172	175	177	180	182	185	187	190	193	195	198	200
137 "	156	159	162	164	167	169	172	175	177	180	182	185	188	190	193	195	198	201	203
138 "	159	161	164	167	169	172	174	177	180	182	185	188	190	193	196	198	201	204	206
139 "	161	164	166	169	172	174	177	180	182	185	188	190	193	196	198	201	204	206	209
140 "	163	166	169	171	174	177	180	182	185	188	190	193	196	199	201	204	207	209	212
141 "	166	168	171	174	177	179	182	185	188	190	193	196	199	201	204	207	210	212	215
142 "	168	171	174	176	179	182	185	188	190	193	196	199	202	204	207	210	213	216	218
143 "	170	173	176	179	182	184	187	190	193	196	199	202	204	207	210	213	216	219	221
144 "	173	176	178	181	184	187	190	193	196	199	201	204	207	210	213	216	219	222	224
145 "	175	178	181	184	187	190	193	196	198	201	204	207	210	213	216	219	222	225	228
146 "	178	180	183	186	189	192	195	198	201	204	207	210	213	216	219	222	225	228	231
147 "	180	183	186	189	192	195	198	201	204	207	210	213	216	219	222	225	228	231	234
148 "	182	185	188	192	195	198	201	204	207	210	213	216	219	222	225	228	231	234	237
149 "	185	188	191	194	197	200	203	206	210	213	216	219	222	225	228	231	234	237	240
150 "	187	191	194	197	200	203	206	209	212	215	219	222	225	228	231	234	237	240	243
151 "	190	193	196	199	203	206	209	212	215	218	222	225	228	231	234	237	241	244	247
152 "	192	196	199	202	205	208	212	215	218	221	224	228	231	234	237	241	244	247	250
153 "	195	198	201	205	208	211	214	218	221	224	227	231	234	237	240	244	247	250	253
154 "	198	201	204	207	211	214	217	221	224	227	230	234	237	240	244	247	250	253	257
155 "	200	203	207	210	213	217	220	224	227	230	233	237	240	243	247	250	253	257	260
156 "		206	210	213	216	220	223	227	230	233	236	240	243	247	250	254	257	260	264
157 "				216	219	222	226	229	233	236	239	243	246	250	253	257	260	263	267
158 "						225	229	232	236	239	243	246	249	253	256	260	263	267	270
159 "								235	239	242	246	249	253	256	260	263	267	270	274
160 "										245	249	252	256	259	263	266	270	274	277
161 "												255	259	263	266	270	273	277	281
162 "												259	262	266	270	273	277	280	284
163 "														269	273	277	280	284	288
164 "														273	276	280	284	287	291

Refer to paper entitled "A Study of the Transverse Diameter of the Heart Silhouette with Prediction Table Based on the Teleoroentgenogram" presented to the Association of Life Insurance Medical Directors of America by Dr. Harry E. Ungerleider of the Equitable Life Assurance Society, and Dr. Charles P. Clark, of the Mutual Benefit Life Insurance Company. (1938)

Table for Determining the Per Cent. Deviation from Average

Minus 25%	20%	15%	10%	5%	Av'ge %	Plus 5%	10%	15%	20%	25%
75	80	85	90	95	100	105	110	115	120	125
76	81	86	91	96	101	106	111	116	121	126
77	82	87	92	97	102	107	112	117	122	128
77	82	88	93	98	103	108	113	118	124	129
78	83	88	94	99	104	109	114	120	125	130
79	84	89	95	100	105	110	116	121	126	131
80	85	90	95	101	106	111	117	122	127	133
80	86	91	96	102	107	112	118	123	128	134
81	86	92	97	103	108	113	119	124	130	135
82	87	93	98	104	109	114	120	125	131	136
83	88	94	99	105	110	116	121	127	132	138
83	89	94	100	105	111	117	122	128	133	139
84	90	95	101	106	112	118	123	129	134	140
85	90	96	102	107	113	119	124	130	136	141
86	91	97	103	108	114	120	125	131	137	143
86	92	98	104	109	115	121	127	132	138	144
87	93	99	104	110	116	122	128	133	139	145
88	94	99	105	111	117	123	129	135	140	146
89	94	100	106	112	118	124	130	136	142	148
89	95	101	107	113	119	125	131	137	143	149
90	96	102	108	114	120	126	132	138	144	150
91	97	103	109	115	121	127	133	139	145	151
92	98	104	110	116	122	128	134	140	146	153
92	98	105	111	117	123	129	135	141	148	154
93	99	105	112	118	124	130	136	143	149	155
94	100	106	113	119	125	131	138	144	150	156
95	101	107	113	120	126	132	139	145	151	158
95	102	108	114	121	127	133	140	146	152	159
96	102	109	115	122	128	134	141	147	154	160
97	103	110	116	123	129	135	142	148	155	161
98	104	111	117	124	130	137	143	150	156	163
98	105	111	118	124	131	138	144	151	157	164
99	106	112	119	125	132	139	145	152	158	165
100	106	113	120	126	133	140	146	153	160	166
101	107	114	121	127	134	141	147	154	161	168
101	108	115	122	128	135	142	149	155	162	169
102	109	116	122	129	136	143	150	156	163	170
103	110	116	123	130	137	144	151	158	164	171
104	110	117	124	131	138	145	152	159	166	173
104	111	118	125	132	139	146	153	160	167	174
105	112	119	126	133	140	147	154	161	168	175
106	113	120	127	134	141	148	155	162	169	176
107	114	121	128	135	142	149	156	163	170	178
107	114	122	129	136	143	150	157	164	172	179
108	115	122	130	137	144	151	158	166	173	180
109	116	123	131	138	145	152	160	167	174	181
110	117	124	131	139	146	153	161	168	175	183
110	118	125	132	140	147	154	162	169	176	184
111	118	126	133	141	148	155	163	170	178	185
112	119	127	134	142	149	156	164	171	179	186
113	120	128	135	143	150	158	165	173	180	188
113	121	128	136	143	151	159	166	174	181	189
114	122	129	137	144	152	160	167	175	182	190
115	122	130	138	145	153	161	168	176	184	191
116	123	131	139	146	154	162	169	177	185	193
116	124	132	140	147	155	163	171	178	186	194
117	125	133	140	148	156	164	172	179	187	195
118	126	133	141	149	157	165	173	181	188	196
119	126	134	142	150	158	166	174	182	190	198
119	127	135	143	151	159	167	175	183	191	199
120	128	136	144	152	160	168	176	184	192	200
121	129	137	145	153	161	169	177	185	193	201
122	130	138	146	154	162	170	178	186	194	203
122	130	139	147	155	163	171	179	187	196	204
123	131	139	148	156	164	172	180	189	197	205

TABLE VIII.* - *Prediction for Normal Cardiac Area and Transverse Diameter*

Predicted T-D = +0.1094 × A − 0.1941 × H + 0.8179 × W + 95.8625

I				II			
Stature		Area,	Transverse Diameter,	Weight		Area,	Transverse Diameter,
Cm.	In.	Sq. Cm.	Mm.	Kg.	Pounds	Sq. Cm.	Mm.
150	59	66.7	66.74	50	110	17.00	40.90
151		67.57	66.55	51	112.2	17.34	41.71
152	60	68.44	66.36	52	114.4	17.68	42.53
153		69.31	66.16	53	116.6	18.02	43.35
154		70.18	65.97	54	118.8	18.36	44.17
155	61	71.05	65.77	55	121	18.70	44.98
156		71.92	65.58	56	123.2	19.04	45.80
157		72.79	65.39	57	125.4	19.38	46.62
158	62	73.66	65.19	58	127.6	19.72	47.44
159		74.53	65.00	59	129.8	20.06	48.26
160	63	75.40	64.80	60	132	20.40	49.07
161		76.27	64.61	61	134.2	20.74	49.89
162		77.14	64.42	62	136.4	21.08	50.71
163	64	78.01	64.22	63	138.6	21.42	51.53
164		78.88	64.03	64	140.8	21.76	52.35
165	65	79.75	63.83	65	143	22.10	53.16
166		80.62	63.64	66	145.2	22.44	53.98
167		81.49	63.45	67	147.4	22.78	54.80
168	66	82.36	63.25	68	149.6	23.12	55.62
169		83.23	63.06	69	151.8	23.46	56.44
170	67	84.10	62.86	70	154	23.80	57.25
171		84.97	62.67	71	156.2	24.14	58.07
172		85.84	62.47	72	158.4	24.48	58.89
173	68	86.71	62.28	73	160.6	24.82	59.71
174		87.58	62.09	74	162.8	25.16	60.52
175	69	88.45	61.89	75	165	25.50	61.34
176		89.32	61.70	76	167.2	25.84	62.16
177		90.19	61.50	77	169.4	26.18	62.98
178	70	91.06	61.31	78	171.6	26.52	63.80
179		91.93	61.12	79	173.8	26.86	64.61
180	71	92.80	60.92	80	176	27.20	65.43
181		93.67	60.73	81	178.2	27.54	66.25
182		94.54	60.53	82	180.4	27.88	67.07
183	72	95.41	60.34	83	182.6	28.22	67.89
184		96.28	60.15	84	184.8	28.56	68.70
185	73	97.15	59.95	85	187	28.90	69.52
186		98.02	59.76	86	189.2	29.24	70.34
187		98.89	59.56	87	191.4	29.58	71.16
188	74	99.76	59.37	88	193.6	29.92	71.98
189		100.63	59.18	89	195.8	30.26	72.79
190		101.50	58.98	90	198	30.60	73.61
191	75	102.37	58.79	91	200.2	30.94	74.43
192		103.24	58.59	92	202.4	31.28	75.25
193	76	104.11	58.40	93	204.6	31.62	76.06
194		104.98	58.21	94	206.8	31.96	76.88
195		105.85	58.01	95	209	32.30	77.70
196	77	106.72	57.82	96	211.2	32.64	78.52
197		107.59	57.62	97	213.4	32.98	79.34
198	78	108.46	57.43	98	215.6	33.32	80.15
199		109.39	57.23	99	217.8	33.66	80.97
200	79	110.20	57.04	100	220	34.00	81.79

To find normal transverse diameter for a given individual, add T-D figure for stature to T-D figure for weight and to this total add 1 mm. for every decade of age; e. g., height, 6 feet; Weight, 187 pounds; age, 50 = 134.86 mm. T-D or 60.34 + 69.52 + 5.

* The figures of this table are valid for orthodiagrams and for male subjects. The hearts of female subjects of same stature, weight and age are slightly smaller in size.

From P. C. Hodges and J. A. E. Eyster: Arch. of Int. Med. 1926, 37; 711-713.

lique views may be obtained (Figure 3), the degree of motion of separate chambers and vessels may be observed, and minor degrees of enlargement not ordinarily manifested in the usual measurements may be detected.

The usual measurements made on the cardiac silhouette of a teleroentgenogram (2 meter plate) or on orthodiagram are shown in Figure 4. If the "area" of the cardiac shadow is desired, it is measured first by completing its superior and inferior borders, by conjecture, and then by determining the area of the ovoid thus formed with a planimeter.

The transverse diameter is the most widely used measurement (Figure 4). When calculated on the teleroentgenogram, it may be compared to the predicted normal for the height and weight of that individual (Table VII), determined on radiographs made in mid-inspiration. A deviation of ten per cent from this prediction is likely to be abnormal. In making the normal table, the authors measured the heights of their subjects with shoes on, and the weights included all clothing except coat and vest. Corrections must be made for this, because heights and weights in the Army are determined with the subject completely unclothed.

When the transverse diameter is measured on an orthodiagram made during quiet respiration, a different prediction table must be used. (Table VIII). The prediction from this table is based on height, weight, age, and sex. A deviation of more than 1 cm from this prediction is regarded as abnormal. The normal cardiac area on the orthodiagram can also be predicted from this table.

The width of the aorta can be measured in several ways, the most common being the one shown in Figure 4 in which the greatest distances between the midline and the lateral borders of the shadow of this vessel on either side are summated. In male adults this measurement normally does not exceed 7 cm.

For the technique of making a teleroentgenogram, see TM 8-240.

29. EXAMINATION OF THE LUNGS. (AR 40-105 Section XII and AR 40-110, par. 20d)

a. Tuberculosis. This diagnosis will usually be based on roentgenographic findings. The pathogenic phase in which a given lesion presents itself should be differentiated since such knowledge is helpful in selection for military duty as well as in prognosis and treatment.

(1) Primary Phase	(2) Reinfection Phase
(a) Site of Initial Lesion	
A single parenchymal lesion (occasionally multiple) usually in the lower or mid-lung field and involvement of one or more hilar lymph nodes.	A parenchymal focus usually in upper third of the lung without gross involvement of the hilar lymph nodes.
(b) Pathological Lesion	
Exudative pneumonic lesion proceeding to caseation, both in the pulmonary lesions and in the involved hilar nodes. Heals by fibrotic encapsulation of caseous foci with or without calcification.	1. Exudative pneumonic lesion with caseation and liquefaction necrosis in center. 2. Productive pneumonic lesion - a true tubercle with a caseous center. 3. Mixed lesions of 1 and 2; usually one or the other predominates. Heals by resorption, fibrosis, and occasionally calcification.
(c) Early Appearance on Roentgenogram	
A patch of mottled or rounded homogenous clouding associated with density of enlarged hilar nodes, which cause the	1. Exudative - diffuse shadow of uneven density with hazy, irregular borders gradually fading into surround-

mediastinal border to appear wider than normal, or sometimes a localized rounded bulge is seen. In adults the enlargement of the hilar nodes is not as prominent as in children.

ing normal densities.

2. Productive - Round or irregular shadows of uniform density which are sharply delineated from surrounding normal shadows.

3. Mixed - any combination of the above.

(d) Late Appearance or Roentgenogram

May not be evident in adults, or may appear in the healed stage as a calcified pulmonary focus (Ghon tubercle) and calcified nodes. More often only the calcified nodes are visualized.

NOTE: These apparently calcified lesions often are still partly caseous and harbor viable tubercle bacilli. Usually they remain quiescent after adolescence, but large lesions or those not uniformly calcified are potential sources of future disease .

1. Exudative - changes more rapid, definite and extensive. Excavation denoted by rarefaction within the shadows of the various infiltrations.

2. Productive - same changes may occur but are likely to be less rapid and less extensive.

3. Mixed - changes depend on which type is predominant.

Healing of all types is indicated by gradual fading of shadows about the periphery. Fibrosis often appears as stellate densities radiating from the central round lesions or as wiry streak-like sharply defined lines radiating in a fan-like manner from the hilum toward the periphery. Healing by calcification is infrequent. Early exudative lesions may resorb completely.

b. Quantitative classification (National Tuberculosis Association).

(1) Minimal. Slight lesions without demonstrable excavation confined to a small part of one or both lungs. The total extent of the lesions, regardless of distribution, shall not exceed the equivalent of the volume of lung tissue which lies above the second chondrosternal junction and the spine of the fourth or body of the fifth thoracic vertebra on one side. NOTE: Early and minimal tuberculosis are not synonymous terms. Early tuberculosis may be extensive and minimal tuberculosis may be of long duration.

(2) Moderately advanced. One or both lungs may be involved, but the total extent of the lesions shall not exceed the following limits: (a) Slight disseminated lesions which may extend through not more than the volume of one lung, or the equivalent of this in both lungs. (b) Dense and confluent lesions which may extend through not more than the equivalent of one-third the volume of one lung. (c) Any gradation within the above limits. (d) Total diameter of cavities, if present, estimated not to exceed 4 cm.

(3) Far advanced. Lesions more extensive than moderately advanced.

c. Method of Interpretation of Chest Roentgenograms.

(1) Technique employed (TM 8-240, pp. 150-155)

(a) Posture - scapula out of pulmonary field.

(b) Phase of Respiration - note blurring due to movements of ribs, diaphragm, heart or blood vessels.

(c) Proper centering of x-ray tube - Improper centering or rotation of patient projects image of mediastinum to one side. With proper centering the spinous processes of the upper thoracic vertebrae should be in a vertical line which falls midway between sternal ends of the clavicles.

(2) Technical quality (TM 8-240, pp. 66 to 73)

(a) Artefacts.

(b) Overpenetration. Small pulmonary lesions not seen.

(c) Underpenetration. General fogginess, no contrast in details.

(3) Order of Examination.
(a) Densities of soft tissues - breast, nipple shadows, neck, etc.
(b) Bony frame work - ribs, clavicles and size of intercostal spaces.
(c) Trachea - position, course and size.
(d) Cardiovascular silhouette (see par. 28)
(e) Diaphragms and costophrenic sinuses - position, contour, adhesions.
(f) Lung fields. 1. Hilar and truncal shadows. 2. Pulmonary parenchyma.

d. Standards.
(1) For candidates for commission - See AR 40-105, October 14, 1942, par. 35.
(2) For candidates for enlistment - see MR 1-9, March 15, 1942, par. 55-59.
(3) For original applicants for flying training - as for candidates for commission (see AR 40-110, December 3, 1942, par. 20d).

30. BONES, JOINTS, MUSCLES, AND FEET.

a. Exercises. The applicant will be put through a series of movements which will bring into action the various joints and muscles of the body. The examiner should give the commands for these exercises in concise easily understood language but should not demonstrate them to the applicant. This enables the Flight Surgeon to evaluate the applicant's intelligence.

The elbows should be brought firmly to the sides of the body and the forearms extended to the front, palms of the hands uppermost; extend and flex each finger separately; bring the tips of the thumbs to the base of the little fingers; close the hands, with the thumbs covering the fingers; extend and flex the hands on the wrists; rotate the hands so that the finger nails will first be up and then down ; move the hands from side to side. Extend the arms and forearms fully to the front and rotate them at the shoulders; flex the forearms on the arms sharply, striking the shoulders with the fists. Extend the arms at right angles to the body; place the thumbs on the points of the shoulders; raise and lower the arms, bringing them sharply to the sides at each motion. Let the arms hang loosely by the sides; swing the right arm in a circle rapidly from the shoulder, first to the front and then to the rear; swing the left arm in the same manner. Extend the arms fully to the front, keeping the palms of the hands together and the thumbs up; carry the arms quickly back as far as possible, keeping the thumbs up, and at the same time raise the body on the toes. Extend the arms above the head, locking the thumbs, and bend over to touch the ground with the hands, keeping the knees straight.

Extend one leg, lifting the heel from the floor, and move all the toes freely; move the foot up and down and from side to side, bending the ankle joint, the knee being kept rigid; bend the knee freely; kick forcibly backward and forward; throw the leg out to the side as far as possible, keeping the body squarely to the front; repeat all these movements with the other foot and leg; strike the breast first with one knee and then with the other; stand upon the toes of both feet; squat sharply several times; kneel upon both knees at the same time (if the man comes down on one knee after the other there is reason to suspect infirmity).

Take the position of "fire kneeling"; stand erect, present the back to the examiner, and then hold up to view the sole of each foot; leap directly up, striking the buttocks with both heels at the same time; hop the length of the room on the ball of first one foot and then the other; making a standing jumpas far as possible and repeat it several times; run the length of the room several times.

b. Pes planus. Changes in the arches of the foot may be marked but if they have occurred slowly they may cause no symptoms. A slight change rapidly evolved may, on the other hand, cause acute symptoms.

(1) Classification. It has been customary in accordance with AR 40-100, November 16, 1942, to describe pes planus as being first, second or third degree depending upon the extent of the anatomical deformity. By usage first degree pes planus has come to mean lowering of the longitudinal arch; second degree means that in addition to the lowered arch there is a beginning bulge of the medial border with some bowing of the tendon of Achilles; and third degree indicates complete disappearance of the longitudinal arch, inward rotation of the astragalus with bulging of the inner border, bowing of Achilles tendon, abduction, and variable degrees of rigidity. This amount of deformity, espec-

ially lowering of the longitudinal arch, does not necessarily parallel the severity of the symptoms, and that weakness of the foot may be marked when there is slight or no deformity.

(2) Examination. The examination should include inspection for (a) lowering of the longitudinal arch, (b) abduction, (c) bowing of Achilles' tendon, (d) weakness of the feet on exercise (see par. 29a.), (e) spasticity and rigidity determined by manipulation, (f) the line of weight bearing, (g) bulging of the medial aspect of the foot, (h) callosities. The most common symptoms of weak foot are aching principally along the medial border of the foot, with variable degrees of stiffness, aching in the calf, and symptoms of low back strain. In general these symptoms are brought on or exaggerated by use of the foot.

(3) Requirements. A "flat foot" is disqualifying for commission or for flying training if it accompanied by symptoms of weak foot or when the foot is weak on test. If there is eversion, and bulging of the astragalus this is disqualifying in itself despite the absence of symptoms. In terms of the classification of pes planus given above this last means that asymptomatic first or second degree pes planus is qualifying but that asymptomatic third degree pes planus is disqualifying.

31. REFERENCES.

a. Regulations.

(1) AR 40-100 (November 16, 1942)

(2) AR 40-105 (October 14, 1942)

(3) AR 40-110 (December 3, 1942)

b. Articles.

(1) Schneider, E.C.; A Cardiovascular Rating as a Measure of Physical Fatigue and Efficiency, J.A.M.A. 74:1507, 1920.

(2) Fellows, H.H.; Serial Chest Roentgenograms of 3179 Office Employees, 1926-38, J. Ind. Hyg. and Toxicol, 22:157, 1940.

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(4) Ungerleider, H.E., and Clark, C.P.; A Study of the Transverse Diameter of the Heart Silhouette with Prediction Tables Based on the Teleroentgenogram, Am. Heart J. 17:92, 1939.

c. Manuals.

(1) TM 8-240, Roentgenographic Technicians, July 3, 1941.

(2) TM 8-305, Notes on Cardiology in Aviation Medicine, November 12, 1940.

d. Texts and Pamphlets.

(1) Nomenclature and Criteria for Diagnosis of Diseases of the Heart, by the Criteria Committee of the N.Y. Heart Association, 4th Ed., New York, 1940.

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(6) Roesler, H.; Clinical Roentgenology of the Cardiovascular System, Baltimore, Charles C. Thomas, 1937.

(7) Manual of Clinical and Laboratory Procedures, Third (N.Y.U) Medical Division, Bellevue Hospital, New York, 1941.

(8) Orias, O. and Braun-Menendez, E.; The Heart Sounds in Normal and Pathological Conditions, New York, Oxford University Press, 1939.

SECTION II
EXAMINATION OF THE EYE

32. TECHNIQUE OF THE EYE EXAMINATION FOR FLYING. a. Visual Acuity.

(1) Equipment. The standard Snellen test charts or the self-illuminated test cabinets as issued will be used in the determination of visual acuity. The use of a satisfactory projector with screen in a dark room is authorized when available. Where the test letters are printed upon white cardboard the chart should be illuminated by a 100-watt daylight Mazda lamp placed 4 feet above and in front of it, and this lamp should be so screened or shaded that no direct light from it falls upon the eyes of the examinee. The test chart or cabinet must be installed in a room of such dimensions that a space of exactly 20 feet is available from the examinee to the test chart. The windows of the room should be equipped with shades or shutters so that extraneous sources of light in front of and to the sides of the examinee may be excluded. For the purpose of screening the eye not being examined an opaque card of suitable dimensions is necessary. Such a screen may be devised by cutting a disk from cardboard, approximately 2-1/2 inches in diameter with a handle projecting from one side.

(2) Procedure. Immediately upon entering the room the examinee is seated in a chair directly facing the Snellen chart and exactly 20 feet away from it. The test should begin promptly in order to prevent memorizing the test letters. The examiner, using the opaque card or disk, screens the left eye of the examinee, and directs him to read as many rows of the illuminated letters as possible, beginning with those of a larger size, as for example the 20/50 row. When the maximum acuity of the right eye has been obtained, the left eye is tested in the same manner, the right being screened. The smallest row of letters read correctly determines the fraction used in recording visual acuity, the numerator of the fraction being the distance in feet from the eyes of the examinee to the test chart, and the denominator being the size type of the smallest row read. The number of letters read correctly in the next smaller line or row is added to the fraction following the plus sign, for example, visual acuity R.E. 20/20 plus 3; L.E. 20/20 plus 5. In instances where visual acuity is reduced below 20/20, the fraction, when reduced, does not represent the actual visual efficiency. Assuming an acuity of 20/20 to be normal or 100 per cent, the following table gives the percentage of visual efficiency corresponding to the Snellen notations for visual acuity at 20 feet:

Snellen notation for distance:	Percentage of visual efficiency:	Snellen notation for distance:	Percentage of visual efficiency:	Snellen notation for distance:	Percentage of visual efficiency:
20/20	100.0	20/50	76.5	20/120	40.9
20/25	95.7	20/60	69.9	20/140	34.2
20/30	91.5	20/70	64.0	20/160	28.6
20/35	87.5	20/80	58.5	20/180	23.9
20/40	83.6	20/90	53.4	20/200	20.0
20/45	80.0	20/100	48.9		

On examination, when the examinee habitually wears correction for distant vision, the acuity for each eye uncorrected and corrected should be determined and recorded, also the prescription worn should be noted on WD AGO Form No. 64, at the first examina-

ially lowering of the longitudinal arch, does not necessarily parallel the severity of the symptoms, and that weakness of the foot may be marked when there is slight or no deformity.

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(2) Procedure. Immediately upon entering the room the examinee is seated in a chair directly facing the Snellen chart and exactly 20 feet away from it. The test should begin promptly in order to prevent memorizing the test letters. The examiner, using the opaque card or disk, screens the left eye of the examinee, and directs him to read as many rows of the illuminated letters as possible, beginning with those of a larger size, as for example the 20/50 row. When the maximum acuity of the right eye has been obtained, the left eye is tested in the same manner, the right being screened. The smallest row of letters read correctly determines the fraction used in recording visual acuity, the numerator of the fraction being the distance in feet from the eyes of the examinee to the test chart, and the denominator being the size type of the smallest row read. The number of letters read correctly in the next smaller line or row is added to the fraction following the plus sign, for example, visual acuity R.E. 20/20 plus 3; L.E. 20/20 plus 5. In instances where visual acuity is reduced below 20/20, the fraction, when reduced, does not represent the actual visual efficiency. Assuming an acuity of 20/20 to be normal or 100 per cent, the following table gives the percentage of visual efficiency corresponding to the Snellen notations for visual acuity at 20 feet:

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20/30	91.5	20/70	64.0	20/160	28.6
20/35	87.5	20/80	58.5	20/180	23.9
20/40	83.6	20/90	53.4	20/200	20.0
20/45	80.0	20/100	48.9		

On examination, when the examinee habitually wears correction for distant vision, the acuity for each eye uncorrected and corrected should be determined and recorded, also the prescription worn should be noted on WD AGO Form No. 64, at the first examina-

tion after such prescription has been obtained, or after any change is made in a former correction.

(3) Precautions. Every possible safeguard is thrown around the test to prevent memorizing the charts. Examinees awaiting their visual acuity test are not permitted to remain in the room within sight of the test letters nor where they can hear them read aloud. When the examinee is suspected of having memorized the charts the examiner will select letters in the doubtful line, screening all others, and will have the examinee name them. The examinee will not be allowed to reduce the palpebral fissure to a narrow slit, but must read with his lids open to the natural position. The pupils should be examined to make certain that no miotic has been instilled in order to cause a contraction. Such a procedure markedly improves the vision of an ametrope while effects of the drug continue. A bright light in front of or above, so situated that it shines directly into the eyes of the examinee, is not allowable. Such a light, by causing the contraction of the pupils, may result in an apparent improvement in visual acuity. The eye not being examined is to be screened completely from the letters while the other is being tested.

b. Visual Acuity at 13 inches.

(1) Equipment. Standard Jaeger cards which may be calibrated in Snellen system or Jaeger system of notation.

Snellen .37 m = J-1/2
.50 m = J - 1
.62 m = J - 2
.75 m = J - 3

(2) Procedure. The examinee stands with his back to a source of light so that the card is well illuminated. Each eye is tested separately. The card is held level with the eye at a distance of 13 inches. The examinee reads a line of a paragraph with the smallest visible print. "J-1-13", J-2-13" is recorded for each eye.

(3) Precautions. Illumination should be sufficient; artificiallight may be used. To prevent memory replacing visual acuity in testing the second eye, reading of the lower line of same paragraph may be requested of the examinee. Cards with different texts may be used for the same purpose. The use of squinting, miotics or glasses are not allowed in measuring uncorrected near visual acuity. If glasses are worn, near visual acuity is measured without and again with glasses (corrected), the Jaeger type read recorded in each case, together with the prescription for each eye.

c. Depth perception at 6 meters.

(1) Equipment. The standard depth perception apparatus as issued is fixed in a position immediately beneath the Snellen test chart or cabinet where it will receive overhead illumination, or the standard depth perception apparatus modified for indirect instead of overhead illumination is authorized. Care should be taken that the apaaratus is fixed in position so that when the movable rod is on the zero marking, both rods will be the same distance from the examinee, and the apparatus at about the same level of the eyes of the examinee when seated. Extraneous light should be excluded.

(2) Procedure. On the original examination particularly, the operation of the apparatus should be explained at close range to the examinee, and the necessity of accuracy, precision, and promptness emphasized. The examinee is seated in the chair 20 feet in front of the rear screen of the apparatus, as in the determination of visual acuity; the window in the front screen is occluded (as by the examiner standing before it) and the movable rod is widely separated from the fixed rod, being placed either in front of or behind it. The examinee is then directed, after the examiner has stepped aside, to adjust the movable rod by manipulating the cords attached to it, so that it appears to be exactly alongside the fixed rod. When this is accomplished the procedure is repeated, a notation being made of the distance in millimeters the movable rod is away from the zero marking. If the results of the individual trials are approximately the same, five trials will be sufficient. If, however, they are widely variant ten trials may be given. The average error in millimeters is then determined and recorded.

(3) Precautions. No information concerning the results of the successive trials will be given the examinee until after the test is completed. The examinee is required to hold his head fixed and is now allowed to move from one side to the other. The examinee will not be allowed to pull the rods back and forth the full length of the apparatus

as this gives information as to the length of the box. The rods should be adjusted promptly by the examinee as the time element is an important factor. Care will be taken by the examiner:

(a) To avoid casting a shadow on the background.

(b) To avoid so placing the hands as to give the examinee information as to his error.

(c) To avoid any facial expression from which the examinee might gain information as to the result of his efforts.

(d) To remove the cord from the examinee's hands while separating the rods preliminary to each trial so that the examinee will not be able to judge the distance the rods have been separated by the length of cord that has slipped through his fingers.

(e) To cover the window of the front screen of the apparatus while the examiner is placing the movable rod prior to each trial.

d. Heterophoria at 6 meters.

(1) Equipment. A phorometer trial frame equipped with a pair of multiple Maddox rods and a pair of Risley rotary prisms, or a hand phorometer; a spotlight approximately 1 centimeter in diameter (as a component of the illuminated test cabinet, or a muscle lamp) and a suitable monocular screen such as used in the determination of visual acuity. If the phorometer trial frame is not available, the trial frame, Maddox rod, and prisms from the standard trial lens case may be used satisfactorily, but the procedure is somewhat more tedious and time consuming. (Also see paragraph 34).

(2) Procedure. Before beginning the test the examinee's sighting or fixing eye is determined. For this purpose a blank card approximately 13 by 20 centimeters with a 1.5-centimeter round hole in the center is employed. The examinee, seated, facing the spotlight 6 meters away, grasps the card by the short sides with both hands. While fixing on the spotlight, he slowly raises the card at arm's length and locates the light through the hole without closing either eye. Only one eye can see the light through the hole and by screening the eyes alternately, while the card is held steady, the eye which fixes the light can be determined. This is the fixing (or sighting) eye:

(a) With phorometer trial frame. Having determined the sighting eye, the phorometer is adjusted closely in front of the examinee's eyes, is leveled, and is adjusted for interpupillary distance. One of the multiple Maddox rods is swung into position before the nonfixing eye. A rotary prism is placed before the same eye. The sighting (or fixing) eye must have an unobstructed view of the spotlight. For the measurement of esophoria or exophoria, the Maddox rod is adjusted before the nonsighting eye to give a vertical line of light. The rotary prism is adjusted also before the non-sighting eye for the measurement of lateral deviation; that is, with the zero mark vertical, and set 4 or 5 prism diopters off the zero mark. This gives enough deflection at the first reading to determine whether an examinee has been coached to say the line passes through the light.

The opaque disk is moved from one eye to the other a few times to ascertain that the examinee sees both the line and the light. If the line is not seen readily, the Maddox rod is readjusted by centering it carefully in front of the pupil. Some further darkening of the room may be necessary to render it clearly visible.

When the examinee sees the line with one eye and the light with the other, the examiner holds the card or screen in front of the nonfixing eye to shut out the image of the line. The examinee now sees only the light. After he has fixed it for several seconds the screen is removed for an instant and quickly replaced. In that brief interval the examinee should see the line and be able to locate it with reference to the light. After one or two such exposures he will say that the line is to the right or the left of the light, or possibly through it. He is instructed to grasp the milled head that rotates the prism and turn it to shift the line directly into the light. To enable him to do this, the screen is removed from in front of the eye at intervals and quickly replaced. Finally the examinee will have rotated the prism enough to cause the line to pass through the light each time he sees it when the screen is removed. The number of prism diopters necessary to do this is read from the scale of the rotary prism. This is entered on the record as esophoria if the prism is base out (displaced temporally) and exophoria if the prism is base in (displaced nasally). For the measurement of hyperphoria the Maddox rod before the nonfixing eye is readjusted before the same eye to measure vertical deviation; that is, with the zero

marking out and set 1 or 2 diopters off the zero mark. The screen is used exactly as before to give an occasional glimpse of the line. The number of prism diopters read from the scale is recorded. Whether it is right or left hyperphoria is determined by the position of the prism. If it is base down it is hyperphoria of that eye (i.e., the eye before which it is located). If it is base up it is hyperphoria of the other eye.
(b) With spectacle trial frame. Use the Maddox rod and prisms from trial lens case. Adjust the spectacle trial frame on the examinee so that it is comfortably worn and the cells properly placed as to interpupillary distance.

For determining an imbalance in the horizontal meridian, that is, exophoria or esophoria, place the Maddox rod in the cell before the nonsighting eye so that the axis of the rod is horizontal. Direct the examinee to fix upon the spot of light, and for a few seconds at a time alternately cover and uncover the nonfixing eye, allowing the fixing eye to maintain fixation constantly.

If orthophoria exists, the visual lines of the nonfixing eye will not deviate and the vertical line of light will be seen as passing through or bisecting the spotlight.

If the line of light is seen on the same side (homonymous diplopia) of the examinee as the Maddox rod is placed (for example, the Maddox rod before the left eye and the line is seen to the left), the qualitative diagnosis of esophoria is made, and in order to make a quantitative determination a prism must be used base out. Homonymous diplopia indicates esophoria, the amount of which is estimated by the use of a prism before the nonfixing eye with base out or toward the temporal side. A weak prism, base out, that is, of one diopter, is placed before the nonfixing eye, and the procedure of covering and uncovering the nonfixing eye is repeated. It will be found that perhaps the line of light has moved nearer the spot of light but still does not pass through it. The prism is replaced by a stronger one until the line of light passes through the spot of light, and the strength of the prism used indicates the amount of esophoria in prism diopters.

If the line of light is seen on the opposite side, as for example, the Maddox rod is before the left eye and the line is seen to the right (crossed diplopia) then a qualitative diagnosis of exophoria is made. A crossed diplopia indicates exophoria, the amount of which is estimated by the use of a prism before the nonfixing eye with base in or toward the nasal side. The procedure is the same as with esophoria except that the prism is used base in. The strength of the prism used to cause the line of light to pass through the spot of light indicates the amount of exophoria in prism diopters.

Hyperphoria is used as a diagnostic term where a deviation of one of the visual lines on the vertical meridian exists and the designation is made as to right or left, depending upon which of the visual lines is the higher, or which tends to deviate upward in comparison with its fellow. For the measurement of hyperphoria the Maddox rod is adjusted before the nonfixing eye with its axis vertical, hence the line of light is seen as horizontal. The nonfixing eye is alternately covered and uncovered, and if the line of light is seen passing through the spot of light there is no hyperphoria. If the line of light is seen below the spot of light, there is a hyperphoria of the eye behind the Maddox rod, and the strength of prism, base down, before the eye which causes the line to pass through or bisect the spot of light represents the deviation in prism diopters. If the line of light is seen above the spotlight a hyperphoria of the opposite eye is indicated, and the strength of prism base up before the eye behind the Maddox rod represents the amount of deviation in prism diopters.

(3) Precautions. The Maddox rod and the measuring prism are always used together before the nonfixing eye. The test gives an inaccurate result if the examinee is permitted to see the line for a longer time than is allowed by the momentary exposures described above.

e. Power of divergence.

(1) Equipment. Phorometer trial frame; 1 centimeter spotlight or muscle lamp at 6 meters distance; or if phorometer trial frame is not available, spectacle trial frame and prisms from trial lens case.

(2) Procedure. The examinee is seated facing the spotlight 20 feet (6 meters) away as in the determination of heterophoria at 6 meters. A rotary prism of the phorometer trial frame is adjusted before one eye with the milled head exactly vertical and the

prism set at the zero marking. The examinee is directed to fix upon the spot of light and the examiner slowly rotates the prism base in. As the prism is rotated in this manner the spotlight, as seen by the examinee, will eventually blur and then separate into two distinct spots of light. The number of prism diopters which causes the light definitely to blur, or the maximum strength prism, base in, which he is able to overcome by divergence is the measurement of his power of divergence in prism diopters and is so recorded. Where the phorometer trial frame is not available, the prisms from the trial lens case may be used, base in, one after another, beginning with the weakest and replacing by stronger prisms, until diplopia occurs.

(3) Precautions. Examiners are cautioned that the prism strength which causes the first actual diplopia exceeds the examinee's diverging power.

f. Red lens test.

(1) Equipment. Spectacle trial frame; red lens from trial lens case or large spectacles made up with a large red lens on one side only; small light such as ophthalmoscope without head; metric rule or tape.

(2) Procedure. The examinee is seated in the dark room and the spectacle trial frame is adjusted in place. The red lens from the trial lens case is placed in one of the cells of the trial frame, and the small lamp is held directly in front of his eyes 75 centimeters away and at the same level of his eyes. The presence or absence of diplopia in this position (primary) is noted. The light is then slowly moved from this position toward the examinee's right through a distance of 50 centimeters in the horizontal plane. In the same manner the light is moved in the remaining five cardinal directions and the presence or absence of diplopia noted in these meridians. Diplopia should not occur in any meridian within 50 centimeters from the primary position, which approximately limits the field of binocular fixation. Where diplopia does occur within 27.30 centimeters of the primary position (approximately 20^{o}) a more accurate determination will be made upon a blackboard or wall. The examinee with the spectacle trial frame and red lens before one eye is seated before the wall so that his eyes are exactly 75 centimeters from it, a point marked on the wall at the same level of his eyes and in the median line; from this point the light is moved outward in the six cardinal directions and the exact point where diplopia occurs is marked on the wall. The exact distance from the primary point to the point where diplopia first occurs will be measured in centimeters and from the following table the angle in degrees may be determined:

Degrees	Distance from primary point in cm.	Degrees	Distance from primary point in cm.
1	1.31	19	25.82
2	2.62	20	27. 30
3	3.93	21	28.79
4	5.24	22	30.30
5	6.56	23	31.84
6	7.88	24	33.39
7	9.21	25	34.97
8	10.64	26	36.58
9	11.88	27	38.21
10	13.22	28	39.88
11	14.58	29	41.57
12	15.95	30	43.30
13	17.32	31	45.07
14	18.70	32	46.87
15	20.09	33	48.71
16	21.50	34	50.59
17	22.93	35	52.52
18	24.37		

Where diplopia is found within 27.30 centimeters, notation should be made as to whether it is crossed, homonymous, or vertical. When the light is seen on the same side as the red lens is worn, the diplopia is homonymous; crossed when seen on the opposite side. Where diplopia may be suspected and the examinee coached to deny its presence, a prism of 3 or 4 diopters may be placed either base up or down in one of the cells of the trial frame, and if diplopia is still denied, the statement is obviously untrue. The prism may be alternately replaced by a weak spherical lens (minus .12) in order to confuse the examinee.

(3) Precautions. The head of the examinee must remain fixed while the light is being moved, no tilting or rotation of the face being permitted.

g. Inspection of the eyes. Observation of the eyes and adnexa is conducted throughout the entire examination. In addition a careful objective examination employing special methods is indicated on all examinations to determine any evidence of past or present abnormality, disease, or defect.

(1) Equipment. Plus spherical lenses (from trial lens case) with suitable illumination as required for oblique illumination; the hand slit lamp and the binocular loupe when available; Ophthalmoscope, preferably electric.

(2) Procedure. On the original examination the inspection of the eyes is not completed until the ophthalmoscope is used in the examination of the cornea, anterior chamber, iris and lens. This examination should be particularly thorough, as evidence of previous injury or disease may be found which may not be obtained in the history taken. The following conditions should be borne in mind and noted:

(a) Changes from the normal position of the globes, as changes in the direction of the visual axes (squint) exophthalmos and enophthalmos.

(b) Lids: Ptosis, blepharitis, trichiasis, entropion, ectropion, symblepharon, chalazion, and hordeolum.

(c) Lacrimal apparatus: Dacryocystitis, acute and chronic, dacryoadenitis, imperfect drainage or epiphora from any cause.

(d) Conjunctiva and sclera: The lids are to be everted and the palpebral conjunctiva and fornices exposed. The following are to be noted: conjunctivitis, acute and chronic, evidence of trachoma, contractures, cicatrices, circumcorneal injection, evidences of episcleritis or scleritis, and chalklike meibomian concretions.

(e) Cornea: Keratitis, opacities, vascularization, pterygium, deposits on posterior surface, anterior synechia, post-traumatic irregularity of corneal surface or retained foreign bodies.

(f) Pupils: Note size, shape, inequality, direct and consensual reactions to light, and reaction to accommodation.

(g) Iris: Synechiae, anterior and posterior, evidence of past or present iritis, congenital anomalies, traumatic sequelae, and minute pigmented neoplasms.

(h) Anterior chamber: Abnormality in depth and any evidence of alteration in normal character of aqueous humor, retained foreign bodies.

(i) Lens: Opacities and anomalies.

(j) Intraocular tension: Taken by palpation and recorded as normal, increased, or decreased. When there is a question of increased intraocular tension the tonometer will be used and results recorded with the type of tonometer employed being stated.

(3) Interpretation of findings. Distinction should be made between defects considered as being of a temporary or of a permanent nature, and notation made as to interference with function. Any evidence of acute inflammation of the eye or adnexa is temporarily disqualifying. A small chalazion which is non-irritating and does not interfere with the normal function of the lid is not disqualifying but will be recorded. A hordeolum should be considered as a temporary disqualifying condition but the possibility of error of refraction being an etiological factor should be considered. Corneal opacities, which in no way interfere with vision are not disqualifying but will be recorded as to size, position, and density (example: "irregularly round nebula 3 mm. in diameter, 4 mm. within limbus at 6 o'clock"). An inactive pterygium that does not encroach more than one millimeter upon the cornea is of no significance, but one that is definitely progressive, as evidenced by marked vascularity and thick elevated head, temporarily disqualifies, and its removal is indicated even though it barely encroaches on the cornea. Any evident increase or decrease in intraocular tension disqualifies. Actual nystagmus dis-

qualifies, but nystagmoid movements which are noted only at extreme limits of the normal ocular movements are of no significance and must be differentiated from a true nystagmus. If anisocoria exists, further attention will be given to visual fields (form), pupillary reaction to light, serology, and history of syphilis. Abnormal pupillary reaction is disqualifying if caused by organic disease. Any defect, disease, or abnormality that materially interferes with the normal ocular function disqualifies for all three classes. Evidence of past or present iritis should be given particular attention, because of the frequent possibility of rheumatic, syphilitic or focal infectious background.

h. Accommodation.

(1) Equipment. The Prince rule; a small millimeter rule; a card with several rows of small letters; the Thorne rule when available.

(2) Procedure. Accommodation is measured from the anterior focus of the eye which is about 15.7 millimeters in front of the cornea. Using the millimeter rule, a pencil mark is made on each side of the examinee's nose 15.7 millimeters in front of the right and the left cornea, respectively. In measuring the accommodation of the right eye, the flat side of the Prince rule is laid against the right side of the examinee's nose with the end of the rule at the pencil mark. The rule is held horizontally and extends directly to the front, edge up. The card of test letters is held not more than 5 centimeters in front of the examinee's right eye. His left is screened from sight of the letters by the flat side of the rule. The card of test letters is now carried slowly away from the eye and the examinee instructed to begin reading the letters aloud as soon as they become legible. The card is halted the instant that he begins to read the letters correctly, and the point of the rule opposite the card is read off in diopters. This is the measure of accommodation of the right eye. To test the left eye, the rule is changed to the left side of the nose and the above procedure is repeated, using a different line of letters.

(3) Precautions. Care must be taken that the examinee is seated with his back to a window and that the card is illuminated by good daylight. The letters on the test card are read aloud. The same line of letters is not used for testing both eyes. The size of the letters on the card should be that of Jaeger type No. 1 (Snellen 0.5 cm. or 50 cm.) and the Jaeger card may be used as test letters provided the Jaeger No. 1 type only is used. The card is first held within 5 centimeters from the eye and slowly carried away from it. It is important that the test card be clean and legible. (See par. 35f).

(4) Interpretation of findings. The appended table gives the mean values of accommodation in diopters from 18 to 50 years of age. These values have been computed on the basis of emmetropic individuals. Accommodation may be considered as within normal limits provided it is not more than 3 diopters below the mean for the examinee's eye. Before an examinee is disqualified his accommodation must be taken on three successive days and an average of the three findings determined. Low accommodative power may be indicative of accumulative fatigue, staleness, or of a debilitating condition either of a transient or permanent nature. For classes 2 and 3, examinees are qualified with accommodation below 2 diopters regardless of age, provided they actually wear their correction for near vision while flying and their correction while worn enables them to read Jaeger-1 test letters at 20 inches (50 cm.).

Table IX - ACCOMMODATION (DUANE)

Age	Minimum Allowable	Average	Age	Minimum Allowable	Average	Age	Minimum Allowable	Average
18	8.9	11.9	27	6.6	9.6	36	4.1	7.1
19	8.7	11.7	28	6.4	9.4	37	3.8	6.8
20	8.5	11.5	29	6.2	9.2	38	3.5	6.5
21	8.2	11.2	30	5.9	8.9	39	3.2	6.2
22	7.9	10.9	31	5.6	8.6	40	2.9	5.9
23	7.6	10.6	32	5.3	8.3	45		
24	7.4	10.4	33	5.0	8.0	50		
25	7.2	10.2	34	4.7	7.7			
26	6.9	9.9	35	4.3	7.3			

i. Power of Convergence.

(1) Near point of convergence (PcB).

(a) Equipment. The Prince rule or a rule graduated in millimeters at least 30 centimeters long; a pin with a white head 2 millimeters in diameter.

(b) Procedure. The distance to the near point is computed from the base line connecting the centers of rotation of the eyes. The end of the Prince rule is placed, edge up, at a mark on the right side of the nose, 11.5 millimeters in front of the cornea. The white-headed pin is held 33 centimeters away in the median line above the edge of the rule, and the examinee is instructed to look at it intently. If both eyes are seen to converge upon the pin, it is then carried in the median line along the edge of the rule toward the root of the nose. The examinee's eyes are carefully watched by the examiner fixing his gaze upon the examinee's glabella, thus observing both eyes at once. The instant one is observed to swing outward or fails to follow the pinhead, the limit of convergence has been reached. The point on the rule opposite the pin is then read in millimeters. This test is repeated until a fairly constant reading is obtained. To this reading 25 millimeters are added, which will give approximately the distance from the near point of convergence to the base line (PcB).

(c) Precautions. Both eyes must converge upon the pin at the start of the test. The examinee's observation of the onset of diplopia is not relied upon to determine the near point, although , in order to test his veracity, he is asked to state when he sees double. The pin should be carried in toward the nose at a moderate speed. Frequent repetition usually tires the muscles and gives erroneous findings.

The near point of convergence, unlike the near point of accommodation, varies little with age.

(2) Interpupillary distance (Pd).

(a) Equipment. A millimeter rule.

(b) Procedure. The examiner stands with his back to the light, face to face with the examinee. The rule is held in the examiner's right hand and laid across the examinee's nose in line with his pupils, as close to the two eyes as possible. The examiner closes his right eye and instructs the examinee to fix his eyes on the open left eye. With the eyes in this position a predetermined mark on the rule is placed in line with the nasal border of the examinee's right pupil. The rule must be held steadily in this position while the examiner opens his right eye and closes his left. The examinee is then instructed to look at the open right eye. The point on the rule in line with the temporal border of the examinee's left pupil is read in millimeters and the exact difference in millimeters between the two points on the rule is the interpupillary distance.

(3) For Classes 1 and 2 the distance from the baesline to the near point of convergence (PcB) must not exceed the interpupillary distance (Pd) by more than 25 mm. Test is omitted in Class 3 .

j. Central color vision.

(1) Equipment. The Ishihara or American Optical Company books of Pseudo-Isochromatic plates for testing color vision defects and either a set of Holmgren yarns or the School of Aviation Medicine (S.A.M.) color test lantern.

(2) Procedure. The purpose of the test is to determine into which of four groups the applicant belongs. These are: (a) normal color perception; (b) defective color perception but considered "safe for aircrew" duty; (c) defective color perception, "unsafe for aircrew" duty who can "distinguish pure red and pure green"; (d) disqualified for all flying duty.

All applicants are first examined by reading the Ishihara or A.O.C. plates. They should be exposed only in daylight (not bright sunlight) and only three to four seconds per plate should be allowed. Persons with normal color perception and mental alertness can easily read the plates in that length of time. Instructions accompanying the test are to be followed strictly. A.O.C. plates Nos. 39, 40, 43, and 44 are not used and may be removed. If no plates are incorrectly interpreted the candidate is considered to have normal color perception and no further color test is given. If he misses more than 25% of the plates he is considered unsafe for air crew and is disqualified. If he misses 25% of the plates or less he is given an adjunct test with the S.A.M. lantern or Holmgren yarns.

Adjunct Test with S.A.M. lantern:

(a) The examinee is given an ordinary writing pad and pencil, told to write his name, the date and series 1 at the top of the page.

(b) He is then seated in a dark room 15 to 20 minutes to permit dark adaptation.

(c) A small light (a well shaded standard 7.5 watt light) is turned on above and behind him. This gives barely enough light to write without disturbing the test itself.

(d) The examinee is instructed by the examiner as follows: "You will see a total of 18 different colored lights. As each light is shown, I will call out a number. These numbers are not in sequence. You are to write the number on the pad and next to it the color you believe that light to be. It is unnecessary to qualify the color as being light or dark, merely state the name of the color. Five seconds will be allowed for each one."

(e) The examiner who holds the instrument stands 20 feet away (the examiner can safely be any trained and alert enlisted man.) He reads the numbers seen in the mirror at the top of the instrument which is directed at the individual tested, or the middle of the group if more than one is being tested. The disks can be turned so that all the numbers are read as they come. No filter is used for the first series and the one-quarter inch aperture is used at all times. A different starting point is used each time.

(f) After the first series has been run the examinee is instructed to turn the page over and write on the top, Series 2. The neutral filter is then interposed, which duplicates the effect of haze, rain, etc., quite closely. The entire procedure is repeated.

(g) The papers are then collected immediately and the written record compared to a key. This should be done by an officer, but a trained enlisted man will be able to do this equally well.

(h) CAUTION: The examiner must ascertain that the batteries in the lantern are fully charged before each test, and that the colors are clearly perceptible.

(i) When the S.A.M. lantern is not available the Holmgren test wools will be employed and the test will be conducted in accordance with instructions contained in Section XVIII TM 8-300.

(3) Precuations. The Ishihara and Stillings plates and the skeins of yarn should be kept in darkness when not actually in use. Care must be taken that the plates and skeins of yarn do not become soiled or stained in handling. Where memorizing the plates may be suspected, plates involving tracing of a tract will be of particular value. The small numerals giving the plates numbers should be covered with an opaque card. The examination must be conducted in daylight, preferably a north light.

(4) Interpretation.

(a) Applicants for appointment as commissioned officers in the Army of the United States will be required to meet the basic requirements of AR 40-105.

(b) Applicants for flying training who correctly interpret all the plates of the test books mentioned above will be recorded as having "normal" central color vision (corresponds to first group - 31j(2)a. above).

(c) Applicants for flying training who incorrectly interpret 1 to 25% of the plates in the color vision books will be recorded as "misses 3 A.O." or "misses 3 Ish." referring to the number of plates missed and the book used.

(d) Those who correctly interpret less than 75% of the plates in the test books will be recorded as "fails Ishihara" or "fails A.O." and are disqualified for any type of flying training.

(e) Aviation cadets undergoing classification and personnel, commissioned or enlisted, undergoing flying training in grade who are found to have defective binocular central color perception, as indicated by having incorrectly interpreted more than 25% of the plates of the color test book, will be subjected to further color vision tests, as directed by the Commanding General, AAF (as outlined under j(2)(a) Adjunct Test with S.A.M. lantern above.) Applicants who are considered "unsafe" will be recommended for elimination from further flying training.

k. Field of vision for form. Peripheral vision for form will be determined by the use of the confrontation test on all examinations.

(1) Equipment. A 1 cm. white sphere with a black wire handle of appropriate length or, if not available, an ordinary wooden applicator may be substituted as a handle.

(2) Procedure. The examiner faces the examinee about two feet away. He instructs the examinee to close his left eye and fix his right eye on the examiner's left eye. (The examiner's right eye being closed). He brings in from the periphery a white ball 1 cm. in diameter on the end of a dark wire. The examinee states when he first sees the object. If it is brought in from the periphery at a point midway between the examiner and the examinee they should both see the object at the same time. This is true in all meridians except directly temporal. In that meridian the test object should be brought out slowly from a position peripherally and behind the examinee until he sees the object. This is necessary because of the fact that the visual field extends to 90 degrees at the temporal side and the examinee should see the object when it is brought forward to a point corresponding to the 90 degree tangent from the eye.

(3) Precautions. The test object should be approximately 1 cm. in diameter and should be attached to a slender black rod of such a length that the hand is not seen in moving it. The eye being examined must not be permitted to shift fixation. The test object must be clean and well-illuminated.

(4) Interpretation. The normal field for form extends temporally 90° or more; superiorly 50°; nasally 55°; inferiorly 65°. Any contraction of the visual field for form of 15° or more in any meridian disqualifies for flying unless the contraction is the result of the anatomic conformation of the examinee's face. Other pathological changes of the visual field disqualify for flying (scotomata, nasal contraction, etc.). If scotomata are suspected, they will be mapped on a tangent screen at 75 cm. Scotomata other than the normal blind spot are disqualifying. This standard applies to all three classes.

The test is then repeated for the left eye. Should any abnormality be detected, the more detailed examination with a perimeter is indicated. Any apparent scotomata should be outlined with the perimeter or on the blackboard or tangent screen at 75 centimeters.

1. Summary of steps in refraction. (1) Cycloplegia is obtained by using 5% homatropine, instilling 2 drops at 5-minute intervals and waiting about an hour.

(2) The examinee should be seated comfortably with the trial frame or phorometer adjusted so that:

(a) The visual axis is in the center of the lens aperture.

(b) The lenses are near the point 15.7 mm. anterior to the cornea.

(c) The lenses are in a plane at right angles to the visual axis (tilting of spherical lenses induces cylindrical effect).

(3) The working lens (preferably a + 1.50) is inserted in the back cell of the trial frame or phorometer. The examiner should be seated comfortably so that his eye is the proper distance from the eye of the examinee. (66 cm. or 27 inches if + 1.50 working lens is used). This distance should be determined in relation to the examiner's reach.

(4) It is considered good practice to cover one of the examinee's eyes.

(5) If complete cycloplegia has been obtained, it is safe to have the examinee fix on the examiner's forehead above the retinoscope. If, however, as is often the case, cycloplegia is not complete, it is safer to have the examinee look just past the examiner's head and fix on an object 20 feet away. In this way the tendency of the examinee to accommodate for the near point is avoided. Retinoscopy of the patient's right eye with the examiner's right eye and of the patient's left eye with the examiner's left eye is then done. It is important that the object fixed be seen just past the examiner's head, as this enables retinoscopy of the portion of the retina near the macula, and will give a more accurate reading than retinoscopy of an area farther away from the visual axis.

(6) The character of the light reflex is noted.

(a) Color. While by no means an absolute rule, in general, a pearly white color suggests an error of more than + or - one diopter. If the reflex is orange, it suggests less than a + or - one diopter error. The dull red central portion of the reflex should be noted as the end point is approached. This dull red central reflex moves "with" while the peripheral portion of the light reflex moves "against." The dull red central reflex not more than 2 mm. in diameter is the diagnostic portion of the reflex. The peripheral portion should be ignored.

(b) Shape of light reflex. If the reflex is round or nearly so, it indicates a single plus or minus spherical correction. If the reflex is oval, there is generally a small cylindrical error with axis the same as the greatest diameter of the oval. If a "band"

is seen, this usually indicates the presence of astigmatism in that eye and the axis of the correcting cylinder is the same as the axis of the "band".

(c) Direction of motion. Motion of the light reflex in the same direction as the movement of the retinoscope light is called a "with" movement. In this instance, plus lenses are used to reach the end point. If the light reflex moves opposite to the motion of the retinoscope light, it is called an "against" motion and minus lenses are used.

(d) Speed of movement. As the end point is aproached, the speed of the light reflex increases so the retinoscope must be rotated much more slowly. Failure to observe this will occasionally result in underestimation of errors.

(7) Spherical lenses are generally used in neutralizing the movement of the light reflex. It should be remembered that a spherical lens may be considered as being composed of two equal cylindrical lenses combined at right angles. In using a spherical lens, properly centered, one of these two cylindrical components is neutralized at a time. It is easier to use than two cylinders, or than a sphere and a cylinder, because slight deviations of axis may cause some confusion. However, the use, by experienced refractionists, of a sphere to neutralize the weaker meridian, with a cylinder added to neutralize the stronger meridian, will be found very useful. It should not be attempted by beginners.

(8) If the retinoscope is always rotated about its long axis, the meridian of the eye being refracted will be corrected by a cylinder placed in the same axis as the retinoscope handle. For example, if the handle of the retinoscope is vertical, rotation of the head around this vertical axis causes the beam of light to move from side to side. The direction of motion of the light reflex is horizontal and is observed to be either "with" or "against". If the motion is "with", plus lenses are added until it is noted that there is an "against" motion of the central portion of the reflex. This is the end point for practical purposes. This then neutralizes a cylinder whose axis is at 90°. (The same as the axis of the retinoscope handle).

The handle should be then turned 90° and the value of the cylinder at 180° determined.

(9) The working lens is now removed and the formula obtained by the use of the two cylinders found above should be placed before the eye.

(10) If cycloplegia has been complete, the findings on retinoscopy should be the same as the lens with which the patient can see best under cycloplegia.

m. Ophthalmoscopic examination. The examination of the media and fundi of the eyes routinely follows refraction on the original examination, while the pupil is widely dilated and accommodation completely relaxed.

(1) Equipment. Ophthalmoscope, preferably electric, and in instances where cycloplegia and mydriasis have not been induced for purposes of refraction, 5 percent homatropine solution or 4 percent euphthalmin solution. The latter solution has the advantage of having a transient effect and is particularly desirable for use in the examination of individuals past 40 years of age.

(2) Procedure. The examination should be conducted in the dark room and with pupils dilated. Where homatropine has not already been used, the euphthalmin solution may be instilled, one drop every 10 minutes until dilatation occurs. The direct method of ophthalmoscopy should be employed routinely and the indirect method utilized when circumstances permit and the examiner is familiar with its technique. The examiner should wear his correction for ametropia. The fundus of each eye is examined thoroughly and any abnormality of the disk, the blood vessels, the retina, and the choroid noted. By the interposition of plus spherical lenses in the aperture of the ophthalmoscope, the media, the lens, and the iris may be examined.

(3) Precautions. In the examination of the macular region the illumination of the ophthalmoscope should be reduced and the exposure made as brief as possible. The examinee should be advised to wear smoked lenses until the effects of the mydriatic have disappeared. The use of a miotic, as eserine salicylate, 1/2 percent solution, one drop in each eye repeated once after 10 minutes, is advisable upon completion of the examination.

(4) Interpretation of findings. Any abnormality, as may be discovered by the ophthalmoscopic examination, that materially interferes with the normal ocular function disqualifies for all three classes, Attention is invited to the fact that pathological con-

TABLE X. MINIMAL VISUAL REQUIREMENTS, FLYING PERSONNEL, BY CLASSES (APRIL 30, 1943).

CLASS		1	2	3
VISUAL ACUITY		20/20	20/40 CORRECTIBLE TO 20/20	20/100 CORRECTIBLE TO 20/20
DEPTH PERCEPTION		30 MAXIMUM	35 MAXIMUM WITH CORRECTION	OMITTED
HETEROPHORIA	ESO	10 MAXIMUM		12 MAXIMUM
	EXO	5 MAXIMUM		7 MAXIMUM
	HYPER	1 MAXIMUM		2 MAXIMUM
PRISM DIVERGENCE		3 TO 15, INCLUSIVE. P.D. MUST EQUAL OR EXCEED ESO		OMITTED
RED LENS TEST		NO DIPLOPIA OR SUPPRESSION WITHIN 50 CM.		OMITTED ROUTINELY COMMAND & SERVICE PILOTS: NO DIPLOPIA WITHIN 27.3 CM.
POWER OF CONVERGENCE		PcB MUST NOT TEXCEED Pd BY MORE THAN 25 MM.		OMITTED
ACCOMMODATION		NOT LESS THAN MINIMUM FOR AGE (SEE TABLE IX)	CLASS I STANDARDS OR J-1 AT 50 CM. WITH CORRECTION	
COLOR VISION		ORIGINAL EXAMINATION: ERRORS IN ISHIHARA OR A.O. MAY NOT EXCEED 25% SUBSEQUENT EXAMINATIONS: ADJUNCTIVE TEST WHEN ERRORS EXCEED 25%		
FIELD OF FORM		CONTRACTION OF 15° OR MORE IN ANY MERIDIAN DISQUALIFIES. SCOTOMATA DISQUALIFY. (NORMAL LIMITS OF FIELD: UP 50° , TEMPORALLY 90° , DOWN 65° , NASALLY 55°)		
REFRACTION (WHEN INDICATED)		ORIGINAL EXAMINATION: NOT MORE THAN 1.5 D IN ANY MERIDIAN; NOT MORE THAN 0.5 D CYLINDER.		

ditions of the retina and choroid are most frequently indicative of extraocular or systemic disease. Particular attention should be paid to the ophthalmoscopic examination of individuals past midlife, where arteriosclerosis may be suspected or where there is a history of rheumatic or of focal infection as dental foci and chronic disease of the nasal accessory sinuses. Repeated ophthalmoscopic examination is indicated following head injury with fracture, concussion, or period of unconsciousness other than momentary. Any abnormality found is to be classified and described accurately, and where possible substantiated by subjective findings (visual field defects, reduction in visual acuity, etc.). Lenticular opacities should be described as to appearance, location, and interference with function.

33. MINIMAL VISUAL REQUIREMENTS FOR FLYING PERSONNEL
See Table X.

34. VISUAL REQUIREMENTS; ALL BRANCHES. See Table XI

35. IMPROVISED EQUIPMENT FOR CONDUCTING THE EYE EXAMINATION FOR FLYING. Under present wartime conditions it is often necessary to conduct physical examinations without the use of regular equipment. While this is not desirable, it may at times be necessary to improvise such equipment.

a. Visual acuity. For testing visual acuity a card of Snellen Test letters may be used if procurable. This should be illuminated by 7-10 ft. candles of light. This will be obtained by use of a 100-watt daylight lamp placed about 4 ft. above and 4 ft. in front of the chart. The lamp must be shaded so that none of the light from the lamp passes directly to the examinee's eyes.

If no test card is available one can be made. Each letter should subtend an angle of 5 minutes. Each portion of the letter should subtend an angle of 1 minute.

One minute angles are subtended by lines of the following widths of the indicated distances:

200 ft. - 18.3 m m
100 ft. - 9.1 m m
70 ft. - 6.4 m m
50 ft. - 4.6 m m
40 ft. - 3.7 m m
30 ft. - 2.7 m m
25 ft. - 2.3 m m
20 ft. - 1.8 m m
15 ft. - 1.4 m m

b. Depth Perception. The Howard-Dolman Depth Perception apparatus can be built by a local carpenter or metal worker (see Figure 8). If fluorescent lighting is not available, the box may be left open on top and illuminated by a reflector placed above the apparatus in such a way that no light is permitted to go directly back to the examinee (100 watt light 4 ft. above and in front of the instrument). The illumination of the apparatus must be chiefly direct against the white background at the back of the box. The rods must be evenly illuminated and should show no variation in light intensity as they are moved back and forth. This may be assisted by painting the rods with a good grade of very flat black paint.

c. Heterophoria Tests.

(1) Muscle Test Light. If no test cabinet is available which has the regulation sized (1-1/2 cm) spot of light, a flashlight head can be covered with adhesive tape leaving only a hole this size through which light can emerge. If an American Optical Co. Projecto-Chart is available it can be modified to give this type of spot also. The hole now in the slide is too large and it projects too large a spot of light on the screen. If a hole is drilled in the slide 3/4 mm. in diameter (using a dental drill) placed 1/2 inch beyond the present hole in the slide, a very satisfactory spotlight will be projected on the screen. It will be approximately 1 cm. in diameter and will be found most satisfactory for muscle balance testing. A Maddox rod can be made by placing a glass

TABLE XI. - EYE REQUIREMENTS (APRIL 30, 1943)

	Aviation Cadet Applicants (when facilities for "64" exam not available)		Aviation Cadet at Classification Center		
	Air Crew Pilot, Bombardier, Navigator	Ground Duty Armament, Meterology, Engineering, Photography, etc.	Pilot, Bombardier, Bombardier-Navigator	Navigator	Student Officers
Visual Acuity	20/20	20/100 corr. to 20/20 in one eye and 20/30 in other. No organic disease	20/20	20/40 corr. to 20/20 by glasses worn while flying	20/20
Depth perception	Not required	Not required	30 mm	Defective depth perception may be waived	30 mm
Heterophoria 6 M	Not required	Not required	Class 1	Defective muscle balance may be waived	Class 1
Color vision	Pseudo-isochromatic plates 75% to 100% correct	Recognize vivid red and vivid green	Pseudo-isochromatic plates 75% to 100% correct or less than 75% correct and color 'Safe' by SAM lantern or Holmgren yarn.	Same as pilot and bombardier	Same as pilot and bombardier
Refraction	Only if indicated	If indicated by defective visual acuity, etc.	Only if indicated	If visual acuity less than 20/20	Only if indicated
Jaeger Req.	J-1-13	J-1-13	J-1-13	J-1-13	J-1-13
Form	64	63	64	64	64

TABLE XI. - EYE REQUIREMENTS (APRIL 30, 1943)
(CONT'D)

	Applicants for Enlistment MR 1-9	Commission in Regular Army, except Medical Department, Chaplain, JAGD	Commission in Regular Army in Medical Department, Chaplain, JAGD only	Commission in ORC, all branches NG, and for Federal recognition
Visual Acuity	General military service in all arms and services: 20/200 each eye correctible to 20/40 in either eye / no organic disease. Limited service: 20/400 bilateral correctible to 20/40 in each eye, or non-progressive blindness in one eye with 20/100 correctible to 20/20 in other eye.	20/40 correctible to 20/20 in one eye and 20/30 in the other	20/100 in each eye correctible to 20/20 in one eye and 20/30 in the other when no organic disease exists.	2-/100 in each eye correctible to 20/20 in one eye and 20/30 in the other
Depth Perception	Not required	Not required	Not required	Not required
Color vision	Not required	Distinguish vivid red and vidid green	Distinguish vivid red and vivid green	Distinguish vivid red and vivid green
Refraction	Not required	Not required if vision satisfactory	Not required if vision satisfactory	Not required if visual acuity satisfactory

TABLE XI. - EYE REQUIREMENTS (APRIL 30, 1943)
(CONT'D)

	Flying Personnel	Civilian Flying Instructors	Combat Crews	Aircraft Observer	Non-Rated and Technical Observer	Control Tower Operator
Visual Acuity	Class 1 - 20/20 Class 2 - 20/40 corr. to 20/20 Class 3 - 20/100 corr. to 20/20	20/50 corr. to 20/20 bilateral	20/20 - If already trained, local C.O. can give waiver for 20/40 corr. 20/20 bilateral	20/20	20/100 corr. to 20/20 bilateral	Vision corr. to 20/20 bilateral
Depth Perception	Class 1 - 30 mm Class 2 - 35 mm Class 3 - not done except for Command pilots - 35 mm	35 mm	30 mm If already trained, local C.O. can give waiver to 35 mm	30 mm	Not required	Not required
Heterophoria 6 M	Class 1) See mini- Class 2) mal visual Class 3) requirements Table X	Class 2	Class 1 - If already trained, local C.O. can give waiver to Class 2	Class 1	Class 3	Not required
Color vision	Pseudo-Isochromatic plates 75% to 100% correct.	Pseudo-Isochromatic plates 75% to 100% correct.	Pseudo-Isochromatic plates 75% to 100% correct.	Pseudo-Isochromatic plates 75% to 100% correct.	Pseudo-Isochromatic plates 75% to 100% correct.	Recognition without confusion of true red and true green
Refraction	Only if indicated	Only if indicated	Only if indicated	Only if indicated	Only if indicated	Only if indicated

TABLE XI. - EYE REQUIREMENTS (APRIL 30, 1943)

	Applicants for West Point	Liaison Pilot	Service Pilot	Parachute Troops
Visual Acuity	20/30 bilateral corr. to 20/20 bilateral	20/40 corr. to 20/20 bilateral	20/100 corr. to 20/20 bilateral	20/40 uncorr. bilateral
Depth Perception	Not required	35 m.m.	Class 1, 2, or 3	Not required
Heterophoria 6 M	Disqualified by Eso. more than 10 diopters; Exo. more than 5 diopters; Hyper. more than 1 diopter	Class 1 and 2	Class 1, 2, or 3	Not tested
Color vision	Distinguish pure red and pure green	Pseudo-Isochromatic plates 75% to 100% correct.	Pseudo-Isochromatic plates 75% to 100% correct.	Recognize pure red and pure green
Refraction	If indicated - Disqualified if board feels error excessive. Disqualified by more than 2 D in any meridian or myopia more than .75 any meridian	Only if indicated	Only if indicated	If indicated

stirring rod over a hole in a card, so that no light can reach the eye around the outside of the stirring rod. This rod, placed before the eye, will give a satisfactory line of light at right angles to its long axis.

A chart is made on a piece of cardboard or wall board approximately one meter square. In the center of the cardboard a hole 1/2 to 1 cm. in diameter is cut. Lines are then drawn on the board as shown in the accompanying sketch, "Heterophoria Test Board" (Figure 5).

A light is now placed behind the hole in the center of the board at the end of the 20 ft. dark room. This end of the room is then dimly illuminated so the examinee can see the lines on the board from 20 ft. away. The Maddox rod, constructed from the stirring rod, is placed before the non-fixing eye and the applicant sees a line of light and a dot of light as with the regular test. The number of lines that the line of light is displaced from the dot gives the number of prism diopters of Heterophoria which the patient has in that position. The test will give an inaccurate result if an occluder is not used to cover and uncover the non-fixing eye at several second intervals.

This method is recommended only if no phorometer or trial lens case is available.

(2) Trial lens case. If a trial lens case is available, this method is better than the above mentioned test. The trial lens frame is placed on the examinee with the Maddox rod in place before the non-fixing eye. A 1/2 to 1 cm. spotlight is turned on at the end of the 20 ft. dark room. Loose prisms are then inserted into the trial frame until the line of light bisects the spot of light. (Interruption of the vision of the non-sighting eye with an occluder is essential). The amount of phoria is equal to the prism strength required to place the line of light through the dot of light.

Prism divergence may also be estimated with the use of loose prisms, but this method is recommended only if a phorometer is not available. Any existing phorias are first determined using loose prisms. The examinee is directed to fix the muscle light with both eyes. A 3 D loose prism is placed base in before one eye (if esophoria) . of more than 3D exists, the power of the loose prism must equal the amount of esophoria). The examinee is qualified for Class 1 or 2 if he can overcome diplopia through divergence. If he is unable to overcome a prism of this strength, a prism is selected the power of which is 2 D (or 1 D less than the existing esophoria). If the examinee is able to overcome a prism of this strength, a 1 D prism base in is superimposed on the first, thus creating a combined prism of at least 3 D. Care must be taken not to interrupt vision in superimposing the second prism. If the examinee is able to overcome the combined prism, he is qualified.

A combined prism of a strength of 15 D. is placed base in before one eye. If the examinee is able to overcome diplopia, he is disqualified for class 1 or 2.

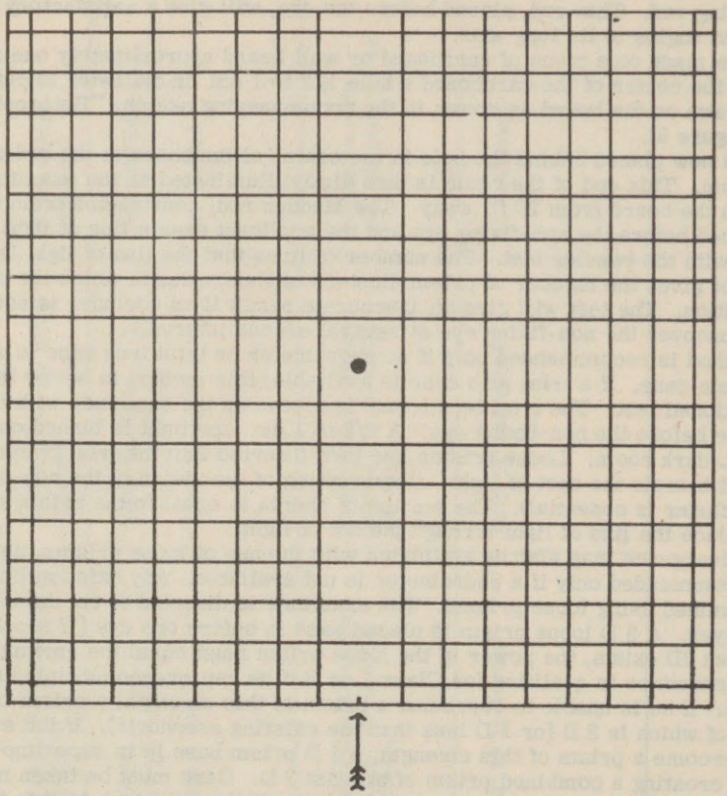
A quicker method of determining the phorias with loose prisms consists in using a prism table to determine the power of a prism rotated base in or out in the following manner:

The sighting eye is determined in the usual way. The trial frame is carefully adjusted to the examinee's face. Special care should be taken to see that the frame is level. The Maddox rod is placed in the posterior fixed cell of the frame before the non-sighting eye. Prisms are placed in the anterior rotating cell.

Vertial phorias. Place a 2 D prism base 180° (or 5 D prism if vertical phoria exceeds 2 D). Instruct examinee to rotate prism by turning the adjustment screw on the trial frame until the light streak bisects the point of light. The position of the base of the prism is noted on the degree scale of the trial frame, as well as its relation to the horizontal base line, whether base up or down. If the marker at the base of the prism is brought to rest off the degree scale, reverse the prism in the cell of the trial frame. Vertical equivalents are determined from the table of "Vertical Equivalents of Obliquely Placed Prisms," below.

VERTICAL EQUIVALENTS OF OBLIQUELY PLACED PRISMS

2 Diopters Prism		5 Diopters Prism	
0° -	0 diopter - 180°	0° -	0 diopter - 180°
14° -	0.5 diopter - 166°	6° -	0.5 diopter - 174°
30° -	1.0 diopter - 150°	12° -	1.0 diopter - 168°
48° -	1.5 diopter - 132°	18° -	1.5 diopter - 162°



HETEROPHORIA TEST BOARD

LINES ABOUT 1CM WIDE. SPACED 6 CM FROM CENTER OF HOLE TO CENTER OF FIRST LINE IN EACH DIRECTION. LINES 6 CM APART – (CENTER TO CENTER)

(BY PLACING AN ARROW BELOW THE BOARD IT CAN BE USED AS A TEST TO DETERMINE PRISMATIC POWER AT 20 FEET EACH LINE THE ARROW IS DISPLACED RERRESENTS 1 PRISM DIOPTER.)

FIGURE 5

VERTICAL EQUIVALENTS OF OBLIQUELY PLACED PRISMS (CONTD.)

2 Diopters Prism	5 Diopters Prism
90° - 2.0 diopters - 90°	24° - 2.0 diopters - 156°
	30° - 2.5 diopters - 150°
	37° - 3.0 diopters - 143°
	44° - 3.5 diopters - 136°
	53° - 4.0 diopters - 127°
	64° - 4.5 diopters - 116°
	90° - 5.0 diopters - 90°

Horizontal phorias. Place a 5 D prism base 90° (or a 10 D prism if phoria exceeds 5D.) Instruct the examinee to rotate the prism until the vertical streak bisects the point of light. Note the position of the base of the prism on the degree scale of the trial frame, as well as its position in relation to the vertical, whether base in or out. If the marker at the base of the prism is brought to rest off the degree scale, reverse the prism in its cell and repeat. Horizontal equivalents are determined from the table, "Horizontal Equivalents of Obliquely Placed Prisms." Thus, if an examinee were being checked for his horizontal phoria and turned a 5 diopter prism base out to 60° (prism before left eye), he would have referring to the table below) an esophoria of 2.5 diopters.

HORIZONTAL EQUIVALENTS OF OBLIQUELY PLACED PRISMS

5 Diopter Prism	10 Diopter Prism
90° - 0 diopter - 90°	90° - 0 diopter - 90°
84° - 0.5 diopter - 96°	87° - 0.5 diopter - 93°
78° - 1.0 diopter - 102°	84° - 1.0 diopter - 96°
72° - 1.5 diopter - 108°	78° - 2.0 diopters - 102°
66° - 2.0 diopters - 114°	72° - 3.0 diopters - 108°
60° - 2.5 diopters - 120°	66° - 4.0 diopters - 114°
53° - 3.0 diopters - 127°	60° - 5.0 diopters - 120°
46° - 3.5 diopters - 134°	53° - 6.0 diopters - 127°
37° - 4.0 diopters - 141°	46° - 7.0 diopters - 134°
26° - 4.5 diopters - 154°	37° - 8.0 diopters - 141°
0° - 5.0 diopters - 180°	26° - 9.0 diopters - 154°
	0° - 10.0 diopters - 180°

d. Red lens test. An improvised lens for this test can be made from a tail light lens ground smooth and mounted in one side of a pair of large sun glass frames. The other lens is entirely removed from the sun glasses. This gives a large, unobstructed field of vision and even if other equipment is available, will be found most satisfactory.

e. Power of Convergence. The angle of convergence need no longer be calculated according to existing regulation. A candidate may be qualified on the relation of the PcB and Pd alone. If PcB minus Pd = 25 mm or less, the candidate may be qualified.

In the absence of a Prince Rule, the PcB and pupillary distance may be accurately measured with an ordinary ruler graduated in centimeters or inches. A centimeter rule may be used in exactly the same manner as a Prince rule, and the angle similarly computed. If an inch ruler is used, the PcB and Pd expressed in centimeters are obtained by multiplying the distances in inches by the factor 2.54.

f. Accommodation. (1) The accommodative power may be easily determined even if no Prince Rule is available. An ordinary Jaeger card, used in lieu of the usual mounted type card, is carried away from the eye until the J-1 type is correctly read by the examinee. The distance from the anterior focus of the eye (15.7 mm. in front of the cornea) to the point at which the type is first read is measured and noted. One of the following formulae

is used to determine accommodative power in diopters:

$$\frac{40}{\text{Inches}} = \text{Power in diopters}$$

$$\frac{100}{\text{CM}} = \text{Power in diopters}$$

A substitute for the Prince Rule is easily constructed by pasting on a centimeter or inch ruler a scale graduated in diopters according to the following table. In conducting the examination the zero end of the rule is placed at the anterior focus of the eye (15.7 mm. in front of the cornea).

CM		Diopters		Inches
5.0	=	20.0 D	=	2
5.5		18.0 D		2 1/8
6.3		16.0 D		2 1/2
6.7		15.0 D		2 5/8
7.1		14.0 D		2 13/16
7.7		13.0 D		3
8.3		12.0 D		3 1/4
9.1		11.0 D		3 9/16
10		10.0 D		3 15/16
10.5		9.5 D		4 1/8
11.1		9.0 D		4 3/8
11.8		8.5 D		4 5/8
12.5		8.0 D		4 7/8
13.3		7.5 D		5 3/16
14.3		7.0 D		5 5/8
15.4		6.5 D		6 1/8
16.7		6.0 D		6 5/8
18.2		5.5 D		7 1/8
20		5.0 D		7 7/8
22.2		4.5 D		8 11/16
25		4.0 D		9 13/16
28.6		3.5 D		11 5/16
33.3		3.0 D		13 1/8
40		2.5 D		15 11/16
44.4		2.25 D		17 1/2
50		2.0 D		19 11/16
66.7		1.5 D		26 5/16
100		1 D		39 3/8

(2) The approximate additional lens power required for near vision in older pilots is listed as follows:

Age	Reading Distance 13 inches	Desired 16 inches
45	+ 1.00	+ .50
50	+ 1.50	+ 1.00
55	+ 2.25	+ 1.75
60	+ 3.00	+ 2.50

36. PRIMARY DIFFERENTIAL DIAGNOSTIC POINTS IN NYSTAGMUS. See Table XII

37. ACTION OF EYE MUSCLES. See Table XIII and Figures 6 and 7.

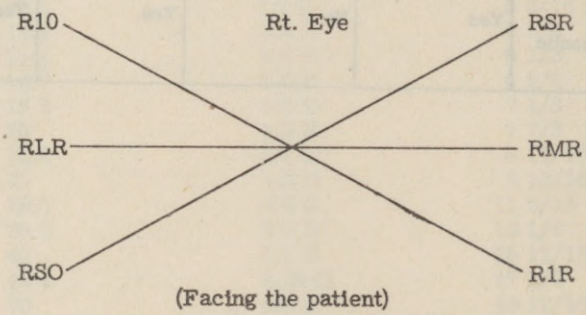
TABLE XII. - PRIMARY DIFFERENTIAL DIAGNOSTIC POINTS IN NYSTAGMUS

	Visual Acuity	Slow and quick Component	Occurs only in extreme positions	Occurs in any position	Accompanied by vertigo, nausea, vomiting, past pointing, etc.
Physiological Nystagmus	Not diagnostic	Yes	Yes	No	No
Ocular Nystagmus	Much impaired central vision	No	No	When attempting to see objects	No
Nystagmoid movements due to extra ocular muscle paralysis	Not diagnostic	As a rule	Only in extreme position in field of action of paralyzed muscle	No	No
Central nystagmus (lesion of C. N. S.)	Not diagnostic	As a rule, but not always	No	Yes	Not as a rule
Labyrinthine Nystagmus	Not diagnostic	Yes	No	Yes	Yes

TABLE XIII. - ACTION OF EYE MUSCLES - (PETER)

Tables of Primary and Subsidiary Actions of Individual Ocular Muscles

Muscle	Primary Action	Subsidiary Action
Internal Rectus	Internal Rotation	None
External Rectus	External Rotation	None
Superior Rectus	Elevation	Intemal Rotation, Intorsion
Inferior Rectus	Depression	Internal Rotation, Extorsion
Superior Oblique	Intorsion	Depression, External Rotation
Inferior Oblique	Extorsion	Elevation, External Rotation



(Facing the patient)

FIGURE 6. - DIAGRAM OF ACTION OF INDIVIDUAL EYE MUSCLES IN SIX CARDINAL DIRECTIONS FROM EYE FRONT - (PETER)

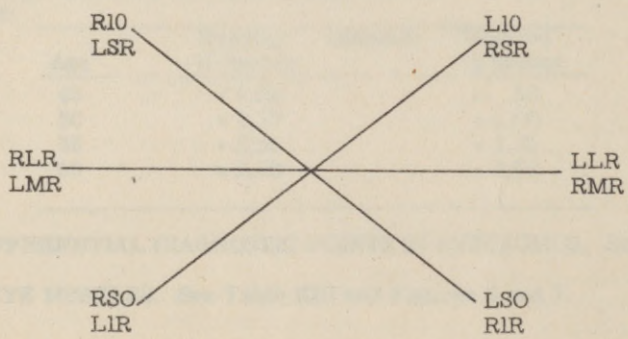


FIGURE 7. - DIAGRAM SHOWING CONJUGATE (YOKE) ACTION OF EXTRINSIC OCULAR MUSCLES IN BINOCULAR MOVEMENTS - (PETER)

38. A WHEEL-CONTROLLED DEPTH PERCEPTION APPARATUS. (See Figure 8). The apparatus described below will be found of value in that the use of the ordinary adjustment cords is eliminated and in the convenience of having scale at the examiner's end of the eye lane.

Floor construction. Measurements, 12 inches x 32 inches. Fixed rod placed 20 inches behind front end of box. Movable rod is fixed in a wooden block, which slides in a groove made of metal or wooden strips. Block is moved by light airplane cable passing through a pulley system, as indicated in the diagram. Rods are 11 inches long, 1 cm in diameter and 64 mm apart, painted flat black. Millimeter scale, 150 - 0 - 150 mm, is placed alongside the movable rod.

Roof construction. Illumination is provided by two light tubes, preferably 24 inches daylight fluorescent, fixed to the roof of the box. Tubes should be placed as far forward as possible and in the long axis of the box, in order to provide uniform illumination upon the rods.

Rear screen. Covered with white unglazed paper.

Wheel construction. Solid round wheel affixed to wall in position convenient to the examinee's chair. The chair is placed in position directly in front of the depth perception apparatus. The lower cable is wound several times about the hub of the wheel, and passes around a wheel fixed to the wall behind the examinee's chair.

Reading scale. A millimeter scale is affixed to the wall beneath the upper cable. Rod positions are indicated by a marker attached to the cable. The scale is concealed from the examinee by placing it behind his chair or by placing it in a deeply grooved block.

39. DARK ROOM TABLE. Plans for a control cabinet for use in the eye room for conducting examinations for flying are appended (Figures 9 and 10).

This table has switches on it to control all electrical equipment used, including overhead light, projecto-chart, depth perception apparatus, muscle test spot light, and transformer switch for ophthalmoscope and retinoscope.

The bottom switch on the panel controls the input to the transformer which is located inside the table. The transformer is reached through the small door at the end of the table, as shown, and the cord to the instrument is brought out through the hole adjacent to the door.

The four other switches are connected to four single outlets in the back of the cabinet. In this way, the table can be connected to drop cords which, in turn, are connected to the items of electrical equipment to be controlled. If it is desired at a later date to change the equipment or to add other items, it is only necessary to pull out the plug and insert the plug attached to the new item. By attaching in this fashion, the table can be made movable for a distance of three or four feet, which has been found to be very convenient when doing refractions.

When the vision test cabinet with eight button control box is in use, this box can be mounted directly on the face of the table as shown.

When a reading scale on the wall near the examinee is being used in depth perception tests, this wall light may be wired so it will turn on when the depth perception apparatus is turned on.

The trial lenses are removed in the tray from the box in which they usually are issued. This tray is set into the frame formed of one-quarter rounds. Since this frame is on a sloping surface, the lenses are easily seen with the examiner either sitting or standing. The lenses are illuminated by either a small night light or a flexible neck lamp attached to the tables. This light does not interfere with retinoscopy. When not in use, the lenses are covered by a towel.

The shelf on the table is wide enough to use in filling out forms or recording refraction findings.

The drawer holds Jaeger cards, flashlight, ophthalmoscope, retinoscope, occluder, card for determination of sighting eye, blank forms, and other equipment.

The table should be made of plywood to be of light weight and mounted on large size casters so that it can be freely moved.

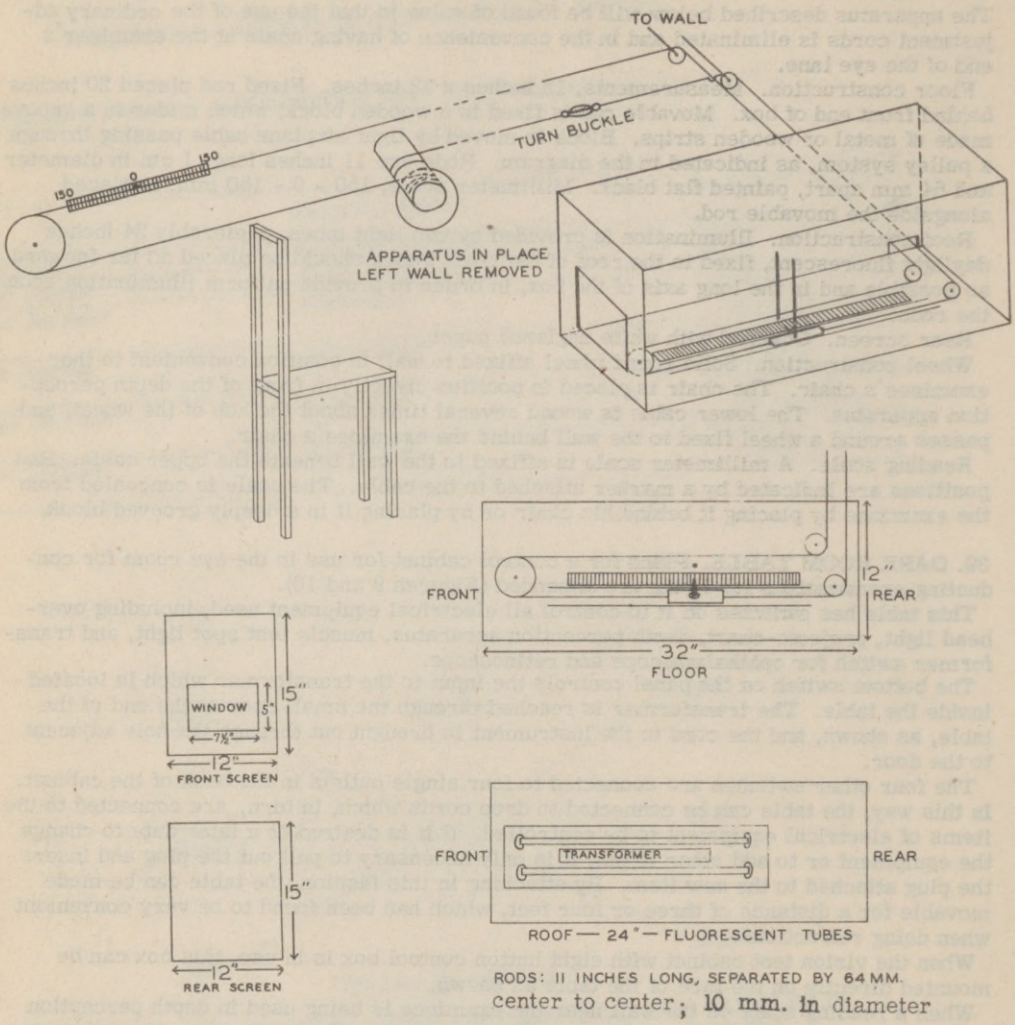
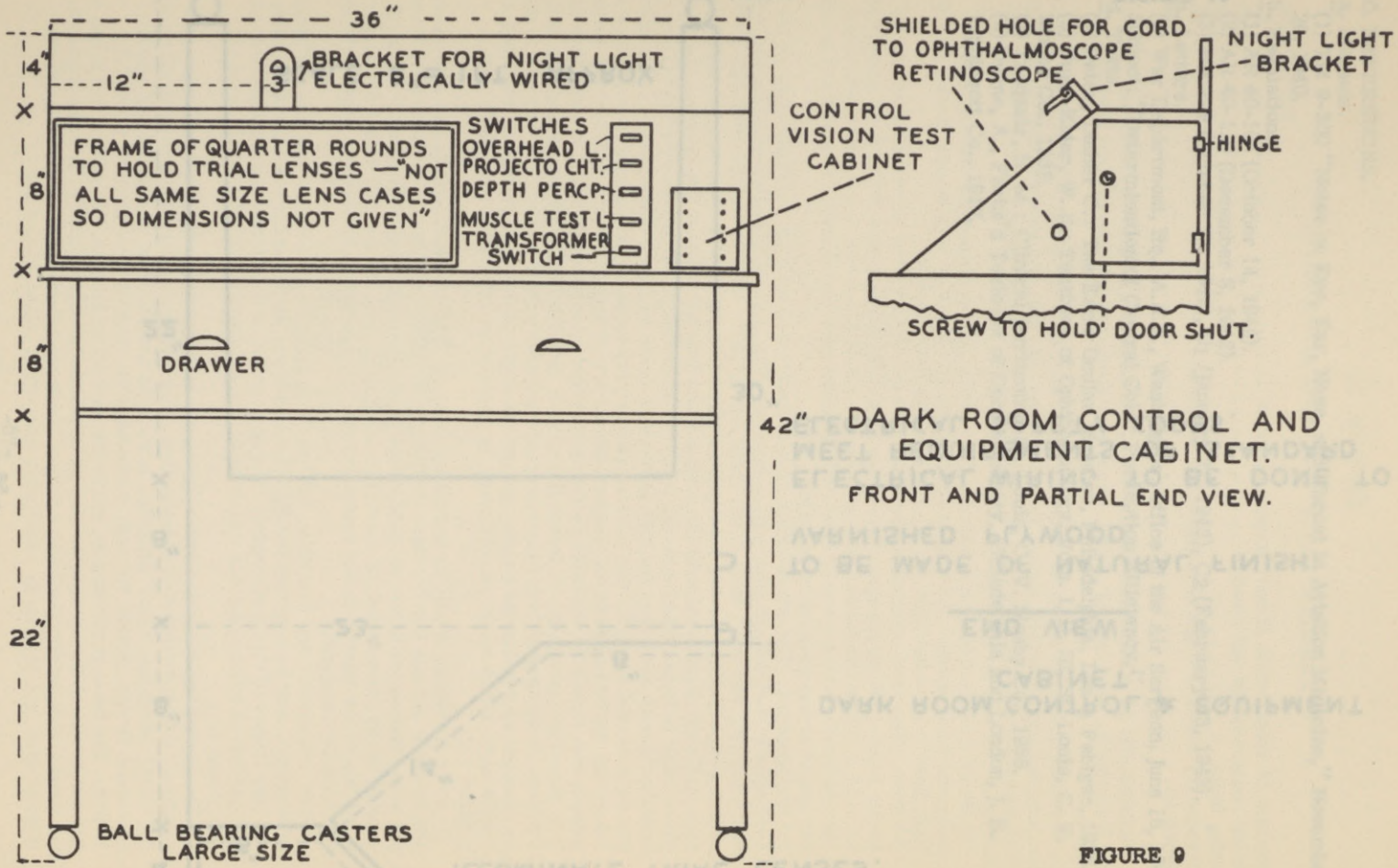

TO WALL
TURN BUCKLE
150
0
150
APPARATUS IN PLACE
LEFT WALL REMOVED
FRONT
12"
REAR
32"
FLOOR
WINDOW
5"
7½"
15"
12"
FRONT SCREEN
15"
12"
REAR SCREEN
FRONT
TRANSFORMER
REAR
ROOF — 24" — FLUORESCENT TUBES
RODS: 11 INCHES LONG, SEPARATED BY 64 MM.
center to center; 10 mm. in diameter

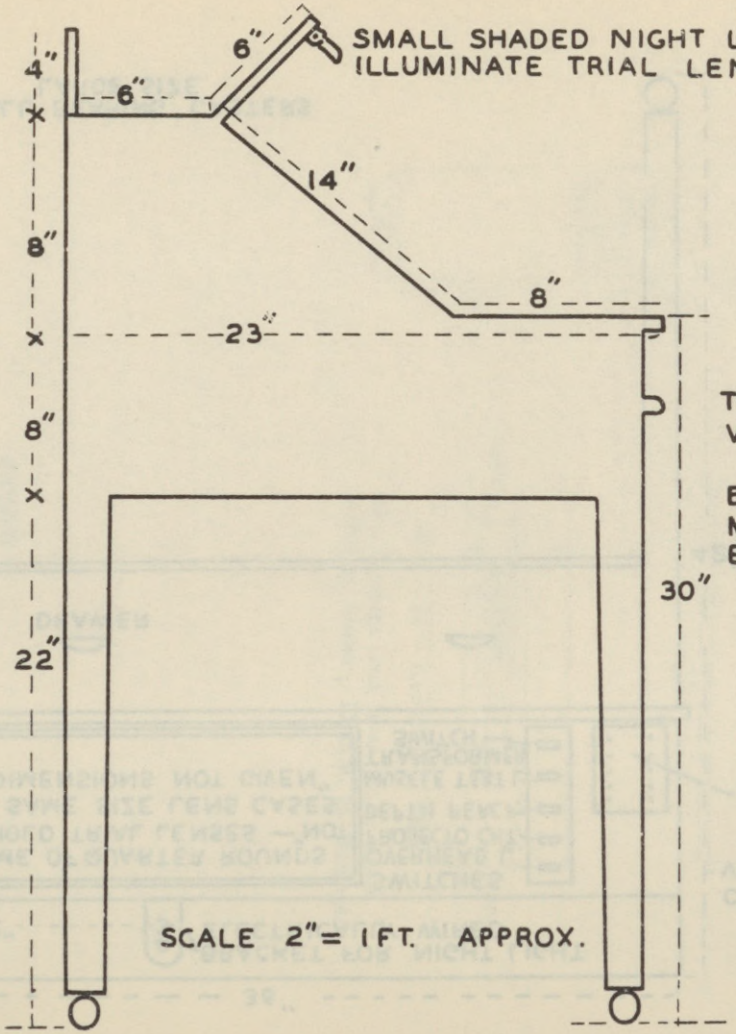
FIGURE 8



DARK ROOM CONTROL AND EQUIPMENT CABINET.

FRONT AND PARTIAL END VIEW.

FIGURE 9



DARK ROOM CONTROL & EQUIPMENT CABINET.

END VIEW

TO BE MADE OF NATURAL FINISH VARNISHED PLYWOOD.

ELECTRICAL WIRING TO BE DONE TO MEET REQUIREMENTS OF STANDARD ELECTRICAL SAFETY CODES.

FIGURE 10

40. REFERENCES.

a. Manuals.

(1) TM 8-300 "Notes on Eye, Ear, Nose, and Throat in Aviation Medicine," November 26, 1940.

b. Regulations.

(1) AR 40-105 (October 14, 1942).

(2) AR 40-110 (December 3, 1942).

(3) MR 1-9 (October 15, 1942), C_1 (January 22, 1943), C_2 (February 23, 1943).

c. Letters.

(1) War Department, Hq., A.A.F., Washington, Office of the Air Surgeon, June 16, 1942, Subject: "Determination of Central Color Perception Efficiency."

d. Texts.

(1) Peter, Luther C.: The Extra Ocular Muscles, Philadelphia, Lea & Febiger, 1936.

(2) Duke-Elder, W. S.: Textbook of Ophthalmology, Vols. I, II, III, St. Louis, C. V. Mosby Co., 1933.

(3) Traquair, H. M.: Clinical Perimetry, St. Louis, C. V. Mosby Co., 1938.

(4) Duane, A., Fuchs's Textbook of Ophthalmology, Philadelphia and London, J. B. Lippincott Co., 1917.

SECTION III

EXAMINATION OF EAR, NOSE AND THROAT

41. TECHNIQUE OF EXAMINATION OF EAR, NOSE AND THROAT. a. Nose and Throat. (1) Equipment: Head mirror, lamp, nasal speculum, nasopharyngeal and laryngeal mirror.

(2) Methods of Examination. A complete examination by reflected light, will be made of the anterior and posterior nares, the mouth, the pharynx, nasopharynx and the larynx. When considered necessary the use of special instruments, transillumination and studies by X-ray will be employed.

(a) Mouth and oro-pharynx. The mouth is ordinarily examined by reflected light using the head mirror and tongue blade. The examination may be performed by flashlight held to illuminate the mouth and oro-pharynx directly.

(b) Nose. The nasal speculum and head mirror are used for examination of the anterior nare . When the speculum is not available suitably fashioned wire loops may be used to dilate the nares. Though usually not satisfactory, the electric otoscope battery handle with the nasal speculum attached may be utilized. In some instances the nasopharyngoscope may be used.

(c) Nasopharynx. The examination is best performed with the reflected light of the head mirror and the nasopharyngeal mirror. The usual difficulties encountered with this technique are thick tongue and tense soft palate. Instructing the examinee to concentrate on breathing or to pant rhythmically will usually relax the tongue, which may then be firmly depressed with the tongue blade into the floor of the mouth. The soft palate may remain tensed and retracted but when the examinee is asked to try to breathe through the nose, the soft palate will relax and drop down toward the fauces and an adequate entry for the mirror will be presented. Instruments may be firmly but gently applied against the mucous membrane of the palate and pharynx but these tissues can rarely be irritated by recurrent contact without eliciting the gag reflex. It is therefore necessary to insert the mirror into the nasopharynx without touching the base of the tongue, soft palate or posterior pharyngeal wall. The instrument may be steadied by resting the handle against the angle of the open mouth or the lower bicuspid teeth which serve as a fulcrum or rest for an otherwise tremulous hand. (Figure 11).

In some instances it will be necessary to apply topical anesthesia to the soft palate and pharynx and use a soft palate retractor. A rubber catheter may be passed through the nose, recovered in the oropharynx and brought out through the mouth. Traction applied to the two presenting ends, will adequately elevate the soft palate for the presentation of the mirror in the nasopharynx. Though rarely necessary, digital palpation may be employed.

When practicable and available, the nasopharyngoscope, which is actually an infant cystoscope, may be inserted through the nares and the nasopharynx examined under the tiny lenses of this instrument. The application of this instrument entails the same difficulties as cystoscopy and requires some familiarity with its use for accurate interpretation.

(d) The hypopharynx, larynx and esophagus. Indirect observation with a large mirror is usually employed for this examination. The tongue is extruded and grasped between the thumb and index finger while the mirror is inserted into the mouth and applied gently but firmly against the soft palate with the mirror face directed toward the larynx. The base of the tongue, epiglottis, pyriform sinuses, the glottis and contents, and the mouth of the esophagus may be examined in this manner. In some instances the tongue may be depressed by a tongue blade into the floor of the mouth and the mirror used in a fashion as previously described. (See Figure 11).

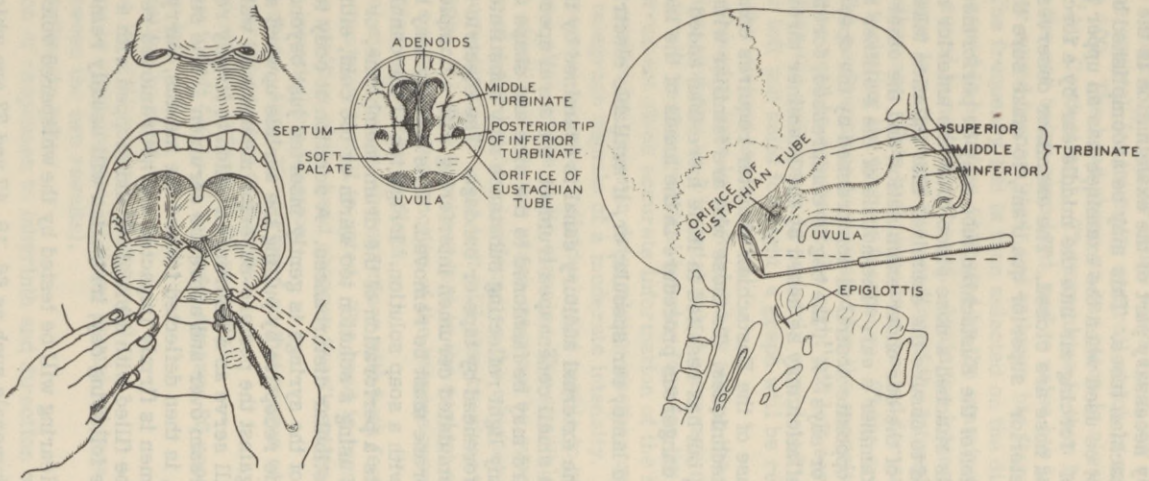

ADENOIDS
MIDDLE TURBINATE
SEPTUM
POSTERIOR TIP OF INFERIOR TURBINATE
SOFT PALATE
ORIFICE OF EUSTACHIAN TUBE
UVULA
SUPERIOR
MIDDLE
INFERIOR
TURBINATE
ORIFICE OF EUSTACHIAN TUBE
UVULA
EPIGLOTTIS

FIGURE 11.

Further examination of the larynx, trachea and the oesophagus is performed with the endoscopic instruments.

b. Eustachian Tube.

(1) Equipment. Head mirror, aural speculum or electric otoscope, auscultation tube, Politzer bag, and Eustachian catheter.

(2) Methods of examination.

(a) Valsalva technique. A very necessary part of the examination is the determination of the patency of the Eustachian tubes. This may be accomplished by the Valsalva technique, but should not be used when the examinee has an upper respiratory infection. The test consists of forcing air into the middle ear by a forcible expiratory effort while the mouth and nose are closed. The examiner observes bulging of the drum, particularly the posterior superior quadrant, to make sure than inflation takes place.

(b) Politzer technique. Inflation of the Eustachian tube may be performed by means of the Politzer bag, to which is attached a nose piece to fit the anterior nares. The aural auscultation tube is used to assure the examiner that inflation takes place. One end is inserted in the meatus of the ear under examination and the other end is inserted in the meatus of the examiner's ear. The nozzle of the Politzer bag is inserted into one nostril, while the opposite nostril is compressed by the operator's hand. When the examinee swallows or says "K", the bag is compressed, forcing air into the Eustachian tube and the inflation may be heard by the examiner through the auscultation tube.

(c) Catheter technique. The use of the Eustachian catheter requires considerably more skill than the previous techniques. To those who are familiar with the technique this method will prove useful, but has resulted in little more than added trauma to the nasopharynx and can be a dangerous procedure in the hands of the inexperienced.

c. The ear.

(1) Equipment. Head mirror and lamp, ear specula; or, if available electric otoscope.

(2) Methods of examination.

(a) Objective examination. The external auditory canal is examined by the reflected light of the head mirror and a small coneshaped trumpet, the aural speculum. A small bit of paper or cardboard may be fashioned to the size and shape of a suitable speculum when necessary. Any light reflecting substance may substitute for a head mirror by attaching it to the forehead by tape or bandage. The electric otoscope may be used when available. Accumulated cerumen interfering with a complete view of the canal and tympanic membrane must be removed. This usually may be accomplished by irrigation of the canal with a soap solution. Irrigation of the canal should not be attempted when there exists a perforation of the drum membrane, or history thereof. One should be cautious of using a solution too warm or too cold, either of which might result in unpleasant vestibular disturbances. A solution at body temperature is safe to apply. The nozzle of the syringe is gently inserted just beyond the external auditory meatus which is made receptive by pulling the auricle upward and backward. Holding the nozzle steadily against the postero-superior meatal wall which is formed by a triangle of soft tissue will serve as a fulcrum on which to firmly rest the instrument as well as direct the stream over and above the cerumen . The stream, after striking the drum membrane, is then deflected toward the meatus, carrying the cerumen with it. Where the cerumen is firmly impacted and not removed readily by simple irrigation the canal may be filled with a bland oil and stopped with a cotton plug. Several hours later, or on the following day, irrigation will usually remove the material. (Figure 12).

(b) Subjective examination. Hearing will be tested by the whispered voice and by the audiometer when available.

1. Whispered voice test. Numerals such as 66, 18, 47 and 23 are whispered by the examiner at a distance of 20 feet, using only the air remaining in the lungs at the end of a normal expiration in order to give more uniform intensity. When done correctly as described, an accurate estimation of hearing may be made as the numbers six and seven represent the high frequency range, while eight and nine represent intermediate frequency and two and four represent the low frequency range. Other numerals and words with sibilants predominant should also be used, so that

the examinee does not become familiar with the test numbers. If he misses any group of numbers or words, audiometric examination must be done.

2. Audiometer. The hearing by the audiometer should be done whenever practicable. The audiometer furnishes an accurate record of the hearing. Instructions for its use accompany the instrument. The audiometer is not unlike a radio in that among other accessories it has a power switch, a "station selector",(or frequency selector) ranging in eight or more tones from low frequency to high frequency, and a "volume control"(or intensity control) which is measured on the dial in decibels from 0 to 100. The head phone or ear piece is always connected with the receptor marked "Air Conduction". The examinee is then instructed to hold the ear piece firmly to the ear being examined, and to raise his index finger when he is aware of the tone or sound transmitted, and to lower his finger when he no longer hears the sound. The frequency 128 is then selected on the dial and the intensity increased until the sound is heard as indicated by the examinee. Intensity is then decreased until the sound is no longer heard. Again the intensity is increased until the examinee's finger is raised and the reading of the intensity dial is recorded under 128 on the audiogram. This technique is repeated for each frequency on the audiometer up to and including the highest frequency. These are properly recorded on the audiogram. The performance is repeated for the opposite ear and recorded. A small R or L may be used to represent the right and left ear as designations on the audiogram. When the audiogram is properly completed and the notations joined by lines, dotted for left and solid for right, a graph will be revealed which shows the hearing level for the various tones tested.

Average hearing loss is determined by adding the decibel loss at 512, 1024, 2048, frequencies, dividing by 3 to establish the average decibel loss across that range. The result will be the practical hearing loss for the ear tested.

The instrument gives accurate information of the hearing for eight or more tones and is of particular value in determining whether or not a man is enabled to hear radio or telegraph signals of a moderate intensity. It has been found that many apparently normal-hearing individuals are unable to hear certain tones, in many cases of the same pitch as the radio signals. The possible danger of missing radio or telegraph signals is a factor which must not be overlooked.

In cases of defective hearing found on the whispered voice test or audiometer test, the low conversational voice test will also be given and recorded.

d. The labyrinth. (1) The Romberg test is the easiest and simplest method for eliciting information concerning the function of the balance mechanism and should always be used in correlation with other findings.

The individual stands before the examiner with both feet in contact and eyes closed. Any swaying or tendency to fall is noted. The head is turned to one side, then the other to determine if the position of the head changes the direction of falling.

(2) Tests for labyrinthine function:

(a) Barany chair. Head 30° forward so that tragus of the ear is on a horizontal plane with the external canthus of the eye.

1. Turn to right (10 times in 20 seconds).
Nystagmus to left (10 to 34 seconds, average 26 seconds, is normal).
Vertigo to left.
P.P and falling to right.

2. Turn to left (10 times in 20 seconds).
Nystagmus to right (normally, there should not be a variation of more than 5 seconds between the two results).
P.P and falling to left.

3. Relation of responses to labyrinth and direction of turn:

Related to labyrinth stimulated after rotation	Relation to direction of turn after rotation
Nystagmus to same side	Opposite
Vertigo to same side	Opposite
P.P. and falling opposite	Same

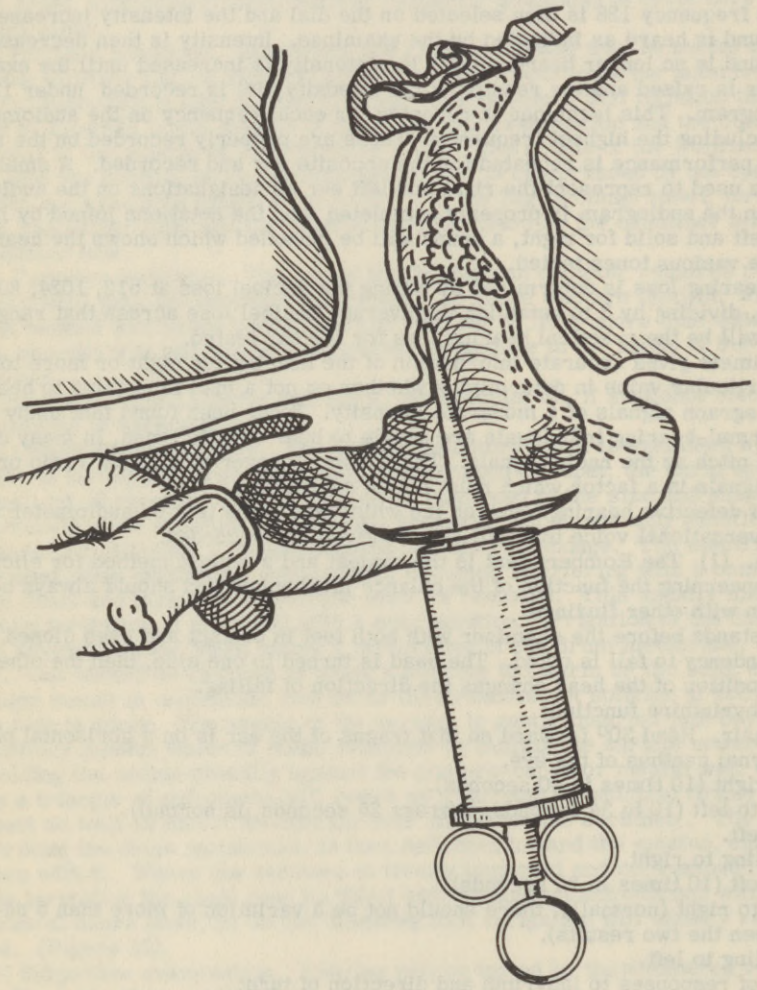


FIGURE 12.

TABLE XIV. - HEARING REQUIREMENTS, ARMY AIR FORCES (JANUARY 1, 1943)

Type of Examination	Form Used	Hearing		Audiometer
		Whisper	Spoken	
Aviation cadet applicant - aircrew	64 or 63 (and 22 if qualified)	20/20 on "64"	20/20 on "63"	Not required on "63". Maximum loss 20 decibels on "64".
Aviation cadet applicant - ground duty	63 (and 21 or 22 if qualified)	Not done	20/20	Not required
Aviation cadet replacement center (classification aircrew)	64 (and 22 if qualified)	20/20	Not done	Required if hearing below 20/20
Officer training in grade - air crew	64	20/20	Not done	Required if hearing below 20/20
Flying personnel (rated aircrew)	64	Not done	15/20 (Class 2) (Bombardier 20/20, Class 1)	When practicable
Rated Observer	64	Not done	8/20 (Class 3) Balloon Observer 15/20, Class 2)	When practicable
Non-rated Observer	64	Not done	8/20 (Class 3)	When practicable
Service pilot	64	Not done	15/20 (8/20 on recommendation of of CG, AAF)	When practicable
Glider pilot	64	Not done	15/20 (Class 2)	When practicable
Combat Crews (enlisted)	64	Not done	20/20 (Local C.O. can waive defects on trained or training personnel)	When practicable

TABLE XIV. - HEARING REQUIREMENTS, ARMY AIR FORCES (JANUARY 1, 1943)
(CONT'D)

Type of Examination		Form Used	Hearing		Audiometer
			Whisper	Spoken	
Applicants for West Point		64	Not done	20/20	Not required
Applicants for enlistment MR 1-9	General Service	22	8/15 bilateral		Not required
	Limited Service	22	5/15 bilateral, 0/15 in one, 15/15 in other	5/20 bilat. or 10/20 one ear, 0/20 in other	Not required
Candidates for commission in regular army		63	Not done	20/20	NNot required
For commission in National Guard and for service with troops in organized Reserve		63	Not done	15/20 one ear, and 20/20 in other	NNot required
Limited service officers		63	Not done	5/20 bilat. or 10/20 in one, 0/20 in other	Not required
Civilian flying instructors		64	Not done	15/20 (Class 2)	When practicable

NOTE: When hearing for whispered voice falls below 20/20, hearing for the spoken voice will be recorded and the audiometer test given when practicable.

(b) Caloric test.

1. 1 cc of ice water placed in right ear canal, nystagmus to the left. (Average normal onset is 30 seconds; average normal duration is 120 seconds).
Vertigo to left.
P.P. and falling to right.

2. 1 cc of ice water in left ear canal. Nystagmus to right (any significant variation between the two sides should be considered in the interpretation, and correlated with other pertinent information.
Vertigo to the right.
P.P. and falling to the left.

Labyrinthine nystagmus is characteristically rhythmic, with a slow component and a quick component.

42. HEARING REQUIREMENTS, ALL CLASSES. See Table XIV.

43. HEARING TESTS. a. The following are tests for the auditory function. For interpretation, See Table XV.

(1) Whispered voice
(2) Spoken voice
(3) Audiometer (more than 20 decibels loss for 512, 1024, and 2048, is disqualifying for Class 1. For Class 2 and 3 no qualifying standards are set, but qualifications will be based on the results of low conversational voice test.)
(4) Rinne test, AC/BC or $\frac{\text{Air Conduction}}{\text{Bone Conduction}}$ with 256 fork
(5) Weber - lateralization of sound with 128 fork at hair line of forehead
(6) Schwabach - Comparing examiner's bone conduction with examinee's bone conduction

TABLE XV INTERPRETATION OF HEARING TESTS

Test	Normal	Conduction Deafness	Perception Deafness	Mixed Deafness
Wh. Voice (Stage Wh.)	20/20	Usually less than 20/20	Usually less than 20/20	Usually less than 20/20
Spoken	20/20	Usually less than 20/20	Usually less than 20/20	Usually less than 20/20
Rinne	AC greater than BC	BC greater than AC	AC greater than BC, but diminished	AC = BC
Weber	No lateralization	Lateralized to lesion	Away from lesion	Varies
Schwabach	BC same as examiner's	BC better than examiner's	BC poorer or same	BC poorer or same
Audiometer	Normal	Usually loss of low tones	Usually loss of high tones	May be general loss

44. TECHNIQUE FOR TAKING X-RAYS OF SINUSES AND MASTOIDS. a. X-ray of sinuses (see also TM 8-240).

(1) Erect. Fluid level position, showing antra; chin in contact with plate; nose 1 inch away from plate; cone in contact with back of head and directed on a line running above the auricle through the orbit.

Exposure, 6 - 7 seconds at 30 MA and 54 KV.

(2) Prone. Chin position for antrum; 1 inch throat stick between teeth; cone in contact with vertex of skull, directed vertically half way between orbit and ear.
Exposure, 5 seconds at 30 MA and 54 KV.
(3) Prone. Forehead - nose position; slanting board for plate (23°); focus in front of ear; cone contact with head.
Exposure, 5 seconds at 30 MA and 54 KV.
(4) Lateral view. Side position; cone focused in front of ear at a distance of 28 inches.
Exposure. 3/4 seconds at 30 MA and 54 KV.
(5) Lateral view of neck. Shoulder against plate; tube 5 ft. distance.
Exposure, 1/10 second at 100 MA and 75 KV.

b. X-ray of mastoids.

(1) Law position. Divide film, right and left on same film, fold ear forward; tip cone 20° toward feet and 10° toward face from behind; cover 1/3 ear lobe with cone in contact with temporal and parietal bone.
Exposure, 2 seconds at 30 MA and 54 KV.
(2) Occipital projection for petrous pyramids. Occiput on plate on slanting board, 23°; tip tube 15° toward feet; central ray through hair line.
Exposure, 6 seconds at 30 MA and 54 KV.
(3) Chin position for petrous pyramids. Chin on plate; cone tipped 20° toward feet and central ray directed from top of head through external auditory canal.
Exposure, 6 seconds at 30 MA and 54 KV.
(4) Petrous pyramid through the orbit. Patient on back; central ray through orbit; cone 1 inch from forehead.
Exposure, 3 seconds at 30 MA and 54 KV.

45. REFERENCES.

a. Texts.

(1) Turner, A. L.: Nose, Throat, and Ear, Baltimore, William Wood and Company, 1936.
(2) Gleason, E. B.: Nose, Throat, and Ear, Philadelphia and London, W. B. Saunders Company, 1929.
(3) Ballenger, H.C.: Otology, Rhinology, Laryngology, Philadelphia, Lea & Febiger, 1940.
(4) Ophthalmology and Otolaryngology, Military Surgical Manuals, Nat'l. Research Council, Philadelphia, W.B. Saunders and Company, 1942.
(5) Morrison, W.W.: Diseases of the Nose, Throat, and Ear, Philadelphia and London, W. B. Saunders, 1940.

b. Regulations.

(1) AR 40-110 (December 3, 1942)
(2) AR 40-105 (October 14, 1942)
(3) AR 40-100 (November 16, 1942)
(4) MR 1-9 (March 15, 1942)

SECTION IV
THE PSYCHOLOGICAL AND NEUROPSYCHIATRIC EXAMINATION

46. GENERAL. The procedures and interpretations of a personality study are equally applicable in original examinations of applicants for flying training, in the examinations of those who come to the flight surgeon for guidance and advice, and in the examination of those who are referred as patients for neuropsychiatric study. Under actual combat conditions, and in the theatre of operations, there is reason to suppose that there will be many of the latter two groups, who are unable to make satisfactory adjustments to operational flying and combat. Many of these may not have had the benefit of a complete personality study by a trained examiner at the original examination, and many who have had such benefit may be unable to adapt themselves under such circumstances, in the presence of the cumulative effects of the ever-potent agents of fear and anxiety. It is particularly important that the flight surgeon should be able to make sound recommendations as to the disposition of personnel so affected on the basis of information he can obtain through a psychological evaluation of the individual as a functioning unit.

47. CONDUCT OF EXAMINATION. a. Technique. The interview should be conducted in a quiet, friendly manner in surroundings of privacy and comfort. It is a formal examination informally conducted. The taking of notes, and other writing during the interview is to be discouraged. Abrupt, blunt questioning is uniformly unsuccessful, and questions must be carefully and intelligently worded. No question should be so framed that it will permit a "Yes" or "No" answer. The examiner is attempting to delve into the psychic constitution of the individual, and such an answer definitely blocks any further approach.

The examiner should always attempt to be "en rapport" with the examinee. If a clash of personalities is evident, or becomes apparent, as the examination progresses, it is advisable to terminate the interview, and if possible, have some other examiner continue the investigation. Each examiner must approach the personality study with a sympathetic understanding, realizing that with a proper transference, the examinee may lay bare his soul. This is not a responsibility that may be approached lightly, and the medical officer should be definitely aware of the responsibility. During the course of the questioning it is expected that any unusual mental conflicts, morbid fears, phobias, etc., will be elicited. Information should be sought with a view of evaluating the family history, environment during the formative years, intelligence, psychomotor activity and achievement, emotional content, somatic demands, particularly as to evidences of instability and control over these demands, and sociality.

To satisfactorily elicit the information suggested above it is necessary for a chronological life history of the individual to be obtained. The method of doing this will vary somewhat from examiner to examiner, but no aspect of the examinee's life must be ignored, and no time left unaccounted for. During the questioning objective reactions as noted under paragraph c should be observed.

b. Suggested inquiries. The list of questions presented here are intended only as a guide, with the thought that they may suggest the type of information to be sought for. Each examiner will, because of his own background, have to develop his own technique.

(1) What is your age? The ages of your brothers and sisters?
(2) Where did you live as a child: farm, town, city?
(3) What was your father's occupation?
(4) Have your parents always lived together? If not, why not?
(5) Has there been or is there now any nervous breakdown in your family?
(6) Has any member of your family ever been a resident of a mental hospital?
(7) Has there been any suicide in your family?
(8) Has any member of your family frequently used alcohol excessively?

(9) What was the financial status of your home: poor, average, better than average?
(10) How old were you when you finished high school?
(11) What failures did you have in the grades or in high school?
(12) How much college work have you accomplished?
(13) What colleges have you attended?
(14) What failures have you had in your college work?
(15) As a student have you been on the whole: superior, better than average, average, below average?
(16) What has been the goal of your education?
(17) In what activities did you participate in high school and college aside from academic school work?
(18) When did you stop going to school or college?
(19) Why did you stop going to school?
(20) Who financed your education?
(21) What particular skills or ability do you have?
(22) What jobs have you had and for how long?
(23) How many years and months have you been unemployed since out of school?
(24) What hobby do you have?
(25) Does anyone have it in for you - a real enemy?
(26) During the past five years how many fights have you had?
(27) What major disciplinary actions have been taken against you, as expulsion from school, military discipline, civilian arrests?
(28) How many auto accidents have you had? In how many of these were you the driver? How often have you been arrested - for what reasons?
(29) How do you get along with girls; enjoy their company, indifferent, avoid them?
(30) How many romances have you had (steady girl for weeks or months)?
(31) Have you ever been married?
(32) What illnesses have you had that were so severe that you were out of your head, or delirious?
(33) Did you ever stammer or stutter? Are you left handed?
(34) Have you had any periods of unconsciousness due to accident, injury, or being knocked out? Duration of such periods?
(35) Have there been any instances of fainting, giving age and circumstances?
(36) Have there been any instances of walking in your sleep? Give age and place.
(37) Do you have headaches? Frequently, rarely, never?
(38) Have you ever taken medicine to help you get to sleep?
(39) Have you ever been wakened by frightening dreams? If so, when?
(40) How old were you the last time you wet the bed (urinated) while asleep?
(41) Have you ever had any fits or convulsions?
(42) Do you get the "blues": frequently, seldom, never?
(43) Of what things are you afraid?
(44) How many cigarettes or pipefuls of tobacco do you smoke a day?
(45) How much liquor do you use: frequently drunk, occasionally drunk, occasional social drink, occasional beer, none?
(46) Is there any period of your life that is blank to you - of which you have no memory - for 15 minutes, half an hour, or longer?
(47) Have you had any previous military service? Army, Navy, Marines, ORC, ROTC, CMTC?
(48) What ratings or advancements have you had?
(49) How long have you been interested in flying?
(50) Why have you wanted to do army flying?
(51) How many minutes or hours have you spent flying (student or passenger)? Soaring? Gliding?
(52) Have you ever been sick or dizzy in the air?
(53) What is the attitude of your parents toward your flying: enthusiastic, content, opposed?

c. Objective reactions to be observed. The following reactions should be noted during the interview, and correlation attempted between their occurrence and precipitating stimuli if possible: Facial expression, postures, attitudes, tenseness, motor movements -

as gait, gestures, restlessness, fidgetiness, tears, blushing, mottling of extremities, sweating, tachycardia, increase in blood pressure, sighing, tremor, pupillary dilation, obvious embarrassment, lack of poise, ill at ease, speech defects, nail biting, tics, and mannerisms.

48. UNFAVORABLE FINDINGS IN THE PERSONALITY STUDY AND EVIDENCES OF INSTABILITY.

a. History of multiple (2 or more) instances of mental disturbances in the family.

b. Intelligence is considered below the required standard because of:

(1) Many failures in the grades and high school, requiring extra months or years to complete high school.

(2) Inability to accomplish college work because of many academic failures.

(3) Complete lack of accomplishment to date, and failure to take advantage of opportunities (school and work).

(4) Specific instances of applicant's behavior indicating questionable intelligence. Record must be made of evidence demonstrating poor judgment, poor comprehension, poor memory, poor attention, poor learning, or other faulty intellectual operations. These must be so obvious that they outweigh any educational attainments.

c. A history of stammering.

d. A history of migraine or migraine type of headache.

e. A history of psychogenic amnesia.

f. A history of severe head injury with persistent symptoms - or prolonged unconsciousness.

g. A history of epilepsy.

h. A history of repeated fainting due to inadequate cause. (The only adequate cause being: (1) pain following a severe injury, (2) during convalescence from an acute illness, (3) moderate to severe loss of blood).

i. Persistent insomnia (anxiety).

j. Obsessions or phobias which motivate conduct.

k. Instability manifest by combinations of following:

(1) Convulsions in minor illness
(2) Prolonged enuresis
(3) Frequent headaches
(4) Multiple histories of momentary unconsciousness in minor injuries
(5) Pavor nocturnus (anxiety)
(6) Mild insomnia (anxiety)
(7) Nail Biting
(8) Tics
(9) Excessive tobacco
(10) Repeated low Schneider indices
(11) Tenseness

l. Excessive alcohol.

m. Any major psychosis.

n. Any minor psychosis.

o. Any consitutional psychopathic state.

p. The following personality trends, if present to a considerable degree: Seclusive, overactive, depressive, suspicious, egotistical, irritable, sexually abnormal, and criminalistic.

49. THE ADAPTABILITY RATING FOR MILITARY AERONAUTICS (ARMA). a. Rating.

(1) Qualified. The majority of aviation cadet applicants will be found to be satisfactory psychologically for flying.

(2) Disqualified. A psychological disqualification may be the only disqualification, but it is just as valid a reason for disqualifying as any physical defect.

(a) A psychological disqualification should be well supported although the reasons need not appear on the "64" (suspected of being sexually abnormal, for instance).

(b) In most instances psychological disqualifications will be supported by evidences of instability. (Repeated instances or combinations of items listed above.)

b. Report of psychological examination.

(1) Score. A theoretically perfect score is considered to be 200 points. Scores above 160 are qualifying, those below that figure disqualifying. While the assignment of numerical values to personality traits is somewhat impracticable the following numerical values for certain conditions are suggested in order that there may be a uniform system of evaluation. The smallest figure represents the minimum amount to be subtracted from 200 if that particular condition exists, and the largest figure the maximum. It can be seen that in those instances in which an applicant has two conditions, the minimum value for which is 20, he is automatically disqualified, as he cannot be assumed to be perfect in all other respects. Similarly, in those instances in which the maximum value for a given condition is 40, that condition may be disqualifying in itself. The examiner must exercise his judgment in assigning values to other conditions not specifically mentioned, and which may influence qualification or disqualification. Evidence of marked vasomotor instability and other emotional phenomena, for example, will be given special unfavorable consideration particularly if occurring in conjunction with some other condition such as nail-biting, even though the latter is minimal in degree.

Suggested numerical values to be deducted from total score:

(10-20) Nervous and mental disease in family (each instance)
(10-20) Alcoholism in family (each instance)
(10-20) Criminality in family (each instance)
(5-10) Insomnia in applicant (persistent)
(20-40) Hay fever, asthma or other allergic phenomena
(10-40) Enuresis (prolonged)
(20-40) Sommambulism
(5-40) Alcoholism
(15-40) Fainting (inadquate)
(12-40) Unconsciousness (duration and cause)
(40) Fracture of skull or severe concussion
(5-40) Phobias and obsessions (excessive fears)
(10-20) Nail-biting
(20-40) Amnesia
(20-40) Fits, spasms and convulsions
(10-40) Speech defects (corrected or uncorrected)
(10-40) Chorea, poliomeyelitis, encephalitis, meningitis
(10-40) Arrests

Probably relatively few applicants will be disqualified who do not have some positive findings in the above list, although final decision may be influenced by other factors in each individual case.

(2) Entry in par. 36, WD, AGO Form No. 64.
(a) State "satisfactory" or "unsatisfactory".
(b) Record the ARMA score.
(c) A low ARMA is sufficient reason for an unsatisfactory rating. Do not put unfavorable remarks concerning applicant's personality on the "64".

50. REFERENCES.

a. Manuals.
(1) TM 8-230, Notes on Psychology in Aviation Medicine.
(2) TM 8-325, Outline of Neuropsychiatry in Aviation Medicine.

b. Regulations.
(1) AR 40-110 (December 3, 1942).

SECTION V
THE DENTAL EXAMINATION

51. NOTATIONS USED. a. In par. 11, WD, AGO Form 63, or par. 19(a), WD, AGO Form 64, indicate by (x) missing teeth, (0) carious teeth (restorable), (/) carious teeth (not restorable, caries involving pulp chamber or possibly only carious roots remaining).

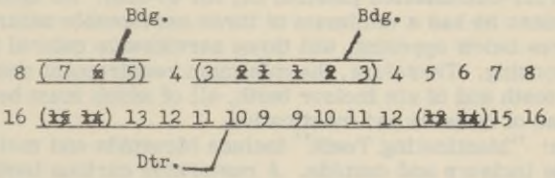
b. In par. 11, Form 63, or par. 19(b), Form 64, remarks including other defects: Enter here various conditions such as: gingivitis, pyorrhea alveolaris, Vincents Stomatitis, etc. This paragraph may be used to note any dental irregularities or peculiarities which may be valuable for identification, such as "no symptoms", and "tooth pulpless R 1, no symptoms (or fistula if present)".

A broad classification of malocclusion is valuable for record, such as neutrocclusion in which all incisor teeth, in some types, fail to occlude in any movement of the jaw; mesiocclusion in which the lower teeth are generally forward (anterior) of the upper (prognathism); and distocclusion in which the lower teeth come to rest generally distal (posterior) of normal, causing the upper anterior teeth to appear protruded.

If space is insufficient, paragraph 24, Form 63, or paragraph 37, Form 64, may be used for further remarks.

In case of malocclusion, severe or marked, which is considered disqualifying, dental casts will be forwarded to Headquarters Army Air Forces with at least two penciled lines on each side drawn across opposing casts to denote rest occlusion. They should also be plainly marked with the individuals name and organization or address. In the absence of a dental officer the services of a civilian dentist may be secured to make these casts. No expense to the Government will be incurred in this connection.

c. In par. 11, Form 63, or par. 19(c), Form 64, prosthetic appliances: Artificial appliances replacing missing teeth are charted as follows:



Enter further remarks about prosthetic appliances in this paragraph, such as: Bdg. Fx. R1, 2, 3, L, 1, 2, 3, defective. Bdg. Rm. R5, 6, 7, serviceable. Dtr. Pr. R 14, 15, L13, 15 unserviceable, crown R 4 etc.

d. Explanation of abbreviations used on "63" and on "64".

(1) Bdg. Rm. - bridge removable. This appliance is usually made of metal with porcelain teeth, replacing one or two missing teeth. It can be removed by the wearer. It is held in place with clasps around neighboring natural teeth or abutments. The clasped teeth are included within the oval brackets.

(2) Bdg. Fx. - bridge fixed. This appliance is fixed premanently to the natural abutment teeth and cannot be removed by the wearer. The abutment teeth are included within the oval brackets.

(3) Dtr. Pr. - denture partial. This appliance is constructed of some plastic material, metal, and porcelain teeth. Masticating stress is borne mostly by the alveolar ridge. Clasps aid in stabilizing it and it is removable by the wearer. The clasped teeth are

not included within the square brackets - see charted example above.

e. In par. 11, Form 63, or par. 19(d), Form 64: Enter here classifications I, II, III, or IV, as described below in par. 36.

52. DENTAL CLASSIFICATION OF INDIVIDUALS.

Class I Persons requiring immediate treatment of conditions such as:
- (a) traumatic injuries
- (b) acute infections (pulpitis, gingivitis, stomatitis, etc.)
- (c) conditions necessitating extractions
- (d) defects not listed above but of a nature requiring emergency treatment
- (e) Insufficient teeth to masticate the Army ration.

Class II Persons requiring early treatment (favorable cases for preventive dentistry, except persons in Class I) such as:
- (a) filling operations which do not involve pulp canals
- (b) replacement of defective fillings (except root canal fillings)
- (c) prophylactic treatment
- (d) correction of defects not listed above but of a nature favoring preventive procedures, including orthodontia

Class III Persons requiring extended treatment (constructive dentistry, except persons in Class I and Class II), such as:
- (a) treatment of chronic infections
- (b) filling operations involving pulp canals
- (c) replacement of defective root canal fillings
- (d) construction of crowns, bridges, and dentures
- (e) correction of defects not listed above but of a nature requiring extensive treatment

Loss of one or two teeth does not necessarily warrant Classification III.

Class IV Persons not requiring dental treatment.

53. STANDARDS.

a. Requirements for commission (Section IX, AR 40-105). No applicant or candidate will be accepted unless he has a minimum of three serviceable natural masticating teeth above and three below opposing, and three serviceable natural incisors above and three below opposing. Therefore, the minimum requirement consists of a total of six masticating teeth and of six incisor teeth, all of which must be so opposed as to serve the purpose of incision and mastication.

(1) Definitions: "Masticating Teeth" include bicuspids and molars. "Incisor Teeth" include incisors and cuspids. A restorable carious tooth is considered a serviceable natural tooth.

(2) Causes of rejection:
- (a) Loss of teeth in excess of those noted above.
- (b) Marked pyorrhea.
- (c) Gross prognathism or irregularity which interferes with serviceable occlusion.

(3) Teeth replaced by bridge work which appears sound may be accepted in lieu of natural teeth if candidate otherwise meets the requirements.

b. Requirements for Aviation Cadet training, officer candidate schools, enlistment, recruiting and induction under Selective Service (par. 15 b, Section III, WD Circular No. 86, March 24, 1942 and par. 20 f, AR 40-110, December 3, 1942). Applicants who meet the following minimum dental requirements and who are otherwise qualified will be eligible for commission for general military duty in all arms and services.

(1) Individuals may be accepted who have a minimum of three serviceable natural masticating teeth above and three below, and three serviceable natural incisors above and three below, so opposed as to serve the purpose of mastication and in-

cision during the excursions of the mandible, even though they are not in actual contact when the mandible is at rest in centric occlusion.

(2) In lieu of the minimum number of serviceable natural teeth set forth above, the following will be acceptable for individuals who otherwise do not show evidence of physical impairment either from loss of masticatory efficiency or from ill health incurred from the pathological processes which led to their loss of teeth:

(a) In the upper jaw, a minimum of an edentulous ridge corrected or correctible by a full denture.

(b) In the lower jaw a minimum of a sufficient number of natural lower teeth in proper position and condition to support a partial denture which can be removed and replaced by the individual and which is retained by means of clasps with rests and or special precision attachments to abutment teeth wherein the stress of mastication is borne partially by the abutment teeth and partially by the soft tissues of the mouth.

Interpretation of the above regarding the lower jaw is that candidates must have two natural teeth in the lower jaw, one on each side in such a position that they will serve as support for a partial denture. The teeth may be cuspids, bicuspids, or molar teeth but not incisors.

(c) Malocclusion. When it is evident from the individuals general physical condition and his occupation in civil life that his malocclusion has not seriously interfered with the mastication of a normal diet, provided that in the excursions of the mandible or with the mandible at rest the teeth do not impinge upon opposing soft tissue and that the malocclusion has not resulted in secondary pathological changes.

54. DENTAL IDENTIFICATION RECORD. A complete Dental Identification Record for all flying personnel including air borne troops and officers in the military service will be made out by a dental officer on M.D. Form No. 79 (revised February 24, 1941).

55. REFERENCES.

a. Regulations.

(1) AR 40-110, (December 3, 1942).

b. Letters.

(1) SGO Circular Letter No. 6, January 2, 1943, Subject: Dental Identification Record for All Flying Personnel.

c. Circulars.

(1) WD Circular No. 86, March 24, 1942.

CHAPTER 4
PROBLEMS IN THE CARE OF THE FLYER

SECTION I
SICK CALL AND MEDICAL ATTENDANCE

56. GENERAL. Until the Flight Surgeon has established the confidence which must exist in any physician-patient relationship, it is difficult to make the flyer report to the hospital for even moderately serious illnesses. By personal contact, comradeship, and participation in all activities of the pilot, the Flight Surgeon can create an understanding of his good intentions in relation to health. It has been found that the best medical attendance can be given by the Flight Surgeon who diligently visits and associates with his pilots daily at their work. A short visit to each hangar or other gathering place in the morning, not to be construed as a formal inspection visit, with a discussion of common interests, will often bring to light ailments which ordinarily would be neglected. Arrangements can then be made, if necessary, for further examination and possibly prevention of significant disease.

57. FLYING PAY. When a flying officer is incapacitated for illness or injury other than that due to an airplane accident, he should be restroed to flying duty if possible within ninety days; otherwise, flying pay is lost for the entire period of illness (par. 2, 3, AR 35-1480). If he has been incapacitated as a result of an airplane accident, the following abstract from the Comptroller General's Decisions applies with respect to aviation pay (see Decisions of the Acting Comptroller General of the U.S., vol. 16, p. 134, July 1, 1936 to June 30, 1937):

> "The three months' period, stipulated by Executive Order issued pursuant to law, during which flights are not required of an Army officer, incapacitated for flying duty by reason of an aviation accident while making an authorized flight, to entitle him to additional pay for flying, commences with the first of the month following the accident where prior to the accident the officer had completed sufficient flights to qualify for additional pay for flying for the month in which he was injured.
> "Where the flights required by Executive Order are made at any time during the three successive calendar months next following the three months period during which no flights were required, additional pay for flying for the three months' period is authorized."

SECTION II
FLYING FATIGUE

58. DEFINITION. "Flying fatigue" may be observed in normal or predisposed individuals as the result of strain from prolonged or hazardous flying. It is an acute illness having mental, emotional, and physical symptoms and is particularly found in members of combat crews engaged in combat missions. The term "flying fatigue" is not an adequate or exact one, in that fatigue itself is a subjective phenomenon, degrees of which are difficult to measure. It is thought that fatigue consists of physical factors, resulting from the appearance of certain metabolites in the body, and of psychic or emotional factors. The latter are apparently the most distressing to the affected individual. "Aeroneurosis", "aeroasthenia", and "flying stress" are the chronic forms of flying fatigue. "Shell shock' and the fatigues seen in Tank Crews and in Merchant Seamen are apparently the same essential illness occurring in different dangerous occupations. It is becoming generally recognized that most of the symptoms probably result from states of anxiety and that, relatively, flying fatigue is an anxiety neurosis just as are "shell shock" and the related anxiety states seen in civilian life. "Staleness" is an apt term that can be applied to the early manifestations of the condition. (See Ch. 4, Section XI).

59. SYMPTOMS AND CHARACTERISTICS.

a. The characteristics of flying fatigue are extremely variable, but in every case there is a sufficiency of symptoms and signs which are as likely to be spotted by a good squadron or flight commander as by the squadron medical officer. However, the early diagnosis of this condition is the medical officer's responsibility for, if not diagnosed early, irreparable harm may be done to the individual and he may be lost permanently to the Air Forces. A good Flight Surgeon will so surely know his men that he will quickly discern the slightest variations in the personalities of his squadron. There should be close liaison between the Flight Surgeon and Squadron Commander so that deviations in flying skill of a particular individual will be part of the Flight Surgeon's data in arriving at a diagnosis. Flying fatigue may show itself first in a reduction or change in flying ability. The various symptoms run the gamut from the mild so-called "fed-up" state, or staleness, to complete mental and emotional break down. Irritability, insomnia, depression, nightmares, anorexia, and loss of weight, are common signs. In fact, weight loss is one of the most significant changes which can be objectively measured. It usually occurs when flying fatigue is developing. All sorts of cardio-respiratory and gastro-intestinal symptoms, similar to those seen in neurotics in civilian practice, may be observed. Cold hands, cold feet, and tremors are common. Alcohol and tobacco may be used to excess. The pilot may become seclusive and develop a marked sense of guilt and shame. He loses his love for flying and begins to find fault with his airplane. His flying skill deteriorates and his judgment is poor. His tolerance to anoxia may actually be lowered.

b. As a general guide to the diagnosis, flying fatigue is especially likely to occur in certain periods in the flying life of an individual. Roughly speaking, symptoms of fatigue may develop in the first 10-20 hours of operational flying. This is so because of the strangeness and tensions of early combat work. During these hours the predisposed or emotionally unstable pilots become ill. But it is believed that anyone, even the most stable individual, when subjected to severe, prolonged, hazardous, combat work will develop the symptoms. In general this is likely to occur after 100 hours for fighter pilots and upwards from 120 to 150 hours for bomber pilots. It also may occur when the individual is physically below par, when he has had little sleep, or when he is recuperating from physical illness.

c. There is no apparent yardstick by which the development of flying fatigue can be measured. The factors determining the cause are not simply long hours of duty, hurried

meals, curtailed sleep, etc., although these do have a bearing. Of much importance is the mental tension on the ground between flights. For example, pursuit pilots when on the alert react with a feeling of excitement and tense anticipation to telephone calls which might be an order to take to the air.

d. The bodily fatigue occurring with operational flying seems disproportional to the physical effort involved. As a matter of fact, there is little physical effort involved in flying under ordinary circumstances. Pilots returning from an engagement often feel exhilarated but, nevertheless, "washed-out" and fatigued. Usually there are no symptoms of this nature after non-operational flights of similar duration. The average pilot is capable of from 100 to 130 hours of operational flying. After this he experiences increasing physical and mental tiredness or boredom during the day and unrefreshing sleep at night. When in this condition his reaction to tactical situations is neither as rapid nor as satisfactory as it should be. Some pilots clearly recognize the condition in themselves but hesitate to speak of it for fear of misinterpretations. With unrelieved fatigue various nervous symtoms having an anxiety background appear. Pilots with a strong sense of duty usually will not report sick until they are definitely ill and for this reason it is sometimes difficult to detect early symptoms of fatigue. Loss of weight may be one of the earliest objective symptoms, but will usually develop subsequent to the earliest subjective manifestations. Frequent checking of weight has one advantage. It enables the Flight Surgeon to observe the pilot and to note changes in personality which might ordinarily pass unobserved. It is the earliest detection of flying fatigue that is important both from a preventive, as well as therapeutic, point of view. Once severe fatigue has set in the results of therapy are disappointing. Individuals thus affected must be hospitalized, and a large percentage of these never return to duty.

60. PREVENTION.

a. Prophylaxis is the only successful therapy of flying fatigue. It is fundamentally and primarily an administrative responsibility, the measures of prevention governing such matters as discipline, leaves of absence and rest periods, recreation and diversion, suitable living quarters, comforts off and on duty. Unless these measures are properly controlled the only result will be an ever increasing number of cases of fatigue, many of which will be stressed to the danger point which may well render them unfit for further operational duties.

b. It has been observed statistically in an active theater of operations in World War II that the incidence of flying fatigue is directly proportional to the "degree of hazard" and the "casualty rate" or "missing rate" of the air crews involved in operational duties. There was no correlation in this study between the incidence of flying fatigue and non-operational flying, nor was there any definite relationship to other factors such as cold, vibration, glare, etc. The degree of hazard, the casualty rate, and the "missing per sortie" rates were the important etiological factors related to the incidence of flying fatigue. It would seem, statistically at least, that anxiety, fear of injury or death in combat, and the tension and danger of operational flying are the causes of most fatigue. Other factors such as cramped position in a gun turret, low temperatures, vibration of the plane, and glare do produce flying inefficiency, but apparently do not alone cause flying fatigue.

c. The following suggestions are offered as a guide to Commanding Officers in offsetting and combating the devastating effects of flying fatigue within their organizations:

(1) Use young individuals for combat missions insofar as possible.

(2) Assign medical officers to squadrons who are familiar with the problems of flying, and who are good mixers and keen observers. The medical officer should enjoy the privilege of having the confidence of his squadron. No rule of thumb instructions can produce in him the qualities he should have. No one can detail the activities of a wise friend.

(3) Evenly space the operational effort required of the individual, i.e., not four missions one week and one the next.

Bomber - a minimum of 24 hours between missions.

Fighter - on 8 hours alert, off 16 hours during which time he is subject to call.

(4) Inviolately limit the effort required of an individual except under very unusual circumstances. The aim should be:

Fighter - 90 - 110 hours operational flying or 6 weeks.

Bomber - 120 - 130 hours operation, 20 missions or 3 months.

Leave should then be given in manner to be discussed later, followed by a short period of alternative employment before return to operational duty. The nature of the alternative employment should not be to give a sudden rest such as might be produced by a long leave, but to provide flying duties which will carry no operational risk, and yet keep the individual fully occupied and prevent possible reaction after removal from operational strain.

(5) Long leaves of absence should not be given - 7 days as a rule, and not over 14 under any circumstances. Leaves should be at regular intervals, and only exceptional circumstances should be allowed to interfere. The following schedule is offered:

1/2 day every three or four days.

48 hours every two weeks.

7 days at end of limit of effort.

More than 7 days' leave at one time appears to encourage a disinclination to return to operational flying.

(6) Upon completion of a mission, crews should be taken to a point 3 to 5 miles from the airdrome for sleep and rest.

(7) The importance of tactfully organizing games at operational stations cannot be overemphasized.

(8) Mild degrees of anoxia increase fatigue. Strict oxygen discipline should be insisted upon.

(9) It is important to realize that pilots fear weather conditions as much as enemy action, and in determining leave and rest periods due allowance for weather conditions must be made.

(10) Pilots, where squadrons have suffered many casualties, should be given frequent rest periods.

(11) New personnel joining operational units should be carefully watched during the first fifteen or twenty hours of operational flying. It is during this period that those persons who are unable to face the strain of operational flying reveal their inadequacy.

61. TREATMENT.

a. The squadron medical officer is best equipped to treat mild cases of flying fatigue. His main function is diagnosis. He must follow hunches and if in doubt about the diagnosis it is recommended that the pilot in question be grounded for 2 to 3 days for further observation.

b. Psychotherapy consists in frank explanatory and advisory discussion with the pilot. Verbalization of complaints is probably of most value to the pilot. Adequate sleep with sedatives may be recommended for several days and a short leave period afterwards. If the case appears more serious it should be discussed with the Commanding Officer and a longer leave may be recommended. If the pilot has lost his courage and refuses to fly, it is best to talk this over with the Squadron Commander who may then reclassify the pilot, or, in some cases, the Fighter pilot may be transferred to Bomber work with good effect.

c. The severe case is hospitalized. Psychotherapy is carried out as for the various neuroses encountered in civilian life. Pilots so afflicted should be removed at the earliest possible time from their squadrons, for they are detrimental to the morale of other personnel.

62. CONCLUSIONS. It is emphasized (1) that a proper selection of personnel for air crews is essential.

(2) That the pilot may not be capable of understanding the nature or development of flying fatigue.

(3) That it is the responsibility of the Flight Surgeon to detect the illness in its incipiency.

(4) That neurotic behavior, an ofttimes escape mechanism, is infectious or contagious to other members of the group and is detrimental to morale.

(5) That the problem, etiologically, is essentially psychological; e.g., an anxiety type of reaction.

(6) That the pilot should be able to anticipate his leave well in advance; that leaves

should be regular and that they should be brief.

63. REFERENCES.

a. Articles.

(1) A Study of Some Factors in the Causation of Flying Stress. W.A.M. 153-6, F.P.R.C. 450

(2) An Enquiry into Psychological Disorders in Flying Personnel. W.A.M. 153-2, F.P.R.C. 412 (b).

(3) A Series of Cases with Psychological Disorder Examined in Relation to the Problem of Selection of Flying Personnel. F.P.R.C. 412 (a).

(4) Memorandum on the Use and Abuse of the Term "Flying Stress". F.P.R.C. 412.

b. Bulletins.

(1) A.A.F. Bulletin No. 42-6, Washington, February 26, 1942.

SECTION III
AERO-OTITIS MEDIA

64. DEFINITION. Aero-otitis media is an acute or chronic traumatic inflammation of the middle ear, caused by a pressure difference between the air in the middle ear and that of the surrounding atmosphere. Literally the term is translated and transposed to read aero-middle ear inflammation.

65. DYNAMICS. Ventilation of the middle ear is dependent upon the normal function of the Eustachian tube. When obstruction exists between the middle ear and the nasopharynx atmospheric pressure differentials are built up during flight which may be sufficient to cause pathologic changes in the mucosa of the middle ear.

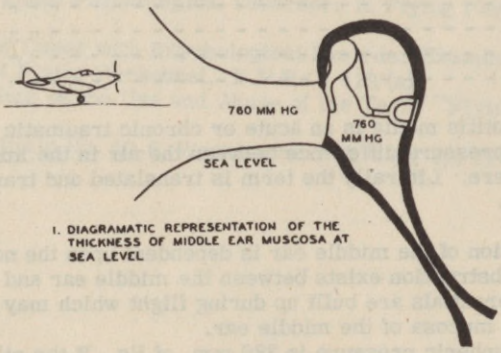
At 18,000 feet the atmospheric pressure is 380 mm of Hg. If the pilot is forced to dive to 5,000 feet, where the atmospheric pressure is about 632 mm. Hg., a difference of over 150 mm of Hg will exist between the middle ear and the external ear. This difference represents a column of mercury about 15 cm. high pressing against the drum. Fig. 13 illustrates diagramatically the factor of difference in atmospheric pressure on either side of the tympanic membrane involved in producing aero-otitis media.

66. DIFFERENTIAL DIAGNOSIS. The different traumatic inflammatory stages may easily be differentiated from the various stages of infectious otitis media. A history of flight usually simplifies the diagnostic problem.

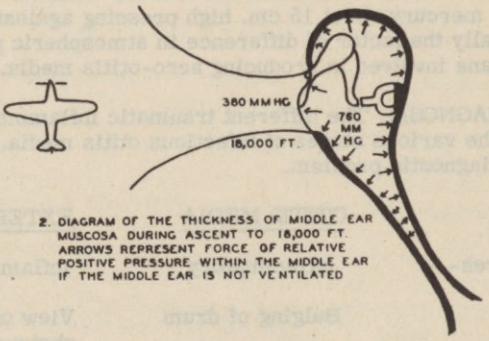
AERO-OTITIS MEDIA	OTITIS MEDIA	EXTERNAL OTITIS
1. Due to barometric pressure changes	Inflammatory	Inflammatory
2. Retraction of drum	Bulging of drum	View of drum may be obstructed
3. Drum land mark accentuated	Drum landmark obliterated	--
4. Rupture of vessels	Diffuse Erythema	--
5. No thickening of drum	Thickening of drum	May be thickening of drum if visible
6. Usually no fever	Fever usually present	May be fever
7. White blood count normal	White blood count elevated	White blood count elevated
8. Sero sanguinous fluid in middle ear	Serous or seropurulent fluid in middle ear	No fluid in middle ear
9. Deafness profound	Deafness profound	Hearing normal if canal not obstructed
10. No pain on pressure over tragus and movement of auricle	No pain or pressure over tragus and movement of auricle	Pain on pressure over tragus and movement of auricle
11. No swelling of canal	Slight if any swelling of canal	Swelling of canal

67. PROPHYLAXIS. The Air Crew should be advised against flying during episodes of rhinitis or nasopharyngitis. Discriminate selection and subsequent education with emphasis on the hazards of flying with rhinitis and nasopharyngitis will limit considerably the frequency of occurrence of aero-otitis media.

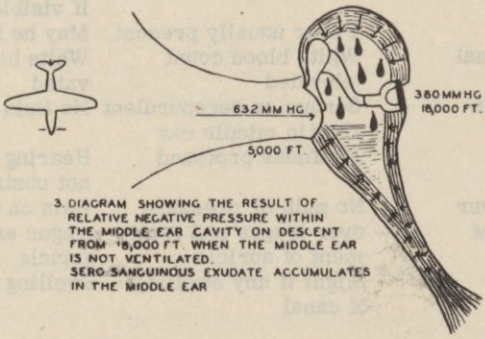
Recurrences of the disease should suggest meticulous search for infections of the up-



1. DIAGRAMATIC REPRESENTATION OF THE THICKNESS OF MIDDLE EAR MUSCOSA AT SEA LEVEL



2. DIAGRAM OF THE THICKNESS OF MIDDLE EAR MUSCOSA DURING ASCENT TO 18,000 FT. ARROWS REPRESENT FORCE OF RELATIVE POSITIVE PRESSURE WITHIN THE MIDDLE EAR IF THE MIDDLE EAR IS NOT VENTILATED



3. DIAGRAM SHOWING THE RESULT OF RELATIVE NEGATIVE PRESSURE WITHIN THE MIDDLE EAR CAVITY ON DESCENT FROM 18,000 FT. WHEN THE MIDDLE EAR IS NOT VENTILATED. SERO-SANGUINOUS EXUDATE ACCUMULATES IN THE MIDDLE EAR

FIGURE 13.

per respiratory tract and for evidence of allergy. Allergy is far more frequent than one is likely to suspect. The presence of eosinophiles in the nasal secretions is practically pathonomonic of nasal allergy.

68. TREATMENT.

AERO-OTITIS MEDIA	OTITIS MEDIA	EXTERNAL OTITIS
1. Vaso constriction to nasopharynx	Vaso constriction to nasopharynx	--
2. External heat	External head	External heat
3. Analgesics	Analgesics	Analgesics
4. Gentle politzerization	--	--
5. --	Paracentesis	Paracentesis contra-indicated
6. --	Sulfonamides	Sulfonamides may be of value
7. --	Hygroscopic medication in canal	Mild antiseptics in canal

In aero-otitis media conservative measures in the form of rest, analgesics or hypnotics for control of severe pain, and vasoconstriction to the nasal passages, are indicated. External heat to the ear is the most effective pallative treatment. The vasoconstrictions may be applied by dropper, atomizer or inhalator. Applications of liquid detergents are more effective when administered in the head-low position.

Relief from severe pain has been accomplished in some instances by the Proetz Displacement technique. Politzerization is effective for relief of pain and the concomitant deafness in mild cases of aero-otitis media. Catheterization of the Eustachian tube in experienced hands has not infrequently afforded relief of pain and alleviated the sensation of fulness in the ears. If unskillfully used it may cause undesirable trauma. Recovery, in most cases, will take place without treatment of any kind.

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SECTION IV
AEROSINUSITIS

70. DEFINITION. Aerosinusitis is a sudden or delayed traumatic inflammation of the paranasal sinuses caused by a pressure difference between the air in the sinuses and that of the surrounding atmosphere. The sinuses most commonly involved are the frontal and maxillary.

71. DYNAMICS. Ventilation of the paranasal sinuses depends upon a normally functioning nasal passage, free from obstruction. Certain deviations of the septum, redundant or inflamed tissues in and around the orifices or ostia of the sinuses may impinge on these openings in the manner of ball-valves and thus interfere with the exchange of air necessary to maintain pressure equilibrium at various altitudes (Figures 14 and 15).

When such an effect exists in flight the pressure differentials which result will produce pathologic changes in the mucosa of the sinuses. The process is very similar to that which takes place in aero-otitis media.

72. DIFFERENTIAL DIAGNOSIS. The different traumatic stages of aerosinusitis symptomatically resemble the various stages of infectious sinusitis. History of flight will aid materially in making the diagnosis, but will not obviate the possible existence of infection or allergy.

	INFECTIOUS SINUSITIS	ALLERGIC OR VASO-MOTOR SINUSITIS	AEROSINUSITIS
HISTORY	Acute U.R.I.	Recurrent sensitivity	Aerial flight
SYSTEMIC REACT.	Sepsis	Toxicity	None
C.C.	Headache with pain accentuated in the sinus	Heavy headache Sneezing, "watery" discharge	Severe, localized sinus pain
TEMPERATURE	Usually elevated	Subnormal or normal	Normal
LOCAL FACIAL FINDINGS	Tenderness, may have edema	May have tenderness	Usually have tenderness
NASAL FINDINGS	Inflammation, brawny edema Hypertrophy Pus	Pale, boggy edema Alternating obstruction Serous or mucoid discharge Hyperplasia Polyps and polypoid degeneration	Normal
NASAL SMEAR	Polymorphonuclear cells Causative organism	Eosinophilia Normal nasal bacteria	Normal nasal cells and bacteria

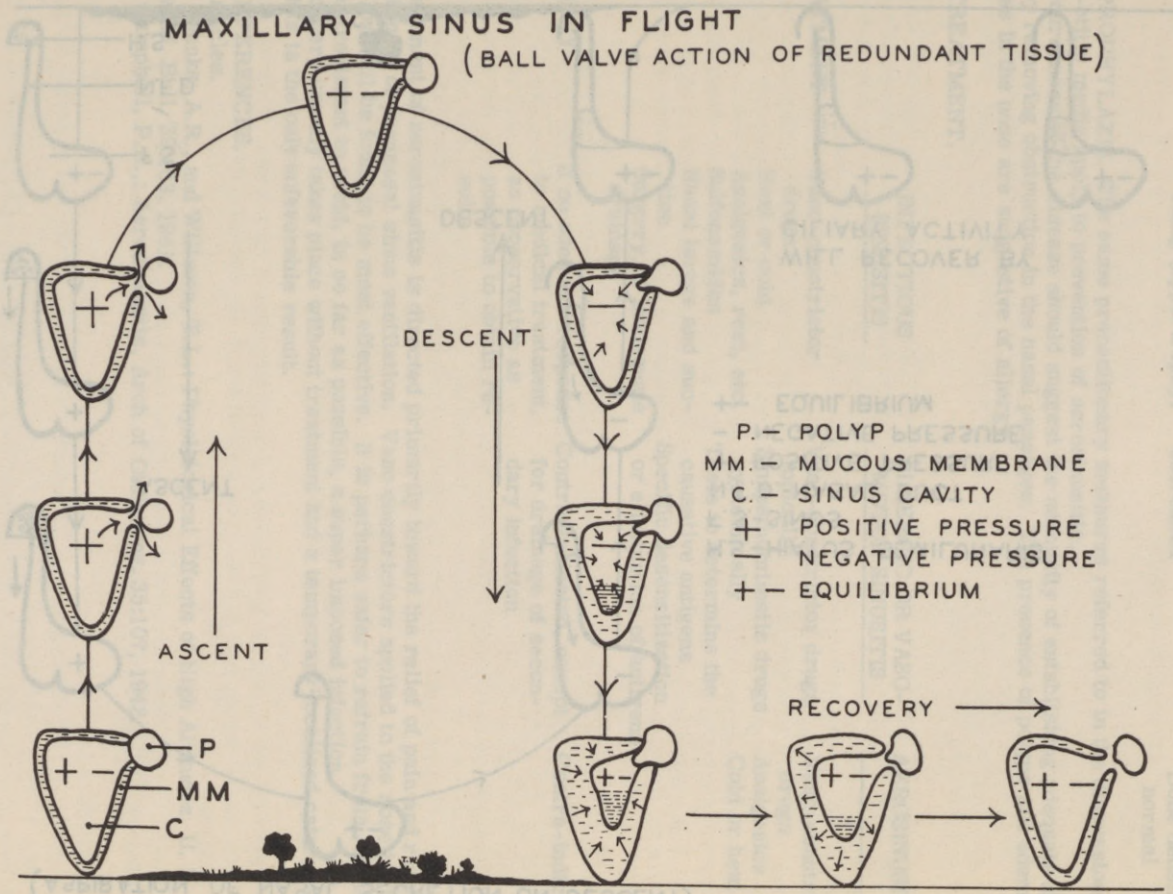
MAXILLARY SINUS IN FLIGHT
(BALL VALVE ACTION OF REDUNDANT TISSUE)
DESCENT
ASCENT
RECOVERY
P
MM
C
P.— POLYP
MM.— MUCOUS MEMBRANE
C.— SINUS CAVITY
+ POSITIVE PRESSURE
— NEGATIVE PRESSURE
+ — EQUILIBRIUM

FIGURE 14.

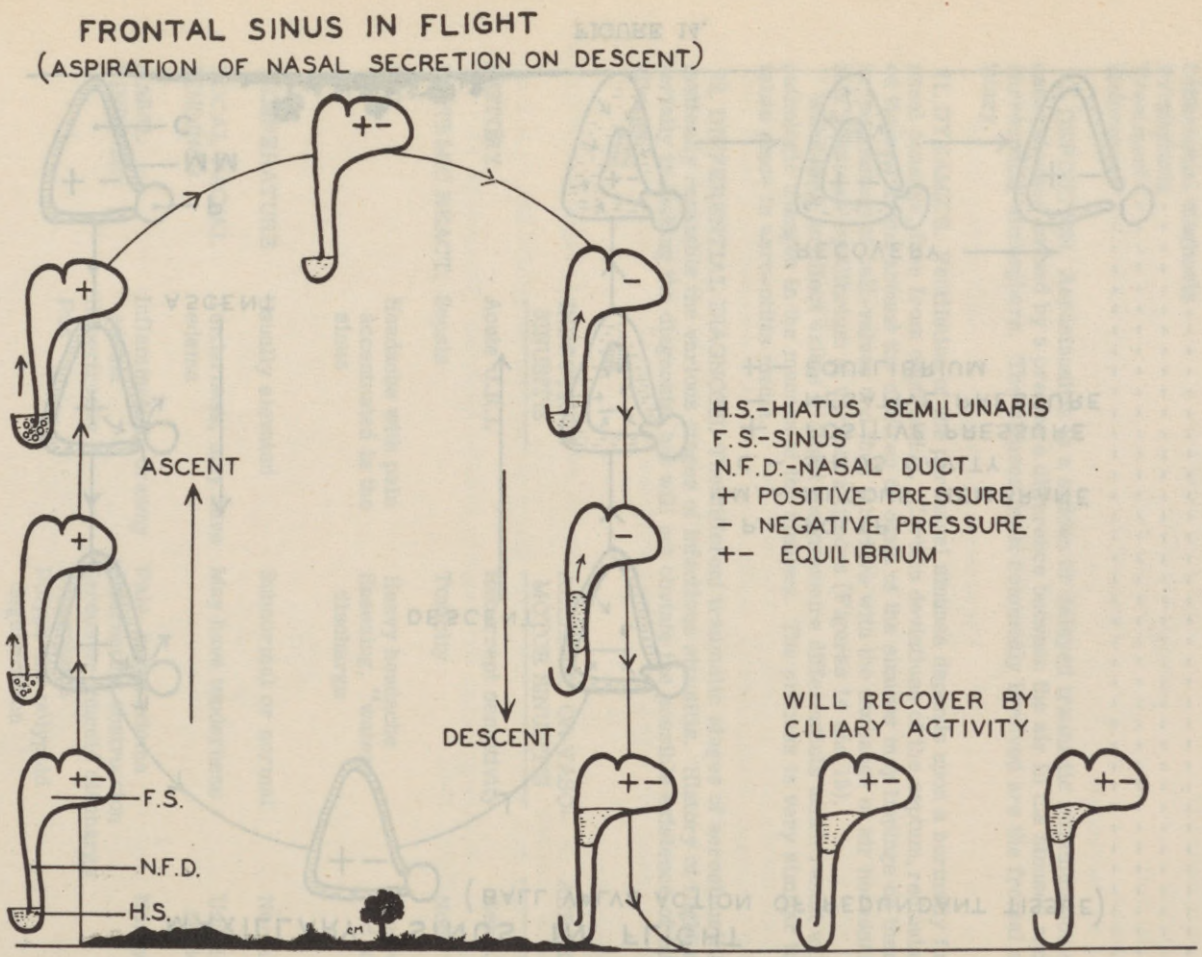
FRONTAL SINUS IN FLIGHT
(ASPIRATION OF NASAL SECRETION ON DESCENT)
ASCENT
DESCENT
F.S.
N.F.D.
H.S.
H.S.-HIATUS SEMILUNARIS
F.S.-SINUS
N.F.D.-NASAL DUCT
+ POSITIVE PRESSURE
- NEGATIVE PRESSURE
+- EQUILIBRIUM
WILL RECOVER BY
CILIARY ACTIVITY

FIGURE 15.

TRANS-ILLUMINATION	Affected anterior sinuses dull or "black"	Clear	Affected anterior sinuses dull
X-RAY	Opacity with increased bone density Regular mucosal thickening (hypertrophy)	Irregular mucosal thickening (hyperplasia) Bone density normal or decreased	Regular mucosal thickening (edema) Bone density normal

73. PROPHYLAXIS. The same precautionary measures referred to in the discussion of aero-otitis media apply to prevention of aerosinusitis.

Recurrences of the disease should suggest the necessity of establishing adequate drainage by removing obstruction in the nasal passages. The presence of polyps and edematous tissues in the nose are suggestive of allergy.

74. TREATMENT.

	INFECTIOUS SINUSITIS	ALLERGIC OR VASO-MOTOR SINUSITIS	AEROSINUSITIS
TREATMENT	Vaso-constrictor drugs Heat or cold Analgesics, rest, etc. Sulfonamides Nasal lavage and suction Surgery, if inadequate drainage	Vaso-constrictor drugs topically Sympathomimetic drugs systemically Tests to determine the causative antigens Specific desensitization or elimination of antigens	Vaso-constrictor drugs Analgesics Cold or heat
SURGERY	If no adequate response to medical treatment, as conservative as possible to obtain results	Contra-indicated, except for drainage of secondary infection	Contra-indicated

Treatment of aerosinusitis is directed primarily toward the relief of pain and reestablishment of paranasal sinus ventilation. Vaso constrictors applied to the nose in the head-low will be found to be most effective. It is perhaps safer to refrain from further topical treatment to avoid, in so far as possible, a super imposed infection.

Recovery usually takes place without treatment and a temporary localized catarrhal sinusitis is the only unfavorable result.

75. REFERENCES.

a. Articles.

(1) Behnke, A.R., and Willmon, T.L.: Physiological Effects of High Altitudes, U. S. Nav. M. Bull. 39:163, 1941.

(2) Campbell, P.A.,: Aerosinusitis, Arch of Otolaryng. 35:107, 1942.

SECTION V

CHANGES IN HEARING PRODUCED BY FLIGHT

76. FACTORS AFFECTING AUDITORY ACUITY. Three of the unalterable characteristics of flight affect auditory acuity. In order of magnitude of effect, they are noise, change in barometric pressure, and anoxia.

77. EFFECT OF NOISE. Noise in aircraft may at times reach the rather extreme intensity of 115 decibels. The resultant loss of hearing produced by such noise follows the general pattern of fatigue, and is reversible following rest. Contrary to expectation, there is little relationship between the frequency of sounds producing the decrease in hearing threshhold, and the frequency area of the hearing affected. For the most part, the frequencies of the noises of highest intensity produced by aircraft lie below 1,000 double vibrations per second, whereas the hearing range which is affected usually extends between the 4,000 and 6,000 frequencies. As the area used in normal conversation represents frequencies of from 300 to 3,000 double vibrations per second, speech intelligibility is not much affected However, if the insult is great enough, the area of loss may spread into this range. After many hours of exposure (300 to 12,000 hours), permanent notching of the curve of hearing may occur in some individuals.

78. EFFECT OF CHANGING BAROMETRIC PRESSURE. Barometric pressure alterations coincident with altitude change, may, if the eustachian tube is not ventilating the middle ear properly, also affect hearing. Any disruption in the equilibrium between the air pressure inside the middle ear and that of the outside atmosphere produces a form of conduction deafness, which in turn may affect any or all of the frequencies used in conversation. Again it is the rule that these changes are reversible, and hearing returns to normal after equilibrium is established, providing the changes produced by this condition (aero-otitis media) have subsided.

79. EFFECT OF ANOXIA. Little is known of the effect of anoxia upon the end organ of hearing. However, it is known that anoxia affects all nervous tissues, especially those of the higher functions.

80. EFFECT OF AGE. Age in itself produces a certain loss of high tones. This variation takes place decade by decade, and must be considered in the interpretation of the audiogram of any airman.

81. SUMMARY. The effect of all of these changes may be best demonstrated by a composite audiogram (Figure 16, Audiogram 4).

82. REFERENCES.

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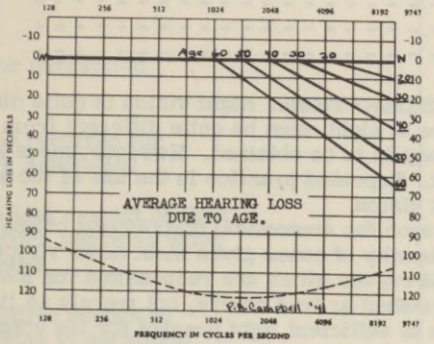
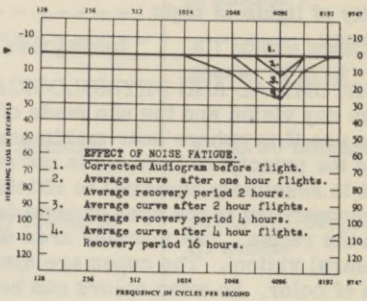


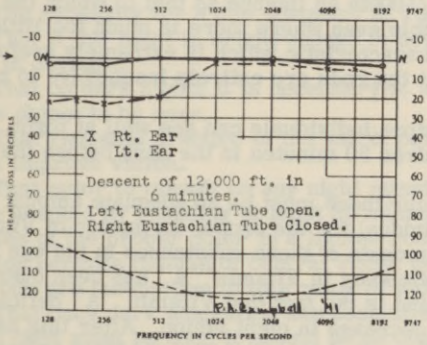
Audiogram 1

Effect of age upon hearing acuity.



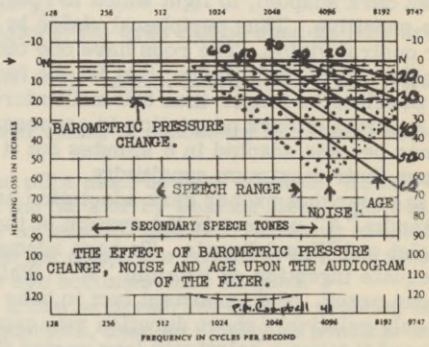
Audiogram 2

Example of the effect of noise upon hearing acuity.



Audiogram 3

Example of the effect of barometric pressure change upon hearing acuity.



Audiogram 4

Composite audiogram demonstrating the effect of age, noise and barometric pressure change upon hearing acuity.

FIGURE 16. Audiograms demonstrating changes which must be considered in the analysis of the hearing of an airman.

SECTION VI
NIGHT VISION

83. ANATOMICAL AND PHYSIOLOGICAL CONSIDERATIONS. Night vision is quite different from day vision and the use made of the eyes at night must be quite different from the daytime use if anywhere near maximum efficiency is to be obtained. However, mere knowledge of the principles involved is not sufficient. Repeated practice in the use of the eyes at night is absolutely essential to efficient night vision.

The proper use of the eyes at night is based upon the anatomical distribution of end organs in the retina. The macular area with its density of cones gives most acute vision by day (central vision). The cones are also the end organs which are responsible for the perception of color. So when colors can be distinguished as true colors, not merely as lighter or darker shades of grey, it is known that there is sufficient light present for the cones of the central visual area to function.

The cones have one very serious limitation, however. They are not capable of functioning in light of less intensity than moonlight. When light becomes less intense than moonlight, the individual has a central blind spot and cannot see things at which he is directing his gaze.

The rods in the peripheral portion of the retina give only gross vision both day and night. Small objects are not picked up by peripheral vision. The rods cannot distinguish color, all colors being seen as varying shades of grey. They can, however, become sensitive, when dark adapted, to light which is roughly 1/1000th as intense as that to which the cones are sensitive. Thus peripheral vision is possible even where there is much too little light for central vision. The rods have one other characteristic which is extremely useful in the application of night vision; that is, the fact that the rods are entirely insensitive to red light of wavelengths longer than 600 millimicrons.

A period of dark adaptation is necessary before individuals can see well at night. The cones become adapted in 8 minutes but it requires 30 minutes in the dark before the rods reach their maximum sensitivity.

In order that proper dark adaptation can occur there must be an adequate amount of Vitamin "A" present in the system of the individual for the proper formation of Visual Violet and Visual Purple. To have adequate amounts of these substances in the eye requires adequate ingestion of Vitamin "A". While deficiency in Vitamin "A" has been overrated, it can occur. The important fact to bear in mind is the fact that Vitamin "A" deficiency of only relatively short duration may cause a decrease in night vision. After this has occurred it takes a relatively long period (3 to 6 months) to return the condition to normal even with large doses of Vitamin "A". Prevention is thus much more effective than cure. Vitamin "A" or its precursor Carotene is obtained in the diet by ingestion of vegetables or fruits containing chlorophyll(those that are or have been green during growth, especially carrots and spinach), from butter, cheese, cream, eggs, liver, etc. If an adequate diet is ingested, added Vitamin "A" is not effective in increasing night vision.

Dark adaptation is an individual process in each eye. Thus if one eye is closed it will become dark adapted even though the other eye is being exposed to bright light.

At present no drug is known which will increase night vision.

Efficient night vision is decreased by age, significantly so over 35 years of age; by anoxia, significantly so over 5,000 feet, and by anything which decreases general physical efficiency such as fatigue, drinking or excessive smoking.

84. SUMMARY OF VISUAL CHARACTERISTICS OF RODS AND CONES.

	Cones	Rods
Visual Acuity	Very acute for form	Not acute for form but very sensitive to motion
Color perception	Colors recognized	All colors seen as shades of gray
Time required for Dark Adaptation	About 8 minutes	About 30 minutes
Smallest amount of light to which sensitive when adapted.	About 1/1000th ft. candle	About 1/1,000,000th ft. candle
Sensitive enough to function in moonlight	Yes	Yes
Sensitive enough to function in starlight	No	Yes

85. PRACTICAL APPLICATIONS. From a study of the above facts the following practical applications should be pointed out to Air Forces personnel:

a. The necessity for a diet adequate in Vitamin "A".

b. That if the night is bright enough to detect colors, the eyes can be used as they are used in daylight.

c. That on dark nights it is necessary to look 10^{o} - 15^{o} above, below or to either side of the object to be seen.

d. That repeated practice of the use of peripheral vision is necessary and that it will much improve vision.

e. That prior to takeoff on any night mission the pilot must be dark adapted. He can become adapted by spending at least 30 minutes in the dark or by wearing light-tight red goggles of the proper color in a lighted room for at least 30 minutes. Wearing of the red goggles permits the use of central vision because the cones are sensitive to it but since the rods are insensitive to this color of light the eye becomes dark adapted.

f. That once dark adaptation has been attained it can be preserved only by avoiding light. When light must be used it should be as dim as possible, used as briefly as possible and should be red light if that can be used. The pilot should be so familiar with his ship that all gauges that can be read by the sense of touch are not illuminated.

g. That if exposure to light becomes unavoidable, dark adaptation can be preserved in one eye by closing it during exposure to light. This is especially useful if caught in a searchlight, if maps or instruments must be read, etc.

h. That a slowly roving gaze should be used as the eye is more sensitive when used in this fashion.

i. That objects are seen at night only by contrast differences, being either lighter or darker than their backgrounds. These contrast differences will be reduced by light reflected on the windshield or goggles, by fog, haze or scratched or dirty windshield or goggles. Goggles or windshields must be spotlessly clean for night operations.

j. That contrast differences should be used to aid in finding enemy planes and hiding their own ships. Thus in flying over dark areas such as land, fly below the enemy. Flying above white clouds, desert, moonlit water or snow, they should fly above the enemy.

k. That peripheral vision is very gross and large retinal images are required to see things at night. Therefore, enemy planes should be followed either above or below where they form large retinal images. When seen from directly behind they form such a small retinal image that they are apt to be lost.

l. That oxygen should be used on night missions from the ground up to prevent poor night vision.

m. That adequate rest and the best possible physical condition are required to have satisfactory vision.

86. VISIBILITY OF LIGHTS AT NIGHT. Light in the blue end of the spectrum is seen more easily by the rods than any other. If used just above minimum threshold, only the gross vision of the rods is available and it requires an adapting period of 30 minutes before it can be used. It can be seen by the enemy throughout his visual field so he can readily pick it up if it strikes any part of his peripheral retina. If the light is made bright enough to use central cone vision it is 1,000 times as intense as a minimal stimulus and can be seen at a great distance.

Red light of over 600 millimicrons in wavelength however, is not seen by the rods at all. If just above threshold cone vision can be used and an adapting period of only 8 minutes is required. In order to see it the enemy must be looking directly at it. By actual test red light of intensity just above the cone level can be seen only 1/10th as far as blue light just above the cone intensity level.

Red light is therefore preferable for illumination of objects subject to enemy observation. White light is next best and blue light the poorest.

87. REFERENCES.

a. Articles.

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(2) Macdonald, R., and Adler, F.H.: Effects of Anoxemia on Normal and Vitamin A Deficient Eyes, Arch. Opth. 22:980, 1939.

(3) Mandelbaum, J.: Physiological and Clinical Considerations of Dark Adaptation, Arch. Opth, 24:203, 1941.

SECTION VII
DECOMPRESSION SICKNESS

88. DEFINITION. The physiological effects on some individuals of reduced barometric pressure, independent of the effects of hypoxia or anoxia.

89. SYNONYMS. For the manifestations arising from the evolution of gases in the blood, body fluids and tissues the synonyms are aeroembolism, nitroembolism, aeroemphysema and aerial bends.

90. DYNAMICS. Reduced barometric pressure produces:

a. Hypoxia and anoxia - decreased partial pressure of alveolar oxygen (See Ch. 5).

b. Decompression sickness. The term is now used to include the manifestations arising from:

(1) Expansion of gases in closed cavities.

(a) Ears and sinuses (See Ch. 4, Sections III and IV).

(b) Gastro-intestinal tract. - "Gas Pains".

(c) Teeth - especially in those with caries or large fillings.

(2) Evolution of gases in blood and tissues. Bubbles, consisting chiefly of nitrogen but also of oxygen, carbon dioxide, other gases in the body, and water vapor are formed in the blood and in the tissues.

91. SYMPTOMS.

a. From trapped gases they are purely mechanical. Special symptoms arise from the expansion of gases in the nasal sinuses and in the ears (See Sections III and IV).

b. From the evolved gases (the so-called "nitrogen" bubbles) symptoms are dependent upon the size of the bubbles (increase in size by coalescence and by expansion as altitude is increased), their location (high nitrogen content in fat and nerve tissues) and the state of tissue in which they occur (activity leads to symptoms).

(1) In inelastic structural tissues (bones, joints, tendons) pressure of the bubbles is greatest. The symptoms resulting are called "bends" and consists of severe progressive pain in and around the joints, especially the larger ones. These are the most frequent severe symptoms.

(2) In soft tissues (skin, subcitaneous fat, muscle) the effects are in either the vascular or nervous elements. This produces paresthesias as "itch" or "creeps" and also various skin rashes. These are the most common symptoms but usually are not severe.

(3) In the cerebro-spinal system (brain, spinal cord and peripheral nerves) the "bubbles" may produce "palsy", "paralysis", "fits", "staggers", "visual defects", and collapse. These are infrequent but are the most serious symptoms.

(4) In the chest the "chokes" occur and account for about 10% of the severe symptoms. They usually start as a burning sensation under the sternum, which becomes more severe in time, and is usually painful and is accompanied by a desire to cough and a sense of suffocation. In some cases the pain is absent.

(5) The cardio-vascular system is rarely involved as such. Bubbles can form in blood vessels and be carried to any part of the body.

(6) In the gastro-intestinal system the greatest difficulty arises from expanding trapped gases on ascent. Other phenomena are very infrequent.

(7) The genito-urinary system is rarely involved.

92. FACTORS CONCERNED IN PRODUCTION OF SYMPTOMS.

a. Individual susceptibility. In general symptoms are more common in older persons, and in obese persons, but there are many unknown factors in individual susceptibility.

b. Rate of ascent. The slower the ascent the better altitude is tolerated.

c. Altitude attained. Symptoms seldom occur below 30,000 feet.

d. Length of time at altitude. Appearance of symptoms is apt to be delayed. If none appear in 4 hours they are unlikely to occur.

e. Temperature. Cold may aggravate all the symptoms.

93. DIAGNOSIS. History of exposure to reduced barometric pressure simplifies the diagnosis. For cases occuring during flight a conclusion must depend on self-diagnosis by members of the crew. Instruction of all personnel is therefore important. In a crash from a high altitude, this diagnosis must always be considered as a possible contributing cause.

94. TREATMENT.

a. Active. Recompression to 25,000 feet relieves "bends". In cases with "chokes" or cerebro-spinal symptoms a return to ground level should be accomplished as soon as possible. All bubbles must be eliminated from the body and equilibrium again established between internal and external environment before again proceeding to altitudes above 30,000 feet.

b. Prevention.

(1) Selection. Attempts to detect susceptible individuals are made in the Altitude Training Program. Several flights are of more value than a single one in determining individual susceptibility.

(2) Prophylaxis.

(a) Slow ascent or limited ceiling may prevent symptoms of aeroembolism, but not always symptoms caused by trapped gases in body cavities.

(b) Denitrogenation - Wash out dissolved nitrogen in the body by breathing additional oxygen on the ground prior to ascent or during slow ascent below levels of about 20,000 feet. 100% oxygen is necessary only when rapid ascents are made. Exercise while breathing increased percentages of oxygen is of little value and may be dangerous if personnel is exposed to low temperatures. Exercise above 30,000 feet will produce "bends" around the joints used.

(c) Use of pressure cabins or pressure suits.

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a. Texts.

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b. Memoranda.

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c. Manuals.

(1) TM 1-705, Physiological Aspects of Flying.

d. Letters.

(1) WD, Hq, AAF, November 15, 1942, Subject: Altitude Training Program.

SECTION VIII
AIRSICKNESS

96. DEFINITION. Airsickness is a term now generally used to describe a symptom complex that results from alterations in the speed and direction of motion experienced in aircraft. It is a form of motion sickness and is analogous to seasickness, trainsickness, and carsickness. It should not be confused with other variations from normal, manifested at times by flyers, such as anoxia, decompression sickness, and aero-neurosis.

97. ETIOLOGY. a. The primary factor in the production of airsickness is the motion of the aircraft in flight. No precise analysis of the random motion of aircraft has been accomplished to date. From subjective analysis, the types of random motion taking place during attempted straight and level flight may be classified as follows:

(1) Lateral rotation - a deviation of the vertical axis of the aircraft through variable arcs at a right angle to the long axis.
(2) Scending - vertical acceleration either up or down.
(3) Pitching - a rapid change, tending to be irregular, of the long axis of the aircraft in which the nose and tail deviate vertically in opposite directions from a parallel to the line of progression.
(4) Yawing - the tail of the aircraft swings in an arc from a relatively stable nose that remains on the axis of progression.
(5) Any combination of the above motions.

b. These motions of the aircraft in flight are for the most part due to:

(1) Atmospheric conditions.
(2) Design of the aircraft.
(3) Load distribution.
(4) Control efficiency of the pilot or automatic pilot.
(5) Any combination of the above.

c. In addition to the random motions described above which may occur in attempted straight and level flight the motion of the aircraft induced by standard flying maneuvers and, more important, the motion secondary to aerobatics and combat flying, contribute to the production of airsickness.

d. The amplitude of motion to which any occupant of an aircraft is subjected is a function of his position relative to the center of rotation of that particular aircraft.

98. SYMPTOMS. a. A previously well individual becomes ill during flight. The usual order of occurrence of symptoms is as follows. An epigastric awareness gradually progresses to nausea. Concurrently salivation is increased, pallor develops, sweating is noted, and the individual loses his general feeling of well being. Yawning may occur. If the stimulus continues the symptoms progress until the subject feels utterly wretched, volition disappears, any constructive task seems impossible, nausea progresses and vomiting occurs. Seldom is headache and vertigo present. The act of vomiting may temporarily relieve the other symptoms and an approach to a feeling of well being may recur only to disappear in another cycle of symptoms.

b. No consistently noteworthy changes in blood pressure, pulse rate, blood chemistry or respiration can be measured. Loss of gastric tone and peristalsis associated with pylorospasm is usually seen. All symptoms usually subside without sequelae soon after the stimulus is eliminated either by landing the aircraft or by encountering smooth flying conditions.

99. PHYSIOLOGICAL MECHANISM. Apparently every individual is susceptible to air-

sickness when the motion of the aircraft is of sufficient degree or is prolonged. Individual susceptibility varies within wide limits. No adequate explanation for this individual variation in susceptibility is available. It can be said that as groups the blind, the deaf, the tabetic, the insane, and infants are relatively immune. Experimentally, dogs that are blindfolded, subjected to labyrinthectomy or placed in plaster casts to restrict movements of their extremities are made less susceptible to induced motion sickness. These pathologic or experimentally induced states, as well as the immaturity of infancy, have in common the elimination or minimization of sensory stimuli reaching the brain stem, or the impairment or underdevelopment of the cerebral cortex. The sensory stimuli so attenuated are all related to the individuals mechanism for maintaining equilibrium in space. This equilibratory mechanism includes the vestibular apparatus, the ocular system, and muscle and joint sensations. Of these the vestibular apparatus is probably the most important.

When the equilibratory mechanism is normal it functions well while the individual pursues his hereditary forms of locomotion. This same mechanism, however, when subjected to the unusual motion of aircraft transmits the sensations of a constantly changing position in space to the centers in the brain stem. In addition, these centers are bombarded by afferent stimuli from the viscera and from the vascular system.

Apparently each individual has a level at which these multitudinous and unusual stimuli, when they are of sufficient intensity, will produce the symptom complex of airsickness. This level of susceptibility varies greatly. Roughly it is found to be high in stable individuals and lower in the unstable races and types. In each individual this level of susceptibility can be lowered temporarily, and apparently at times permanently. Apprehension, anxiety, fear, fatigue and physiologic variations such as are produced by recent over-indulgence in alcohol and dietary indiscretions may lower the level of susceptibility.

100. INCIDENCE. a. The incidence of airsickness among trainees for air crew varies. Between 10% and 15% of all trainees become airsick at least once during training but only about 5% are airsick more than once. The "washout" rate because of chronic airsickness is between 0.5% and 1.5% for all members of the air crew but is highest in the pilot and navigator classifications.

b. From 3% to 9% of 10,000 airborne infantrymen were found to be susceptible to airsickness during flight in troop carrying aircraft. Airsickness is a relatively unimportant problem among pilots probably because the most susceptible are eliminated before they get their wings. Even in an experienced air crew, however, all members may become airsick while the pilot remains immune. His relative immunity under these circumstances is attributed to his feel of the aircraft on the controls. He is thus able to anticipate part of the motion and makes bodily adjustments accordingly.

101. PREVENTION AND TREATMENT. a. Complete prevention of airsickness in military aircraft is impossible because the design of the aircraft and the weather in which it flies are determined by its mission. At times, however, the method of completing the mission might be modified so that smoother air levels could be flown and personnel, during a variable proportion of the flight, should be allowed to ride in parts of the plane where motion is at a minimum. Violent and unnecessary maneuvers might be avoided. Aircraft with relatively stable flying characteristics might be produced in greater numbers at the expense of less stable aircraft.

b. Selection of personnel offers the best method of preventing airsickness. Individuals with a history of other forms of motion sickness are known to be more susceptible to airsickness than those who have never been seasick, trainsick, carsick, etc. A properly administered ARMA should eliminate the unstable types. Tests for motion sickness that correlate well with airsickness should be applied to all candidates for air crew training. Such tests are now being developed.

c. Apparently 50% of those who experience airsickness become relatively immune after a time. This is probably due to the gradual decrease in apprehension associated with early flying, and a resultant rise in the threshold of tolerance to motion.

d. No adequate studies have been made concerning the effects of diet on the prevention of airsickness. There seems to be great individual variation in the matter of a full or empty stomach and the ratio of fluid to solid food intake immediately before or during flight. Each individual seems to have his own favorite feeding schedule.

e. Drug therapy aimed towards the prevention or amelioration of airsickness has been adopted directly from seasickness therapeutics. None of these drugs can be safely used by members of the air crew because of the disadvantages of their side effects. (See Ch. 4, Section X).

f. Airsickness is self limited. If it occurs it needs no treatment per se.

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SECTION IX
INSTRUMENT FLIGHT

103. DEFINITIONS. a. Instrument flight is defined as the method by which flying is accomplished when the pilot is unable to maintain direct or indirect (celestial) visual reference to the earth. The actual conditions under which such flights are made were originally defined as blind flight but the term has gradually given way to "instrument flight", and the pilot with special training qualifying him to make such flights is said to hold an instrument rating.

b. Aerial equilibration and aerial orientation have somewhat different meanings although they are frequently used syonomously. "Aerial equilibration" is defined as the awareness of the pilot of the attitude of his airplane with respect to the earth's surface. "Aerial orientation" is the awareness of the pilot of the spatial relationship between his airplane and some fixed point on the earth's surface.

104. BODILY EQUILIBRIUM. a. Maintenance of equilibrium of the human body depends upon sensory impressions arising from:

(1) The eyes.
(2) The vestibular apparatus.
(3) The joints, muscles, tendons, viscera, and skin.

b. For maintenance of balance, at least two of these three mechanisms must be functioning.

c. As soon as an airplane leaves the ground the pilot loses the normal kinesthetic stimulus of direct or indirect contact with the earth's surface. If, in addition, visual reference with the earth is lost the relatively crude kinesthetic mechanism may easily mislead the pilot. For example, pressure on the seat in a turn may be interpreted as climbing; a decrease in this pressure as the turn is ended may be interpreted as falling.

d. Further, in instrument flight the vestibular apparatus is unaided by visual sensations, and perhaps hindered by kinesthetic stimuli erroneously interpreted by the cerebrum. The vestibular apparatus itself is notoriously untrustworthy in flight, for it is stimulated only when there is a certain minimum rate of change in turning movement (2° per second per second). Turning, if it is gradual or of constant rate, is not perceived presumably because under these circumstances the movement of the endolymph does not differ enough from the movement of the semicircular canals themselves to stimulate the sensory end organs in the ampullae. If, on the other hand, a turn which has gone on for some time suddenly ceases then the fluid continues to move in the direction of original turn after movement of the canals has stopped. It mechanically stimulates the sensory receptors and gives a sensation of turning in the opposite direction.

105. SENSORY ILLUSIONS IN FLIGHT. The limitations of the equilibratory apparatus lead to dangerous sensory illusions in instrument flight which must be overcome by implicit faith in the instruments. These illusions arise both from deliberate and random movements of the aircraft, and play an important part in the development of airsickness during blind flight. Among these illusions may be listed the following:

a. The feeling of ascent while turning.
b. The feeling of descent on recovery from a turn.
c. The feeling of tilt to the opposite side during a shallowly banked turn.
d. A feeling of turning during a straight and level flight.
e. A feeling of spinning in the opposite direction after cessation of a spin.
f. A sensation that a wing continues low if it should dip abruptly but return slowly to its original position.

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SECTION X
DRUGS IN RELATION TO FLYING

107. MODIFYING FACTORS. Two of the most frequently encountered modifying factors of of drug action found in the flyer are:

a. Anoxia.

b. Fatigue.

108. SULFONAMIDES. Anoxia may appreciably modify the action of the sulfonamide drugs. The toxic effects of particular interest at altitude are:

a. Mental disturbances which may be accentuated by anoxia and are particularly dangerous because they come on suddenly.

b. Nausea and vomiting. This may not be serious at ground level but may be dangerous at high altitudes when an oxygen mask is being worn.

c. Loss of available hemoglobin. This may be due to a gradual production of a secondary anemia or the rapid production of a hemolytic anemia. It also may be the result of methemoglobin or sulfhemoglobin formation which occurs occasionally with all of the sulfonamides but is much more apt to occur after the use of sulfanilamide.

d. Frequently the application of large quantities of the sulfonamides, particularly sulfanilamide, to a large wound or burned area results in the extraordinarily rapid absorption of sufficient sulfonamide to produce a marked cyanosis. This is probably in large part due to methemoglobinemia, and may also be of importance in the high altitude transportation of patients because of reduction in available hemoglobin.

e. Although in some ways the toxic reactions following sulfanilamide administration are more frequent than after any other sulfonamide, there may be some advantage in preferring sulfanilamide for local use on large burned areas where there is already a potential source of renal damage, since the solubility of both sulfanilamide and the acetylated sulfanilamide are much higher than of any other sulfonamide in common use.

f. Flying personnel are not permitted to participate in aerial flights while receiving sulfonamide therapy or for six days after the last dose of the drug (See Ch. 10, Section V).

109. CARBON MONOXIDE AND OTHER TOXIC FUMES. While in the usual sense of the word these are not drugs, they are frequent causes of a low tolerance to anoxia and should be suspected when no other obvious cause is known. (See Par. 152).

110. ARSENICALS. a. There is evidence that the action of arsenic upon protoplasm is essentially an interference with the oxidation - reduction processes in the cell. Theoretically, therefore, arsenic may cause symptoms of tissue anoxia with degrees of anoxic anoxia which ordinarily give rise to no symptoms. Proof of this is lacking, however.

b. On the basis of these considerations and on the basis of the slow excretion of arsenicals (80% mapharsen excreted in one week), it is probably desirable for flying personnel to avoid high altitude missions during and immediately after receiving a course arsenicals.

111. ATABRINE. It has been suggested that atabrine may diminish tolerance to anoxia. While the evidence for this is not conclusive, there is a tendency to prefer quinine for the prophylaxis of malaria in flying personnel.

112. USE OF DRUGS IN FATIGUE. When inadequate rest has been obtained or when long, fatiguing aerial missions must be undertaken the use of caffeine or benzedrine may be indicated. Both drugs are useful in producing sleeplessness and diminishing the sensation of fatigue.

a. Caffeine: This drug may be given in doses of 0.3 Gm. of pure alkaloid or 0.5 Gm. of caffeine sodium benzoate.

b. Benzedrine sulfate: Used in doses of 5 to 20 mg. It is more powerful than caffeine. The effects are appreciable about one hour after administration and continue for 8 to 12 hours. If excessive sleeplessness is produced this may usually be counteracted with a sufficient dose of ethyl alcohol as ordinary whisky, or other suitable beverage at the end of the mission.

113. USE OF DRUGS IN AIRSICKNESS. In general the drug therapy of airsickness is unsatisfactory (See Ch. 4, Section VIII). Atropine, 1.0 mg., or scopolamine (hyoscine), 0.5 mg., may be effective.

Some of the shorter acting barbiturates may be effective but are undesirable in pilots for they may produce undue central nervous system depression.

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SECTION XI
THE PSYCHONEUROSES AND PSYCHOTHERAPY

115. GENERAL. a. The psychoneuroses constitute a group of reactions which are first in importance, from a psychiatric point of view, to the practitioner of military or aviation medicine. Approximately 80% of all psychiatric casualties in the armed forces fall in this group. In this connection it is well to bear in mind that many conditions diagnosed as medical, surgical, orthopedic, etc., might also well be classified here. Some observers have estimated that as high as 25% of the cases seen in the general wards of army hospitals should properly be diagnosed as psychoneurotic.

b. The two important factors to be considered in the development of a psychoneurosis are the personality of the individual involved, and the environmental situation. The psychoneurotic reaction represents an effort on the part of the individual to adapt the personality to the situation. A psychoneurosis may be thought of further as the existence of an emotion in an unusual degree or for an unusual period after the stimulus has occurred. The emotion with which we are concerned here is anxiety, an expression of the primary emotion of fear. The environmental situation in the Army is ideally suited to the production of this emotional reaction, and the environment of aviation is peculiarly suited for its production. Fear, or anxiety, is the natural result of the frustration resulting from conflict. This reaction may arise as readily from a threat to self-esteem as from a threat to self-preservation. Its end-results are the same in either case, and its effects are cumulative in nature.

c. From the moment that a man leaves the ground he is subject to one of the most inherent fears that man is subject to - the fear of falling. He may become conditioned to it, and he may learn to ignore it, but it is with him always, and is constantly being reawakened by new or unusual situations. The conditions under which the operational pilot works are conducive to the development of a high degree of anxiety and apprehension, both on and off the ground. Here again, the individual may be able to partially suppress or repress his fears, but the very fact that they exist, is productive of new conflicts, making him uncertain and doubtful of himself.

d. The psychoneuroses are reactions which result from repeated conflicts with attendant anxiety, repression, and an increased dynamic drive which finds expression in physical and mental symptoms. These symptoms represent the effort of the personality to adapt itself to the existing environment. The symptoms are as real, as disturbing, and as incapacitating as any symptoms resulting from organic pathology, and physiological changes may be produced through the agency of these emotional disturbances.

116. NEURASTHENIA. This is a form of psychoneurosis in which the patient attempts to transfer the anxiety and worry which arises from mental conflict, to anxiety and worry regarding physical symptoms.

a. Symptoms. There are certain general symptoms of neurasthenia which are so frequent in occurrence that they cannot be over-emphasized.

(1) Continuous fatigue, accompanied by a low ebb of interest. Characteristically, the patient complains of fatigue being worse in the morning, and improving in the evening. His "rest doesn't do him any good".

(2) Loss of weight. This is due in part to dietary idiosyncrasies which these patients develop and also to the fact that they do rest poorly. Here again, the complaint is that "his food doesn't do him any good".

(3) Headache. The headache complained of may be either occipital or frontal or both and the classic complaint is that of a feeling of a bandlike constriction around the

head.

(4) In addition to these more or less cardinal symptoms these patients complain of a host of other symptoms, with which every physician is familiar, referable to every system in the body. They include nausea, constipation, abdominal discomfort, palpitation of the heart, excessive perspiration, urinary frequency, nocturia, dysuria, dyspnea and low back pain. The latter seems to be a particularly frequent complaint in pilots.

(5) The nervous and mental symptoms are largely insomnia, inability to concentrate and mild depression of mood.

b. Predisposition. Neurasthenia occurs in disappointed, discouraged people, who are doing a job they do not like. They fear rejection because of failure and they want to stop functioning. There are some goal-seeking aspects to the reaction in that the conditions wins pity and attention and brings an illusion of being wanted and looked after. It also justifies laziness, increased sleep, etc., to a certain extent.

117. HYSTERIA. As described here this sub-classification includes only the so-called conversion phenomena and in this reaction the mental conflict is converted into physical symptoms which serve to solve the conflict or to gratify a disguised wish. The type of personality developing hysteria is usually characterized by mental instability, abrupt emotional changes, exaggerated self-consciounesss and susceptibility to influence.

a. Symptoms. The physical symptoms of this condition occur in both the motor and sensory fields.

(1) The motor symptoms are largely concerned with paralyses and/or contractures. Usually only an extremity is involved, but hemiplegias do occur.

(2) The sensory symptoms include anaesthesias and hyperesthesias which are often associated with the paralyses, amblyopia of varying degree, deafness and hyperacusis.

(3) The nervous and mental symptoms include the hysterical fugue in which the individual engages in a series of complicated acts for which he has no memory afterward, and the dream state in which there is an apparent partial clouding of consciousness. The dream state often terminates in convulsions, which may also occur independently. Pseudo-faints are also common. Absent corneal and pharyngeal reflexes are frequently seen.

(4) The complaints of globus hystericus or a feeling of a "ball in the throat" and clavus or a feeling of sharp object being driven into the head are fairly common.

b. Predisposition. Hysteria occurs in individuals who are outgoing and dependent and who need and seek attachment to others. In general, the intellectual level is usually relatively low. The symptoms are reactions to stress, by which the patient seeks to avoid responsibility, but the symptoms may become habitual and persist after the stress has passed. The symptoms may be a defense reaction (blindness to avoid unpleasant sights, etc.) but in general they are expressions of helplessness and a bid for protection.

c. Differential diagnosis. The chief condition giving difficulty from a differential standpoint in hysteria is malingering. The differentiation lies in the conscious element and is often difficult to establish. It must be remembered that a mixture may exist, and that what began unconsciously, may later be motivated consciously.

118. PSYCHASTHENIA. This is a reaction characterized by doubt and hesitation, and fixed, though recognized by the individual as irrational ideas, and actions resulting from these ideas. Both the ideas and the action are usually so bizarre as to materially interfere with the leading of a normal life and the forming of normal relationships. Such individuals are vacillating, hesitant and uncertain of themselves, and are attempting to cope with their conflicts through increased repression.

a. Symptoms. The symptoms of this reaction fall in the following groups:

(1) Obsessions and compulsions.

(2) Impulsions.

(3) Phobias.

b. Predisposition. Psychasthenia occurs in individuals of an extremely orderly, idealistic personality, who are conscientious and often stubborn. They feel a great need for security and safety and they fear their own decisions. They are trying to establish an environment in which decisions are not necessary, and in which nothing unexpected can

happen. The obsessive ideas usually have to do with injury to self and the compulsive feelings therefore most often deal with violence or counter-attack. The impulsion is a reaction of hostility to a threatening environment, and the phobia usually is an expression of displacement of a fear from one situation to another. The psychasthenic is usually of a relatively high intellectual level, and has a realization that his ideas are absurd, yet he cannot avoid them. This reaction is of particular interest in aviation because fear of heights, compulsions to jump, etc., are common manifestations.

119. ANXIETY STATE. This is a reaction characterized by feelings of anxiety or apprehension which may arise at first from a real cause and later become habitual. In the latter case the anxiety becomes "free-floating" and is not consistently referred or attached to any specific stimulus. The individual developing the anxiety reaction admits his inability to cope with his conflict by any of the methods previously described.

a. Physical symptoms. These symptoms are the physical accompaniments of fear and include dry mouth, rapid heart, excessive perspiration, nausea, vomiting, diarrhea, muscular tremor, etc. Loss of weight occurs early in the syndrome.

b. Nervous and mental symptoms. The outstanding early symptom is increased irritability which represents counter-attack, insomnia, often in the form of sudden awakening with a feeling of extreme apprehension after having gone to sleep, and frightening dreams. The last are usually concerned with the patient's occupational pursuits and involve injury to him. Vertigo is a common complaint. The patient's anxiety often takes the form of the fear of recurrence of some physical symptoms previously experienced.

c. Predisposition. The individual developing the anxiety state is usually of a relatively high intellectual level. He has a self-evaluation of helplessness and expectation of injury either to his whole body or parts of it. The emotion of fear which he expresses and shows openly is an admission of his inability to solve his conflict, and is a dramatic appeal for help.

The anxiety state is of particular interest in aviation, inasmuch as the majority of those conditions which are labelled "aeroneurosis", "aero-asthenia", etc., are manifestations of this reaction, for the most part.

120. TRAUMATIC NEUROSIS. Here are included a group of reactions which arise as a result of trauma. The trauma which occurs here is trauma to the personality, resulting in its disruption, and this is not the post traumatic personality change sometimes seen after actual organic damage to the brain. This group of reactions is sometimes referred to as the "war neuroses" and as "shell-shock" both of which are unfortunate terms. The reaction is not peculiar to war as it may arise in any situation which the individual interprets as constituting a sudden, serious threat to existence, and the lack of relationship between it and the concussive force of shells is now too well known to merit discussion.

a. Symptoms The symptoms of this reaction fall largely in the same field as those discussed under hysteria and the anxiety states, but the following symptoms are most frequent:

(1) Symptoms of shock, with typical manifestations of terror.
(2) Comatose and stuporous conditions.
(3) Maniacal reactions, excitements and fugues.
(4) Delirious reactions.
(5) Paralyses and sensory disturbances.
(6) Epileptoid seizures.

The individual who develops a traumatic neurosis suddenly perceives the world as a hostile, threatening place as the result of a threat to his life in the form of a severe traumatic incident. Along with this altered conception of the environment comes a re-evaluation of himself and he begins to doubt his ability to deal with this threatening situation. Therefore, his symptoms largely take the form of psychological and physiological inhibition which constitute a bid for increased protection and security. This altered conception of the world and of himself is capable of reversal during the first two weeks. After that the reaction becomes fixed and his highly resistant to therapy, resulting in the so-called "chronic war neuroses". For this reason early treatment is imperative. The prognosis is best in those cases which are treated close to the scene of the precipitating incident.

b. Treatment. In the treatment of the traumatic neuroses the following principles

should be observed:

(1) Early treatment - as soon as the patient can be removed from the immediate stress.

(2) Treatment of physical condition - rest, fluids, warmth, etc.

(3) Psychotherapy - eliciting expression of underlying fears, making patient aware of break-down of fear-controlling mechanisms and the advantages he seeks to gain by being ill.

(4) Recommend base hospital care only for the actual psychoses and traumatic neuroses which have been proven to be fixed, or resistant to treatment.

(5) Avoid making organic diagnoses in functional cases.

121. PSYCHOTHERAPY. a. General. The type of psychotherapy which may be successfully employed by the average flight surgeon may be thought of as a superficial form of therapy and as such is applicable to the acute traumatic neuroses as described above, to early psychoneurotic reactions of all types, and particularly to acute or early anxiety states. The last often respond quite well under proper circumstances to rest, encouragement, and a chance to freely discuss their fears, and what they suppose is cowardice.

The military environment is not the most suitable environment for successful psychotherapy. In the first place, ideally, the therapist should be able to modify the environment as well as the patient's reaction to it. There is relatively little possibility of this in the military environment which is quite fixed and rigid. The time factor is also important as psychotherapy is often a long drawn out and tedious process. The exigencies of the military situation are such that the necessary time is often not available. Further than this the military psychiatrist is in a rather anomalous position in his relation with the patient. The patient's attitude toward the military physician is a mixture, as the latter represents at once a possibility of help, an avenue of escape, and the authority which keeps the patient in his undesirable situation. Finally, there are certain characteristics of personality required for successful adjustment in the military environment which no amount of psychotherapy can instill, and which must be thought of as inherent in the individual. The individual must have a certain philosophy of life and a certain amount of stoicism. It is in those individuals already possessed of these innate qualities, and who have been overcome either by cumulative or sudden stress, that psychotherapy plays a successful role.

In general, all psychotherapy can be divided into two types. These types are suggestion and analysis. The chief point of differentiation between these two types is the degree of insight developed by the patient. Suggestion aims at the removal of symptoms with the development of very little insight into their cause. Analysis aims at the removal of symptoms with the development of a relatively complete insight. It is the first type of therapy with which we are concerned at present.

b. Suggestion. In the final analysis suggestion implies the acceptance of some one else's opinion as being better than one's own, and it is therefore obvious that the evaluation of the second person is of utmost importance. If the therapist is able to establish the proper rapport with the patient, the latter can accept his suggestions.

This is not a type of therapy which can be dispensed with the perfunctory attitude of most military sick calls. The statement is sometimes made that for psychotherapy to be successful it must deal with an intelligent patient. Another requirement, that might be added, is that it be given by an intelligent therapist. The therapist must approach the patient with a kindly, sympathetic, understanding attitude, and he must make the patient feel that he (the therapist) is a strong, reliable individual who is interested in the patient's problems and understands their existence. The therapist must neither minimize nor emphasize the patient's difficulties. To do the former, serves to convince the patient that he is in worse danger than he suspected. To do the latter, tends to increase his symptoms and deprive him still more of any sense of responsibility in the matter. It should be the aim of the therapist to convince the patient that his problems are neither hopeless nor ignored, that they are recognized but can be helped, and that his present environment (hospital, etc.) is relatively safe. If this can be accomplished a long step has been taken toward providing the patient with hope, one of the necessary components of successful readjustment.

Assuming that this relationship has been established between the therapist and patient

the next step is the therapeutic interview which forms the primary basis of all psychotherapy.

(1) Therapeutic interview. A therapeutic interview is any type of prolonged contact between the patient and the physician in which conversation plays a central role. This conversation centers around the patient's difficulties and is chiefly carried on by the patient. Some patients will enter into such an arrangement readily, while others will need some guidance and encouragement. In no case should the patient be forced in this type of conversation, although sooner or later by appropriate questions, every significant aspect of his life can be touched upon. That being the case, this type of interview is diagnostic as well as therapeutic.

The therapeutic value of such an apparently simple procedure as this lies in the fact that the patient is allowed and encouraged to verbalize his difficulties and aerate his conflicts to someone toward whom he feels as he does toward the therapist. This strong, reliable person (the therapist) listens to his innermost fears without condemning or punishing him. This is another long step towards reestablishment of his self-esteem, which is another necessary component of readjustment. This also makes him feel that he is facing himself and his problems, and is consequently more worthwhile. The emotional outbursts which often occur during this type of interview are also a desirable form of release of pent-up emotions.

The situation which exists between the therapist and the patient is entirely similar to that which may exist between the patient and an older brother, between the patient and a trusted friend, or in some instances between the patient and the priest. It has the added advantage, however, that the physician is able to guide the patient's conversation more intelligently to significant points of stress. The therpaist must never lose sight of the fact that all individuals solve their problems differently, and consequently he must not expect the patient to conform to any pre-conceived standards and he must not lecture or moralize with him.

The duration of such an interview should be about an hour, and the frequency should be once or twice a week. In cases such as acute traumatic neurosis it may be advisable to have daily interviews. The total number required will vary with the individual case.

(2) Reassurance. Into every relationship of this kind some element of reassurance, encouragement, etc. will enter. The very fact that the physician accepts the physician-patient relationship in such a case is vastly reassuring to the patient. This provides him with the third of the necessary components for readjustment--security. This is accomplished due to the fact that he is accepted as worthy of help. He must also be reassured that his reactions are not unusual and are entirely normal, occurring in everyone. He must also be impressed with the fact that his symptoms and the things which he fears, are the result of a disturbance of the fear-controlling mechanism and are not evidence of cowardice as he supposes. This further increases his feeling of worthiness and enhances his belief that he may be helped and restored to usefulness with consequent increase in self-esteem. It also serves to divert his attention from his symptoms to their probable cause.

(3) Advice. It is commonly thought that advice to the patient constitutes a prominent part of an interview such as this. This is not the case. The patient should seldom be given direct advice as to how to solve his problems. As the situation progresses the majority of patients will begin to discover the answers for themselves, and will offer perfectly logical solutions for approval. In some cases in which this does not occur, after a reasonable time, the therapist may offer advice, but always with the qualification that that is the way he would handle a given situation. The patient must not be expected to solve his problems in the same way, although an appropriate train of thought may be started.

(4) Interpretation. Some element of interpretation enters into an interview of this kind by virtue of the fact that the therapist guides the conversation from one point to another. However, actual interpretation of the patient's motives should not be attempted by any but well-trained therapists. Interpretation in the hands of others may well be incorrect and the appropriate time for it may not be recognized. There is good reason for the patient to be unconscious of his motives, and hasty or reckless destruction of his defenses may precipitate an emotional crisis.

(5) Information. Information on various subjects may be of distinct value in such an interview. A simple explanation of the autonomic nervous system, its functions, and the results of disturbance of its functions may be quite beneficial. The explanation of other physiological phenomena, which seem quite common-place to the physician, may do much to convince the patient that his reactions are not abnormal. Various laboratory procedures, etc., may be employed to similar advantage.

(6) Persuasion. Persuasion implies that the patient is able to logically reason that it is unnecessary for the symptoms to occur after their cause has been explained. The degree of success which will be attained here depends upon the amount of insight developed by the patient, and in general no great degree of success can be expected without resorting to analytic procedures. However, it is the aim of all therapy of this type to shift the patient's attention from the symptoms to their cause, and to convince him that his illness is psychological rather than physiological.

c. Hypno-analysis and narco-analysis.

(1) General. In the more severe types of the traumatic neuroses, and in conversion phenomena and fugues the patient is usually not accessible to interview therapy. Most often he has a complete amnesia for the traumatic event and it is necessary that it be brought to consciousness for him in order that he may be benefited. Here, it is not the lifting of the amnesia which accomplishes the cure, for this is simply a defense reaction, but it is the ability of the patient to examine and reevaluate this unconscious material after it has been brought to light, and consequently alter his conception of the dangerous world.

(2) Hypno-analysis. This material may be brought to light through hypnosis and hypnosis may be employed in combination with partial analysis and suggestion. This involves forced recall of the traumatic incident and the patient may be given appropriate suggestions while still under the influence of hypnosis. He may also be forced to relive the traumatic incident, many times if necessary, until he is able to evaluate it at its true worth. Many times it is found that the symptoms the patient shows are repetitions of his behavior at the time of the traumatic incident.

(3) Narco-analysis. A similar result to that achieved by hypnosis may often be obtained by inducing a partial narcosis through the administration of small amounts of the barbiturates intravenously. Sodium amytal (0.5 Gm.) or pentothal sodium (10 cc. of a 2-1/2% solution) may be employed in this connection. It must be remembered that the majority of these patients are extremely tolerant of the barbiturates, and a dosage producing sleep in a normal individual ordinarily serves only to make them more accessible. Oftentimes, in acute reactions, a single treatment of this type may suffice.

Those cases which are resistant to all these forms of therapy, will probably require extensive, and intensive, therapy of various types. The point of cardinal importance is to reverse the patient's reevaluation of himself and his enviromnent, before it is firmly fixed or established.

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SECTION XII
ANOXIA

123. DEFINITION. The term anoxia, literally meaning "without oxygen" is used physiologically to mean a deficiency rather than lack of oxygen in the tissues. A more correct term is "hypoxia", for the tissues at altitude are probably never entirely without oxygen. Both terms are to be differentiated from "anoxemia" and "hypoxemia" which mean, literally and respectively, absence of oxygen from and decrease of oxygen in the blood. The reason for the differentiation of the latter terms from the former is that oxygen want may exist in the tissues when the blood has a normal oxygen content. (See Par. 124).

For convenience sake, the dividing line between anoxia and hypoxia is sometimes arbitrarily taken as 15,000 feet altitude roughly corresponding to an atmosphere containing 12% oxygen or an oxygen tension of 90 mm Hg.

124. CLASSIFICATION OF ANOXIA.

a. Anoxic anoxia. The type of anoxia pertinent to aviation resulting from a deficiency of oxygen in the respired air.

b. Anemic anoxia. A cellular anoxia due to a deficiency in the transport of oxygen to the tissues. Carbon monoxide poisoning is primarily of this type of anoxia.

c. Stagnant anoxia. A type of oxygen deficiency due to local or general circulatory disturbances with stagnation of blood in the capillaries.

d. Histotoxic anoxia. A type of intracellular oxygenation defect attributable to a poisoning of the oxidative enzymes. The usual example is cyanide poisoning.

125. SIGNS AND SYMPTOMS OF ANOXIA OF HIGH ALTITUDE.

a. The chief factors that influence tolerance to anoxia are:
(1) Absolute altitude.
(2) Rate of ascent.
(3) Duration at altitude.
(4) Ambient temperature.
(5) Physical activity.
(6) Individual factors as inherent tolerance, physical fitness, and emotionality.

b. Too much emphasis cannot be placed on the fact that intellectual impairment may occur so early that the individual may never show a definite protective reaction. It is the lack of comprehension of his general impairment that makes the individual, not indoctrinated in high altitude work, so dangerous to himself and to others.

c. Subjective symptoms that can occur at high altitude (above 12,000 feet) may be divided into three principal groups:
(1) Fatigue, lassitude, headache, and somnolence.
(2) Euphoria.
(3) Absence of symptoms right up to the time of unconsciousness.

d. Objective symptoms that may be observed:
(1) Cyanosis.
(2) Impaired muscular coordination.
(3) Poor judgment.
(4) Release of basic personality traits. With euphoria there may be hilariousness, pugnaciousness, and overconfidence such as is often seen with acute alcoholism.
(5) Hyperventilation.
(6) Tetanic manifestations.
(7) Syncope.
(8) Unconsciousness with vascular collapse.

e. After effects. Anoxia of even minor degree for moderate intervals is sometimes followed by headache or fatigue of variable duration

126. THERAPY. a. Objects.

(1) To prevent death from anoxia either directly from lack of oxygen or indirectly from loss of ability to function with normal astuteness.

(2) To augment fulfillment of military missions through the maintenance of a high level of personnel performance.

(3) To prevent post-flight fatigue and help in the prevention of flying stress or general fatigue.

(4) To maintain rapid dark adaptation on night missions.

b. Methods. The proper use of oxygen equipment (See Chapter 5).

c. Directions: Technical Order No. 03-50-1 states that oxygen should always be used at altitudes above 15,000 feet, and at altitudes of 10,000 to 12,000 feet if the flight at this height is of more than 1 hours duration. This will vary somewhat depending on the mission and the type of aircraft. For combat work where a considerable amount of physical exertion is usually involved, oxygen should always be used above 10,000 feet. Under certain circumstances the pursuit pilot should use oxygen from the ground up, for his ascent may be rapid to high altitude, and his oxygen mask is not easily put in place during flight. On high altitude night missions all personnel should use oxygen from the ground up. On long bombardment missions at extreme altitudes (above 25,000 feet) the use of oxygen immediately on entering the plane will aid in denitrogenation and reduce the incidence of bends.

127. REFERENCES.

a. Texts.

(1) Armstrong, H.C.: Principles and Practice of Aviation Medicine, Blatimore, The Williams and Wilkins Co., 1939.

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(1) No. 03.50-1, Use of Oxygen - Oxygen Equipment, June 15, 1942.

CHAPTER 5
PHYSICAL FACTORS OF PHYSIOLOGICAL IMPORTANCE IN FLYING

SECTION I
PHYSICAL CHARACTERISTICS OF THE ATMOSPHERE

128. COMPOSITION OF THE ATMOSPHERE.

Gas	Volume	Partial Pressure mm Hg.
Oxygen	20.93	159.07
Carbon dioxide	0.03	0.23
Nitrogen and rare gases	79.03	600.40
Water Vapor	1.00 (aver)	7.60 (aver)

The measurements given for oxygen, nitrogen, and carbon dioxide are for dry air. Wet measurements are somewhat lower, and vary depending upon the amount of water vapor present. The rarer gases are physiologically inert and include helium, argon, neon, xenon, krypton, and others. Together they constitute approximately 1% of the atmosphere.

129. ALTITUDE-PRESSURE DATA (with equivalent percentages and partial pressures of oxygen), Table XVI and Figure 17 (modified from TM 1-705).

130. TEMPERATURE CONVERSION TABLE (Centigrade to Fahrenheit), Table XVII.

131. REFERENCES.

a. Texts.

(1) Hodgman, C.D., and Holmes, H.N.: Handbook of Chemistry and Physics, 24 Ed., Cleveland, Chemical Rubber Publishing Co., 1940.

(2) The National Geographic Society - U.S. Army Air Corps Stratosphere Flight of 1935 in the Balloon "Explorer II", Stratosphere Series No. 2, Washington, National Geographic Press, 1936.

(3) Physiology of Flight, Wright Field, Aero Medical Research Laboratory, 1942.

b. Manuals.

(1) TM 1-705, Physiological Aspects of Flying.

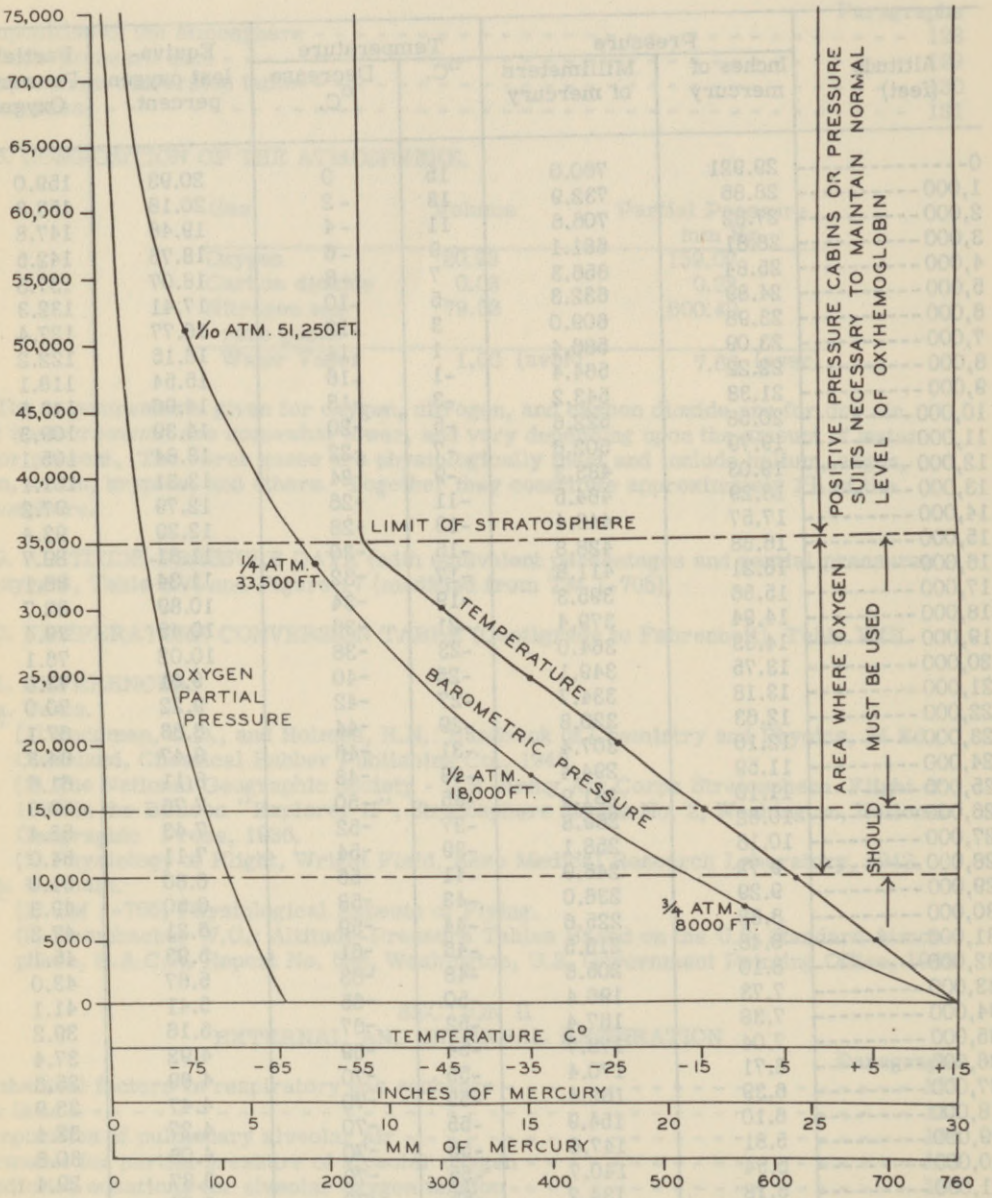
(2) Brombacher W.G.: Altitude-Pressure Tables Based on the U.S. Standard Atmosphere, N.A.C.A. Report No. 538, Washington, U.S. Government Printing Office, 1942.

SECTION II
EXTERNAL AND INTERNAL RESPIRATION

132. MECHANICAL FACTORS IN RESPIRATORY GAS EXCHANGE. Figure 18 (in this figure the values for nitrogen include the rarer gases and the values for all gases are on a dry basis.)

TABLE XVI - Altitude Pressure Table to Which is Added the Equivalent Oxygen Percent and Partial Pressure (Based on the United States Standard Atmosphere (1935))

Altitude (feet)	Pressure		Temperature		Equivalent oxygen percent	Partial Pressure Oxygen
	Inches of mercury	Millimeters of mercury	°C.	Decrease °C.		
0	29.921	760.0	15	0	20.93	159.0
1,000	28.86	732.9	13	-2	20.18	153.3
2,000	27.82	706.6	11	-4	19.46	147.8
3,000	26.81	681.1	9	-6	18.76	142.5
4,000	25.84	656.3	7	-8	18.07	137.3
5,000	24.89	632.3	5	-10	17.41	132.3
6,000	23.98	609.0	3	-12	16.77	127.4
7,000	23.09	586.4	1	-14	16.15	122.2
8,000	22.22	564.4	-1	-16	15.54	118.1
9,000	21.38	543.2	-3	-18	14.96	113.6
10,000	20.58	522.6	-5	-20	14.39	109.3
11,000	19.79	502.6	-7	-22	13.84	105.1
12,000	19.03	483.3	-9	-24	13.31	101.1
13,000	18.29	464.5	-11	-26	12.79	97.2
14,000	17.57	446.4	-13	-28	12.29	93.4
15,000	16.88	428.8	-15	-30	11.81	89.7
16,000	16.21	411.8	-17	-32	11.34	86.1
17,000	15.56	395.3	-19	-34	10.89	82.7
18,000	14.94	379.4	-21	-36	10.45	79.4
19,000	14.33	364.0	-23	-38	10.02	76.1
20,000	13.75	349.1	-25	-40	9.61	73.0
21,000	13.18	334.7	-27	-42	9.22	70.0
22,000	12.63	320.8	-29	-44	8.83	67.1
23,000	12.10	307.4	-31	-46	8.47	64.3
24,000	11.59	294.4	-33	-48	8.11	61.6
25,000	11.10	281.9	-35	-50	7.76	59.0
26,000	10.62	269.8	-37	-52	7.43	56.4
27,000	10.16	258.1	-39	-54	7.11	54.0
28,000	9.72	246.9	-41	-56	6.80	51.6
29,000	9.29	236.0	-43	-58	6.50	49.3
30,000	8.88	225.6	-44	-59	6.21	47.2
31,000	8.48	215.5	-46	-61	5.93	45.1
32,000	8.10	205.8	-48	-63	5.67	43.0
33,000	7.73	196.4	-50	-65	5.41	41.1
34,000	7.38	187.4	-52	-67	5.16	39.2
35,000	7.04	178.7	-54	-69	4.92	37.4
36,000	6.71	170.4	-55	-70	4.69	35.6
37,000	6.39	162.4	-55	-70	4.47	33.9
38,000	6.10	154.9	-55	-70	4.27	32.4
39,000	5.81	147.6	-55	-70	4.06	30.8
40,000	5.54	140.7	-55	-70	3.87	29.4
41,000	5.18	134.2	-55	-70	3.70	28.0
42,000	5.04	127.9	-55	-70	3.52	26.7
43,000	4.80	122.0	-55	-70	3.36	25.5
44,000	4.58	116.3	-55	-70	3.20	24.3
45,000	4.36	110.8	-55	-70	3.05	23.1



PHYSICAL CHARACTERISTICS OF THE ATMOSPHERE

FIGURE 17.

TABLE XVII. TEMPERATURE CONVERSION TABLE

Centigrade to Fahrenheit

For temperatures below 0° C.

Temp. °C.	0	1	2	3	4	5	6		8	9
0	+32.0	30.2	28.4	26.6	24.8	23.0	21.2	19.4	17.6	15.8
-10	+14.0	12.2	10.4	8.6	6.8	5.0	3.2	+1.4	-0.4	-2.2
-20	-4.0	5.8	7.6	9.4	11.2	13.0	14.8	16.6	18.4	20.2
-30	-22.0	23.8	25.6	27.4	29.2	31.0	32.8	34.6	36.4	38.2
-40	-40.0	41.8	43.6	45.4	47.2	49.0	50.8	52.6	54.4	56.2
-50	-58.0	59.8	61.6	63.4	65.2	67.0	68.8	70.6	72.4	74.2
-60	-76.0	77.8	79.6	81.4	83.2	85.0	86.8	88.6	90.4	92.2
-70	-94.0	95.8	97.6	99.4	101.2	103.0	104.8	106.6	108.4	110.2
-80	-112.0	113.8	115.6	117.4	119.2	121.0	122.8	124.6	126.4	128.2
-90	-130.0	131.8	133.6	135.4	137.2	139.0	140.8	142.6	144.4	146.2
-100	-148.0	149.8	151.6	153.4	155.2	157.0	158.8	160.6	162.4	164.2

For temperatures above 0° C.

0	32.0	33.8	35.6	37.4	39.2	41.0	42.8	44.6	46.4	48.2
10	50.0	51.8	53.6	55.4	57.2	59.0	60.8	62.6	64.4	66.2
20	68.0	69.8	71.6	73.4	75.2	77.0	78.8	80.6	82.4	84.2
30	86.0	87.8	89.6	91.4	93.2	95.0	96.8	98.6	100.4	102.2
40	104.0	105.8	107.6	109.4	111.2	113.0	114.8	116.6	118.4	120.2
50	122.0	123.8	125.6	127.4	129.2	131.0	132.8	134.6	136.4	138.2
60	140.0	141.8	143.6	145.4	147.2	149.0	150.8	152.6	154.4	156.2
70	158.0	159.8	161.6	163.4	165.2	167.0	168.8	170.6	172.4	174.2
80	176.0	177.8	179.6	181.4	183.2	185.0	186.8	188.6	190.4	192.2
90	194.0	195.8	197.6	199.4	201.2	203.0	204.8	206.6	208.4	210.2
100	212.0	213.8	215.6	217.4	219.2	221.0	222.8	224.6	226.4	228.2

MECHANICS OF RESPIRATION

RESPIRATORY SYSTEM FUNCTIONAL DIVISIONS	BODY SIZE SMALL	AVERAGE	LARGE
TIDAL AIR	350cc	500cc	650cc
SUPPLEMENTAL AIR	1500cc	1700cc	1900cc
COMPLEMENTARY AIR	1500cc	1700cc	2000cc
VITAL CAPACITY	3350cc	3900cc	4550cc
DEAD SPACE	100cc	150cc	200cc

DEFINITIONS:—

TIDAL AIR—AIR WHICH ENTERS AND LEAVES BODY WITH EACH NORMAL RESPIRATION.
SUPPLEMENTAL AIR—AIR WHICH CAN BE FORCIBLY EXPIRED AFTER A NORMAL TIDAL EXPIRATION.
COMPLEMENTAL AIR—AIR WHICH CAN BE FORCIBLY INSPIRED AFTER A NORMAL TIDAL INSPIRATION.
RESIDUAL AIR—AIR WHICH CANNOT BE VOLUNTARILY EXPELLED FROM LUNGS.
CC—CUBIC CENTIMETERS. CO_2—CARBON DIOXIDE O_2—OXYGEN N_2—NITROGEN

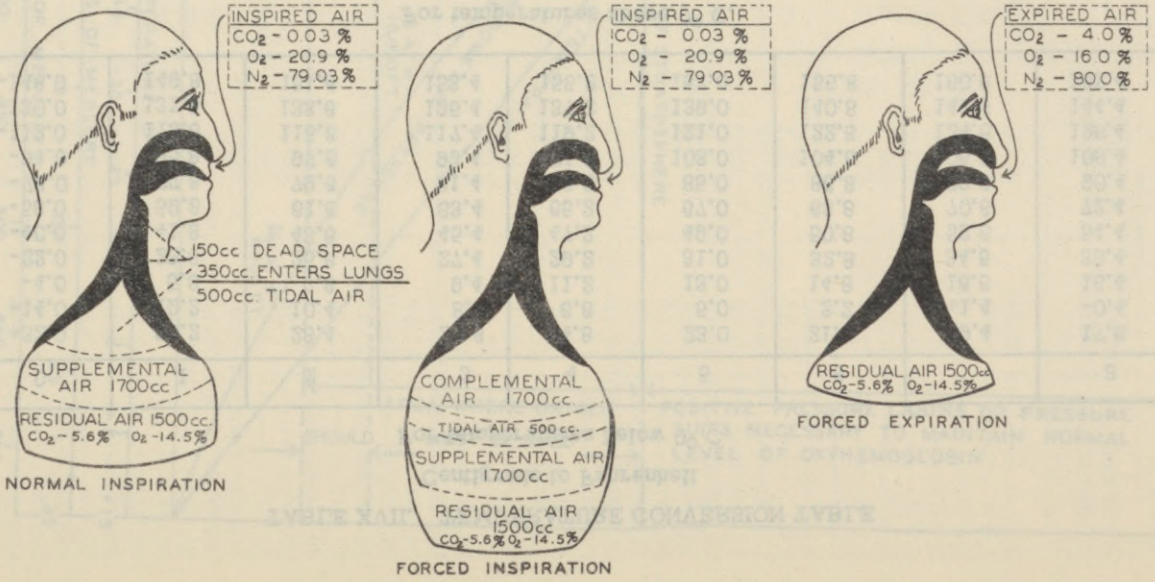


FIGURE 18.

133. THE GAS LAWS. a. Boyle's Law. With a constant temperature the volume of a mass of gas varies inversely as the pressure, or the product of the pressure times the volume is a constant

$$V = \frac{1}{P} \qquad P'V'=P''V'', PV=C$$

When using Boyle's law for calculating the expansion of gases in body cavities on ascent, allowance must be made for 47 mm. of Hg. pressure exerted by the water vapor found in these trapped body gases at 37°C. The effect of the water vapor pressure is relatively greater at altitude, and indicates that the expansion of a gas kept fully saturated with water exceeds the rate at which a dry gas expands with decreasing pressure. Comparison of the change in volume of a wet gas and a dry gas at sea level and at 40,000 feet (141 mm. of Hg.) demonstrates this.

Saturated $\quad \frac{P1 - 47}{P2 - 47} = \frac{760 - 47}{141 - 47} = 7.6$

Dry $\quad \frac{P1}{P2} = \frac{760}{141} = 5.4$

b. Charles' Law (Gay-Lussac). The volume of a gas at constant pressure is proportional to its absolute temperature (-273°C), or

$$\frac{V1}{V2} = \frac{T1}{T2}$$

where V1 and V2 are volumes of the same mass of gas at absolute temperatures, T1 and T2.

c. Henry's Law (solubility of gases). With a constant temperature the weight of a slightly soluble gas which goes into solution in a given liquid is proportional to the partial pressure of the gas.

c. Dalton's Law (law of partial pressures). The pressure exerted by each component in a gaseous mixture is independent of other gases in the mixture, and the total pressure of the mixture of gases is equal to the sum of the partial pressures (pp) of the separate components.

pp = Barometric Pressure x volume percent

Total Pressure = pp1 + pp2 + pp3 etc.

e. Standard conditions for gases. For comparative purposes any measured volume of gas is usually recalculated to the arbitrarily chosen standard conditions of 0 degrees C., complete dryness, and 760 mm Hg pressure. For some standards, such as the U. S. standard atmosphere at sea level, a temperature of 15°C is used in the definition.

f. Water vapor tension. The force of molecules of water vapor in saturated air is known as the vapor tension and is expressed in mm Hg. This force is affected by temperature only, not by the barometric pressure. The tension of water vapor in saturated alveolar air at body temperature (98.6°F or 37°C) is 47 mm Hg. This value does not vary with altitude.

134. COMPOSITION OF ALVEOLAR AIR.

Gas	Volume Percent	Partial Pressure mm Hg
Oxygen	13.6	103
Carbon dioxide	5.3	40
Water vapor	6.0	47
Nitrogen & others	75.1	570

The values given are for alveolar air saturated with water vapor at sea level and with a respiratory quotient of 0.83. The volume percentages of the dry gas are nitrogen 79.9; Oxygen 14.5; carbon dioxide 5.6. These are the values usually quoted, but vary somewhat depending upon the source consulted.

At sea level the partial pressure of alveolar oxygen is approximately 35% less than the partial pressure of atmospheric oxygen. This is due to the constant presence in the lungs of water vapor at a tension of 47 mm Hg (6.0 volumes percent), and carbon dioxide at a tension of 40 mm Hg (5.6 volumes percent). With increasing altitude the tension of water vapor does not change although the volume percentage increases. This results in a relatively greater reduction in the partial pressure of oxygen in the lungs as compared to that in the atmosphere.

135. FORMULAE FOR PARTIAL PRESSURE OF ALVEOLAR OXYGEN.

a. $pO_2 = B - pCO_2 - pH_2O - pN.$

Where pO_2, pCO_2, pH_2O, and pN = partial pressure of oxygen, carbon dioxide, water vapor and nitrogen respectively.

b. $pO_2 = (B - 47)\, O_2 - \frac{pCO_2}{RQ}$

where B = barometric pressure
47 = partial pressure of water vapor in lungs in mm Hg at 37°C.
O_2 = volumetric fraction of oxygen in inspired air.
RQ = respiration quotient.
pCO_2 = partial pressure of carbon dioxide in lungs in mm Hg

c. $pO_2 = (B - 47 - pCO_2)\, O_2 - \frac{N_2 \times pCO_2}{RQ}$

where B = barometric pressure
pCO_2 = partial pressure of alveolar CO_2
O_2 and N_2 = volumetric fraction of oxygen and nitrogen respectively in inspired air
RQ = respiration quotient

d. Formula a. is a restatement of Dalton's law. Formula b. (Boothby), though arbitrarily derived, is convenient to use, and reveals that the partial pressure of alveolar oxygen under any given conditions will be maximal when the respiratory quotient is one. Formula c. (Gray) is similar to b. but was derived mathematically, and more accurately represents the facts.

136. PREDICTION EQUATIONS FOR ALVEOLAR OXYGEN TENSION. From the equation 135 c. various prediction formulae have been derived (Gray).

a. Prediction of average alveolar O_2 tension at various altitudes while breathing air (RQ assumed to be 0.83).

$$pO_2 = 0.176B - 30.8$$

where pO_2 is partial pressure of alveolar oxygen, and B is barometric pressure.

b. Prediction of average alveolar oxygen tension at high altitudes (above 33,000 feet) while breathing 100% O_2.

$$pO_2 = 0.851B - 58.7$$

c. Prediction of percentage of oxygen needed in the inspired air at any altitude to provide a normal sea level value for alveolar oxygen tension.

$$O_2 = \frac{151.2}{B-38.8}$$

where O_2 is the volumetric fraction of oxygen required (see Table XIX).

137. CARRIAGE OF OXYGEN AND CARBON DIOXIDE IN THE BODY. Figure 19.

138. OXYGEN DISSOCIATION CURVE. Figure 20. This figure is based upon pH of 7.4, a partial pressure of CO_2 of 40 mm Hg, and a body temperature of 37°C.

139. REFERENCES.

a. Texts.

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(3) Best, C.H., and Taylor, N.B.: The Physiological Basis of Medical Practice, 2nd Ed., Baltimore, William Wood and Co., 1939.

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(1) Gray, J.J.: Unpublished data.

(2) Boothby, W.M., Lovelace, W.R., and Benson, O.O.: High Altitude and its Effect on the Human Body, I. J. Aeronaut. Sc. 7:461, 1940.

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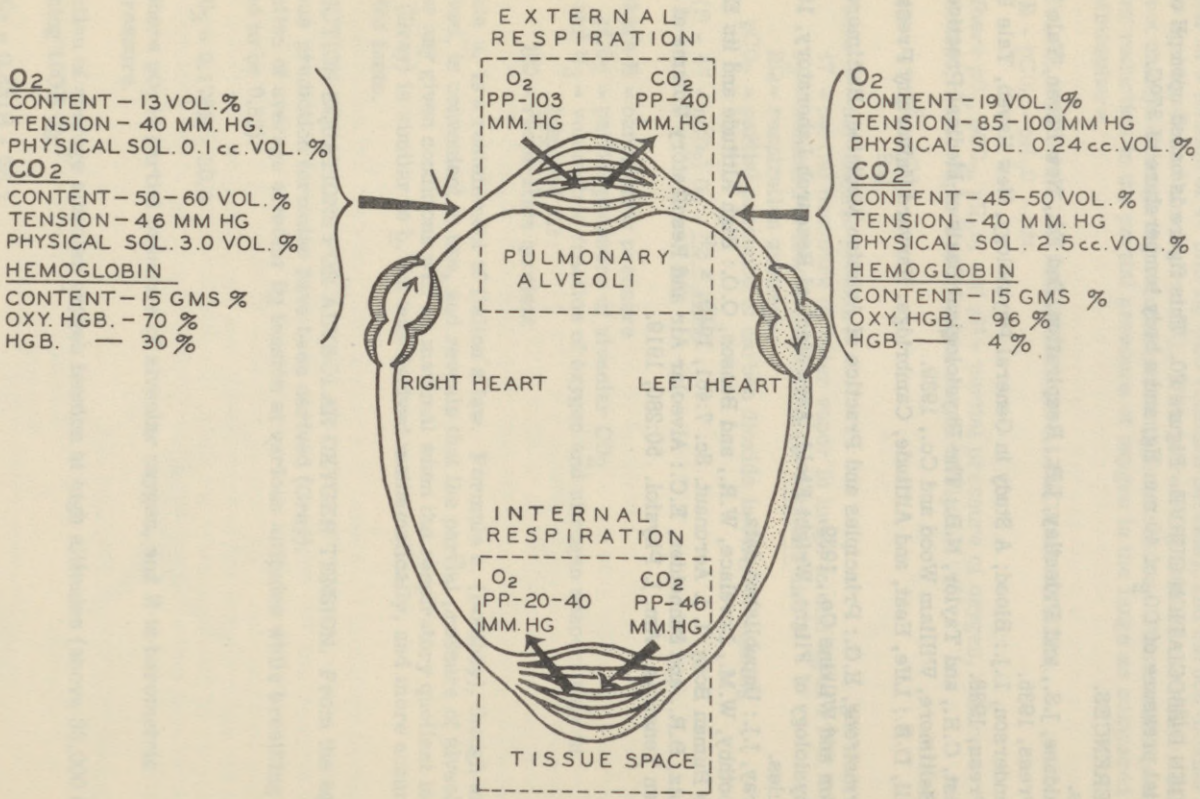

EXTERNAL RESPIRATION
O2 PP-103 MM. HG
CO2 PP-40 MM. HG
O2
CONTENT – 13 VOL. %
TENSION – 40 MM. HG.
PHYSICAL SOL. 0.1 cc. VOL. %
CO2
CONTENT – 50 – 60 VOL. %
TENSION – 46 MM HG
PHYSICAL SOL. 3.0 VOL. %
HEMOGLOBIN
CONTENT – 15 GMS %
OXY. HGB. – 70 %
HGB. — 30 %
V
A
PULMONARY ALVEOLI
O2
CONTENT – 19 VOL. %
TENSION – 85 – 100 MM HG
PHYSICAL SOL. 0.24 cc. VOL. %
CO2
CONTENT – 45 – 50 VOL. %
TENSION – 40 MM. HG
PHYSICAL SOL. 2.5 cc. VOL. %
HEMOGLOBIN
CONTENT – 15 GMS %
OXY. HGB. – 96 %
HGB. — 4 %
RIGHT HEART
LEFT HEART
INTERNAL RESPIRATION
O2 PP-20-40 MM. HG
CO2 PP-46 MM. HG
TISSUE SPACE

FIGURE 19.

OXYGEN DISSOCIATION CURVE OF ARTERIAL BLOOD (40 MM CO_2 PRESSURE)

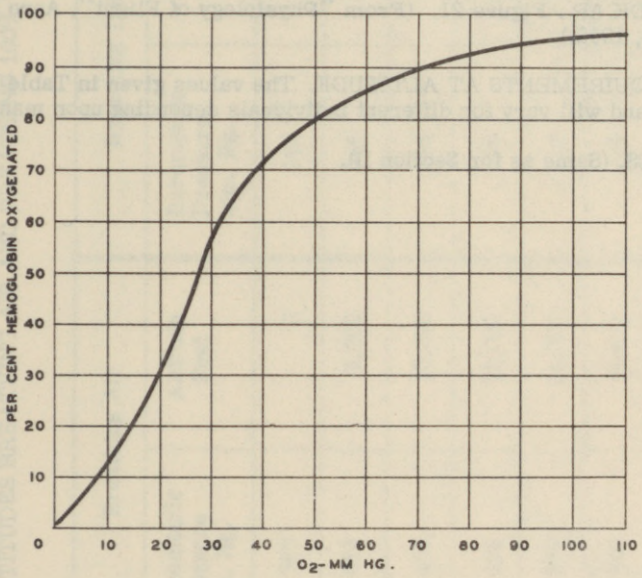


FIGURE 20.

SECTION III
ANOXIA

140. EQUIVALENT ALTITUDES BREATHING AIR AND BREATHING OXYGEN. (Table XVIII).

141. ARTERIAL OXYGEN SATURATION AT VARIOUS ALTITUDES WHILE BREATHING AIR AND WHILE BREATHING PURE OXYGEN IN RELATION TO THE DEGREE OF PHYSIOLOGICAL HANDICAP . Figure 21. (From "Physiology of Flight", Aero Medical Research Laboratory, 1942.)

142. OXYGEN REQUIREMENTS AT ALTITUDE. The values given in Table XIX are average requirements and will vary for different individuals depending upon many variables.

143. REFERENCES. (Same as for Section II).

TABLE XVIII. EQUIVALENT ALTITUDES BREATHING AIR AND BREATHING 100% OXYGEN.

Alveolar Air			Breathing Air		Breathing 100% O_2	
O_2 * Tension mm. Hg.	CO_2 * Tension mm. Hg.	H_2O vapor Tension mm. Hg.	Barometric Pressure mm. Hg.	Altitude Feet	Barometric Pressure mm. Hg.	Altitude Feet
103	40.0	47	760	0	190	33,700
81	37.5	47	632	5,000	166	36,000
61	35.5	47	523	10,000	144	39,500
45	32.5	47	429	15,000	125	42,500
38	31.0	47	380	18,000	116	44,000
35	30.0	47	349	20,000	112	44,800

(* Means of measurements made by Lutz and Schneider, and by Boothby, Lovelace, and Benson.)

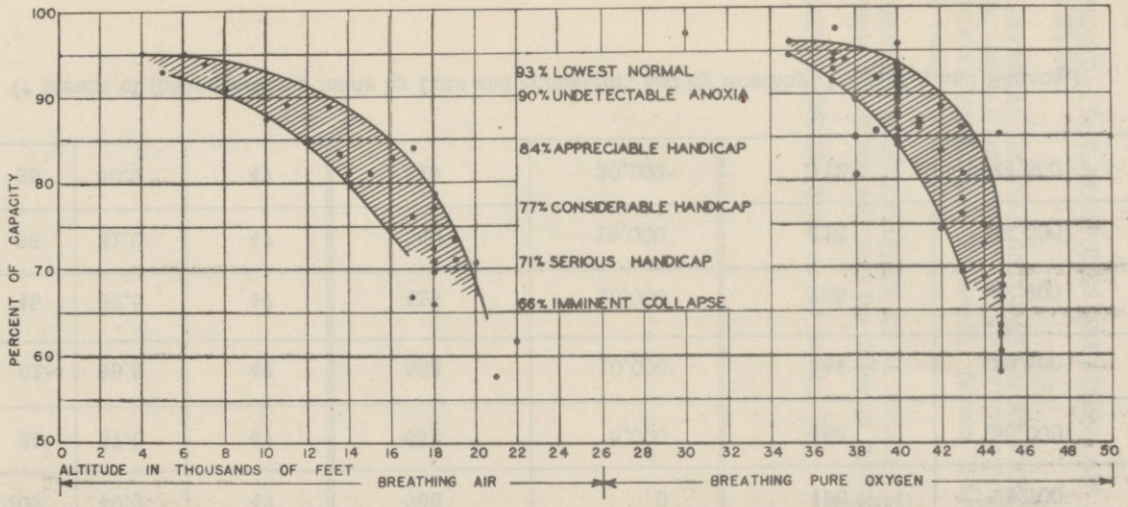


FIGURE 21. Oxygen saturation (percent of capacity) of arterial blood and range of performance at various altitudes in subjects breathing air and in subjects breathing oxygen (from "Physiology of Flight", Aero Medical Laboratory).

TABLE XIX. - OXYGEN REQUIREMENTS AT ALTITUDE

To maintain alveolar oxygen tension at sea level equivalent, 10,000 feet equivalent, and 20,000 feet equivalent (After Gray).

Altitude in Feet	Barometric Pressure mm Hg.	% Oxygen Required		
		"Ideal" (Sea level equivalent)	"Safe" (10,000 feet equivalent)	"Dangerous" (20,000 feet equivalent)
0	760	21	--	--
5,000	632	25	--	--
10,000	523	31	21	--
15,000	429	39	26	--
20,000	349	49	33	21
25,000	282	62	42	27
30,000	226	81	55	36
33,700	190	100	--	--
35,000	179		74	49
39,000	144		100	--
40,000	141			69
44,000	112			100

SECTION IV
USE OF SUPPLEMENTARY OXYGEN

144. OXYGEN EQUIPMENT.

a. Continuous flow system, type A-8-B mask and A-9-A regulator. Figure 22.

b. Demand system. Type A-9 mask and A-12 regulator. Figure 23.

c. Portable (walk-around) cylinder. Figure 24.

145. OXYGEN DURATION CHART. For A-8 series masks and A-8-A and A-9-A regulators, (approximately the same for A-9 and A-10 masks and A-12 regulator), Figure 25. For data in connection with other types of regulators see Technical Orders.

146. REFERENCES.

a. Technical Orders.

(1) No. 03-50-1, Use of Oxygen - Oxygen Equipment, June 15, 1942.
(2) No. 03-50-1A, Supplement on Demand Oxygen Equipment, November 9, 1942.
(3) No. 03-50-6, Oxygen Masks, types A-7 and A-8, May 19, 1942.
(4) No. 03-50-9, Oxygen Equipment Safety Precuations for Combat, December 31, 1941.
(5) No. 03-50-15, Modification of Oxygen Masks - type A-8-B, June 26, 1942.
(6) No. 03-50A-1, Oxygen Regulators: A-6, A-8, A-8-A, A-9, and A-9-A.
(7) No. 03-50A-3, Oxygen Regulators, Reworking of types A-6 and A-8, May 20, 1940.
(8) No. 03-50A-5, Preliminary Operation and Service Instruction, type A-12, May 5, 1942.

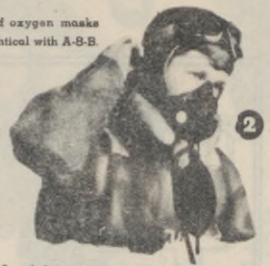
b. Texts.

(1) Physiology of Flight, Wright Field, Aero Medical Research Laboratory, 1942.

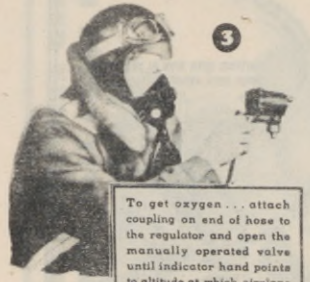
OPERATING DIAGRAM OF A-8-B OXYGEN MASK AND A-9-A CONTINUOUS FLOW REGULATOR

The operation cycle of oxygen masks A-8 and A-8-A are identical with A-8-B.

Oxygen mask in position and attached to left side of helmet, ready for quick attachment on face. When not in use leave mask attached to left side of helmet.



Attach fastener of strap to fitting on right side of helmet and adjust to face. Mask must not leak. To check this, place palms of hands over rubber sponge discs, if air can be drawn in, re-adjust mask and test again.



To get oxygen . . . attach coupling on end of hose to the regulator and open the manually operated valve until indicator hand points to altitude at which airplane is flying. If valve vibrates off setting, tighten gland packing nut.

To insure a proper supply of oxygen at any altitude, make sure the indicator hand is set at the same altitude as shown on altimeter.

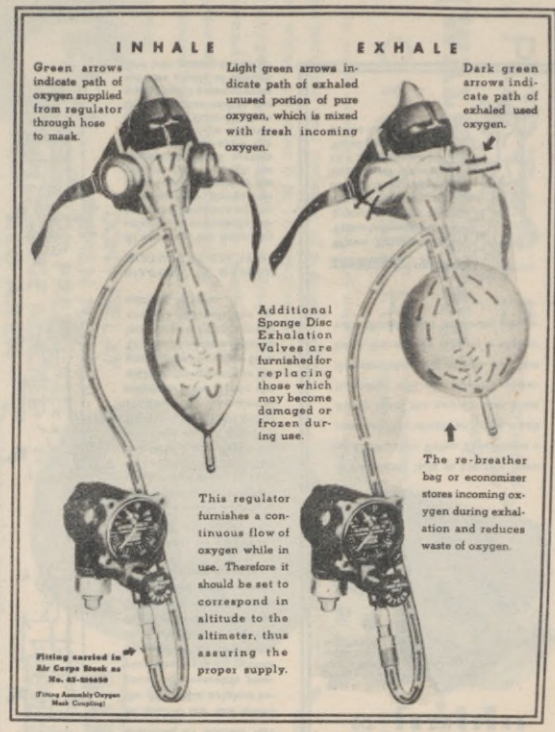
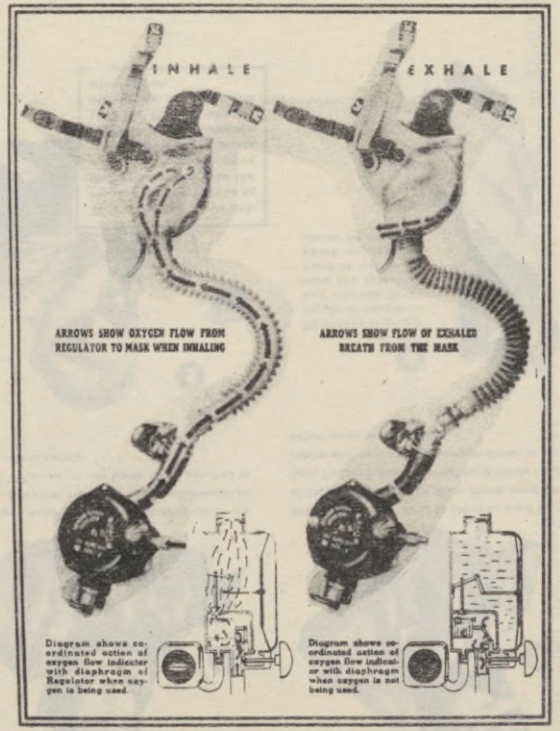


FIGURE 22.

OPERATING DIAGRAM OF A-9 OXYGEN MASK AND A-12 OXYGEN DEMAND REGULATOR



OPERATION of the AUTOMATIC AIR-MIX

DIAGRAM OF OXYGEN MIXTURE AT 30,000 FEET

At 30,000 feet and above the Auto-Mix sylphon because of barometric pressure shuts off all outside air, permitting only pure oxygen to flow through the Regulator. Green arrows indicate the movement of oxygen from the supply line to the mask.

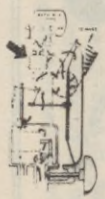


DIAGRAM OF OXYGEN MIXTURE AT 10,000 FEET

At intermediate altitudes the Auto-Mix sylphon controls a variable mixture of oxygen and air. The percentage of oxygen depending on the altitude. All of this is automatically controlled by the action of sylphon. The higher the altitude the greater is the percentage of oxygen flow. The black arrows indicate incoming air and the green arrows indicate the incoming oxygen.

DIAGRAM OF OXYGEN MIXTURE AT SEA LEVEL

At sea level the Auto-Mix sylphon is completely depressed because of the barometric pressure; thus stopping most of the oxygen flow through the Regulator. Black arrows in illustration show the incoming air as it flows through the Auto-Mix into the Regulator and to the mask. Small green arrows indicate trickle of oxygen flow into mixing chamber.

FOR USE IN CASE OF EMERGENCY

If Regulator fails to function, turn on Emergency Valve. This allows a constant flow of oxygen to the mask direct from the supply line. Flow indicator will not operate under this condition, and oxygen will flow from the supply line at a higher rate. Watch your pressure gauge.

EMERGENCY "ON"

When Emergency Valve is opened the green arrows indicate the flow of oxygen from supply line direct through the Emergency Valve and Regulator to the mask.

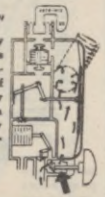


FIGURE 23.

BREATHE NORMALLY AT ALL TIMES

PORTABLE (WALK-AROUND) CYLINDER

(This assembly is carried in Air Corps stock as No. 41G2437)

The portable unit consists of a small cylinder which contains 6 to 12 minutes supply of oxygen, per charging. It is fitted with a demand regulator to which is attached a suspension clamp, recharging valve, a pressure gauge, and a mask hose coupling.

DONT DELAY WHEN POINTER ON PRESSURE GAUGE REACHES RED AREA REFILL CYLINDER

WARNING
KEEP OIL AWAY FROM RECHARGING NIPPLE

To recharge this cylinder, it is necessary only to connect the recharging nipple to the filler valve on a supply hose found in the airplane.

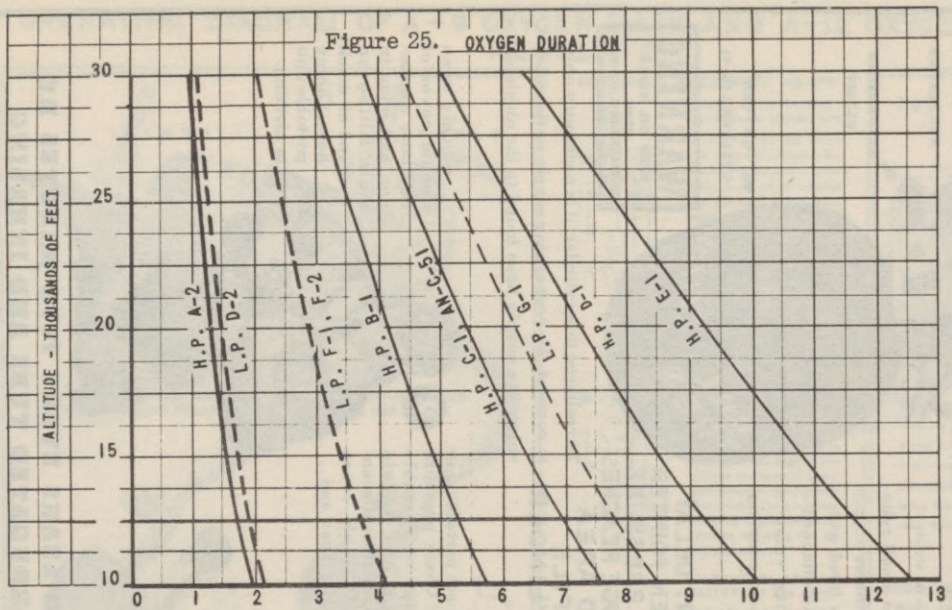
To use portable unit 1st; Check pressure gauge of portable unit; 2nd; Inhale deeply, then disconnect mask from regular hose and..

...quickly open spring cover of regulator connection and snap in male fitting on end of mask hose. Clamp portable unit to clothing.

CHECK MASK FOR LEAKS EVERY FIVE MINUTES BY SQUEEZING CORRUGATED TUBE AND INHALING

FIGURE 24.

Figure 25. OXYGEN DURATION



HOURS SUPPLY PER MAN - USING A-8A & A-9A REGULATOR WITH MASK.
(APPROX. THE SAME FOR A-12 REGULATOR.)

RATES OF FLOW A-8A & A-9A REGULATOR APPROX. THE SAME FOR A-12 REG.		A-8A REGULATOR USED WITH HIGH PRESSURE CYLINDER, 1800 #/SQ. IN. WORKING PRESSURE.			A-9A REGULATOR USED WITH LOW PRESSURE CYLINDER, 400 #/SQ. IN. WORKING PRESSURE.		
ALT. (FEET)	FLOW AT ALTITUDE CORRECTED TO SEA LEVEL. (LITERS/MIN.)	H.P. CYLINDER	INTERNAL VOLUME (CU. IN.)	FREE GAS CAPACITY 1800-200 #/SQ. IN. (CU. FT.)	L.P. CYLINDER	INTERNAL VOLUME (CU. IN.)	FREE GAS CAPACITY 400-50 #/SQ. IN. (CU. FT.)
10,000	1.6 APPROX.	A-2	96	6.4	D-2	500	6.9
20,000	2.2 APPROX.	B-1	295	19.6	F-1 & F-2	1000	13.8
30,000	3.2 APPROX.	C-1 & AN-C-51	386	25.6	G-1	2100	29.0
		D-1	514	34.2			
		E-1	646	42.9			

FIGURE 25.

SECTION V
ACCELERATION IN AIRCRAFT

147. DEFINITIONS. a. Linear velocity is the distance in a straight line traversed per unit of time

$$v = \frac{s}{t}$$

where v is velocity, s distance, and t time.

Linear velocity has no physiological effect on the body if there is adequate protection from wind.

b. Acceleration. Motion is said to be accelerated when the distance covered per unit of time is always greater than that covered during the preceding interval of time. The opposite of acceleration is deceleration, a term which means that the velocity of the moving body is decreasing for each unit of time. Motion is also said to be accelerated if its direction is changed (radial acceleration), or if both its rate and direction are changed (angular acceleration). For uniform acceleration

$$a = \frac{(v_2 - v_1)}{t}$$

where v_1 is the initial velocity, v_2 the final velocity, and t the time.

c. Linear acceleration is the rate of change of velocity without a change in direction. This may be expressed symbolically in terms of the acceleration of gravity (g units):

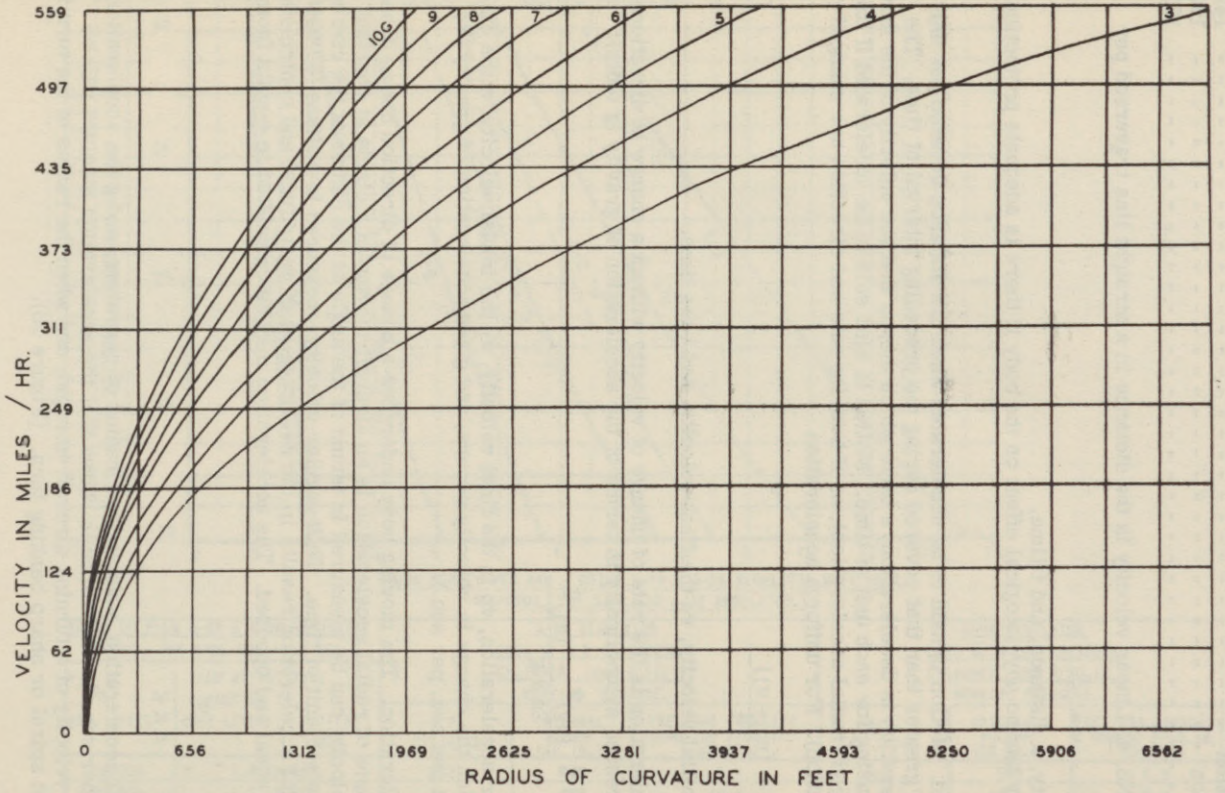
$$la = \frac{(v_2)^2 - (v_1)^2}{2s \times g}$$

where la is linear acceleration, v_2 is the final velocity, v_1 the initial velocity, s the distance through which the change in velocity occurs, and g the acceleration of gravity (32 feet or 10 meters per sec. per sec.).

d. Radial acceleration. The moving body undergoes a change of direction but no change in rate. An example of radial acceleration is an aircraft moving in a circle at constant velocity. This velocity can be measured in terms of the angle at the center of the circle which it traverses per unit of time. This angular velocity, measured in radians (57.296°), is constant. Radial acceleration results in the development of centrifugal and centripetal forces which are equal and opposed. The acceleration may be calculated in g units from the formula:

$$ra = \frac{v^2}{r \times g}$$

where ra is radial acceleration, v velocity, r radius of curvature, and g the acceleration of gravity (32 ft. per sec.^{2}). The formula shows that the acceleration involved will be greater when the velocity of a turning aircraft is rapid, and when the radius of the turn is small as in a tight spiral or sharp banking turn. (Figure 26).



THE RELATION BETWEEN VELOCITY, RADIUS OF CURVATURE AND FORCE OF RADIAL ACCELERATION IN G UNITS.

FIGURE 26.

e. Angular acceleration. If in addition to changing its direction a moving body also changes velocity it is said to display angular acceleration. In this type of acceleration the angular velocity is changing.

148. LINEAR ACCELERATION. Linear acceleration and deceleration occur in the catapult take-off, carrier deck landings, crash landings, and parachute jumps. The distance factor, s, given in the denominator of the equation in par. 147 c., emphasizes the importance of the distance through which a change in velocity occurs. Even when this distance is small the total force involved is greatly reduced compared to what it would be if this distance were zero. It probably explains the relatively minor injuries sometimes encountered in crash landings and in falls from great heights into snow banks or soft earth. The other variable involved is the area of the body over which such forces act. When this is large the human body apparently can withstand instantaneously as much as 200 g.

149. ANGULAR ACCELERATION. This occurs in an aircraft when it is changing both its velocity and direction of motion. It is encountered in some maneuvers especially the spin.

150. RADIAL ACCELERATION. a. The centrifugal force involved in radial acceleration (Figure 27) may cause marked physiological effects because of the inertia and the mobility particularly of the fluid contents of the pilot's body. These effects depend upon

(1) Direction of the force.

(a) Positive acceleration. The applied (centripetal) force is perpendicular to the line of flight and is directed toward the under surface of the airfoil. The reaction (centrifugal force) is in the opposite direction, and with respect to seated occupants acts from head to seat. (Figure 27). Positive acceleration is encountered in the inside loop, a sharp banking turn, the inside spin, the barrel roll, and in a pull out after a dive. Subjectively, radial acceleration of +2 to +3g will cause a sensation of being compressed in the seat ("concertina action"), and heaviness of the hands. For most individuals +4g acting for approximately 5 seconds will cause graying of vision, +5g will cause blackout ("amaurosis fugax") for the same interval, and +6g will cause loss of consciousness. Thresholds, in terms of g's and time, may be determined for these three manifestations in different individuals. Objectively, the pulse and respiratory rate increase early, and the blood pressure in the carotid arteries falls. The soft tissues of the face are pulled downward from the facial bones causing a drawn, haggard appearance.

Manifestations cease as soon as the force stops acting except that if unconsciousness has occurred confusion may persist for 5 to 10 seconds.

(b) Negative acceleration. The applied (centripetal) force is perpendicular to the line of flight, and is directed toward the upper surface of the airfoil (Figure 27). The opposing centrifugal force acts from the seat to the head of the seated occupants of the aircraft. Negative acceleration is encountered in outside loops, oustide spins, and push downs. Subjectively, it is accompanied by a feeling of congestion of the head and face, throbbing pain in the head, and above -4.5 g by redout. Objectively, there may be facial and conjunctival congestion, increased pulse and respiratory rates, increased intracarotid perssure, and mental confusion. For several hours after the force ceases to act headache may persist.

(2) Duration of force. To cause physiological effect the forces involved in radial acceleration must act over a certain minimum period. For centrifugal forces this minimum is probably about 1 second.

(3) Condition of flying personnel. The individual tolerance to negative acceleration probably does not vary. On the other hand tolerance to positive acceleration varies greatly. It may be reduced by such factors as inadequate sleep, fatigue, anoxia, alcohol and tobacco to excess, and illness.

(4) Velocity of the aircraft and radius of turn (see par. 147 d. and Figure 26).

b. Pathological physiology. Physiological effects of radial acceleration are explained largely on the basis of simple hydrostatics. During positive acceleration, circulation to the head is impaired for two reasons. First, the hydrostatic effect of positive acceleration on the intracarotid blood opposes the pumping action of the heart. Second, the hydrostatic

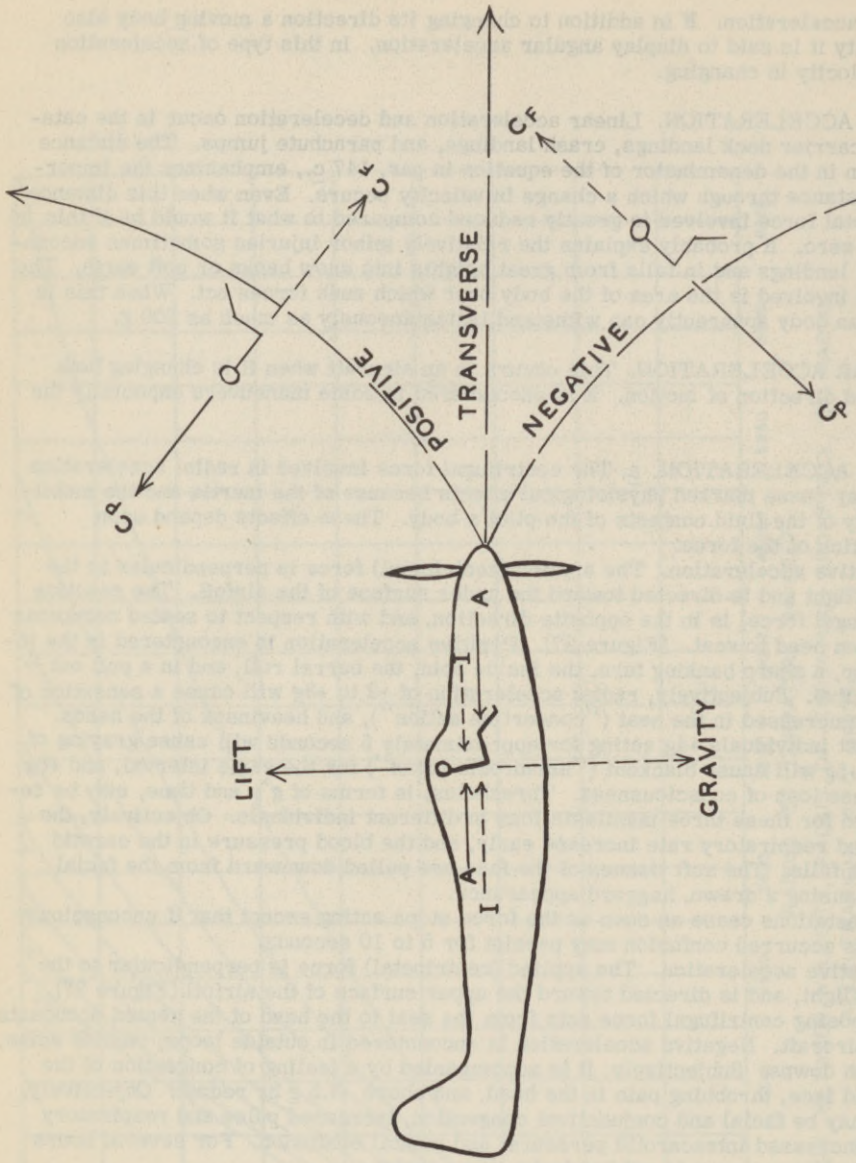


FIGURE 27. Acceleration in aircraft. In positive acceleration the applied force (Cp, centripetal) is to the under surface of the airfoil, and the inertia of the pilot's body is in the opposite direction (Cf, centrifugal), acting from his head to his seat. A reversal of these forces occurs in negative acceleration. Transverse acceleration occurs when velocity is increased or decreased in level flight. In an arrested landing the applied force (A, solid arrow) is from front to back, with the force of inertia (I, dashed arrow), acting from back to front. A reversal of these forces occur in the catapult takeoff. It is to be noted that when an aircraft changes its direction the forces Cp and Cf do not replace lift and gravity but occur in addition to them.

effect on venous blood below the level of the heart impairs return flow to this organ with consequent reduction in cardiac output. Visual disturbances, namely, the "grayout" and "blackout", are ascribed to the normal intraocular pressure of 20 mm Hg. Any reduction of blood pressure in the vessels of the head will therefore find the central artery of the retina already at a disadvantage of approximately 20 mm Hg. With negative acceleration, blood is driven to and retained in the upper part of the body, raising the intracarotid and intracranial pressures.

c. Prophylaxis.

(1) Positive acceleration.

(a) Personnel - crouching position, grunting or yelling, eating before flying, physical fitness, and various types of anti-blackout suits and devices increase tolerance to g.

(b) Materiel - high rudder bars, limited elevators, diving flaps, horizontal seats (pilot prone), and automatic tilting seats have value.

(2) Negative acceleration - none. Avoidance is the only preventive.

151. REFERENCES.

a. Reports.

(1) Bulletin of the Subcommittee on Acceleration, O.S.R.D., C.A.M., N.R.C., September, 28, 1942.

(2) Rose, B., and Martin, W.R.: The Determination of the Blackout Threshold in Aircrew Trainees, and Factors Concerned in its Variations, No. 2, Initial Training Center, RCAF, 1942.

b. Articles.

(1) De Haven, H.: Mechanical Analysis of Falls from Heights of Fifty to One Hundred and Fifty Feet, War Medicine 2:586, 1942.

(2) Ham, G.C.: Effects of Centrifugal Acceleration on Living Organisms, War Medicine, 3:30, 1943.

SECTION VI
NOXIOUS GASES IN AIRCRAFT

152. CARBON MONOXIDE;

a. Sources of carbon monoxide in the cockpit.

(1) Exhaust fumes of aircraft engines (concentration 1% to 7%, average 2.8%).

(2) Leaky cockpit or cabin heaters which utilize exhaust gases for heating.

(3) In some single-engine airplanes it may be impossible to eliminate carbon monoxide entirely from the cockpit. The maximum concentration safely permissible has been established as 0.005%.

b. Toxicology. The affinity of hemoglobin for carbon monoxide is 250 times as great as its affinity for oxygen. The union is a strong one so that oxygen cannot combine with hemoglobin and anemic anoxia results. In addition the dissociation curve of whatever oxyhemoglobin is present is shifted to the left making it difficult to supply the oxygen that is present in the blood to the tissues (Figures 28 and 29). Dangerous concentrations of carbon monoxide are as follows:

Concentration, percent	Effect
0.01, or 1 part in 10,000	No symptoms for 2 hours
0.04, or 4 parts in 10,000	No symptoms for 1 hour
0.06 to 0.07, or 6 to 7 parts in 10,000	Headache and unpleasant symptoms in 1 hour
0.10 to 0.12, or 10 to 12 parts in 10,000	Dangerous for 1 hour
0.35 or 35 parts in 10,000	Fatal in less than 1 hour

c. Symptoms. (Figure 30).

(1) Depend upon

(a) Concentration of carbon monoxide in the inspired air.

(b) Duration of exposure.

(c) Altitude at which exposure occurs.

(2) Symptoms which develop at various concentrations of carbon monoxide in the blood are as follows:

Carbon monoxide, percent in blood	Symptoms
0-10	None
10-20	Tightness across forehead, possibly slight headache, dilatation of cutaneous blood vessels.
20-30	Headache, throbbing in temples.
30-40	Severe headache, weakness, dizziness, dimness of vision, nausea and vomiting, and collapse.
40-50	Same as previous, with increased pulse rate and respiration and collapse, or unconsciousness.
50-60	Unconsciousness, increased respiration and pulse, intermittent convulsions, Cheyne-Stokes' type of respiration.

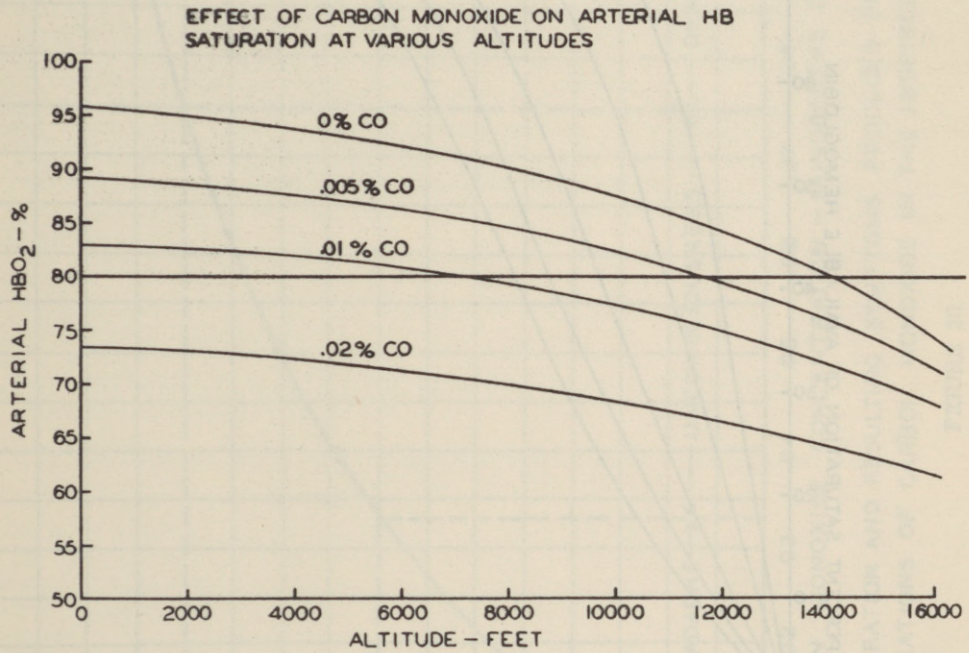


FIGURE 28. (AFTER HEIM).

EFFECT OF CO ON THE SHAPE OF THE OXYGEN DISSOCIATION CURVE

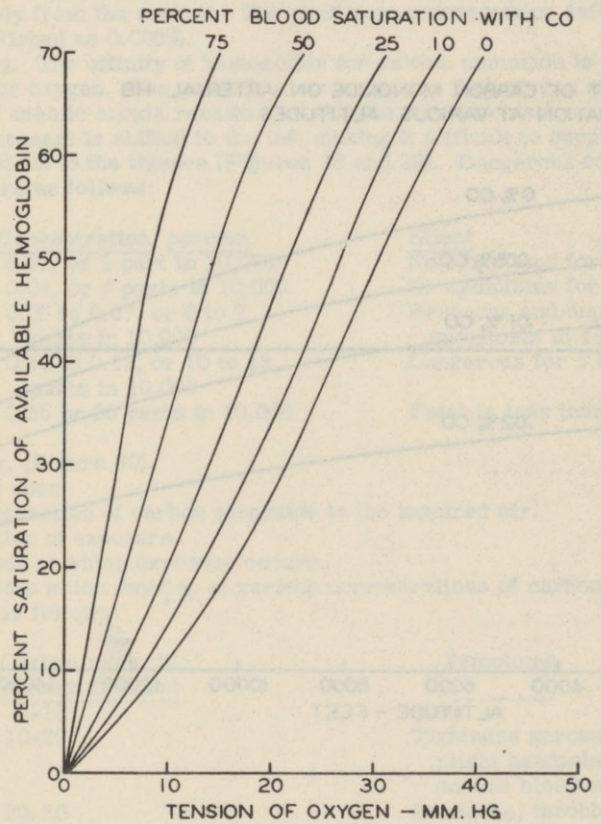
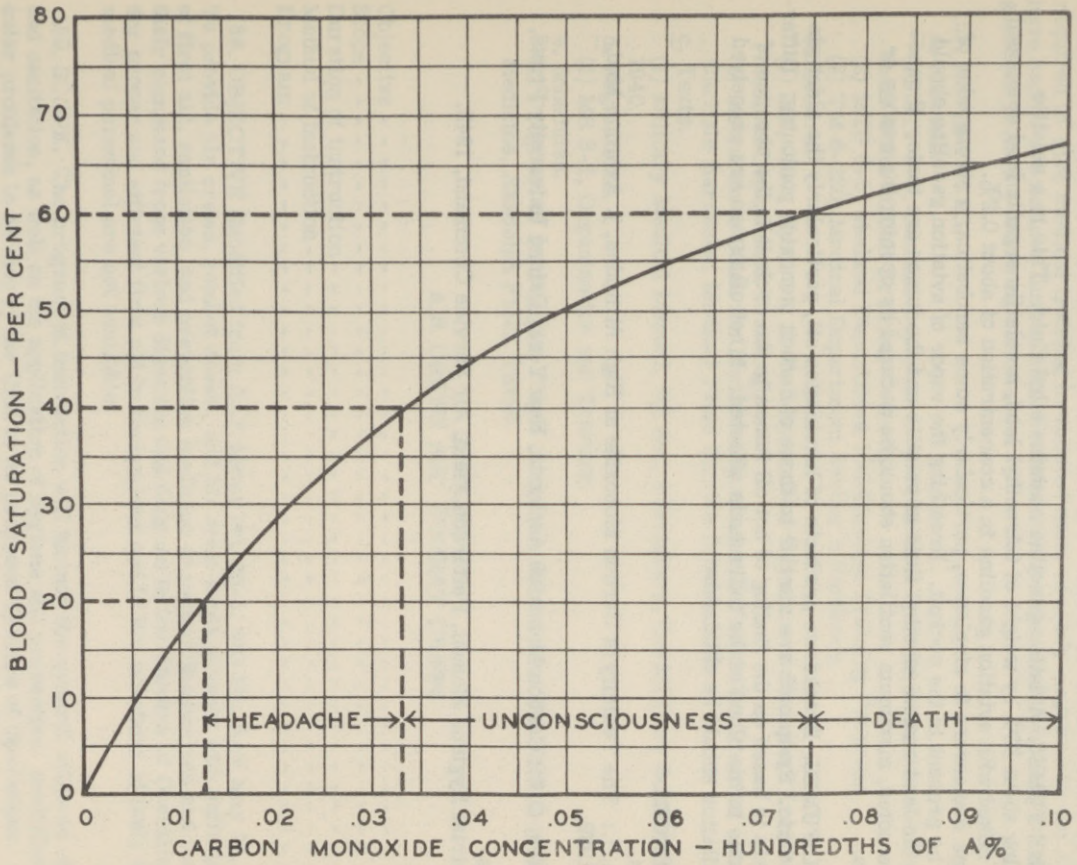


FIGURE 29. (AFTER HEIM).



BLOOD SATURATION AND RESULTING SYMPTOMS PRODUCED BY VARIOUS CONCENTRATIONS OF CARBON MONOXIDE IN THE INSPIRED AIR.

FIGURE 30.

60-70	Coma with intermittent convulsions, depressed heart action - possibly death.
70-80	Weak pulse and slowed respiration, respiratory failure and death.

d. Treatment.
(1) Secure maximum ventilation by opening cockpit canopy or cabin windows.
(2) Turn off any exhaust type heaters in use.
(3) Use supplementary oxygen.
(4) Descend to low altitude or return to ground.

153. GASOLINE FUMES. Aviation gasoline contains ethyl fluid. This is a volatile liquid containing about 60% by weight of tetraethyl lead, a volatile organic lead compound. Ethyl fluid is mixed with aviation gasoline in a concentration of about 0.2%.

During some maneuvers in airplanes, particularly some aerobatics, a strong odor of gasoline may be present in the cockpit. Breathing the vapor of aviation gasoline should be avoided as the lead content of ethyl fluid is volatile and the fumes are toxic. If gasoline fumes are noted, maximum ventilation should be secured by opening the canopy or cabin windows.

154. HOT OIL FUMES. Breakdown products of lubrication oil, particularly the aldehyde acrolein, are toxic. Symptoms are similar to those of carbon monoxide posioning. Differential diagnosis is based on the finding of hot oil fumes in the cockpit in the absence of carbon monoxide in the blood of the individuals affected. If hot oil fumes are preceived adequate ventilation should be obtained.

155. REFERENCES.

a. Articles.
(1) Heim, J.: The Toxicity of Carbon Monoxide at High Altitudes, J. Aviation Med. 10:211, 1939.
b. Texts.
(1) Drinker, C.K.: Carbon Monoxide Asphyxia, New York, Oxford University Press, 1938.
c. Manuals.
(1) Industrial Hygiene Manual, Patterson Field, Air Service Command, 1942.

CHAPTER 6
MEDICAL TRAINING

SECTION I
MEDICAL DEPARTMENT ENLISTED MEN

156. GENERAL. The Flight Surgeon will usually have one or more Flight Surgeon's assistants who have been trained at the School of Aviation Medicine. However, he may be required to give medical training to enlisted men, recently acquired by the Army, who have had no specialized instruction. To accomplish this the Flight Surgeon may obtain guidance from the following references:

157. REFERENCES.

a. Manuals.

(1) MTP 8-1, Medical Department Mobilization Training Program for Medical Department Units at Unit Training Centers.

(2) MTP 8-5, Medical Department Mobilization Training Program.

(3) TM 8-220, Medical Department Soldier's Handbook.

b. Letters.

(1) WD, AGO, April 17, 1940, Subject: War Department Training Directive, 1940-1941 (Medical Department Training).

(2) Instructor's Guide for Medical Department Mobilization Training Program 8-1, Carlisle Barracks, Medical Field Service School, 1942.

c. Texts.

(1) Military Medical Manual, 4th Ed., Harrisburg, The Military Service Publishing Co., 1940.

d. Regulations.

(1) MR 3-1, Organization and Training.

e. Schedules.

(1) Program of Instruction, Flight Surgeon's Assistants, The School of Aviation Medicine, Randolph Field, Texas.

SECTION II
AIR CREWS AND COMBAT CREWS

158. OBJECTIVE (Modified from AAF Memo No. 25-1, WD Hq. AAF May 21, 1942). To provide air crews, combat crews, and air crew replacements with sufficient knowledge of first aid, sanitation, and preventive medicine to protect themselves and those under their command from various diseases and dangers in the Theatre of Operations. To render proper and efficient first aid to themselves and to the members of their command when medical personnel are not available.

159. SCOPE. The program of instruction will include the general subjects of first aid and sanitation, as well as the application of hygiene and preventive medicine to the particular problems to be met by the Unit in its proposed Theatre of Operations. Instructions will consist of film strips, lectures and demonstrations by the Unit Surgeons, and the actual application of first aid to simulated war time injuries by each crew member.

160. DURATION OF INSTRUCTION. The length of the course will be regulated to conform with the time available and the objective to be attained.

161. METHOD OF INSTRUCTION. Lectures and demonstrations must be carefully prepared and rehearsed in advance in order to provide a maximum of instruction in the minimum amount of time. Sanitary appliances will be prepared and demonstrated. Dramatization of simulated injuries will be utilized to the fullest extent. Attendance will be required of all members of the Unit. Upon the completion of the course, each Unit Surgeon will forward a report direct to the Office of the Air Surgeon outlining the course, accompanied by a certificate that all members of his organization have received this instruction.

162. PROGRAM OF INSTRUCTION. The emphasis of all training must be placed on practical measures which can be accomplished by non-medical personnel to relieve suffering and to save lives of members of the crew who are wounded in the air or who are injured on the ground in places which professional medical personnel cannot reach in a relatively short period of time. Simple details of the following must be covered:

a. First aid treatment of gunshot, shell, and bomb wounds. In the control of hemorrhage too much confusing detail on "pressure points" should be omitted, and more detail given on the use of large, sterile, compress type of bandages over wounds caused by explosives. When the lower part of the face has been shot away, it is imperative to keep the tongue, or what remains of it, out of the pharynx.

b. First aid treatment of burns.

c. The first aid kit aeronautic including the use of sulfanilamide powder in fresh open wounds, and the use of "Syrettes" of morphine.

d. Preventive aspects of disease especially of malaria (mosquito bar, mosquito head net, mosquito boots, long trousers and shirt sleeves, mosquito control), of venereal diseases, and of gastrointestinal diseases (sterilization of water, thorough cooking of foods, fly control).

e. The following is a guide for the medical officer in giving this medical instruction to flying personnel (approximately 20 hours). Throughout the personal, individual aspects of each subject must be emphasized. It is more important, for example, to tell the combat crew how to sterilize a canteen full of water, should they be forced down, than to give them details of a complicated purification plant that will be used only by an Engineering Unit attached to a relatively large task force. In addition, if the Flight Surgeon has an inkling of where the Unit is going, he may emphasize, with the unit Intelligence Officer's permission, the problems most likely to confront the group or squadron.

Subject	Reference
(1) Field Sanitation and Personal Hygiene.	
(a) Essential steps in transmission of diseases.	FS 8-3; FS 8-5; Military Medical Manual; Field Sanitation (FM 8-40); Dunham's Military Preventive Medicine" (Army Medical Bulletin No. 23); Desert Operations (FM 31-25).
(b) Water purification.	
(c) Mosquito and fly control.	
(d) Field sanitary appliances.	
(e) Individual delousing methods.	
(f) Care and prevention of trichophytosis.	
(g) Prophylaxis of venereal diseases.	
(2) First aid.	
(a) Use of first aid kit, aeronautic.	FS 8-33; Guides to Therapy for Medical Officers (TM 8-210); Military Sanitation and FirstAid (AM 21-10); Military Medical Manual; Medical Department Soldier's Handbook (TM 8-220); Desert Operations (FM 31-25).
(b) "Shock", prevention, treatment.	
(c) Hemorrhage, methods of control.	
(d) Wounds; Dressings; Topical use of sulfanilamide powder.	
(e) Burns.	
(f) Fractures.	
(g) Heat exhaustion and heat stroke.	
(3) Tropical Medicine.	
(a) Mosquito-borne diseases. The discussions of these should be brief with greatest emphasis on the habits and control of mosquitos	Jungle Warfare (FM 31-20); Stitt's "Diagnosis, Prevention, and Treatment of Tropical Di-

and the prevention of mosquito bite.
1. Malaria.
2. Dengue.
3. Yellow fever.

(b) Louse-borne diseases. Control of body infestation is again the most important aspect.
1. Typhus.

(c) Miscellaneous.
1. Trypanosomiasis.
2. Tropical sore.
3. Filariasis.
4. Schistosomiasis.
5. Snake Bite.
6. Poisonous shrubs.
7. Poisonous insects.
8. Poisonous and dangerous acquatic animals e.g. barracuda, morays, sting rays, scorpions.

seases"; Dunham's "Military Preventive Medicine".

(4) Arctic Medicine.
(a) Frostbite.
(b) Arctic clothing; principles of heat regulation of body.
(c) Arctic rescue unit.
(d) Snow blindness.

The Arctic Manual (TM 1-240); Operations in Snow and Extreme Cold (FM 31-35)

(5) Desert Medicine.
(a) Heat exhaustion, heat stroke, and heat cramps. Relation of intake of salt, water, and vitamins.
(b) Protection of eyes from glare and sand.
(c) Sanitation in the desert.
(d) Sandfly fever.

Desert Operations (FM 31-25)

(6) Aviation Medicine.
(a) Anoxia. Use of supplementary oxygen; demonstration of oxygen equipment.
(b) Decompression sickness including aero-embolism, aero-otitis media, aerosinusitis, and the effect of altitude on the gastrointestinal tract.
(c) Airsickness, causes and prevention.
(d) Acceleration in aircraft; physiological effects; Anti-blackout equipment and methods.
(e) Eyes: Solar retinitis; Prevention of foreign bodies (from propeller blast while taxiing); burns of eye in combat; night vision; effect of foci of infection, anoxia, and fatigue on vision.
(f) Ear, Nose, Mouth and Throat: Dangers of flying with an upper respiratory infection or tonsillitis; aviation deafness and prevention; methods of equalizing pressures in middle ear and throat on ascent and descent; dental hygiene.
(f) Flying Fatigue: causes, prevention; importance of recreation, hobbies, adequate diet, rest, tobacco and alcohol, adequate protection from cold, comfortable position in aircraft, physical fitness.
(f) Flying Clothing

High Altitude Physiology, Wright Field, Aero Medical Research Laboratory, 1941.
Air Crew in their Element (Maj. V.E. Henderson), U. of Toronto Press, 1942)
Physiological Aspects of Flying and Maintenance of Physical Fitness (TM 1-705)
Airsickness, Causes and Prevention, S.A.M., 1943
Flight Surgeon's Handbook, 2nd Ed., S.A.M., 1943.

SECTION III
MEDICAL OFFICERS ON DUTY WITH A.A.F.

163. OUTLINE OF BASIC TRAINING. a. Military Training. (1) Military Courtesies and Customs of the Service.
(2) Military Training Methods.
(3) Shelter Tent Pitching and Display of Equipment
(4) Heavy Tent Pitching
(5) Litter Drill and Ambulance Loading
(6) Interior Guard Duty and Drill, Close Order
(7) Soldiers Medical Field Equipment
(8) Physical Training

b. Military Art.
(1) Organization of Army
(2) Organization of Air Forces
(3) Organization of Medical Department
(4) Organization of Medical Service of AAF
(5) Evacuation
(a) Rail
(b) Motor (Mobile & Stabilized Situations)
(c) Air Evacuation
1. by Light Plane Ambulance
2. by Transport Ambulance
3. by Liaison Plane
4. by Transport Plane
5. the Air Ambulance Squadron
6. the Air Ambulance Section
(6) Medical Service with AAF in Zone of Interior
(7) Medical Service AAF Units when operating with Ground units in Theater of Operation
(8) Medical Service with AAF units when operating alone in the Theater of Operation
(9) Medical Plan in Ground-air Defense of an Airdrome
(10) Medical Plan for Defense and Against Treatment of Chemical Casualties and Chemicals
(11) Map Reading
(12) Aeronautical Charts
(13) Avigation
(14) Theory of Flight
(15) Meteorology
(16) Jungle Warfare
(17) Operations in Snow and Ice
(18) Desert Operations
(19) Landing Operations
(20) Identification of Aircraft
(21) S O P for Medical units AAF
(22) Camouflage
(23) Staff Procedure
(24) Defense against Chemicals (General)
(25) Identification Foreign Vehicles

c. Military Sanitation
(1) Housing of Troops
(2) The Medical Inspector
(3) Food Inspection
(4) Mess Sanitation
(5) Field Disposal of Human Wastes

(6) Field Disposal of Kitchen and Animal Wastes
(7) Field Water Supply
(8) Disinfestation in the Field
(9) Control of Respiratory Disease
(10) Control of Intestinal Diseases
(11) Malarial Control
(12) Control of Chiggers, Sand Flies, Ticks, Ants, Bed Bugs, Cockroaches, and Lice
(13) Rodents - Rodent Fleas and Rodent and Flea Borne Diseases
(14) Control of Venereal Diseases
(15) Sanitary Problems in Tropical Countries
(16) Sanitary Problems in Desert Operations
(17) Sanitary Problems in Arctic Operations
(18) Sanitary Orders

d. Military Administration
(1) Military Law
(2) Manual of Courts Martial
(3) Service Records
(4) Morning Reports and Rosters
(5) Pay Vouchers - Pay Rolls- Allotments
(6) Daily Sick Report and Sick Call
(7) Property: Accountability and Responsibility
(8) Clothing and Equipment
(9) Rations and Mess Management
(10) Sick and Wounded Register
(11) EM Tag and Field Medical Record
(12) Report of Sick and Wounded
(13) Statistical Reports
(14) Hospital Administration
(15) Military correspondence
(16) Board of Officers
(17) Efficiency Report
(18) Operation of the Dispensary
(19) Deserters and Reports of Desertion
(20) Death Reports
(21) Squadron Surgeon Administration
(22) Group Surgeon Administration
(23) Safeguarding Military Information
(24) The General Hospital
(25) The Station Hospital
(26) The Evacuation Hospital
(27) The Field Hospital
(28) The Surgical Hospital
(29) The Convalescent Hospital
(30) The Medical Supply Depot
(31) The Medical Laboratory
(32) The Auxiliary Surgical Group
(33) The Hospital Train
(34) The Hospital Center
(35) The Medical Regiment
(36) The Medical Battalion
(37) The Ambulance Battalion

e. Logistics
(1) Motor Maintenance and Care
(2) Selection of Motor Vehicle Drivers
(3) Training of Motor Vehicle Drivers
(4) Motor Movements
(5) Shuttle Movements
(6) Medical Supply
(7) Air Depot Group - Function of

(8) Service Group - Function of

f. Field Medicine and Surgery

(1) Operation of Aid Station
(2) Treatment of Shock and Burns
(3) Treatment of Chest and Abdominal Wounds
(4) Treatment of Fracture and Crushing Injuries
(5) Emergency of Plastic Repair
(6) Treatment of Chemical Casualties
(7) Dental Field Service
(8) Veterinary Field Service
(9) Tropical Field Medicine
(10) First Aid in Flight
(11) Removal of Injured from Plane

164. DIDACTIC PROGRAM FOR RATING AS AN AVIATION MEDICAL EXAMINER. The didactic program at the School of Aviation Medicine consists of lectures, demonstrations, and applicatory exercises in opthalmology, otorhinolaryngology, neuropsychiatry, psychology, and Aviation Medicine. The latter includes a consideration of the Army Regulations pertaining to the physical examination for flying, physical diagnosis, cardiology, and the physiological aspects of flying. During the war emergency courses are included to cover tropical medicine, field medicine and sanitation , and military surgery.

165. REFERENCES.

a. Schedules.

(1) Program of Instruction, The Six Weeks Course, School of Aviation Medicine, Randolph Field, Texas.
(2) Program of Instruction (Medicine), Officer Training School, AAFTTC, Miami Beach, Florida, September 30, 1942.

b. Manuals.

(1) FM 21-5, Military Training.
(2) FM 21-6, List of Publications for Training and Training Films.

c. Films.

(1) TF 7-295, Military Training.

d. Texts.

(1) Military Medical Manual, 4th Ed., Harrisburg, The Military Service Publishing Co., 1940.

CHAPTER 7.

SANITATION

SECTION I

SANITARY REPORT

166. MODEL OF SANITARY REPORT. The following is a model of a monthly sanitary report rendered by a station hospital (see AR 40- 275):

STATION HOSPITAL
Office of the Surgeon

Randolph Field, Texas
March 10, 1942.

SUBJECT: Sanitary Report for February, 1942.

TO: The Commanding Officer, Randolph Field, Texas.

1. The following report of sanitary conditions at this station for the month of February, 1942, is submitted in accordance with paragraph 1, c, AR 40-275, dated November 15, 1932, Section III, WD Circular No. 114, dated June 13, 1941, and letter, Surg. 721.5-(General), Headquarters Eighth Corps Area, Fort Sam Houston, Texas, dated December 19, 1941:

a. Environmental Sanitation:

(1) General environmental sanitation is satisfactory.

(2) Water supply:

(a) Adequate supply at all times during the month of February, 1942.

(b) Maximum daily usage in gallons	1,060,000
Average daily usage in gallons	840,000
Average daily usage per capita in gallons	82
Maximum daily available gallons	2,280,000

(c) Number of samples from post water supply examination for bacteria during the month -
(No analysis of water made).
Number of specimens from post water supply reported as unsatisfactory - None.
Copies of reports on examination of water inclosed.

(d) No improvement in effectiveness of chlorination system over last month.

(3) Sewage Disposal:

(a) Average daily flow in gallons	564,527
Maximum daily flow in gallons	615,273

Number of times plant "by-passed" during month - None.

(b) Suspended solids (monthly average) Raw Sewage PPM - 6,000
Suspended solids (monthly average) Final Effluent PPM - 1,000

Suspended solids (monthly average) % removal	-	76%
BOD (not obtained)		
Relative stability (monthly average) on Raw Sewage (Methylene Blue Test)	-	27%
Relative stability (monthly average) on Final Effluent (Methylene Blue Test)	-	83%
Chlorine Residual (monthly average) in Final Effluent PPM	-	0.4

(c) The receiving stream is intermittent in its flow above entrance of the sewage effluent, dry above plant.

b. Personal Hygiene: Monthly physical inspection of the command was held February 19, 20, 1942, with approximately 100% attendance. No "New" cases of venereal diseases were detected at this inspection. Personal hygiene is satisfactory Venereal rate for the command for the month of February, 1942, 30.3.

c. Undue Prevalence of Acute Communicable Diseases: One case of Typhus Fever occurred in the command during the month of February, 1942.

d. New or Improved Administrative Measures and Sanitary Appliances: None.

e. Subjects Not Covered Under Other Headings:

(1) The menus of all organizations are checked frequently by the Medical Inspector and from time to time by the Post Surgeon. They are well balanced as to protein carbohydrate, and fat contents. The feeding of butter, milk, fresh fruit, and vegetables daily assures an adequate supply of vitamins.

(2) As a result of one case of Typhus Fever developing on this post and a report of nine cases in the City of San Antonio, Texas, a rat extermination campaign was car ried out at this station on February 26 to 28, 1942.

f. Recommendations:

(Signed)
Lieut. Col., Medical Corps,
SURGEON.

6 Incls. - MD Form 95

SECTION II

SANITARY ORDER

167. PROBLEM. You are the Squadron Surgeon of the 361st Pursuit Squadron located at _____ Base, California. Your squadron is ordered to patrol duty along the Mexican border with establishment of a camp 7 miles north of Brownsville, Texas. Water can be supplied from a nearby rancher's windmill and well. Other supplies must be obtained by truck transportation from railhead at Brownsville, Texas, or by local purchase. Prepare a sanitary order for this situation as of date of arrival at camp site.

168. SOLUTION.

Headquarters, 361st Pursuit Squadron,
Brownsville, Texas,
February 20, 1942.

GENERAL ORDER

NO. 1

1. The following provisions for the sanitation of this command are published for the information and guidance of all concerned:

a. The unit commanders are responsible for the carrying out of the provisions of this order in the units and the areas occupied by them.

b. The squadron surgeon is responsible for the inspection, reporting on and the making of recommendations on all matters which affect the sanitation and the general health of this command.

c. Police officer will be responsible for the sanitation of those areas not occupied by individual units and will cooperate with the squadron surgeon and unit commanders in the maintenance of correct sanitary conditions within the camp area.

d. Water Supply: Water for all purposes will be obtained from tank at Ranch X by water cart transportation. Water for cooking and drinking will be sterilized by clorination in water carts as directed in memorandum attached hereto (or par. 20, Field Manual 21-10). Due precaution will be taken to prevent contamination of water after sterilization. Common drinking cups will not be used. Water for bathing and laundry will be drawn each morning from water cart at bathing area.

e. Food and Messes: Squadron mess officer will be permitted to purchase such articles of food as may be offered by local markets and which conform with the provisions of this paragraph. Only meat and dairy products will be used which have received the approval of the medical inspector at either time of purchase or time of delivery. These purchases will be made only at places approved by the medical inspector. Food delivered from town or railhead will be accurately protected in transit. Only bottled and canned milk will be used. Bottled milk will be pasturized, and obtained only from markets approved by the medical inspector. All leafy vegetables will be thoroughly washed prior to use. The squadron mess officer will be held responsible for the protection and storage of all food used. Preservation of food will be accomplished as described in attached memorandum (or par. 39, Field Manual 21-10). Mess kits will be washed in two cans of hot, soapy water and one of hot, clear water.

f. (1) Waste Disposal: Kitchen waste will be separated in edible, non-edible garbage, rubbish, and tin cans. Edible garbage will be called for daily by a designated civilian (Mr. X) at 9:00 A. M. and 6:00 P. M. each day. Non-edible garbage and rubbish will be disposed of by incineration as described in attached memorandum. Tin cans and containers will be flattened, burned, and buried. Liquid waste will be disposed of in soakage pits and grease traps and cared for as described in attached memorandum.
(2) Human Waste: Deep pit latrines will be dug as described in attached memorandum. Latrine boxes, screens, and other equipment necessary for care of latrines will be obtained from squadron supply officer. Crude oil will be sprayed daily in the latrines. Seat boxes will be scrubbed daily with soap and water and two times a week with a two per cent creosol solution. A urine trough will be built as in attached memorandum and run into soakage pit. A latrine orderly will be held responsible for proper policing of latrines and surrounding area. Night urinal cans will be placed in squadron street at taps and will contain two inches of two per cent creosol solution. These will be removed and emptied in soakage pits at reveille, scrubbed with soap and water and air dried.

g. Quarters: Shelter tents and wall tents will be left open during the day when the weather is favorable. All tents will be struck once a week to provide proper airing of site. Bedding will be aired twice a week. Head to foot sleeping arrangements will prevail.

h. Insect Control: Fly traps will be obtained by units from squadron supply officer and placed about kitchens, garbage racks, and latrines. These will be properly baited, inspected, and cleaned daily. Mosquito nets will be used on each bunk. These will be inspected and all holes repaired. A spray gun will be available in each tent. Mosquito bars will be neatly rolled during the day. Guards will be furnished with a repellant and head nets, supplied by squadron supply officer. (Breeding areas of mosquitos will be destroyed as described in attached memorandum).

Scorpions: Because of prevalence of scorpions, all men are cautioned to shake out gloves, shoes, socks, and other articles of clothing before putting them on in the morning and to shake out bedding at night.

i. Personal Hygiene: Shower baths will be made available daily at 4:00 P. M. Buckets of water and basins will be provided at ablution areas at other times. Clothes will be washed at times indicated by squadron commander. Hair will be cut to one inch length.

j. Dispensaries: Squadron dispensaries will be located at end of camp street at entrance to camp, south of squadron headquarters. Red cross flag indicates location in day time. Due to blackout conditions, no light will be used at night. Sick call will be at 7:00 A. M. daily. Emergency cases or individuals who become sick at any other time, will report to the dispensary immediately.

k. Venereal Prophylaxis: Will be available at squadron dispensary at all times and at prophylactic station maintained in the central court house, Brownsville, Texas, at times to be indicated by squadron commander.

l. Physical Inspection: All men who did not complete typhoid or tetanus series of immunizations will report to squadron dispensary at sick call. Physical inspection of squadron will be held at a time designated by the squadron commander.

m. Special Measures for Control of Communicable Diseases: Any personnel with evidence of acute illness or infection will be sent immediately to the dispensary. This entails cooperation of all officers and men. (If the body louse were to become a problem, description of methods of control would be included here).

2. All civilians attached to this command will comply with this order insofar as it applies to them.

(Signed)
Commanding

(Note: The commanding officer signs this, not the surgeon).

OFFICIAL:

(Signed)
Adjutant

Distribution:
General

A memorandum describing many of the sanitary devices could be attached to this order, or the details desired could be incorporated directly in the order.

SECTION III
SANITARY DEVICES

169. REFERENCES FOR. Descriptions of sanitary devices may be obtained in FM 8-40, FM 21-10, Dunham's Military Preventive Medicine (Army Medical Bulletin No. 23), and AR 40-205 to 40-245, 40-270, 40-275, 40-2010, 40-2080, and 40-2150. The following lists the references principally in FM 8-40:

a. Water. Water sterilizing bag, ref. par. 45 and 46, FM 8-40
Water sterilizing unit, ref. p. 336, Dunham's Military Preventive Medicine, 1938

b. Waste.
(1) Human:
Straddle trench, ref. par. 59, FM 8-40
Pit latrine, ref. par. 60, FM 8-40
Bored hole latrine, ref. par. 65, FM 8-40
Urinal, ref. par. 62, FM 8-40
Urine soakage pit, ref. par. 66, FM 8-40
Pail latrine, ref. par. 69, FM 8-40
(2) Kitchen
Semi-closed incinerator, par. 71 f, FM 8-40
Open incinerator, ref. par. 71 g, FM 8-40
Garbage stands, ref. par. 73, FM 8-40
Grease traps, ref. par. 79, FM 8-40
Kitchen soakage pit, ref. par. 78, FM 8-40
Kitchen soakage trenches, ref. par. 80, FM 8-40

c. Storage of food: ref. par. 99, FM 8-40

d. Mess kit washing and dish washing: ref. par. 100, FM 8-40

e. Fly traps: ref. par. 131, FM 8-40
Fly baits: ref. par. 134, FM 8-40

f. Mosquito control: ref. Chapter 8, FM 8-40

g. Disinfestors: ref. par. 169 - 178, FM 8-40

SECTION IV
ABSTRACTS FROM INTERNATIONAL SANITARY CONVENTION FOR AERIAL NAVIGATION
(THE HAGUE: APRIL 12, 1933)

170. GENERAL REFERENCE, SANITARY REGULATIONS ON THE CARE OF CERTAIN DISEASES (PART III, SANITARY CODE).

Article 18

The diseases which are subject to the special measures prescribed by this Part of the Convention are plague, cholera, yellow fever, typhus, and smallpox.

Article 19

For the purpose of the present Convention the period of incubation is reckoned as 6 days in the case of plague, 5 days in the case of cholera, 6 days in the case of yellow fever, 12 days in the case of typhus, and 14 days in the case of smallpox.

Article 20

The chief health authorities shall transmit to the sanitary and authorized aerodromes of their respective countries all information contained in the epidemiological notifications and communications received from the Office International d'Hygiene publique (and the Regional Bureaux with which it has made agreements for this purpose) in execution of the provisions of the International Sanitary Convention of the 21st June, 1926, which may affect exercise of sanitary control in those aerodromes.*

Article 21

The measures prescribed in this Part of the Convention shall be regarded as constituting a maximum within the limits of which High Contracting Parties may regulate the procedure which may be applied to aircraft.

It is for each High Contracting Party to determine whether measures should be applied, within the limits of the present Convention, to arrivals from a foreign local area or aerodrome.

In this respect information received and measures already applied shall, in accordance with Article 54 of the present Convention, be taken into the fullest possible account.

Article 22

*For the purpose of Part III of the present Convention a local area is considered to be infected when the conditions specified in the International Sanitary Convention of the 21st June, 1926, are applicable to it.***

* Cmd. 3207

** *According to the terms of the International Sanitary Convention of the 21st June, 1926, Article 10, and the first paragraph of Article II, a local area is considered "infected" by one of the diseases in question in the following circumstances: For plague and yellow fever when the first case recognized as non-imported is reported; for cholera when forming a foyer - that is, when the occurrence of new cases outside the immediate surroundings of the first cases proves that the spread of the disease has not been confined to the place where it began; for typhus and smallpox when they appear in epidemic form.*

171. MEASURES APPLICABLE IN THE CASE OF PLAGUE, CHOLERA, TYPHUS, AND SMALLPOX (CHAPTER I, PART III, SANITARY CODE).

Measures on Departure

Article 23

The measures to be applied on the departure of aircraft from a local area infected by one of the diseases mentioned in this Chapter are the following:

(1) Thorough cleansing of the aircraft, especially the parts liable to be contaminated.

(2) Medical inspection of passengers and crew.

(3) Exclusion of any person showing symptoms of one of the diseases in question; as well as of persons in such close relation with the sick as to render them liable to transmit the infection of these diseases.

(4) Inspection of personal effects, which shall only be accepted if in a reasonable state of cleanliness.

(5) In the case of plague, deratization if there is any reason to suspect the presence of rats on board.

(6) In the case of typhus, disinsectization, limited to persons who, after medical inspection, are considered as likely to convey infection, and to their effects.

The aircraft's papers shall be annotated in accordance with the requirements of Article 9.

Measures on Arrival

Article 24

Aircraft, even when coming from a local area infected by one of the diseases to which this Chapter applies, may land at any authorized aerodrome. Nevertheless, each High Contracting Party, if epidemiological conditions demand such action, has the right to require aircraft coming from particular local areas to land at prescribed sanitary or authorized aerodromes, account being taken of the geographical position of those aerodromes and of the routes followed by the aircraft, in such a manner as not to hamper aerial navigation.

The only measures which, if necessary, may be taken at authorized aerodromes which are not also sanitary aerodromes, are the medical inspection of crew and passengers and the landing and isolation of the sick. Passengers and crew may not move beyond the limits prescribed by the aerodrome authority except

with permission of the visiting medical officer. This restriction may continue to be imposed on the aircraft at each landing place until it arrives at a sanitary aerodrome, where it will be subject to the measures laid down in this Chapter.

Article 25

The commander of the aircraft is required, on landing, to place himself at the disposal of the sanitary authority, to answer all requests for information affecting public health which are made to him by the competent service, and to produce the aircraft's papers for examination.

Should an aircraft, on entering a territory, land elsewhere than on a sanitary or authorized aerodrome, the commander of the aircraft shall, if the aircraft comes from an infected local area or is itself infected, notify the nearest local authority to this effect, and the latter shall take such measures as are appropriate to the circumstances, being guided by the general principles on which the present Convention is based, and shall, if possible, direct the aircraft to a sanitary aerodrome. No cargo shall be unloaded and no passenger or member of the crew shall leave the vicinity of the aircraft without the permission of the competent sanitary authority.

Article 26

In the application of the present Convention, surveillance may not be replaced by observation except –

(a) in circumstances in which it would not be practicable to carry out surveillance with sufficient thoroughness; or

(b) if the risk of the introduction of infection into the country is considered to be exceptionally serious; or

(c) if the person who would be subject to surveillance cannot furnish adequate sanitary guarantees.

Persons under observation or surveillance shall submit themselves to any examination which the competent sanitary authority may consider necessary.

(A) – PLAGUE

Article 27

If there has not been a case of plague on board, the only measures which may be prescribed are –

(1) Medical inspection of passengers and crew;

(2) Deratization and disinsectization, if in exceptional cases these operations are considered necessary, and if they have not been carried out at the aerodrome of departure;

(3) The crew and passengers may be subjected to surveillance for a period not exceeding six days from the date on which the aircraft left the infected local area.

Article 28

If there is on board a recognized or suspected case of plague, the following measures are applicable:

(1) Medical inspection;

(2) The sick shall be immediately disembarked and isolated;

(3) All persons who have been in contact with the sick, and those whom the sanitary authority has reason to consider suspect, shall be subject to surveillance for a period not exceeding six days from the date of arrival of the aircraft;

(4) Personal effects, linen and any other articles which in the opinion of the sanitary authority are infected, shall be disinsectized and, if necessary, disinfected;

(5) Any parts of the aircraft which are suspected of being infected shall be disinsectized;

(6) The sanitary authority may carry out deratization in exceptional cases, if there is any reason to suspect the presence of rats on board and if the operation was not carried out on departure.

Article 29

If the sanitary authority considers that merchandise coming from an area infected with plague may harbour rats or fleas, such merchandise shall not be discharged except with the necessary precautions.

(B) – CHOLERA

Article 30

If there has been a case of cholera on board, the only measures which may be prescribed are –

(1) Medical inspection of passengers and crew;

(2) Surveillance of passengers and crew for a period not exceeding five days from the date on which the aircraft left the infected local area.

Article 31

If a case of disease presenting clinical signs of cholera appears on board during the voyage, the aircraft shall be subject, at places of call or on arrival, to the following procedure:

(1) Medical inspection;

(2) The sick shall be immediately disembarked and isolated;

(3) The crew and passengers shall be kept under surveillance for a period not exceeding five days from the date of arrival of the aircraft;

(4) Personal effects, linen and all other articles which in the opinion of the sanitary authority are infected, shall be disinfected;

(5) The parts of the aircraft which have been occupied by the sick or which are regarded as liable to have been infected shall be disinfected;

(6) When the drinking water on board is considered suspect, it shall be disinfected, and if practicable emptied out and replaced, after the disinfection of the container, by wholesome water.

In countries in which investigation for the detection of carriers of the cholera vibrio is prescribed for the inhabitants, persons arriving by aircraft who wish to remain in the country shall submit to the obligations imposed on the inhabitants.

Article 32

Persons producing proof that they have been vaccinated against cholera within less than six months and more than six days may be subjected to surveillance only.

Proof shall consist of a written certificate signed by a doctor whose signature shall be officially authenticated; failing such authentication, the certificate shall be countersigned by either (a) the medical officer attached to a sanitary aerodrome or (b) a person, other than the person performing the vaccination, who is authorized to witness an application for a passport under the regulations of the country.

Article 33

The unloading from aircraft of the following fresh foods may be prohibited: Fish, shellfish, fruit and vegetables, coming from a local area infected with cholera.

(C) - TYPHUS

Article 34

(a) If there has not been a case of typhus on board, no sanitary measure may be carried out save those prescribed in Article 52 of the present Convention for persons who have within 12 days left a local area where typhus is epidemic.

(b) The following measures are applicable if there is a case of typhus on board:

(1) Medical inspection.

(2) The sick shall be immediately disembarked, isolated and deloused.

(3) Any person suspected of harbouring lice or of having been exposed to infection shall also be deloused, and may be subjected to surveillance for a period not exceeding 12 days, reckoned from the date of delousing.

(4) Linen, personal effects, and other articles which the sanitary authority considers to be infected shall be disinsectized.

(5) The parts of the aircraft which have been occupied by persons suffering from typhus and which the sanitary authority considers to be infected shall be disinsectized.

(D) - SMALLPOX

Article 35

(a) If there has not been a case of smallpox on board, no sanitary measure may be carried out save in the case of persons who have within 14 days left a local area where smallpox is epidemic and who, in the opinion of the sanitary authority, are not sufficiently immunized. Such persons may be subjected, without prejudice to the terms of Article 52, to vaccination, or to surveillance, or to vaccination followed by surveillance, the period of which shall not exceed 14 days from the date of arrival of the aircraft.

(b) The following measures are applicable if there is a case of smallpox on board:

(1) Medical inspection.

(2) The sick shall be immediately disembarked and isolated.

(3) Other persons who there is reason to believe have been exposed to infection and who, in the opinion of the sanitary authority, are not sufficiently immunized may be subjected to the measures prescribed in paragraph (a) of this Article.

(4) Linen, personal effects, and other articles which the sanitary authority considers to have been recently infected, shall be disinfected.

(5) The parts of the aircraft which have been occupied by persons suffering from smallpox and which the sanitary authority considers to be infected shall be disinfected.

For the purpose of this Article persons shall be considered immune (a) if they can produce proof of a previous attack of smallpox, or if they have been vaccinated within less than three years and more than 12 days, or (b) if they show local signs of early reaction attesting an adequate immunity. Apart from cases where these signs are present, proof shall be afforded by a written certificate of a doctor, authenticated in the manner prescribed in the second paragraph of Article 32.

172. MEASURES APPLICABLE IN THE CASE OF YELLOW FEVER (CHAPTER II, PART III, SANITARY CODE).

General Provisions

Article 36

In territories where endemicity of yellow fever is suspected, the High Contracting Parties shall take the necessary steps to ascertain whether yellow fever exists in their territory in a form which, though not clinically recognizable, might be revealed by biological examination.

Article 37

Independently of the notification of cases of and circumstances relating to recognized cases of yellow fever as laid down in Articles 1, 2, 3, 4, 5, and 8 of the International Sanitary Convention of the 21st June, 1926, each High Contracting Party undertakes to notify immediately to the other High Contracting Parties and at the same time to the Office International d'Hygiene publique (either directly or indirectly through the Regional Bureaux with which it has made agreements for this purpose) the discovery in his territory of the actual existence of yellow fever in the above mentioned form.

Section II - Provisions concerning regions in which Yellow Fever has occurred or exists in an endemic form

Article 38

Notwithstanding Article 4 of the present Convention, and subject to the terms of Article 46 hereafter, every aerodrome which receives aircraft to which Article 1, I, second paragraph, applies, and which is situated in a region, that is to say, a part of a territory, in which yellow fever exists in a form clinically or biologically recognizable, shall become a sanitary aerodrome as defined in the present Convention, and in addition shall be -

(1) Situated at an adequate distance from the nearest inhabited centre.

(2) Provided with arrangements for a water supply completely protected against mosquitoes and kept as free as possible from mosquitoes by systematic measures for the suppression of breeding places and the destruction of the insects in all stages of development.

(3) Provided with mosquito-proof dwellings for the crews of aircraft and for the staff of the aerodrome.

(4) Provided with a mosquito-proof dwelling in which passengers can be accommodated or hospitalized when it is necessary to apply the measures specified in Articles 42 and 44 below.

Article 39

If, in the region where yellow fever has occurred or exists in an endemic form, there is not already an aerodrome fulfilling the conditions specified in the preceding Article, all aerial navigation from this region to any other territory shall be suspended until such an aerodrome shall have been established.

Article 40

Every aerodrome established and equipped in accordance with the provisions of Article 38 above shall be called an anti-amaryl aerodrome, and shall be deemed to be a separate local area. The creation of such an aerodrome shall be notified by the High Contracting Party in whose territory it is situated to

the other High Contracting Parties, and either to the Office International d'Hygiene publique or to the International Commission for Aerial Navigation, under the conditions laid down in Article 7. Consequent on this notification, the declaration of the presence of yellow fever in an adjacent town or village, or in another local area, shall not apply to the aerodrome, and the aerodrome shall not be declared infected unless yellow fever occurs among the persons residing therein.

Article 41

If an anti-amaryl aerodrome becomes an infected local area, aerial navigation from that aerodrome to any other territory shall be discontinued until all measures have been taken to free it from infection, and all risk of the spread of yellow fever has ceased.

Article 42

Where the anti-amaryl aerodrome is not infected, but yellow fever exists in the region, the following measures shall be taken on the departure, or in any event as late as possible before the departure, of an aircraft:

(1) Inspection of the aircraft and cargo to ensure that they do not contain mosquitoes, and, if necessary disinsectization. A record of this inspection and any action taken shall be entered in the journey log-book.

(2) Medical inspection of passengers and crew; those who are suspected of suffering from yellow fever, or in whose case it has been duly established that they have been exposed to the infection of yellow fever, shall be required to remain under observation either within the precincts of the aerodrome or elsewhere, under conditions approved by the sanitary authority, until six days have elapsed since the last day on which they were exposed to infection.

(3) The names of the passengers and crew shall be entered in the journey log-book, together with the revelant information with regard to their exposures to infection, and the period and conditions of the observation which they have undergone prior to departure.

Article 43

Aircraft in transit, not coming from a region in which yellow fever exists, and landing for the purpose of taking in supplies in an anti-amaryl aerodrome, shall be exempt from the prescribed sanitary measures on leaving that aerodrome. In the further course of the voyage they shall not be subject to the provisions of this Chapter provided that the fact that they have called at an anti-amaryl aerodrome for the sole purpose of taking in supplies is entered in the journey log-book.

Article 44

Aircraft to which Article 1, I, second paragraph, of the present Convention applies, flying between two regions where yellow fever exists must depart from and land at an anti-amaryl aerodrome in these regions. Passengers, crew and cargo shall not be disembarked or embarked except at an anti-amaryl aerodrome.

During the voyage between these aerodromes aircraft may land for the purpose of taking in supplies in any aerodrome not situated within a region where yellow fever exists.

The measures to be taken on arrival at the anti-amaryl aerodrome are the following:

(1) Inspection of the aircraft and cargo to ensure that they do not contain mosquitoes, and, if necessary, disinsectization.

(2) Medical examination of passengers and crew to ascertain that they are free from symptoms of yellow fever.

If a person is suspected to be suffering from yellow fever, or if it has not been established to the satisfaction of the sanitary authority of the aerodrome of arrival that a person has completed a period of six days since possible exposures to infection, he may be subjected to observation either within the precincts of the aerodrome or elsewhere under conditions approved by the sanitary authority, for a period not exceeding six days reckoned from the last day on which that person could have been infected.

Article 45

Aircraft having departed from an anti-amaryl aerodrome in a region where yellow fever exists and arriving at a region where yellow fever does not exist, shall be subject to the provisions of Sections III and IV below.

Article 46

For the purposes of local aerial navigation, nothing in this section shall be deemed to prevent the Governments of neighboring territories in which yellow fever is found or exists endemically from

establishing or employing, by mutual agreement, aerodromes which are not anti-amaryl aerodromes, for the needs of aerial navigation exclusively between these territories.

Section III - Provisions in respect of Territories or Regions in which Yellow Fever does not exist, but in which there may be conditions which permit of its development

Article 47

In territories or regions where yellow fever does not exist, but where there may be conditions which permit of its development, the measures which may be taken on the arrival of an aircraft at a sanitary aerodrome are the following:

(1) Inspection of aircraft and cargo to ensure that they do not contain mosquitoes, and, if necessary, disinsectization.

(2) Medical examination of passengers and crew to ascertain that they are free from symptoms of yellow fever.

If a person is suspected to be suffering from yellow fever, or if it has not been established to the satisfaction of the sanitary authority of the aerodrome that a person has completed a period of six days since possible exposure to infection, he may be subjected to observation either within the precincts of the aerodrome or elsewhere, under conditions approved by the sanitary authority, for a period not exceeding six days reckoned from the last day on which that person could have been infected.

Article 48

The High Contracting Parties undertake, save in exceptional circumstances which will require to be justified, not to invoke sanitary reasons for prohibiting the landing in the territories referred to in Article 47 of aircraft coming from regions where yellow fever exists, provided that the provisions of Section II of this Chapter, particularly those concerning the measures to be taken on departure, are observed there.

Article 49

Nevertheless, the High Contracting Parties may designate particular sanitary aerodromes as those at which aircraft from territories where yellow fever exists shall land for the purpose of disembarking passengers, crew or cargo.

Section IV - Provisions in respect of Territories or Regions where the conditions do not permit of the development of Yellow Fever

Article 50

In territories or regions where the conditions do not permit of the development of yellow fever, aircraft coming from regions where yellow fever exists may land on any sanitary or authorized aerodrome.

Article 51

The measures to be taken on arrival are the following:

(1) Inspection of the aircraft and cargo to ensure that they do not contain mosquitoes, and, if necessary, disinsectization.

(2) Medical inspection of passengers and crew.

173. GENERAL PROVISIONS (CHAPTER III, PART III, SANITARY CODE).

Article 52

Persons who arrive in aircraft in the territory of any High Contracting Party and who have been exposed to risk of infection by one of the diseases referred to in Article 18 of the present Convention, and who are within the period of incubation, may, subject to the provisions of Chapter II of this Part, be subjected to surveillance until the termination of that period.

In the case of cholera and smallpox, the provisions of Articles 30 et seq. and 35 relating to immunized persons apply equally to action under this Article.

Article 53

Persons who, on arrival at an aerodrome, are considered under the terms of this Part liable to surveillance up to the expiration of the period of incubation of the disease, may nevertheless continue

the voyage on condition that the fact is notified to the authorities of subsequent landing places and of the place of arrival, either by means of an entry in the journey log-book as prescribed in Article 9 of the present Convention, or by some other method sufficient to secure that they can be subjected to medical inspection in any subsequent aerodrome on the route.

Persons who are liable to observation under the terms of Articles 26, 44 (fourth paragraph) and 47 (second paragraph) of this Convention shall not be authorized until the expiration of the period of incubation to continue their voyage, except - in case of diseases other than yellow fever - with the approval of the sanitary authorities of the places of their destination.

Article 54

In applying sanitary measures to an aircraft coming from an infected local area, the sanitary authority of every aerodrome shall, to the greatest possible extent, take into account all measures which have already been applied to the aircraft in another sanitary aerodrome abroad or in the same country, and which are duly noted in the journey log-book referred to in Article 9 of the present Convention.

Aircraft coming from an infected local area which have already been subjected to satisfactory sanitary measures shall not be subjected to these measures a second time on arrival at another aerodrome, whether the latter belongs to the same country or not, provided no subsequent incident has occurred which calls for the application of the sanitary measures in question, and that the aircraft have not called at an infected aerodrome except to take in fuel.

Article 55

The aerodrome authority applying sanitary measures shall, whenever requested, furnish free of charge to the commander of the aircraft, or any other interested person, a certificate specifying the nature of the measures, the methods employed, the parts of the aircraft treated, and the reason why the measures have been applied.

The authority shall also issue, on demand and without charge, to passengers arriving by an aircraft in which a case of one of the infectious diseases referred to in Article 18 has occurred, a certificate showing the date of their arrival and the measures to which they and their luggage have been subjected.

Article 56

Save as expressly provided in the present Convention, aircraft shall not be detained for sanitary reasons.

If an aircraft has been occupied by a person suffering from plague, cholera, yellow fever, typhus or smallpox, its detention shall be limited to the period strictly necessary for it to undergo the prophylactic measures applicable to the aircraft in the case of each disease referred to in the present Convention.

Article 57

Subject to the provisions of Chapter II of the present Convention, and particularly those of Article 47, any aircraft which does not wish to submit to the measures prescribed by the aerodrome authority in virtue of the provisions of the present Convention, is at liberty to continue its voyage. It may not, however, land in another aerodrome, of the same country except for the purpose of taking in supplies.

An aircraft shall be permitted to land goods on condition that it is isolated and that the goods are subjected, if necessary, to the measures laid down in Article 10 of the present Convention.

Aircraft shall also be permitted to disembark passengers at their request, on condition that such passengers submit to the measures prescribed by the sanitary authority.

Aircraft may also take in fuel, replacements, food and water while remaining in isolation.

SECTION V
QUARANTINE, INSPECTION AND TREATMENT OF AIRCRAFT

174. GENERAL. In order to prevent the transportation of Aëdes aëgypti (vector of yellow fever), Anopheles gambiae (vector of malignant malaria), and Glossina palpalis (vector of African sleeping sickness), or other harmful insects, from foreign areas to the United States, or from one foreign area to another, it is necessary to disinsecticize Army aircraft operating in areas where these insects are found.

175. NONSTOP FLIGHTS WITHOUT QUARANTINE RESTRICTIONS. Flights of Army aircraft may be made nonstop within the following areas without quarantine restrictions, provided there are no quarantinable diseases or epidemic conditions at any port of departure or call:

United States	Virgin Islands
Puerto Rico	Cuba and Bahama Islands
Canal Zone	(All other islands of the
Alaska	Carribbean area where U.S.
Canada	air bases may be establish-
British Isles	ed are included)

176. FLIGHTS WITH QUARANTINE RESTRICTIONS. a. All flights of Army aircraft, except those on strictly confidential missions, having contact with any areas not listed in paragraph 175 above will be reported to the quarantine officer, U.S. Public Health Service, at the first point of landing in United States territory. The station of destination is charged with notifying the quarantine officer of such arrivals (except confidential missions) immediately upon receipt of flight plan, and in sufficient time to permit him to be on the field when the aircraft arrives.

b. In the instance of aircraft going from one foreign area to another, notice shall be given well in advance of arrival to the national health authority at the place where the aircraft propose to land. Local requirements of such countries for the disinsecticizing of aircraft will be complied with by all concerned.

177. USE OF INSECTICIDE. a. All Army planes flying nonstop (with the exception of those listed in par. 175) to the United States from any point on the earth's surface (including Africa, Asia, South America, Australia, Europe, Oceania, and North America) south of 54 degrees north latitude and north of 45 degrees south latitude will be disinsecticized immediately before departure and one-half hour before arrival at their destination. All passengers, cargo equipment, and baggage must be aboard when disinsectization takes place. Flights of Army aircraft from one foreign country to another within these infested areas will likewise be disinfected before departure and before arrival.

b. All flights departing from areas defined in par. 177 a. will be reported to the senior medical officer in sufficient time for him to supervise spray of the interior of the aircraft before take-off. The operations officer of the station of departure is charged with notifying the senior medical officer immediately on receipt of flight plans. A record will be kept of all treatments at the station where disinsectization is performed by the responsible medical officer. (See par. 181).

c. Provisions for the disinsectization of Army aircraft will be provided at Morrison Field, Florida, Trinidad, Belem, Natal, Monrovia, Accra, Khartoum, Karachi, and such other locations as may be designated by responsible authority. No planes will be permitted to leave these fields for travel to another country until approval of the responsible senior medical officer is obtained. It will not be necessary to spray planes leaving Florida bases until they arrive at their first port of call.

d. Planes will be disinsectized as outlined in Table XX. All doors, windows, and all other openings will be closed during the spraying and the aircraft will remain closed for 5 minutes after treatment.

e. The specifications for insecticidal material set forth in Par. 180 may be used as an alternate method for disinsecticizing aircraft.

f. The above quarantine measures shall be applied to Army aircraft coming from any area which may be designated by the Air Surgeon as dangerous on account of the presence of insect vectors of disease.

178. DOSAGE FOR ELIMINATING INFECTIOUS MOSQUITOES FROM VARIOUS TYPES OF MILITARY AIRCRAFT (see Table XX).

179. DIRECTIONS FOR AEROSOL METHOD OF DISINSECTIZATION. a. To operate dispenser bend capillary tube backwards and forwards until it breaks off at the base.

b. The aerosol is then automatically discharged.

c. Walk from the rear of the ship to the pilots' compartment spraying the aerosol into the air. Open all compartments and spray into them.

d. Do not hold closer than one foot to any stainable articles.

e. The number of seconds to spray are: B-17 series - 30 seconds; C-54 series - 90 seconds; B-25 series - 15-27 seconds; and P-40 series - 3-4 seconds.

f. Then invert dispenser, nozzle down, so that only gas is sprayed and screw on temporary cap.

g. For further use remove temporary cap and proceed as above.

(NOTE: About 10 seconds spraying in a pyramidal tent and 3 seconds in a shelter tent will kill flies and mosquitoes.)

180. ALTERNATE METHOD OF DISINSECTIZATION (PYRETHRUM METHOD). The standardized Pyrethrum extract variously designated as pyrethrum concentrate, 20 to 1 strength, pyrethrum extract standardized, pyrethrum extract No. 20, pyrethrum concentrate No. 20, and No. 20 extract standardized, contains 2 grams of pyrethrins per 100 cubic centimeters of deobase or other approved vehicle. The insecticide has a very low flash point, is non-staining and non-corrosive and, except for being mildly irritating to the skin on direct application, is harmless to humans in the concentration used. As the efficacy of the insecticide depends largely on the degree of vaporization secured in spraying, the vaporizer or hand spray producing the smallest droplets (densest cloud of mist) is the most satisfactory. Approved insecticide and hand sprayers may be obtained from the local Quartermaster.

181. FORM TO BE COMPLETED FOR RECORD AFTER DISINSECTIZATION OF AIRCRAFT.

Form A.A.F. _____ DISINSECTIZATION OF AIRCRAFT

Field _____ From _____ Date _____

1. Type of Plane : _____ Number _____
2. Volume : _____ cu. ft.
3. Was plane completely closed: : _____

TABLE XX

The dosage for eliminating infectious mosquitoes from various types of military aircraft - Aerosol method. Ground treatment - planes should be kept closed for five minutes after application. Basic dosage - 10 grams solution per 1000 cu. ft.*

Plane Type	Volume cu. ft.	Planes of the same series and of about the same size	Variance of Volume within series cu. ft.	Dosage Spray Time** seconds
B-17 (Flying Fortress)	1738	C 39, C 42, C 46, C 53 B 24, B 33, B 34, B 98	All of about the same size.	30
B-29 (Boeing)	5000	B 32, C 54, C 55	All of about the same size	90
B-25 (North American light bomber)	1490	B 26, B 23, B 18, A 20 C 67, A 26, A 28, A 24 A 29, C 40.	Considerable. From 850 for A 20 and C 40 to 1490 for B 25	15-27
P-40 (Fighter)	175	P 39, P 38, P 43, P 51, P 66.	175 - 225.	3-4

Note: Wing size of these planes: Fighters -- 150 - 500 cu. ft.
Bombers & Commercial -- 700 - 4,000 cu. ft.

* The insecticidal solution to contain 1% pyrethrins, 2% sesame oil, 4% inert ingredients, and 93% Freon (dichlorodifluoromethane).

** Spray time figures using the one pound "bomb type" container that delivers approximately 1 lb. of insecticidal solution in 13-14 minutes.

4. Dosage* : _____ seconds _____ c.c.
5. Type of Treatment : _____
6. Insects noted : _____
7. Remarks : _____

*Plane closed for 5 minutes after spraying and not reopened before leaving.

Treated by: _____
Rank: _____

182. REFERENCES.

a. Memoranda.

(1) Memorandum Report No. Exp. M-54-653-115, July 6, 1942, Aero Medical Research Laboratory, Materiel Division, Wright Field, "Aerosol Method of Killing Mosquitoes in Aircraft".

b. Regulations

(1) AAF Regulation No. 61-3, "Flying, Outside the United States", November 30, 1942.

CHAPTER 8
ADMINISTRATION

SECTION I
REPORTS

183. RENDERED BY STATION HOSPITALS OR DISPENSARIES. The following reports may vary as to kind, number, and distribution, depending on local conditions, however, the list will serve as a general guide.

NAME OF REPORT	DISTRIBUTION	REFERENCE
DAILY		
Morning Report (WD, AGO 1)	Post Hq. though Personnel Sec.	AR 345-400
Morning Report (WD, AGO 2)	Post Hq. through Personnel Sec.	AR 345-400
Sick Report (WD, AGO 5)	Sick Call Officer	AR 345-415
Sick Report (WD, AGO 5)	Detachment	AR 345-415
Report of Change (WD, AGO 303)	Unit Personnel Headquarters	AR 345-800 AR 345-900
WEEKLY		
Care of Flier (AC 203)	1 copy to TCS 1 copy to Air Surgeon, OCGAAF, Sat. a.m., 1 copy filed	Instr. on form
Statistical (86 ab MD)	Orig. Copy to SCS Dupl. to SGO and TCS ea. Sat. a.m., copy filed	AR 40-1080
Changes in Civ. Emp. Per. (Ltr. form)	Form 4 a to Dist. Manager, U.S.Civ.Ser.Dist. (direct), 5 copies made	See Civ.Per. Regulations, SGO
Progress Report, Civ.Ser. (Form 496)	Dist. Manager, U.S. Civ.Ser. (direct) Monday. Make 4 copies	See Civ.Ser. Cir. Ltr. No. 584
Report of Avn. Cadets Exam. (Ltr. Form)	2 to G.G., S.C., 1 Air Surgeon, OCGAAF, 1 filed	Local regulations
MONTHLY		
Commissary Credit, NCO (Ltr. form)	4 to Post Hq., 22nd Mo., copy filed	AR 30-2290
Dental Ser. Report (MD 57)	Orig. and dupl. to SCS, 3rd of Mo., copy filed	AR 40-1010
Expend. of Dental Materials (MD, AGO 18b)	Orig. and dupl. to SCS, 3rd of Mo., copy filed	AR 40-1010
Hosp. Fund Statement (MD 49)	Orig. to SCS, 10th Mo., copy filed	AR 210-50

NAME OF REPORT	DISTRIBUTION	REFERENCE
MONTHLY (Cont'd)		
Hosp. Laundry List and Voucher (MD 21)	Orig. to SCS., 10th of Mo., copy filed	AR 40-590
Payroll of Detachment, by Per. Sec., (WD, AGO 366 and 366a)	Orig. and dupl. to Fin. Off., 20th of Mo., copy filed	AR 345-155
Ration Return of Det. (QMC 460)	Orig. and 1 to Post Hq., 1st of Mo., copy filed Mess	AR 30-2210
Patient Ration Voucher	Orig. and 3 to Post Hq., 3rd of Mo., copy filed	AR 40-590
Separate voucher for ea. component, also for civ. emp., cadets, CCC, etc. (WD 351)		
Sick and Wounded (MD 51 and 52)	Orig. 51 with orig. cards to SGO, dupl. to SCS	AR 40-1025
Statistical Report, with roster of officers attached, including duties (MD 86c)	Orig. to SCS, 1st of Mo., dupl. SGO, tripl. to TCS Quad. to Air Surgeon, OCGAAF, copy filed	AR 40-1080
Medical and Hospital Care in Army Hospitals of WPA and USEC, (Ltr. form)	Sextupl. to the Surg. Gen., before 1st of ea. mo., copy filed	Cir. ltr. SGO No. 93, 1941
Venereal Report (Mimeo. form)	Orig. and 3 to Post Hq. last Sat. of Mo., copy filed	AR 40-235
Mosquito Control Report (Ltr. form)	3 copies to SGO (through mil. channels) 1st of ea. Mo.	Ltr. SGO, 3-28-41
Reports of number of allocated beds occupied in General Hospital (Ltr. form)	2 to SCS, copy filed	Ltr. SGO, 11-12-41
Meat and Dairy Insp., Veterinary	2 to Post Hq.	AR 40-2260
Vet. Statistical Report (MD 86c)	1 SCS, 1 SGO, 1 filed	AR 40-2245
Vet. Sick and Wounded Report	1 SCS, 1 SGO, 1 filed	AR 40-2245
Monthly-Ship. Ticket (Exp. Med. Supplies)	1 to Post Hq., approved vouch. to Stock Record	AR 40-1705
Report on Bact. Exam. of Water	2 to SCS, 1 filed	AR 40-310
Report on Tetanus React (720.3)	2 to OCGAAF, 2 SCS, 1 filed	Cir. Ltr., SGO
Report of patients in hospital over 60 days; give diag., prog., and probable length of stay in hospital	2 SCS, 1 filed	AR 40-1025
QUARTERLY		
Progress of Inventory (Ltr. Form)	Orig. and 1 to Post Hq. end of ea. quarter. Copy filed	AR 35-6520
Reqn. for Med. Sup. Deteriorating	Orig. and 2 to SCS, end of ea. quarter. Copy filed	AR 40-1705 Med. Sup. Cat., 1941
Reqn. for Authorized Allow. of Stationery and Cleaning Material	Orig. and dupl. to Post Hq. for approval, copy filed	WD Cir. 58/192
Hospital Fund audit	Inspector, Hq.	AR 210-50
Request for funds for proc. of Civ. Ser. Emp.	3 copies to SCS., 15th of Mo., before next quarter	Civ. Ser. Regulations and inst. from SGO

NAME OF REPORT	DISTRIBUTION	REFERENCE
SEMI-ANNUAL		
Semi-Ann. Reqn. for Med. Supplies	Orig. and 2 copies to Depot of Issue. March 31 and Sept. 30, copy filed	Med. Sup. Cat., AR 40-1705
Semi-Ann. Phys. Exam. AC Officers	WD, AGO Form 64 or Certificate	AR 40-110
ANNUAL		
Officers' Statement of Preference	TO SGO, Oct. 1	AR 605-120
Report of Non-Standard Items used	Ltr. to SGO in dupl., 1 filed	SGO Cir. Ltr. No. 1, c.s.
Annual Phys. Exam. AC Officers, other officers, warrant officers and nurses	Form 64 or 63 as required, in trip., 2 copies to Air Surgeon OCGAAF, 1 copy to Sta. Commander	(AR 40-100 (AR 40-105 (AR 40-110
Efficiency Report, Officers (WD, AGO 67)	Orig. only to Post Hq. June 30 ea. yr., and on transfer of either reporting officer or officer reported on	AR 600-185
Efficiency Report, NCO's, (MD 90) 1st 3 grades)	1 copy to SGO, June 30 ea. yr., and upon transfer	AR 600-185
Statement of Cost of Med. Service	Lt. to Surg. Gen. through SCS July 30	AR 40-1705
Annual Inspect. of Records of Flying personnel	April 1st to Air Surgeon, OCG AAF, through CO	AR 40-110
OCCASIONAL		
Reqn. for Biologicals	Ltr. to AMC direct in dupl., copy filed	AR 40-1705
Flight Surg. Report of Aircraft Accidents (Form AC 205)	1 copy, Air Surgeon through TCS to accompany "Care of Flier's Report" if from local st.; 2 to home station F/S if personnel is from different station. (These are not sent immediately but with Form 205) 1 file in each instance (See inst. on form)	See Inst. on form
Immunization Record as required. (Typhoid, smallpox, tetanus, yellow fever, etc.)	In Dupl., one to Orgn. CO., 1 files	AR 40-215

Abbreviations:

TCS - Training Center Surgeon
SCS - Service Command Surgeon
OCGAAF - Office of Commanding General, Army Air Forces
AGO - Adjutant General's Office
SGO - Surgeon General's Office

184. RENDERED BY A TACTICAL UNIT. The following directive indicates the reports rendered by a representative tactical unit. There will be variations in each unit usually dictated by the tactical situation.

HEADQUARTERS Nth AIR FORCE
OFFICE OF THE COMMANDING GENERAL

Tampa, Florida
Date

MEDICAL DEPARTMENT

Medical Reports

MEMORANDUM)
:
NUMBER)

(Memoranda 25-3, this headquarters, August 7, 1941, 25-3A, this headquarters, September 6, 1941, and 25-3B, this headquarters, November 22, 1941, are rescinded)

The following will govern as a guide in the preparation and distribution of Medical Reports by all medical installations and detachments of the Nth Air Force.

1. Station and Air Force tactical unit Surgeons are directly responsible for the preparation and prompt submission of medical reports in the Nth Air Force.

a. Surgeons of tactical units that are assigned to the Interceptor, Bomber or Air Support Commands will prepare such extra copies of reports listed herein as may be requested by the Surgeon of the concerned Interceptor, Bomber, or Air Support Command. When an Air Force tactical unit is attached to another armed force as a supporting element medical reports will be submitted as directed by the Surgeon of the unit to which the Air Force unit has been attached. Extra copies of such reports will be submitted to the Surgeon of the appropriate command (Interceptor, Bomber, Air Support or Air Base Command) for information purposes. Interceptor, Bomber, and Air Support Surgeons will forward reports received frmo such attached units to the Surgeon, Nth Air Force Base Command, within 24 hours of receipt of these information copies.

2. Air Base Surgeons will submit separate reports for all tactical units which do not have a Surgeon assigned and for the Station Complement (when a tactical unit is so reported it will not be included in the Station Complement report). Tactical units with assigned Surgeons will not be included in the Air Base Surgeon's reports.

3. Tactical Unit Surgeons will submit reports for the unit to which they are assigned. The Senior Medical Officers assigned to a Group or Squadron will render reports for their respective units. The next ranking Medical Officer or Dental officer (if no Medical Officers are present) becomes Acting Group Surgeon in the absence of the Group Surgeon and will submit the necessary reports. Group Surgeons will consolidate reports by their respective Squadron Surgeons when at the same location. Independent squadrons will submit reports in a similar manner as Group Surgeons (e.g. when a Squadron leaves the parent group and is acting as a separate squadron, the Surgeon of the Squadron will submit an initial report, marked "INITIAL REPORT". When the squadron rejoins the group the squadron surgeon will submit a final report, marked, "FINAL REPORT".). Where several squadrons are located at a station other than an Air Base, the reports designated for tactical units will be submitted as follows: If one of the squadrons does not have a Surgeon assigned, the reports of that squadron will be the responsibility of the Senior Air Corps Tactical Unit Surgeon of the Nth Air Force at that station.

4. Reports by Air Base Surgeons rendered for the Station Complement and the Air Base Hospital:

a. Weekly Statistical Report: Form 86 ab - 4 copies;
Mailed each Saturday (See AR 40-1080, FM 8-45). Original to Service Command

Surgeon; carbon copy to SGO; carbon copy to Surgeon, Nth Air Force Base Command, Tampa Florida; and carbon copy to file.

b. Monthly Report of Medical Department Personnel and Equipment: Form MD 86 c - 4 copies; prepared as of last day of each month and mailed within 3 days (AR 40-1080, Circular Letter No. 55, SGO, June 13, 1931, and Circular Letter No. 84, SGO, August 19, 1941).

Original to Service Command Surgeon; carbon copy to SGO; carbon copy to Surgeon, Nth Air Force Base Command, Tampa, Florida; and carbon copy to file.

c. Care of Flier Report: Form AC 203 - 3 copies; mailed each Saturday, submitted by the Senior Flight Surgeon at each Air Base for the Air Base and Tactical Units to which no Surgeon is assigned.

Original to Air Surgeon, OCGAAF ; carbon copy to Surgeon, Nth Air Force Base Command, Tampa, Florida; carbon copy to file.

d. Report of Aircraft Accident: Form AC 205 - 3 copies; mailed, when indicated, with Care of Flier Report (AC Form 203). Same distribution as AC Form 203 if required by occurrence of aircraft accident.

e. Sick and Wounded Report: Form 51 MD and Form 52 MD - 4 copies of Form 51 MD - report cards accompany original of Form 51 MD. Mailed by the 5th day of the following month for the preceding month (AR 40-1025 and FM 8-45).

Original of Form 51 goes direct to the Surgeon General accompanied by original report cards; 2 carbon copies (Form 51 only) to the Surgeon, Nth Air Force Base Command, who forwards one to the Service Command Surgeon; carbon copy retained.

f. Sanitary Report: (For form and instructions see AR 40-275 and Circular Letter No. 114, War Dept., dated June 13, 1941) - 4 copies; prepared as of the 1st of the following months and mailed within 3 days.

Original and one carbon copy of Air Base Report through the Air Base Commander to the Service Command Commander; carbon copy to Headquarters, Nth Air Force Base Command; and carbon copy to file.

5. Reports by Tactical Unit Surgeons: (Group and Separate or Independent Squadrons) (See appropriate references for rendition of these reports in Par. 4, this memorandum). Distribution and additional instructions for Tactical Unit Surgeons are as follows:

a. Weekly Statistical Report: Form MD 86 ab - 4 copies and mark "SPECIAL".

Original mailed each Saturday to the Surgeon; Nth Air Force Base Command, Tampa, Florida; one copy mailed each Saturday direct to the SGO; one copy sent to Air Base Surgeon; one copy to Group or Squadron file.

(1) All cases admitted to the Base Hospital, to Quarters or Carded for Record only will be accounted for under sections (E) and (F).

(2) All cases sent to the Base Hospital and admitted will be disposed of by transfer (formal or informal as the case may be) - dispose of by Section (I).

(3) Cases Carded for Record Only and not admitted to Hospital or Quarters status will be disposed of by Section (K).

(4) The only cases which can remain to be accounted for on the next report will be: Those in other than an Army Hospital (e.g. in civilian hospital in case of a Squadron on maneuvers acting independently) and those on a quarters status.

(5) Reference section on communicable diseases - see Par. 72, K, FM 8-45. An entry will be made here only if the communicable disease is treated in quarters. Otherwise the entry should be, "NONE".

b. Monthly Report of Medical Department Personnel and Equipment: Form MD 86 c - 4 copies - marked "SPECIAL". The use of mimeographed lists of Air Corps field medical equipment on this report will be discontinued.

Original mailed within 3 days after period ending the last day of each month - to Surgeon, Nth Air Force Base Command, Tampa, Florida; carbon copy to SGO; carbon copy to Post Surgeon and carbon copy to file.

c. Care of Flier Report: Form AC 203 - 4 copies. Mailed each Saturday.

Original direct to Air Surgeon; carbon copy to Surgeon, Nth Air Force Base Command, Tampa, Florida; carbon copy to Air Base Surgeon and carbon copy to to file.

d. Report of Aircraft Accident: Form AC 205 - mailed when indicated, with Care

of Flier Report (AC Form 203).
Same distribution as AC Form 203 if required by occurrence of aircraft accident.

e. Sick and Wounded Report: Form 51 MD and Form 52 MD - 4 copies of Form 51 MD - report cards accompany original of Form 51 MD. Mailed by the 5th day of the following month for the preceding month (AR 40-1025 and FM 8-45). (See Par. 4e, of this memorandum).

Original and report cards will include: originals (Form 52 MD) for all Quarters and Carded for Record Only cases, and Report Cards prepared from formal transfer cards. These are not numbered, but should be submitted in sequence of admission dates; carbon copies of formal and informal transfer cards will not be forwarded. Report sheets will be folded twice (first through the middle) and with the accompanying cards in order, will be held together by an ordinary paper clip which may be removed without tearing the sheet. The report sheet will not be used as a wrapper covering for the report cards. One carbon copy of Form 51 to the Air Base Surgeon; one carbon copy to file.

f. Sanitary Report: (For form and instructions see AR 40-275 and Circular Letter No. 114, War Department, dated June 13, 1941 and Par. 161 of text) - 4 copies; prepared as of the 1st of the following month and mailed within three days.

Original and one carbon copy through command channels by Unit Commanders by indorsement noting any action taken to the Commanding Officer, Nth Air Force Base Command, Tampa, Florida; one carbon copy to Air Base Commander (for his information only - this copy is not forwarded) and is omitted when the unit is not at the Air Base, e.g. on maneuvers; carbon copy to file.

g. Venereal Report: (For form and instructions see Par. 6, AR 40-235, dated October 11, 1939) - 4 copies; prepared as of the end of each period (at midnight of last Friday in each month). Submit within 3 days after end of period.

Original to Surgeon, Nth Air Force Base Command, carbon copy to Unit Commander (for his information only - this copy is not forwarded); carbon copy to Air Base Surgeon - omitted when unit is not at the Air Base, e.g. on maneuvers; one carbon copy to file.

6. Dental Reports: Group Dental Officers of the Nth Air Force will submi. reports as indicated by SGO Circular Letter No. 61, dated June 16, 1941. Statistical reports will be submitted through Corps Area channels unchanged. Group Dental Surgeons will act similarly to Divisional Dental Surgeons, even though they have no reports to "consolidate," as follows:

a. Form 57 MD - (For the Group - 4 copies with distribution as follows: 2 copies to Surgeon, Nth Air Force Base Command (original for the SGO and carbon for file); one copy to Station Surgeon for transmissions to the Service Command Surgeon (this copy need not be forwarded on maneuvers); one copy to file.

b. No statement of expenditures (18 b MD) is required of Group Surgeons in that they are equipped only with Chest MD No. 60.

7. Venterinary Reports: A copy of all veterinary reports rendered to any higher authority will be submitted direct to The Veterinarian, Nth Air Force, Tampa, Florida. (Specifically Form 86 c, Veterinary Statistical and MD Form 110, Meat and Dairy Hygiene Report).

By command of Major Genenral_____:

_____
Colonel, G.S.C.
Chief of Staff.

OFFICIAL:

_____
Lieut. Col., A.G.D.
Adjutant General.

DISTRIBUTION: "C"

185. REPORT OF SICK AND WOUNDED. a. In zone of interior (Circ. Ltr. No. 100, W. D., S.G.O., Washington, September 2, 1942)

(1) Each post, camp, or station surgeon, and each port surgeon will forward all original MD Forms 52 direct to The Surgeon General with original of MD Form 51 attached. One (1) copy of MD Form 51 will be forwarded direct to the Service Command Surgeon concerned.

(2) The commanding officer of each named station hospital, named laboratory, named station and general dispensary, and named general hospital will forward all original MD Forms 52 direct to The Surgeon General with original of MD Form 51 attached. One (1) copy of MD Form 51 will be forwarded direct to the Service Command Surgeon concerned and one (1) copy to the next higher medical headquarters.

(3) The commanding officer of each exempted, named general hospital, named medical depot, medical section of Quartermaster depot and named medical center will forward all original MD Forms 52 direct to The Surgeon General with original of MD Form 51 attached. One (1) Copy of MD Form 51 will be forwarded direct to Service Command Surgeon.

(4) The Report of Sick and Wounded will be rendered in accordance with AR 40-1025 and routed through the channels indicated in paragraph (1), (2), and (3) above.

b. In theater of operations (FM 8-45).

(1) Emergency medical tag (EMT, Form 52b, M.D.) - In the theater of operations the EMT is used as a sick and wounded record. During or after an engagement it will be attached to all sick, wounded, and dead. It is made out by the first member of the Medical Department who treats the patient previous to his admission to a hospital.

(2) Entries on EMT (Circ. No. 182, W.D., Washington, June 11, 1942).

(a) In combat and simulated combat (maneuvers), aid stations and collecting stations of divisional or brigade units engaged with the enemy will partially accomplish W.D., M. D. Form No. 52b to show only name, grade, Army serial number, date, hour, diagnosis, and treatment given.

(b) Form No. 52b, thus partially prepared, will be signed by the person responsible, indicating his grade.

(c) At clearing stations and other Medical Department establishments in rear of clearing stations, Form No. 52b will be accomplished completely.

(d) Under all conditions of service other than indicated in b. (2) (a) above, Form No. 52b, when used, will be accomplished completely.

(3) The Field Medical Record - In the theater of operations Registers of Sick and Wounded will not be maintained. Instead a field medical record is recorded. It consists of the field medical card (W. D., M. D. Form 52c) and the field medical jacket (W. D., M. D., Form 52d) which together contain a brief history of each patient who is treated in a station, general, or convalescent hospital in the theater of operations.

186. CHECK SYSTEM FOR RENDITION OF REPORTS. In keeping a current check on the forwarding of reports, some stations have found it convenient to have a wall chart of two rows of thirty-one hooks. On the upper row, for each day of the month, properly numbered tags are placed, indicating reports to be rendered on that day. When these reports are forwarded, the corresponding tags are placed on the lower row.

187. LIST OF FORMS COMMONLY USED, BY NUMBER. (With the reorganization of the Army, the distribution of these forms may be changed in the near future).

a. WD, AGO FORMS.

NO.	TITLE AND DESCRIPTION
1	Company Morning Reports. One copy. A permanent record prepared by the commanding officer of the company or detachment and submitted to the commanding officer of the regiment, separate or detached battalion, or similar unit and in the case of separate or detached companies, to the commanding officer of the next higher administrative unit, or of the post, camp, or station. See AR 345-100.
2	Headquarters Morning Reports. One copy. A permanent record provided for the purpose of accounting for officers and enlisted men not belonging or attached to a company or to a detachment using a Company Morning Report, and for Army nurses, warrant officers, and contract surgeons. See AR 345-400.
5	Daily Sick Report. One copy. A permanent record prepared by the commanding officer of a company or detachment and sent to the place of holding sick call by the noncommissioned officer in charge and returned by the same means to organization. See AR 345-415.
6	Duty Roster. One copy. List of officers or enlisted men by name that is kept for the purpose of recording duty performed by each person. See AR 345-25.
9	Monthly Roster. Four (or more) copies. Prepared monthly or at certain other intervals, such as one the day the command is organized, reorganized, demobilized, or rendered inactive. Normal disposition of copies as follows: Original to The Adjutant General, one copy to the chief of the arm or service concerned, one copy to the headquarters of the corps area, and one copy retained for file. See AR 345-900.
13	Report of Enlistments. One copy. Prepared and forwarded to The Adjutant General by the recruiting officer. See AR 600-750.
15	Report of Survey. Whenever loss or destruction of, or damage to public property occurs, the responsible officer will accomplish WD. AGO Form No. 15 in triplicate within 39 days, unless prevented by explained exceptional circumstances, and send all copies to the commanding officer or appointing authority for approval, disapproval, or such other action as he may deem pertinent. After action by appointing authority, the original and one copy are forwarded to the corps area commander and the third copy to the accountable officer. See AR 35-6640.
21	Enlistment Record, Regular Army. One copy. Prepared by the recruiting officer for every soldier enlisted, and forwarded to The Adjutant General. See AR 600-750.
23	Report of Enlisted Men Enlisted for, Reenlisted in, or Transferred to Certain Arms or Services. One copy. Prepared by the commanding officer of the company or detachment upon receipt of soldier's service record. Sent to the chief of the arm or service concerned.

Fact of mailing with date should be entered under remarks in the service record. See AR 600-750.

24 — Service Record. One copy. Prepared by the recruiting officer. Accompanies soldier until end of his enlistment. Then sent to The Adjutant General by the commanding officer of the company or detachment to which the soldier belongs. See AR 345-125.

24-1 to 24-7, incl. — Insert to Service Record. Furnished to record data, when the space alloted in the service record is insufficient. See AR 345-125.

25 — Extract from Service Record. One copy. Prepared by the custodian of the service record upon desertion, transfer, individual change of station, etc. It is filed with the records of the unit. See AR 345-125.

26 — Assignment Card. One copy. Prepared by the commanding officer of the company or similar organization upon the receipt of an order assigning or transferring an enlisted man to his command. Forwarded to The Adjutant General. See AR 615-200.

29 — Authorization for Allotment of Pay. Two copies. Original mailed by the commanding officer of the unit to the Finance Officer, United States Army, Washington, D. C. See AR 35-5520.

29-1 — Authorization for Change of Allotment. Two copies. Same remark as above. See AR 35-5520.

29-2 — Authorization for Deduction of Pay. Two copies. Original mailed by the commanding officer of unit to the Director of Insurance, Veteran's Administration, Washington, D. C. Duplicate retained for file. See AR 600-100.

30 — Notification of Discontinuance of Allotment or Deduction. Two copies. This is a double form - Discontinuance of Allotment printed on one side and Discontinuance of Deduction on the other. Same procedure as for WD, AGO forms Nos. 29 and 29-2, respectively.. See AR 35-5520 and AR 600-100.

30-1 — Notification of Reinstatement or Suspension of Allotment. Two copies. This is a double form - Notification of Reinstatement on one side and Notification of Suspension on the other. Same procedure as for WD, AGO From No. 29. See AR 35-5520.

31 — Furlough. Two copies. Original sent to headquarters for signature of the commanding officer. Not delivered to soldier until expiration of furlough, then signed by company or detachment commander to certify date of return. Both copies sent to Finance Officer for payment of furlough ration money. See AR 615-275.

32 — Individual Clothing Record. One copy. In case of transfer, accompanies soldier. True copy made and retained for file. See AR 35-6680, 35-6720, and 615-40.

33 — Individual Equipment Record. One copy. See AR 35-6680, 35-6720, and 615-40.

35 — Individual Clothing Slip. Two (or more) copies. Used in the issue of clothing to individual enlisted men and in the transfer of accounta-

bility for individual equipment in their possession upon change of station. See AR 35-6560, 35-6680, and 615-40.

36 Statement of Charges. Three copies. Prepared by the commanding officer of the company or detachment. Original to the accountable officer; one copy to the responsible officer; and one copy retained for file. A separate Statement of Charges will be made for property of each supply branch. See AR 35-6620, 35-6640, and 345-300.

38 Report of Physical Examination of Enlisted Man Prior to Discharge or Retirement. Two copies. Prepared by commanding officer of the company or detachment, signed by the soldier concerned. Sent to the surgeon for physical examination of the soldier. Returned to the commanding officer of the company or detachment who transmits the original to The Adjutant General with service record. One copy retained for file. See AR 40-100.

39 Notification of Discharge. One copy. Prepared by the officer who prepares the final statement and sent to the disbursing officer who is to pay the account. Used in case there is not any finance officer located where the soldier is discharged. See AR 345-465.

40 Certificate of Disability for Discharge. Three copies. Prepared by company commander. Sent to the board of medical officers through the officer convening the board, then to the corps area commander. The original is returned to the company commander, who, after discharging the soldier, sends it to The Adjutant General, See AR 600-500 and 615-360.

41 Designation of Beneficiary. One copy. Prepared by the company or detachment commander and sent to The Adjutant General. Prepared in case of change of beneficiary subsequent to enlistment. See AR 600-600.

42 Change in Address of Beneficiary or Next of Kin. One copy. Same remarks as above. See AR 600-600.

44 Report of Desertion. Four copies. Prepared by the commanding officer of company or detachment. Original and two copies forwarded to The Adjutant General with service record. Copy retained for file. See AR 615-300.

46 Report of Apprehension or Surrender of a Deserter. Three copies. Prepared by the commanding officer of the company or detachment. All copies sent to The Adjutant General, who pastes the original in the service record, which is returned to the commanding officer of the post, camp, or station at which the deserter is in confinement. See AR 615-300.

49 Application for Retirement. Two copies. Signed and submitted by the soldier to his organization commander who in turn forwards it to The Adjutant General through the post or regimental commander, with information in his indorsement as to whether or not soldier has lost any time under AW 107 during his current enlistment. See AR 615-395.

52 Report of Death. Three copies. Prepared by the surgeon or by the soldier's immediate commanding officer if medical officer is not pre-

sent or available, in which case it is also signed by a civilian physician. Original and one copy to The Adjutant General. One copy retained for file. A fourth copy will be forwarded to soldier's commanding officer when death occurs away from home station or post. See AR 600-550.

54 Inventory of Effects. Three copies. (See AW 112). Prepared in the case of every person whose effects are under the control of the military authorities. See AR 600-550.

55 Honorable Discharge from the Army of the United States. One copy. Prepared and signed by the commanding officer of the company or detachment and presented to a designated field officer or the commanding officer of the post, camp, or station for his signature. Given to the soldier who must present it to the finance officer paying final statement for notation as to fact of payment. See AR 345-470.

56 Discharge from the Army of the United States (blue): One copy. Same remarks as above. See AR 345-470.

57 Dishonorable Discharge from the Army of the United States (yellow): One copy. Same remark as above, with the exception that discharge is not delivered to soldier until his release from confinement. See AR 345-470.

63 Report of Physical Examination. One copy. Used for the annual physical examination of all officers, warrant officers, and members of the Army Nurse Corps. Used to record the physical examination of the above personnel prior to discharge, dismissal, or resignation and at certain other intervals, such as promotion. See AR 40-100 and 40-105.

64 Physical Examination for Flying. Two copies. For distribution, see Table I. Used to record the physical examination of candidates for commission in the Air Corps and the transfer of officers thereto. Used for January and July examination of all pilots and rated observers. See Table I and AR 40-110.

73 Basic Strength Return. Four copies. Rendered by the commanding officer of each branch of the service represented at a post. Original to The Adjutant General. Copy to the chief of the branch. Copy to the corps area concerned and copy retained for file. See AR 345-50, 345-55, and 345-100.

115 Charge Sheet (for Court Martial): Three copies. Any person subject to military law may prefer charges. After preparation they are signed and affidavit completed as prescribed by AW 70. All copies are submitted to the commanding officer for investigation and such action as he deems appropriate in each case. If tried by summary court martial the three copies are disposed of as follows: The original copy is filed at post headquarters, a copy sent to The Adjutant General and a copy to the officer exercising general court martial jurisdiction. See paragraph 31 and appendix 3, Manual for Court Martial.

181 Enlistment record, Regular Army Reserves. Three copies. Accomplished by the recruiting officer or other officer authorized to accept enlistments for the Regular Army Reserve. The original copy (white)

is sent to the commanding general of the corps area in which the reservist's home is located. The second copy (pink) is sent to The Adjutant General. The third copy (green) is given to the reservist. See AR 155-5.

b. F. B. I. Military Fingerprint Card. One copy. Prepared by the recruiting officer or other officer designated for the purpose for every soldier enlisted, and forwarded to The Adjutant General. See AR 345-120.

c. WD, MD FORMS.

16a Issue Slip-Expendable Medical Property. Made out and signed by the officer in charge of ward or department. Names of articles desired will be written as they appear in the Medical Department Supply catalog. Slip will be completed by the officer in charge, who will insert the date and receipt same. Filed at the medical supply office. See AR 40-1705.

16b Issue Slip-Nonexpendable Medical Property. Made out and signed in duplicate by the officer in charge of the ward or department. Names of articles will be written as they appear in the Medical Department Supply Catalog. Both the original and duplicate slip will be completed by the receipt of the officer in charge, who will insert the date. Original will then be filed at the medical supply office and the duplicate returned to the requesting officer for file with his retained memorandum receipt. See AR 40-1705.

16c Credit Slip-Nonexpendable Medical Property. Made out and signed in duplicate by the officer in charge of the ward or department where the property has been in use. Names of articles will be written as they appear in the Medical Department Supply Catalog. If property to be turned in is unserviceable from any cause other than fair wear and tear in the military service, a statement to that effect will be attached showing what action has been taken to fix responsibility. Both the original and duplicate slip will be completed by the receipt of the storekeeper, who will insert the date. The original will then be returned to the officer turning in the property for file with his retained memorandum receipt, and the duplicate will be filed at the medical supply office. See AR 40-1705.

16d Exchange Slip-Nonexpendable Medical Property. Made out and signed by the officer in charge of the ward or department for which the serviceable property is needed. Names of articles desired will be written as they appear in the Medical Department Supply Catalog. If property to be turned in is unserviceable from any cause other than fair wear and tear in the military service, a statement will be attached showing what action has been taken to fix responsibility. The slip will be completed by the receipt of the officer in charge, who will insert the date. It will then be filed at the medical supply office. See AR 40-1705.

21 Hospital Laundry List. Copy sent to The Surgeon General, with the voucher for laundry service in case the service is being accomplished by a civilian laundry. A copy sent to The Surgeon General as a monthly report in case the service is being accomplished by a Government-owned laundry. One copy retained. See AR 40-590.

42 Contract for Laundry Work (with appendix sheet "A"). Six copies. Three copies sent to The Surgeon General or corps area surgeon for

approval. Three authenticated copies prepared and distributed as follows: One copy for the contracting officer, one to the Returns Officer, General Accounting Office, and one to the disbursing officer. See AR 5-160 and 40-590.

49 Statement of the Hospital Fund. Two copies. Original to The Surgeon General through the SC surgeon. Retained copy for file. See AR 210-50.

49a Employee's Certificate of Indebtedness for Hospital Service. Three copies. Marked "Original," "Duplicate," and "Triplicate." Two copies to the officer under whom the employee is serving. One copy retained by the commanding officer of the hospital. See AR 40-590.

51 Report Sheet for Report of Sick and Wounded. Two copies. Original with report cards and other records to the Surgeon General for checking and then forwarded to The Surgeon General. Copy to SC Surgeon and one filed. See AR 40-1025 and par. 185.

52 Register Cards. Two copies. Original to the SC surgeon along with WD, MD Form No. 51. Copy filed. See above and AR 40-1025.

52a Index Record of Patients (Card): Register index. One copy. Kept in the hospital and prepared by all hospitals in peace or war, wherever located. Also used for keeping the "diagnosis index" and other indices at fixed hospitals in addition to its use as a nominal index of patients. See AR 40-1025.

52b Emergency Medical Tag. Used only in the field. Two copies. Original attached to all sick, wounded, and dead, as soon as practicable. See FM 8-45.

52c Field Medical Card. One copy. Started at the first hospital in the field where treatment is furnished. Accompanies the patient until return to duty, death, or arrival in zone of the interior. Removed and sent with the monthly report of sick and wounded to the chief surgeon, or corps area surgeon, as the case may be, for transmittal to The Surgeon General. See FM 8-45.

52d Field Medical Record Jacket. For field use. Used for inclosing the field medical card, emergency medical tag, and any other clinical record of value. See FM 8-45.

54 Surgeon's Request for Service Record. Used by the commanding officer of hospital to make direct call upon the proper organization commander for the soldier's service record in the event of failure to receive same in due time. See AR 40-590.

55a Clinical Record Brief. A clinical record will be kept by fixed hospitals in time of peace or war, excepting those serving in a theater of operations. This form and 55j are used for every patient treated in hospital and for serious cases treated in quarters. See AR 40-1025.

NOTE: The other lettered blanks of the 55 series will be used as the nature or importance of the case may warrant.

56 Malarial Register. One copy. Prepared for every case or carrier of malaria and should be kept up to date until patient is definitely

cured or terminates his military service. In the event of transfer, accompanies the patient to his new station. In the event of terminations of his military service, will be sent to The Surgeon General. See AR 40-230. (No longer required).

57 Report of Dental Service. Rendered monthly from every station and separate command where a dental officer has been on duty during the month. If post is under the immediate control of the War Department, report is sent direct to The Surgeon General. One copy retained. If forwarded through the corps area surgeon, two copies are forwarded and one retained. See AR 40-1010.

72 Morning Report of Ward. Rendered each morning by ward officer. Sent to the registrar along with clinical records, etc., of completed cases. Not a permanent record. See AR 40-590.

72a Consolidated Morning Report of Wards. Kept by the Registrar of the hospital. See AR 40-590.

73 Diet Card. Made out daily by the ward officer and sent to the hospital mess. Not a permanent record. See AR 40-590.

74 Mess Account. Kept by noncommissioned officer in charge. Filed at the end of every month with retained hospital fund papers for that month. See AR 40-590.

75 Patient's Property Card. Made out in duplicate. Original filed with hospital records; duplicate given to patient. See AR 40-590.

76 Patient's Property Tag. Used for identification of patient's property stored while hospitalized. See AR 40-590.

78 Syphilitic Register. Maintained for each person in active military service who has syphilis. Kept on file in the office of the surgeon. On "cure" or separation from the service, the register will be forwarded to The Surgeon General. See AR 40-235, C.L. No. 1, SGO, each year.

79 Register of Dental Patients (Card). Made for every person admitted to a dental clinic for dental treatment. See AR 40-1010.

81 Immunization Register. Made out in duplicate. Original in cases of officers, warrant officers, and nurses to the person concerned. Original in cases of enlisted men to the organization commander for entry in soldier's service record. Duplicate copy will be filed in an alphabetical immunization file of the medical department records of the station or command to which the individual belongs. See AR 40-215.

86ab Statistical Report (first and second sections). Rendered by the surgeon of every separate station or command. Made out in triplicate. See AR 40-1080, and par. 184.

86c Statistical Report (third section). See above remarks.

95 Report of Bacteriological Examination of Water. Accompanies monthly sanitary report; one copy for each analysis made.

d. WD, QMC FORMS.

22 Statement of Clothing Charged to Enlisted Men. One copy. Used by company commanders to list the names and amount charged to clothing allowance of men to whom clothing has been issued. Sent to officer designated for keeping service records. See AR 35-6560, 35-6720, and 615-40.

364 Weekly Collection and Delivery Sheet. Three copies. Shows names of each enlisted man sending laundry. Original and duplicate to laundry each week; triplicate retained for file. See AR 30-2135.

365 Monthly Roster and Statement. Three copies. Shows names of enlisted men of the organization who have signified intention to have quartermaster laundry service during the month. Original and duplicate to laundry on first day of month; triplicate retained for file. See AR 30-2135.

374 Enlisted Men's Laundry Slip. One copy. A list of laundry sent by enlisted men to accompany each bundle. Sent to laundry. See AR 30-2135.

400 Requisition. Three copies. Used in requisitioning all supplies except those for which special forms are provided. Original and duplicate to commanding officer for approval and in turn to quartermaster for issue. Triplicate retained. See AR 35-6540 and 35-6720.

409 Requisition and Receipt for Clothing in Bulk. Three copies. Normally submitted by organization quarterly for clothing charged against clothing money allowance. Original and duplicate to commanding officer for approval and in turn to quartermaster for supply. Triplicate retained for follow-up purposes. See AR 35-6540, 35-6560, and 35-6720.

411 Requisition and Receipt for Brooms, Brushes, Matches, Mops, Toilet Paper, Soap, etc. Three copies. Quarterly requisitions by organizations for items appearing thereon but not exceeding in money value of budget credit allotted to organizations. Original to commanding officer for approval and in turn to the quartermaster for supply. Triplicate retained. See AR 30-3010, 35-6540, and 35-6720.

412 Requisition and Receipt for Stationery and Office Supplies. Three copies. See remarks about WD, QMC Form No. 411.

413 Requisition and Receipt for Cleaning and Preserving Materials. Three copies. See remarks about WD, QMC Form No. 411.

414 Requisition and Receipt for China and Glassware. Three copies. See remarks about WD, QMC Form No. 411.

424 Stock Record Card for Loose Leaf Binder, Organizations or Posts and Stations. One copy. Used for keeping stock records. See AR 35-6560 and 35-6720.

431 Receiving Report. Three copies. Used as voucher to stock record account to cover receipt and acceptance of articles purchased. Original and duplicate to finance officer designated to make payments. Retained copy, voucher to stock records. See AR 35-6560 and 35-6720.

434 Shipping Ticket. Five copies. Used when property accountability is transferred from one accountable officer to another. Original and duplicate to consignee, who, upon receipt of property, will sign one copy and return to consignor. Third and fourth copy to finance officer of the corps area where consignee is located. Retained copy, credit voucher, to stock record account of consignor. See AR 35-6560 and 35-6720.

445 Over, Short, and Damaged Report. Three copies. See AR 35-6560, 35-6640, and 35-6720.

460 Ration Return. Three copies. A requisition on the quartermaster for rations. Signed and submitted by officers under whom persons entitled to these are serving. After approval by the commanding officer, original and duplicate sent to quartermaster sales officer. Third copy retained. See AR 30-2210 and 35-6720.

487 Memorandum Receipt. Three copies. Used by accountable officer who issues property to individuals or organizations, who in turn assume responsibility used as credit or debit voucher to memorandum receipt account. Original and duplicate to organization or individual to whom property was issued, who will sign original and return to accountable officer. Retained copy used for follow-up purposes. See AR 35-6520 and 35-6720.

488 Account of Property on Memorandum Receipt. One copy. Used by property officer to show where property is located for which he is accountable. Postings are made from WD, QMC Form No. 487. See AR 35-6520 and 35-6720.

e. WD, IG FORMS.

1 Inventory and Inspection Report. Responsible officer will prepare and sign two copies, listing the property to be inspected. Action of the inspector will be final. See AR 20-35.

2 Inventory and Inspection Report of Public Animals. Unserviceable public animals will be listed on this form. Prepared whenever needed. See AR 20-35.

SECTION II
THE FLIGHT SURGEON'S OFFICE

188. TYPES OF EXAMINATIONS. Many types of examinations besides those for flying may be done in a Flight Surgeon's office. The following list indicates the most common of these:

Examination	Form Used
(1) Original examination for training as Air Crew (Pilot, Bombardier, Navigator), Service Pilot, Liaison Pilot.	WD, AGO 64
(2) Enlistment and reenlistments	WD, AGO 21, 22, 165 or 181
(3) Discharges	WD, AGO 38
(4) Prisoners	WD, AGO 21
(5) Preliminary, for applicants for West Point	None
(6) Foreign service	Certificate
(7) Semi-annuals	Certificate
(8) Annuals	WD, AGO 64 for flying officers WD, AGO 63 for non-flying officers
(9) Combat crew (enlisted)	WD, AGO 64
(10) Civilian flying instructors and Trainee Instructors	WD, AGO 64
(11) Promotion	WD, AGO 63
(12) Flying Personnel	WD, AGO 64
(13) Army nurse corps	WD, AGO 63
(14) Service school	Certificate
(15) Government insurance (National Service Life)	Vet. Adm. Ins. Form 350
(16) Civil Service	U.S. Civ. Ser. Form 2413
(17) Officer Candidate (non-flying)	WD, AGO 63

If possible, it is better to have the organization of the office arranged so that all flying examinations will be done by one unit and the remainder of the examinations performed by a separate unit.

189. INSTRUCTIONS FOR COMPLETING W.D., A.G.O. FORM No. 64. (Physical Examination for Flying). a. General Remarks. The following discussion of certain points in the completion of the "64" examination form is an attempt to standardize the manner of filling out this form and to furnish a ready reference for all examiners. Because of frequent changes and additions, especially in the purpose of examination for which this form is used, all examiners should help in keeping this reference up to date by revision whenever indicated.

b. General Instructions. (1) Fill in every entry. If a heading is not applicable, use dashes.

(2) The term "normal" will be used whenever possible to indicate usual, average, qualifying findings. If abnormalities are present describe in detail. If these are not symptomatic, indicate by the use of the abbreviation N.S. If abnormalities are described which are not considered disqualifying indicate by use of the abbreviation N.D.

(3) Negative will not be used except to report the results of laboratory tests and

X-rays.

(4) "None" will be used where indicated. Example: Varicose veins, "none".

(5) If there is insufficient space for remarks, write: "See Par. 37", and continue the remarks in that paragraph. If additional sheets are required they will be considered in an extension of paragraph 37 and should be permanently attached, preferably by pasting, to Form "64".

c. Special Instructions for Individual Items of "64", by Paragraph (Obvious entries will not be discussed).

Par. 1. (a) Give full name, including full middle name. If there is only a middle initial, give the initial followed in parenthesis by "(initial only)". If there is no middle name or initial, write in parenthesis "(none)".

(b) If no military status, write "civilian" over grade and arm of service. Grade means rank as Pvt., Sgt., 1st Lt., etc. Arm means Combat Troops as: Air Forces, Cavalry, Infantry, Coast Artillery Corps, etc. Services are Medical Department, Finance, Q.M.C., etc.

(c) Age. Nearest birthday.

(d) Years of service. Indicate only whole years completed. Where there has been less than one year, state service in nearest twelfth, example: 5/12.

Par. 2. (a) If in service, give service address. Otherwise, give a detailed home address (where individual habitually receives mail).

(b) Purpose of examination.

1. TAC (Air Crew). This is used for all applicants for Air Crew Training.

2. Officer training in grade, (Pilot), (Navigator), (Bombardier), (Aerial) Observer).

3. Other purposes: Service Pilot, Liaison Pilot, Flexible Gunnery Training, Other Combat Crew (Radio or radar operator, airplane mechanic, etc.)

4. Foreign Student.

5. Non-rated Observer. For officers of other branches applying for flying status.

6. Semi-annual. Indicate in parenthesis (pilot), (navigator), (civilian instructor), etc.

7. Special (after hospitalization or after sick leave, or after head injuries, etc.).

(c) Date and result of last examination applies to previous examinations for flying. If this is original examination, enter "original". This entry is to be supported by accompanying certificate. (Form W-3766, AC, revised).

(d) Aeronautical Ratings are Army Ratings only.

(e) Flying time refers to Army flying time only.

Par. 4. In this paragraph should appear remarks concerning any of the conditions called for in small print. On the original examintaion a comprehensive history of personal illness (childhood and adult), of familial illness if relative to selection, and of personal surgery, injury, or abnormality will be recorded. On subsequent examination the medical history since the last examination will be obtained and recorded. Physical findings as scars, deformities, etc., properly belong in the paragraph concerning that part of the physical examination, and not in this paragraph. In recording the history, give dates (year) rather than the age at which the disease occurred. Wordage should be limited. Negative statements should be limited to amplifying illnesses, e.g., "no complications, no sequelae". In the event the examinee denies any history, the following statement should appear in paragraph 4: "Denies any illnesses, injuries, or operations".

Par. 5. Inspection, use "normal". For nystagmus, use "none".

Par. 6. For associated parallel movements, use "normal". For equality, use "equal". For reaction, use "normal".

Par. 7. Visual acuity will always be indicated in positive values, e.g. 20/20+2, not 20/30-6. The acuity 20/25 will not be used because it does not appear on all Snellen charts.

Par. 10. Red Lens Test. - Record as "normal" if no defect found. If suppression

is found give distance and direction in which the light was moved and distance from the neutral point at which the suppression occurred, e.g., "Suppression, right eye, 20 cm. up and to left".

If diplopia is found, list as crossed or uncrossed diplopia and the direction and distance at which it occurs from the neutral point, e.g., "Crossed Diplopia, 25 cm. up and to the right".

Angle of Convergence. Record PcB or Pd in mm. but do not compute angle. Qualification is determined on basis of PcB - Pd = 25 or less.

Par. 11. Addition required for 50 cm - filled in when accommodation falls below 3D. (This refers to rated pilots or service pilots over 40 years old and ordinarily does not apply to the applicant for Air Crew training).

Jaeger type. Reported on all aviation cadet applicants, and when form "64" is used in place of "63" and is to be reviewed in Office of Surgeon General (Commissions, promotions, annual physical). J-1-13 refers to J-1 type legible at 13 inches, without glasses. If glasses are worn, near vision is determined without glasses and with glasses (corrected), and the prescription given.

Par. 12. Color vision will be designated as follows:

(a) If applicant misses no plates, either American Optical Company or Ishihara: "Normal" is recorded.

(b) If applicant misses less than 25% of plates record as "misses 3 A.O." or "misses 2 Ish.".

(c) If applicant misses more than 25% of plates record as "Fails Ishihara" (or Fails A.O.), Perm. Disq".

(d) In the classification center the adjunctive tests may be used in the event an individual misses more than 25% of the plates. Depending on the results of these tests the individual is listed as "safe (or unsafe) for Air Crew (or Combat Crew) training as indicated by (give name of test or tests used)".

Par. 15. Use "Denies", if no history of ear trouble is admitted. If history of ear disease is admitted, record the diagnosis, the ear involved, date of occurrence, operative procedure, if any, and sequelae, if any.

Par. 17. Hearing loss by the audiometer test will not be recorded in percentages, but will be recorded as average decibel loss computed from the practical conversational range of hearing.

Par. 18. Deviations of the septum will be recorded in terms of obstruction. For example: "Septum deviated to right; 40% obstruction, NSND.", or "Septal spur on left, interfering with ventilation and/or drainage of the middle meatus, Temp. Disq.".

Tonsils: "Enucleated", if they have been removed. Do not describe the tonsils unless they have, or may have in the future, some pathological significance. Do not use the term "present". Record "normal", if such is the case.

Par. 19. (b) Remarks including other defects - State "no teeth missing" if this is the case. Enter gingivitis, stomatitis, etc. if present. Also enter irregularities which may be of value in identification, e.g. "tooth malposed R 13 lingually". Note type of malocclusion if present.

Par. 20. Use denies, if no history admitted.

Par. 23. Record height to nearest 1/4 inch, weight to nearest pound, chest measurements to nearest 1/4 inch.

Par. 27. "Exercise Test" is the standard test of hopping on one foot one hundred times.

Par. 30. Use "negative". If X-ray report contains any findings other than normal or negative data, include the entire X-ray report verbatim.

Par. 35. (a) If Kahn negative and Wassermann test not made put dashes after Wassermann.

(b) Microscopical to be completed on all original and on final type examinations; otherwise put dashes after microscopical.

Par. 36. State either "Satisfactory" or "Unsatisfactory". Follow this by "ARMA", giving the score. In this paragraph do not put in any derogatory remarks concerning the individual which are personality evaluations, and which reflect on

his intelligence, character, habits, etc. Do not put in paragraph 36 any remarks which rightly belong in paragraph 4.

Par. 37. Begin continuation as: "Par. 18, cont." Continuations should follow each other in their numerical sequence. If there are no remarks, state: "none". Recommendations for waiver of minor defects should be placed in this paragraph.

Par. 38. Qualified? Yes or No. Class? 1, 2, or 3 (if qualified). If disqualified put in a dash. If qualified, but waiver recommended, indicate as follows: "1 (or 2 or 3) if waiver is granted." List disqualifications by paragraph number only as "Par. 7, 10, 18, 36.". Do not enumerate the actual disqualifications.

Par. 39. Dash out on original applicant only. Fill in on semi-annual.

Par. 40. Dash out on original applicant only. Fill in on semi-annual.

Par. 41. Use "none" or one of the following remarks: (a) "Permanently disqualified, reexamination not recommended." (b) "Temporarily disqualified, reexamination recommended." For original applicants, do not include any recommendations for correction of temporary defects. (c) If the applicant is to wear glasses while flying, a statement to that effect will appear in this paragraph. (d) other remarks as indicated.

Par. 42. On original examinations only, does he meet physical requirements? "Yes, or No." Do you recommend acceptance with minor physical defects? "Yes or No." If rejected enumerate disqualifications, for example: "Defective color vision, hypertension, unsatisfactory ARMA."

d. Signatures. Two on the right, and one reviewing officer. Flight Surgeons and Aviations Medical Examiners may sign "64". Typewritten name will appear below the officer's signature.

190. CARE OF FLIER REPORT. a. Instructions, general. (1) This report will be prepared in duplicate by a Flight Surgeon, or in the absence of a Flight Surgeon, by the Station Surgeon, for every Air Forces station on Saturday of each week and the original forwarded promptly to Air Surgeon, Army Air Forces, Office of the Commanding General, Army Air Forces, Washington, D.C. The retained copy will be filed as a permanent record in the office of the Flight Surgeon.

(2) The report will cover a period of one week from midnight Friday to midnight of the following Friday. It will be dated as of the Friday closing the weekly period.

(3) All personnel receiving flying training will be reported as flying students. While receiving dual instruction, flying students will be reported as passengers.

(4) When an individual is removed from flying for any reason while away from his home station, he will be recorded only on the Care of Flier Report of the Air Forces station where he is under treatment or observation, and will continue to be so recorded until he passes from jurisdiction of that station. In the event of transfer to a General Hospital, the home station Flight Surgeon will be notified and the individual dropped from the records of the station where he had been under treatment. The home station Flight Surgeon will from that time account for the flier on his Care of Flier report. Should the disability occur or be continued at a point where a Care of Flier report is not routinely made, the home station Flight Surgeon will be notified and the individual recorded on his own station report.

(5) Personnel of the Navy or Coast Guard removed from flying for any reason at any Army Air Forces station will not be recorded on this form. A separate report by letter will be made to the appropriate authority. A copy of this letter will be attached to the Care of Flier report.

(6) With reference to cases on sick leave under the provisions of par. 25 a, AR 40-1025, dated October 12, 1940, attention is invited to the two types of sick leave provided for therein. In the preparation of the Care of Flier report due distinction will be made. If the case is on sick leave on a sick status, it will be carried in the same manner as if in hospital. If the sick leave is on a duty status, the days lost will be entered in the sick leave column.

(7) The report will be signed by the Senior Flight Surgeon. In the preparation of this report only those abbreviations authorized by Army Regulations or having official sanction will be used.

b. Preparation. (1) The strength of command may be obtained from Headquarters of the station and should be identical with that shown on WD Form 86 ab for the same period. The breakdown into component parts will be the same as shown on Form 51, MD.

(2) Report of aircraft accidents. Only aircraft accidents resulting in injury to the occupants of aircraft or to bystanders, or as a result of which the flying status of any individual is changed, will be reported hereon. In all such cases, an aircraft accident report (WD, AC Form 205) will also be prepared and attached to this report. It is to be noted that the definition of "aircraft accident" differs from the definition used by the Air Forces. The latter includes any accident involving appreciabl damage to the plane alone.

The number of aircraft accidents is that which has occured during the week covered by the report only. This will be recorded as words and not as numerals: viz., "None," "One," etc.

Personnel involved in the accident will be tabulated in Table A on the appropriate line and in the column corresponding to their classification. In those instances where there is a pilot and a co-pilot involved, both will be recorded as pilots and explanation made under "Remarks." For example, if the pilot and co-pilot are R. A. officers, the figure "2" will be placed on the "commissioned" line in the first "pilot column" and followed by an (*). Under "Remarks" the statement, "*Includes co-pilot," or other suitable phrase will be used. Military personnel only, injured in aircraft accidents will also be tabulated under "disorders due to flying," and listed under "Remarks" on the back of the form. Killed or uninjured military personnel and civilians will not be accounted for anywhere else on the report.

The results of aircraft accidents will be tabulated in a similar manner. An extra column heading "Civilian" may be inserted in the "Total" column for this purpose. Command pilots will be tabulated as "passengers." Civilians will be tabulated in the "Total" columns of Tables A and B. (See the second sentence of this paragraph above).

Propeller accidents. Applies only to those injuries caused by a moving propeller.

Remarks. The space on the front of the Form 203 is reserved for remarks pertaining to accidents only. The names of the killed or injured, together with such other data as seems pertinent will be recorded here. Complete report will be made on Form 205, and attached to this report.

c. Supplemental reports. In the event that injuries prove to be more serious than originally believed, or if death occurs, subsequent to first report of the accident, appropriate remarks will be made on a later Care of Flier report following a notation: "Supplemental report -- see Care of Flier report dated _____." Such notations will be entered below the remarks for the current week. In these instances no tabulations will be made. No supplemental report need be made for civilians.

d. Tabulation. (1) Tabulation of fliers on sick report or those removed from flying for physical causes. Under "Disorders Due to Flying" all military occupants of aircraft, regardless of their crew position, who are incapacitated for flying for reasons incident thereto, will be tabulated here on the appropriate line and in the correct column.

(2) Under "Disorders Not Due to Flying" only classified flying personnel of the Air Corps will be tabulated. Enlisted men who do not hold military aeronautical ratings or who are not receiving training for aeronautical ratings should not be carried on the Care of Flier report. Non-rated observers (officers of other branches) should be carried on the Care of Flier report only when they are injured in aircraft accidents or receiving injuries while flying. (See Table XXI).

(3) In computing time lost the day of admission to sick report or of grounding is always counted as a day lost regardless of the time it occurs, and the day of return to duty is counted as not lost regardless of the time it is effective. In case of death or retirement for disability it is included. In the tabulations only the number of days lost by each individual for the week covered by the report is recorded. The number of days lost by an individual thus may range from none to seven. No days lost will occur when return to duty is effective the first day covered by the report. The total number of days reported as lost by any group of individuals in any column is the sum

TABLE XXI. DATA TO BE CARRIED ON
BACK OF CARE OF FLIER REPORT

COLUMN A Disorders due to flying	COLUMN B Disorders not due to flying
1. To be carried when injuries or diseases are due to flying: a. Officers (1) Air Crew (pilot, bombardier, navigator) (2) Officers training in grade (air crew) b. Flying Sergeants c. Aviation Cadets - Air Crew d. Flight Officers	Same personnel carried as in Column A
2. To be carried only when injuries are received while flying: a. Officers (1) Ground Crew (photographer, armorer, engineer, meteorologist, radioman) (2) Flight Surgeons. b. Aviation Cadets - Ground Crew	This personnel not carried in this Column

of the days lost for that week only, by each.

(4) Only individuals who have lost a minimum of 24 hours from flying will be recorded. This includes those fliers who might be removed from flying for some reason without being on sick report or sick leave.

Should the physical condition of the flier be such that intercurrent diseases indicating a new or changed diagnosis change the cause of removal from flying from a disorder due to flying to a disorder not due to flying, or vice versa, such fact will be noted by an asterisk (*) in the "Days lost" column under "A" and "B" with an appropriate explanation under "Remarks." In such event, the day the change in diagnosis is made will be considered a day lost under the new diagnosis.

(5) This portion of the report is accumulative as far as the number of individuals is concerned. As long as an individual is removed from flying for any reason he must be repeatedly tabulated here until final disposition is made.

e. Remarks. (1) Every individual tabulated under "Disorders Due to Flying" and "Disorders Not Due to Flying" will be listed here and separated into R.A., Reserve, and Flying Student Components. The name, rank, diagnosis, date of admission to this report, date of duty and the total number of days lost for the current admission will be recorded for each. These diagnoses will necessarily be brief and need not conform stricly to regulations governing the preparation of sick and wounded reports elsewhere. The diagnostic table set forth in AR 40-1035 should, however, be used as a general guide for terminology. When the diagnosis is unduly long, unnecessary weekly repetition of this may be avoided by a brief mention of the nature of the disability and stating the date of Care of Flier report on which the complete diagnosis appears, as "Multiple injuries, result of aircraft accident, see report of 9/27/40."

(2) An additional sheet will be used when necessary, and attention called to this by making an appropriate remark at the bottom of the form.

f. Recording of data. (1) The method used for recording necessary data for the preparation of the Care of Flier report varies from one station to another. The system most generally in use is that of keeping individual records (Forms 52, 55a, etc.) which at the end of the week are sorted into "Disorders Due to Flying" and "Disorders Not Due to Flying," and the Care of Flier report prepared from these. Such a system requires a great deal of care to correctly determine the number of days lost for that week and the total number of days lost to date. The Flight Surgeon experiences the same difficulty in checking the accuracy of a report which is prepared from a number of different records. To overcome these difficulties a method of keeping this data on a single form is illustrated(Table XXII).Each of the dates covered by the report is placed at the head of a column provided for it. Daily disposition of each individual is recorded under the corresponding date. Under "Previously" the date of admission prior to the current report week is entered and also the total number of days lost at the end of the previous week. The column headed "Designation" is provided to indicate that the individual is in the Regular Army, Reserve, or is a flying student. When the Care of Flier report is to be prepared the number of days lost during current week by each individual is readily determined and recorded under "This Week." The total number of days lost is also easily determined by adding the number of days lost under "Previously" to that lost under "This Week." Therefore, all the information that is necessary to complete the Care of Flier report is consolidated on one form. By reference to it at any time during the week the Flight Surgeon can readily see who is on sick report and the diagnosis, status, date of admission, date of duty and the number of days lost by each individual.

g. Checking the report. (1) The report is checked in the following manner:
The totals for the "Number"columns of "Disorders Due To Flying" and "Disorders Not Due to Flying" are added. This sum should be the same as the number of names appearing under "Remarks."

(2) Similarly the totals of the columns "Days lost" for "Disorders Due to Flying" and "Disorders Not Due to Flying" are added. This sum should be equal to the total of the days lost during the week by everyone.

(3) This method of checking the report is greatly facilitated by using the single data sheet for all that is necessary is to add the column "This Week" and to count the number of names for comparison with the total shown.

TABLE XXII . DATA FOR CARE OF FLIER REPORT

MONTH April

Week ending April 7th, 1939

Name	Rank	Desig-nation		1st	2nd	3rd	4th	5th	6th	7th	Previ-ously	This Week	To Date
Smith, A. B.	Maj.	Reg. A.	Psychoneurosis, anxiety type, mod. severe	DNIF	DNIF	DNIF	DNIF	DNIF	DNIF	DNIF	3/1/39 31	7	38
Jones, C. D.	Lt.	Reg. A.	Varicose veins, severe, left leg	Hosp	Hosp	Hosp	Hosp	Hosp	Hosp	Hosp	0	7	7
Green, E. F.	Lt.	Res.	Nasopharyngitis, acute, cat., mod. severe	--	--	Qtrs	Qtrs	Qtrs	Duty	--	0	3	3
Brown, G. H.	Capt.	Reg. A.	Sprain, mod., left ankle	--	--	--	Qtrs	Qtrs	Qtrs	Qtrs	0	4	4
Adams, I. J.	Lt.	Student	Nasopharyngitis, acute, cat., mod. severe	--	--	--	--	--	Hosp	Hosp	0	2	2

DNIF - Duty Not Involving Flying

h. Frequent errors made on Care of Flier report.
(1) Ommission from report of students, cadets and officers who are removed from flying status because of physical disqualifications.
(2) Failure to carry on subsequent reports patients transferred to general hospitals or other station hospitals for observation and further treatment.
(3) Failure to give disposition, whether on ground duty, in hospital, quarters, etc.
(4) Failure to enter dates of disposition.
(5) Failure to give date returned to duty.
(6) Failure to carry on report when on ground duty.
(7) Carrying enlisted personnel who do not hold aeronautical ratings and who are not taking such training.
(8) Failure to give full name: (Last name, first name, and middle initial). Initials alone are insufficient.
(9) Failure to distinguish between ground duty (DNIF) and full flight duty (Duty).
(10) Failure to give diagnosis.
(11) Failure to submit reports weekly (single copy only).
(12) Failure to recognize the fact that "Days Lost" should include all flying days lost.
(13) Carelessness in spelling of names on reports, especially those previously reported.

191. LOCATOR CHART. For ready reference to the status of all flying personnel, a wall chart can be constructed, consisting of any background (conveniently imitation leather) which can be slit to receive cards for each officer. These can be arranged either by organizations or by alphabet and rank. Varicolored cards are used to indicate types of personnel involved, as officer, pilot, bombardier, navigator, warrant officer, etc. In addition, small squares of colored cards may be used to indicate the status of the individual; that is, no additional card for an officer on full duty, a small red card superimposed on one corner of officer's name card, indicating "hospital", a yellow card, "quarters," a green card, "duty not involving flying", a black card, "sick leave," etc. Charts of this nature can also be made to indicate status by the use of golf tees or other pegs, inserted in a status hole opposite officer's name.

192. TRANSFER OF RECORDS. a. As a flying officer's records must be sent to the Flight Surgeon of his next station, on transfer (see par. 12, AR 40-110) it will be found convenient to have the officers' clearance slip made with a space for checking by the Flight Surgeon. The pilot on receiving his clearance, will notify the Flight Surgeon of his change of station and his records can then be forwarded with a copy of the pilot's orders attached.

b. When flying personnel are transferred to overseas commands or when their orders indicate that such may be their disposition, their records will be sent to the Air Surgeon, OCGAAF, Washington, D. C.

c. In case of death of any flying personnel records will be sent to the Air Surgeon.

193. GROUNDING, RELIEF, CLEARANCE, AND RESTORATION OF FLYING PERSONNEL.
a. Definitions.
(1) Flying - Moving in the air in an aircraft.
(2) Flying Status- a Status in which an individual has been ordered to participate in regular and frequent flights.
(3) Grounding - The prohibition of an individual from flying, usually for reasons of a temporary or minor nature.
(4) Relief - The issuance of a legal order by the Commanding General, A.A.F., terminating the participation of an individual in regular and frequent flights.
(5) Clearance - Clearance is the authority to fly. In the case of grounding local permission is sufficient. In relief the OCGAAF must grant the authority. In other words, the authority to remove is the same as the authority to restore.
(6) Restoration - The issuance of an order by the Commanding General, AAF, to permit a flyer who has been removed to again participate in flight.
(7) Serious Illness or Injury - In relation to flying any illness or injury that requires major surgical procedure or absence from full military duty for a period of over

one month; fractures, and especially fractures involving the cranium or vertebral column; injuries or interference with function, or diseases of the eye; neurological, mental or neuropsychic conditions; cardiovascular and renal conditions of an organic nature; encephalitis lethargica or any condition accompanied by diplopia or lethargy; and syphilis, malaria, paroxysmal tachycardia, recurrent attacks of any of the rheumatic group, renal calculus, pneumonia, typhoid, and any other debilitating diseases.

(8) Differentiation of Ground and Relief - Grounding has a dual meaning. In the broad sense it means staying on the ground. In the more narrow sense it is used to define a non-flying status of less than 30 days and for minor causes. To a degree the terms "grounding" and "relief from flying" are synonymous. This is to say while clear, relief from flying is a formal procedure requiring the action of the Commanding General, A.A.F., and is only recommended in case of prolonged removal from flying for serious conditions and for a period greater than 30 days. In "grounding" there is no loss of flying pay or flying status. In "relief" both are indefinitely suspended. In grounding the final action is local; in relief the OCGAAF takes final action.

b. Indications. - (1) Grounding - Personnel on flight status are temporarily prohibited from flying usually because of some minor illness or injury which in the opinion of the Flight Surgeon is sufficient to interfere with proper control of the airplane or which might become aggravated by flying.

(2) Relief. Relief from flight status is indicated in the following conditions: (a) For serious illness or injury in relation to flying, (b) Whenever A.G.O. waivers are required.

(3) Clearance. Clearance of fliers must be obtained after grounding for minor illness or injury, after relief from flight status, upon return from leave of 30 days or more, after all aircraft accidents and upon reporting to a new station. Reserve officers with pilot ratings who apply at Air Forces stations to pilot aircraft are required to obtain a clearance before flights are authorized.

(4) Restoration. At any time following relief from flying status and subject to the condition causing this relief the individual may request an examination to determine whether he is physically qualified to fly.

c. Procedure. (1) Grounding. Whenever a Flight Surgeon finds an individual on flight status physically incapacitated for such duty, he will promptly inform the Commanding Officer of his station and at the same time submit appropriate recommendations. Upon the receipt of such notification from the Flight Surgeon, the Commanding Officer will at once ground or suspend the flying training of any individual reported physically incapacitated without reference of the case to the CGAAF.

(2) Clearance. When the Flight Surgeon upon examination has found the individual physically fit to fly, he so notifies the Commanding Officer and makes appropriate recommendations. The Commanding Officer upon receipt of this notification may authorize the resumption of flight duty, if the Flight Surgeon so recommends and the incapacity was for a slight or temporary disability, without reference of the case to the CGAAF.

(3) Relief. When relief from flight status is indicated, the Flight Surgeon notifies the Commanding Officer by letter and makes appropriate recommendations. Upon receipt of the notification, the Commanding Officer will promptly remove the individual from flying status and at the same time notify the CGAAF of the action taken. The CGAAF will then radio the Commanding Officer of his approval or disapproval of this action. When the relief from flight status is affected because a waiver is required the Commanding Officer will initiate a report from the local Flying Evaluation Board, and the Flight Surgeon will forward a report of the physical examination with appropriate recommendations on Form 64. The request for waiver will be initiated by the individual concerned and returned to the Flight Surgeon for attachment to the Form 64. Upon receipt of these records in the OCGAAF, appropriate action will be taken by the Central Flying Evaluation Board.

(4) Restoration - Upon recovery from a serious illness or injury or return from sick leave, a physical examination will be made and reported on WD AGO Form 64 with appropriate recommendations. The CGAAF will act upon these recommenda-

tions and notify the Commanding Officer, usually by radio, that the individual has been restored to flying duty. On the basis of this, the flyer is cleared for duty in the air.

(5) Return of Aviation Cadets to flying duty - Aviation Cadets who have been relieved from flight duty for serious illness, or injury that requires major surgical procedure or absence from full military duty for a period of over one month, will not be allowed to resume any duty in the air until authorized by the general offficer having immediate supervision of his training. Such cases will not be referred to the OCGAAF. (A. G. 221.99 (2-3-41).).

d. Forms Used. - (1) Grounding and Clearance - The Forms used for this purpose are for local use only, and vary from station to station, depending upon the wishes of the Commanding Officer. In general, they may be divided into (a) individual forms, and (b) consolidated forms. Either or both may be used at a station. Individual "Grounding Forms" are generally used at smaller stations where this procedure is relatively infrequent, or at larger stations when the flyer for some reason was not entered on the "Consolidated Form", which is used where the number of flyers on sick report, or who are otherwise disqualified for flying, is relatively great.

(2) The number of copies and their disposition will also vary from one place to another. Usually one goes to the Commanding Officer and one is filed in the Flight Surgeon's Office, preferably in the individual's 64 file. In addition, the Commanding Officer may require a copy to be sent to the Finance Officer, the Post Operations' Officer or other persons designated by him. Grounding and Clearance of personnel of the Navy, National Guard, and Coast Guard. When it becomes necessary to remove personnel of the Navy, National Guard, or Coast Guard from flying at any Army Air Forces Station, the Flight Surgeon notifies and makes appropriate recommendations to the Commanding Officer who will take the necessary action to inform the Department having jurisdiction over the individual. When the individual is reported by the Flight Surgeon as physically fit to resume flying, the Commanding Officer will take appropriate steps to clear him for flying.

(3) Relief and Restoration. See Par. 193c.(4).

194. PROCEDURE IN CASE OF CRASH DEATH. A medical officer is always detailed as a member of the aircraft accident investigation board which inquires into the circumstances surrounding the crash. This medical officer is the logical one to sit as member of the line of duty board if one is concerned. It is therefore desirable that he should be the one to fulfill all the functions required below except such as are specifically delegated to the Station Surgeon.

a. Upon Arrival at the Scene of the Accident.

(1) Establish the fact of death at a specific and exact time.

(2) Notify Station Commander by radio or telephone at once giving positive identification. If this is not possible, give all available information obtained including the number of the plane and any data obtainable from the Form 1.

(3) If the crash has occurred on a military reservation the body may be moved to the Station Hospital. If it occurred off the military reservation authority to remove the body must be obtained from the Coroner. Laws vary in each State and must be complied with even though the death involves only military personnel. Blanket authority to remove any and all crash victims may often be obtained from the local Coroner so that notification to that office only is required.

(4) Remove the body, or bodies, to the Station Hospital morgue. If bodies have been badly mutilated or cremated a special bag is often useful for this purpose. A canvas bag 6-1/2 feet long, 2-1/2 feet wide, lined by rubber sheeting and closed by a long zipper has proven to be valuable. Under any circumstance, wrap the remains in a sheet or blanket. Be sure all fragments of dismembered bodies are collected.

b. After arrival at the Hospital.

(1) When a body has not been positively identified because of mutilation or cremation a dental officer can often determine the individual's identity from the dental records.

(2) The body should be completely disrobed in the presence of a medical officer who will personally remove all valuables. These items will be turned over to the Summary Court Officer and a receipt obtained for them. Items of clothing or equipment issue

are turned over to organization commander.
(3) A complete diagnosis of the cause of death must be established either by complete external examination or by necropsy. A specimen of cardiac blood is taken as soon as possible following the crash and tested for the amount of carbon monoxide saturation. These specimens must be placed in a flask under oil until they can be examined. (Circular Letter to Flight Surgeon, Office Chief of the Air Corps, Aug. 1, 1932).
(4) Call the Station Adjutant by telephone and confirm the identification of the body.
(5) Place 2 tags on the body. One tied firmly to the right great toe, and the other to the left wrist. This tag must show the individual's full name, rank, branch of service, and serial number.
(6) Release the body to the contracting Undertaker. If one is not available a local Undertaker may be employed (AR 30-1830). A copy of the contract between the Quartermaster and the local contracted undertaker should be on file at the hospital as a guide to the medical officer in making arrangements with undertakers not under contract.
(7) Write a letter to Station Commander as shown below.

SUBJECT Report of Death.

TO: The Commanding Officer, Randolph Field, Texas.

1. In compliance with paragraph 2 b, AR 600-550, dated March 6, 1936, and changes thereof, the following report of death is submitted:

a. Full Name of Decedent:

b. Army Serial Number:

c. Rank and Branch:

d. Date, Place, and Cause of Death:

e. *Whether Death Occurred in Line of Duty and Was or Was Not the Result of His Own Misconduct:

_____
SURGEON

*(Statement of line of duty determined ordinarily by a conference with the deceased's immediate Commanding Officer. If the Surgeon and Commanding Officer agree on the line of duty the statement in this letter will ordinarily be accepted. If the Surgeon disagrees with the immediate Commanding Officer, or feels that the line of duty is doubtful, he will so state here and request that a Line of Duty Board be appointed. (AR 345-415 as amended by W. D. Circular Letter 226-1941).)

(8) Complete the following records:
(a) Death Certificate (State Form - original to Undertaker)
Death Certificate (Bureau of Census Form)
(b) Report of death (WD AGO Form No. 52).
"Command" or "Casual Station - Field" as case may be.
(c) M. D. Form No. 52 "Carded for record only, not currently on the register".
(d) Report of Aircraft Accident (W. D. Form No. 205 A. C.)
(e) Proper notation on "Care of Flier Report (W. D. Form No. 203, A. C.)"
(f) Entry is made on organization sick book.

c. After the body has been embalmed.

(1) The body must be inspected by a Medical Officer to determine that it has been properly embalmed. (19 c, AR 40-590). This inspection is usually made with the Quartermaster who inspects the casket and clothing. In the case of mutilated or burned bodies which cannot be embalmed, sawdust saturated with formaldehyde is used. In order to comply with State laws such bodies are placed in a sealed casket (Par. 10, AR 30-1820). When a sealed casket is desired a certificate is furnished the Undertaker by the Surgeon establishing the reason for this type of casket. The Quartermaster is advised at the completion of the inspection that the body is properly embalmed and ready for shipment. It is his function to see that it is properly shipped.

(2) The Medical Officer making the inspection completes a certificate to the effect that he has inspected the body and that it has been properly embalmed. One copy of this certificate is filed with the clinical record of the case, and the original is given to the Quartermaster.

195. REPORTS FOLLOWING HOSPITALIZATION. a. When an individual has been hospitalized in a general hospital for conditions which have necessitated his appearance before a Board of Officers - a copy of the hospital board proceedings, or an extract of clinical history if no board proceedings were prepared, will accompany the Form 64 prepared after his return to a duty status.

b. When Forms 64 AGO are submitted on an individual after admission to hospital for quarters for serious illness or injury the following information will be entered on the Form:

(1) Date of admission to hospital or quarters.
(2) Name of hospital.
(3) Diagnosis.
(4) Hospital or quarters if so admitted.
(5) Date of return to duty.

CHAPTER 9
MEDICAL PROPERTY AND SUPPLY

SECTION I
CLASSIFICATION

196. GENERAL. The Medical Department Supply Catalog lists those items the issue of which is the responsibility of the Medical Department. Items listed in the Medical Department Supply Catalog constitute "standard medical supplies," and those not listed in the Supply Catalog but procured by the Medical Department as required are designated as "nonstandard."

Insofar as practicable, medical equipment and supplies will be provided to the Army Air Forces and Army Ground Forces by the Army Service Forces. Requirements in excess of those authorized by Tables of Allowances and Tables of Basic Allowances plus normal maintenance will be estimated by Army Air Forces and Army Ground Forces and reported to the Army Service Force.

The Air Surgeon shall establish Medical Supply Platoons, Aviation, in Air Forces depots. They shall be stocked with initial and small maintenance stock for the supply of tactical medical units attached to the Air Forces. Replenishments will be drawn from Army Service Force depots.

197. STANDARD SUPPLIES. The standard medical supplies are divided into classes and subclasses as follows:

a. Class 1. Drugs, chemicals
   Biological stains
   Biological products
b. Class 2. Surgical dressings
c. Class 3. Surgical instruments, surgical appliances, miscellaneous diagnostic instruments, and surgical supplies
d. Class 4. Laboratory equipment and supplies
e. Class 5. Dental equipment and supplies
f. Class 6. X-ray equipment and supplies
g. Class 7. Furniture
   Physiotherapy equipment
   Hospital linen and bedding
   Mess equipment and supplies
   Cleaning and preserving equipment and supplies
   Stationery and miscellaneous office equipment and supplies
   Miscellaneous hospital equipment and supplies
h. Class 8. Veterinary equipment and supplies
i. Class 9. Field equipment and supplies
j. N.S. Class 10. Professional books

198. MEDICAL SERVICE AND SUPPLY WITHIN THE TACTICAL UNITS OF THE ARMY AIR FORCES.

a. General. As a preliminary to an understanding of the chain of service and supply in the A.A.F., it is necessary to understand the functions of the Air Depot and Air Service Groups.

The Air Depot Group corresponds to the Air Depot within the Zone of the Interior. As such it is charged with fourth echelon maintenance of military aircraft and the storage and issuance of supplies which are peculair to the Air Forces. It consists of a Headquarters and Headquarters Squadron, a Repair Squadron, and a Supply Squadron. Ordinarily one Depot Group is behind two Service Groups.

The Medical Section of the Depot Group has a total of four Medical officers, one Dental Officer, one MAC Officer, and 35 enlisted men. They perform the usual sanitary functions

of attached medical personnel and operate a dispensary for the unit. The equipment differs from that in a combat group in that a certain amount of second echelon hospitalization is provided for; the moderately sick and less severely impaired may be treated within the unit so that evacuation and replacement are unnecessary.

The Air Service Group corresponds to the air base sub-depot, and is the intermediate unit between the Depot Group and the combat units. Generally the Service Group serves two combat groups of four dispersed squadrons each. It consists of two Service Squadrons, Ordnance Section, Chemical Section, Signal Section, two Quartermaster Truck Companies, a Light Maintenance Company, and a Medical Section. Two functions of the Service Group are to furnish third echelon maintenance to the combat units and to supply and distribute all classes of supplies to the dispersed combat units.

The Medical Section of the Service Group has practically the same composition and equipment as the Depot Group. There are three additional men who are provided for handling medical supplies for distribution to the dispersed units. The Section operates a dispensary which is identical with the dispensary in the Depot Group.

b. Distribution of Medical Supplies. Normally, medical supplies are drawn by Medical Supply Platoons, Aviation, from medical supply depots established by the Army Service Force in depots of armies or theatres. The Medical Supply Platoons, Aviation, are attached directly to the depots, to Air Depot Groups, or elsewhere as needed. This function is to procure the supplies to maintain a 10-day stock, and to distribute supplies automatically or upon requisition to medical detachments of the combat squadrons.

When the Army Service Force does not operate a medical supply point in the vicinity of the group and its combat units, a Medical Supply Platoon, Aviation, is attached to the Depot Group. This platoon consists of two Medical Administrative Corps Officers and 19 enlisted men, and is charged with storage and issuance of replacement medical supplies. Normally these supplies are forwarded to the Service Group by truck or train.

c. Evacuation and Hospitalization. The chain of medical services with the tactical units of the A.A.F. provides no facilities for hospitalization or evacuation. All hospitalization within the theatre of operations is the responsibility of the theatre Commander. The Army Service Forces are charged with furnishing the required facilities. The Air Force will request the required hospital facilities from the theatre commander. Evacuation and hospitalization are usually accomplished by means of the evacuation system which is functioning in the area in which the airdrome is situated. If no such facilities exist, separate facilities for the Air Force must be provided. However, the supply chain from Depot Group to Service Group to advanced airdrome would provide in reverse a very natural chain of evacuation.

SECTION II
PROCUREMENT

199. REQUISITIONS. a. Requisitions for supplies and equipment pertaining to any of the supply arms are ordinarily prepared on WD, QMC Form No. 400 and 401 (extra sheet).

b. Designation:

(1) Semi-annual - March 31 and September 30, AR 40-1705

(2) Quarterly (deteriorating items), AR 40-1705

(3) Emergency requisitions

c. All requisitions are now sent to the designated depot of issue without reference to the Surgeon of the Service Command.

200. SHIPPING TICKET (QMC FORM 434). a. Lists supplies shipped; b. Signed shipping ticket acknowledges receipt; c. Serves as voucher for picking up supplies.

201. PURCHASE ORDER (QMC FORM 308). Used for local purchase.

SECTION III
PROPERTY RECORD

202. STOCK RECORD CARDS. A complete record of all articles of public property for which accountability is required is maintained on stock record cards. WD, QMC Form No. 424 or an authorized modification is used for this purpose. This record will show the quantities on hand, received and issued.

203. VOUCHERS. Vouchers to the stock record account, namely, shipping tickets, reports of survey, and inventory and inspection reports, are numbered serially for each fiscal year. Only one series of numbers is used. Credit vouchers are designated by "C" preceding the voucher number and debit vouchers by "D" preceding the voucher number. These records are filed munerically for the fiscal year.

204. MEMORANDUM RECEIPT. a. Nonexpendable property issued by an accountable officer for use within the command is carried on memorandum receipt (WD, QMC Form No. 487), bearing signature of the responsible officer. Accountability for such property remains with the property officer. This record may be termed an "individual account."

b. In order that the quantity and location of all property on memorandum receipt may be known at any time, each property officer maintains a general record or account of the quantities and location of articles issued to individuals and organizations. WD, QMC Form No. 488 is used for this purpose. This record may be termed a "general account."

205. ANNUAL REPORT. a. Medical supply officers are required to submit to the Surgeon General on December 31 a report showing the quantity of all medical department supplies on hand as of that date.

b. All property accounts are audited once each fiscal year by a property auditor who issues certificates of audit showing status of the account concerned. One copy is forwarded to the corps area commander, one copy to the chief of finance, and one copy to the accountable officer.

SECTION IV
MISCELLANEOUS PROCEDURES

206. OVER, SHORT, AND DAMAGED REPORT (QMC FORM NO. 445). Used when supplies received are over, short, or damaged (see AR 35-6560, 35-6640, and 35-6720).

207. INSPECTION AND INVENTORY REPORT (WD, IGD FORM 1). Used in instances of unserviceable and obsolete property (see AR 20-35.)

208. REPORT OF SURVEY (AGO FORM 15). Used to investigate and report facts, and submit opinions and make recommendations as to the question of responsibility and the disposition of property found unserviceable, short, or damaged (see AR 35-6640).

209. TRANSFER OF PROPERTY. Relief from accountability for property by appointment of a new supply officer is illustrated on the following certificate which is attached to the statement of balances:

_____
(station)

_____
(date)

I certify that the balances shown on the stock record account of the (state organization and station), as of the above data, last Voucher Number_____, dated_____, are true and correct to the best of my knowledge and belief, and that the property has this date been turned over to (state name of officer, organization, etc.) pursuant to Order No._____, dated_____, _____(station)_____, and that all property found in excess of that shown on the stock record account has been taken up (Voucher Nos. _____) and all shortages have been surveyed (Voucher Nos._____).

_____
(signature)

_____
(rank and department)

I certify that I have this date received from (state name of officer, rank, and department), Predecessor, all property pertaining to the above designated stock record account for which my said predecessor is accountable, as shown by the list of balances from last audit, plus all proper charges against and less all authorized credits to my predecessor's account to the time of transfer, last Voucher Number_____, dated_____, and that I have this date assumed accountability for the property pertaining to this account.

_____
(signature)

_____
(rank and department)

APPROVED:

(Signature)
(Rank and department)
(Commanding)

One copy of the list of balances, certified as above, is retained by the officer relieved of accountability; one copy is filed with the property records; the original, together with the order directing the transfer is sent immediately to the Service Command finance officer for the auditor's file; and one copy is sent to the Service Command surgeon.

CHAPTER 10
MILITARY MEDICINE

SECTION I
PERIPHERAL CIRCULATORY FAILURE
(Primary shock, collapse, secondary shock)

210. DEFINITION. A type of circulatory failure which may be caused by:

a. A diminished blood volume.

b. A diminished blood pressure as a result of processes in the nervous system which cause vasodilatation.

c. A diminished blood pressure resulting from vasodilator substances acting on the peripheral blood vessels.

211. SYMPTOMS.

a. Weakness (apathy to asthenia).

b. Retardation of mental processes even to syncope or prolonged unconsciousness.

c. Dizziness.

d. Subjective coldness.

e. Thirst.

f. Restlessness.

212. SIGNS.

a. Diminished temperature.

b. Cold, clammy, ashen (pallor plus cyanosis) skin. The skin is dry in gross dehydration.

c. Rapid, feeble pulse. Sometimes the pulse is normal until just before death. The volume of the pulse is said to be more valuable than the rate, but this is questionable.

d. Blood pressure. The systolic and diastolic pressure may be elevated early. Later, the systolic falls initially, then the diastolic. The blood pressure is probably the most reliable guide to the progress of the case in the field. It should be recorded every 15 minutes, and must be carefully correlated with the extent and the nature of the injury.

e. Distant heart sounds.

f. Respiration is unchanged or deeper. There may be rales in "tissue shock."

g. Vomiting and diarrhea.

h. Urinary changes with elevation of blood NPN.

The last two signs are common in shock of traumatic origin.

The most reliable guides to the severity of the syndrome so far as signs are concerned are: (1) The condition of the skin, especially pallor; (2) the mental state, though alertness may persist to the end; (3) the blood pressure if the mechanism is clearly understood.

213. CLASSIFICATION OF ACUTE PERIPHERAL CIRCULATORY FAILURE. a. Hematogenic type (secondary shock), caused by reduction of the circulating blood volume.

(1) Acute hemorrhage.

(2) Plasma loss (in burns, at site of trauma including crush injury).

(3) Gross dehydration (prolonged diarrhea, diabetic acidosis, adrenal insufficiency).

b. (Neurogenic and psychogenic type (primary shock, collapse), cuased by reflex vasodilation of peripheral vessels which is acute and less serious than the hematogenic type.

(1) Traumatic (solar plexus blow, direct injury to nervous system).

(2) Emotional (inhibition of vasoconstrictor center - vasovagal syncope of Gowers, Lewis).

(3) Postural hypotension - failure of the postural vasoconstrictor reflex (in tabes,

in syringomyelia, in other diseases of the central nervous system, of unknown cause).
(4) Carotid sinus syncope - reflex vasodilatation type.

c. Vasogenic type - caused by agents acting directly on peripheral vessels, such as histamine, nitrites, and mecholyl.

d. Unclassified (toxemic) - seen with peritonitis, gas gangrene, during and after systemic infections (typhoid, pneumonia, influenza).

214. PRINCIPLES OF THERAPY OF PERIPHERAL CIRCULATORY FAILURE, HEMATOGENIC TYPE. A reduction of the circulating blood volume is the most common cause of "shock" encountered in military medicine. Since it is a serious form, details of therapy are given.

a. General.

(1) Head down except in penetrating wounds of the cranium or of the chest.

(2) Warm blankets. Care must be exercised not to overheat the patient. In the early stages of shock there is marked vasoconstriction in compensation for the reduced blood volume. A sudden release of this vasomotor activity by overzealous application of external heat may result in rapid exitus.

(3) Warm drinks, except when the patient is vomiting or when the abdomen is wounded.

(4) Anoxia of all tissue occurs in shock. It is treated by inhalation of high concentrations of oxygen. Every case should receive oxygen, but if equipment is limited, it should be used for the cyanosed patients particularly.

(5) Pain is relieved by opiates and barbiturates.

(6) Classify the case.

(7) Record blood pressure frequently (every 15 minutes).

b. Specific. Specific therapy is concerned with the restoration to the circulation of fluid, of cells, of both, or of sodium chloride. The type of treatment that will be used will depend on the type of loss - whole blood for hemorrhage, plasma for burns, saline for dehydrating diseases. Early in shock the most urgent need is for fluid in any form. The type used will often be at first dictated by the type available, but as soon as possible the correct fluid should be administered. Whole blood must be avoided for the early treatment of burns, for this ultimately further increases the viscosity of a blood already greatly concentrated by plasma loss. Most often the clinical condition met with in the field will be one due to combined hemorrhage and plasma loss. The relative amount of cells and plasma can easily be determined. The hemoglobin, red blood cells, and hematocrit determination will be increased in the hemoconcentration caused by loss of plasma; the reverse will occur in the hemodilution following a hemorrhage. In a base hospital the course of the shock may be further followed by determination of the serum proteins and the specific gravity of the blood.

The preferred route of giving fluid is by vein, but this should be augmented by enteral administration except in patients who are vomiting or who are wounded in the abdomen. The sub-cutaneous or intramedullary routes may be used.

The amount to be used will depend on the amount of blood lost or upon the degree of hemoconcentration, and upon the clinical condition and the level of the blood pressure. A crude guide in this regard is that 500 cc. of fluid will cause a rise in blood pressure of 10 to 20 mm. of Hg. The amount of plasma from the Army-Navy Standard Package that can be given in a 24-hour period should never exceed four liters, because of the small amount of free mercury present in the form of preservative.

The rate of giving the fluid will again largely depend on the clinical condition of the patient. In young subjects who were healthy just before the injury which brings them to the medical officer, it is usually possible to give 500 cc. safely in the first 15 minutes.

(1) Whole blood. Blood may be used fresh or after storage. Blood which has been stored should not be used after ten days, and preferably not after seven days, due to the hemolysis which occurs. Plasma may be prepared from this blood.

(a) The indirect method of giving a transfusion is the preferred one in the Army. Vacuum bottles of 600 cc. capacity, which contain 70 cc. of a 2 1/2% solution of sodium citrate, are available. A "donor's set" consists of a machined valve for regulating flow into the bottle; rubber tubing; a 17-gauge hose hub needle; and a hypodermic syringe and needles for injecting novocain. This set may be used repeatedly after careful washing with saline and autoclaving for 20 minutes between each

use. The "recipient's set" consists simply of an intravenous assembly with an adapter to fit into the rubber cap of the transfusion bottle. It is prepared for each use as is the donor's set.

(b) Blood grouping, using known human sera. It is necessary to have the sera of individuals belonging to known group A and B.

Collect one drop of blood in a small test tube containing 1 c.c. of a 1-percent solution of sodium citrate in physiologic sodium chloride.

Place two drops of type "A" serum on left side of a clean glass slide (see diagram). Place two drops of type "B" on the right side of the same slide. To these sera add one drop of the unknown cell suspension.

Mix thoroughly by tilting at intervals.

Agglutination can be detected macroscopically in from one to sixty minutes. Confirmation of agglutination should be determined microscopically.

A	B
Type "A" serum Unknown cells	Type "B" serum Unknown cells
No agglutination	No agglutination - O
No agglutination	Agglutination - A
Agglutination	No agglutination - B
Agglutination	Agglutination - AB

(c) Blood grouping, using rabbit antisera (preferred method in U. S. Army). Collect unknown blood suspension as outlined above

Place one drop of the unknown cell suspension on opposite ends of a clean glass slide marked A and B (see diagram).

Add anti-"A" rabbit sera to cell suspension on left end of slide and add anti-"B" to the cell suspension on the right end.

Insure mixture by stirring with individual applicators. Caution: Use individual applicators for each end of slide.

Read macroscopically at the end of one minute; if agglutination has not occured at the end of one minute, set aside and recheck at the end of one hour. To prevent drying out ring with vaseline and cover with cover glass.

Anti-"A" Unknown cells	Anti-"B" Unknown cells	
		Type
No agglutination	No agglutination	O
No agglutination	Agglutination	B
Agglutination	No agglutination	A
Agglutination	Agglutination	AB

(d) Direct blood matching. Direct blood matching or cross matching is always advisable before transfusing blood to the recipient even though the donor and patient are of the same group. This added precaution prevents reaction from incompatibility due to subgroups or possible errors in blood grouping.

Technique. Collect 5 cc. of blood from the donor and the patient.

Make separate suspensions of the cells of the donor and of the recipient by adding 2 drops of each sample to 1 cc. of 1% sodium citrate in physiologic sodium chloride solution.

Place the remainder of the blood from the donor and patient in separate centrifuge tubes; allow the blood to clot. Break the clot by stirring with individual applicators.

Centrifuge at high speed for ten minutes.

Pipette the clear cell free serum from the centrifuge tubes into clear test tubes.

Place two drops of donor's serum and one drop of patient's cell suspension on the left end of a glass slide.

Place two drops of patient's serum and one drop of donor's cell suspension on the opposite end of the glass slide.

Mix thoroughly with clean applicators.

Read macroscopically and microscopically after 30 minutes. If agglutination is apparent on either side of the slide, the donor's blood is not compatible. If the donor's cells are agglutinated by the patient's serum, the donor's blood must not be used for transfusing this patient. If the patient's cells are agglutinated by the donor's serum, the donor may be used if no other donor is available.

Donor's serum (DS) Patient's cells (PC)	Donor's cells (DC) Patient's serum (PS)
No agglutination	No agglutination - compatible blood
Agglutination	No agglutination - not compatible, but may be used
No agglutination	Agglutination - must never be used

(2) Plasma. In the use of plasma, cross matching and typing is unnecessary if the original samples are properly pooled. Clots may form in the stored liquid plasma which must be removed by a suitable fliter usually incorporated in the intravenous set.

Dried plasma equivalent to 300 cc. of the isotonic form is available in a standard Army-Navy package. Included in the package are 300 cc. of distilled water which, when added to the dried plasma, restore it to its original state, ready for use (Figure 31). An intravenous assembly with a filter, an airway tube, a clamp, and a double-ended needle complete the package. The bottles containing the dried plasma and the distilled water are sealed in separate cans. Complete instructions for use are lithographed on the can containing the plasma bottle.

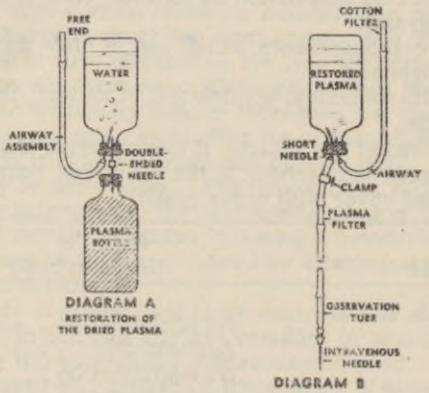


FIGURE 31.

(3) Saline. A practical point to remember in the use of saline is that each 1000 cc. contains 8.5 grams of sodium chloride. If several liters must be given daily over a long period of time, sufficient salt may be stored to cause edema. To avoid this, 1000 cc. of 5% glucose in distilled water may be given after every 2000 cc. of saline.

(4) Human serum albumin. Albumin is the most soluble and most stable of the plasma proteins. The small size of its molecules make it more important than globulin in maintaining oncotic pressure. A solution of albumin is less viscid than a solution of globulin of the same concentration and therefore may be used in more concentrated form. Since it contains no prothrombin, fibrinogen, complement, antibodies, enzymes or hormones, all of which are globulins, its prolonged use may theoretically interfere with the blood clotting mechanism and possibly with resistance to infection.

Each gram of albumin is capable of adding 14 to 24 cc. of fluid to the plasma.

Since 25 grams is equivalent to 450 cc. of circulating plasma the "unit" of human albumin is equivalent to 2 units of dried plasma.

In the standard, fibre board, Army-Navy Package of serum albumin human (concentrated) there are three double ended, rubber-stoppered ampoules, each containing 25 grams of albumin dissolved in 100 cc. of buffered diluent. Each ampoule alalong with an intravenous assembly is inclosed in a metal can.

The directions for use are lithographed on each can and are as follows:

DIRECTIONS FOR THE USE OF CONCENTRATED HUMAN ALBUMIN

One bottle (a unit) of concentrated albumin contains 25 grams in 100 cc. This is equivalent to approximately 500 cc. of citrated plasma or 2 units of dried plasma.

General Indications

1. Severe injuries with or without a decline in blood pressure.

2. Shock, following trauma or hemorrhage. — By drawing fluid into the blood stream an adequate circulating volume may be maintained or restored. Prompt hemodilution results in at least a temporary rise in blood pressure and general clinical improvement.

3. Burns. — Albumin may be used to replace the serum albumin lost and to reduce the hemoconcentration.

4. Hypoproteinemias. — Edema may be reduced and circulating proteins increased.

Precautions

1. Uncontrolled hemorrhage. — As the blood pressure returns to normal following the administration of albumin, uncontrolled hemorrhage may be increased. One should then administer the albumin slowly and be prepared to ligate bleeding vessels.

2. Marked dehydration. — As albumin draws fluid into the blood stream at the expense of other body fluids, patients who are severely dehydrated need additional water and salt. This may be given orally if tolerated, intravenously, or by any other available route.

3. Severe anemia. — Albumin increases the circulating volume without adding red blood cells. If available, a whole blood transfusion should be given.

4. Potential pulmonary edema (Blast injuries, pulmonary irritation, etc.). — The increase in circulating volume may produce pulmonary edema.

5. Limit of dosage. — No more than 10 units should be given in 48 hours, as patients requiring such large amounts of protein probably need whole blood or plasma as well.

6. Stability of solution. — Solutions of albumin should not be used if marked turbidity or a heavy sediment is present.

Dosage

1. Severe injuries and shock. — The initial dose is one unit (25 grams) of concentrated albumin. If desired results are not obtained in 15 to 30 minutes, this dose should be repeated. Transfusions of whole blood or intravenous saline solution enhance the effect. When intravenous fluids are given, they should contain at least two units of albumin per liter.

2. Burns. — The initial dose is one or more units depending upon the extent of the burn. Subsiquent doses should be regulated so as to prevent marked hemoconcentration and should be given in the ratio of two units of albumin per liter of saline solution.

(5) In the treatment of hematogenic shock other solutions are available. These include concentrated plasma, diluted plasma, serum, heterologous plasma (bovine), hemoglobin - Ringer's solution, and 6% gum acacia. The last two have disadvantages which have resulted in their almost complete abandonment. Cortical extracts in their present form are not yet ready for general use in the treatment of peripheral circulatory failure.

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SECTION II
BURNS

216. BODY SURFACE. The total body surface of an adult in percentage of the different parts is as follows:

Head - 6%
Trunk - 38%
Both upper extremities - 18%; one hand 2%
Both lower extremities - 38%; one foot 3%

A knowledge of the percent of the total area burned is of importance from the viewpoint of therapeutics and prognosis. Those with 20% involved have a mortality of 15-20% and the mortality rises rapidly toward 100% when the involved area is 50% or more. The method of estimating area involved should be taught to all medical personnel and should be marked at once on the Emergency Tag of each burn casualty.

217. CLASSIFICATION OF BURNS. The classification of burns involves the degree, the extent, and the location. Burns are usually classified as first, second, and third degree by the following criteria: Erythema only - first degree; vesication only, associated with loss of more or less of the epithelial elements - second degree; vesication, slight coagulation or charring which involves destruction of all epithelial elements - third degree. The extent is of importance because of its relation to mortality. The location is of interest because of its relation to future disability and cosmetic result. A minor burn is one which is mainly first degree involving less than one tenth of the body area and having no second or third degree areas located on hands, feet, flexion creases, or face. A major burn is one which involves the latter areas in second or third degree burns or extends over more than one tenth of the body, the greater part of the area being second or third degree.

218. OBJECT OF TREATMENT. a. The ideal objectives in the treatment of burns may be listed as follows:

(1) Prevention of Infection.
(2) Relief of pain.
(3) Treatment of Shock.
(4) Prevention of further tissue damage and shock.
(5) Early restoration of function.
(6) Accomplishment of best possible cosmetic result.

b. In spite of modern chemotherapy infection is still one of the greatest threats to recovery in burns, the rate running from 40% under good conditions to as much as 80% in military operational areas. The commonest bacterial contaminants are staphylococci and streptococci. In addition to the threat to life infection also kills precious epithelium, promotes scarring, and delays the opportunity for early skin grafting. These militate against the best functional and cosmetic result. A burn may be considered an open wound associated with permanently and temporarily damaged tissue with more or less contamination. The first interest is the prevention of further contamination and the second the removal of known useless tissue and gross dirt. It is almost impossible to estimate the degree of burn when first seen and even the most careful debridement may injure more tissue and spread contamination from one area to another. Evidence is accumulating that debridement should be confined to the removal of the loose covering of broken blisters and the removal of gross dirt within the pain limits of morphine analgesia only.

219. FIRST AID TREATMENT. a. Relief of pain is of immediate importance. Morphine is the drug of choice and should be given in quantities sufficient to achieve results. Reports from operational areas indicate that the indiscriminate use of 0.03Gm. doses is unsafe and that doses of 0.015Gm. to 0.02Gm. are safer when shock is imminent or present. They should be repeated as necessary.

b. Prevention of infection begins with the first aid treatment, and all flying personnel as well as medical officers and enlisted men should be impressed with the importance of avoiding all possible contamination of burned areas. They should be particularly cautioned about exposing such areas to organisms from their hands or mouths. To this end the first aid man will remove, with minimum handling, only such clothing as is necessary to expose the burn. Then with the best possible technique, he will apply sterile compresses, towels, sheets or clean linen if nothing else is available. Such dressings should be kept in place by snug bandages preferably of the elastic type.

c. The patient should be kept warm but caution should be exercised about overheating as too much warmth will cause peripheral vasodilatation and increase shock. If conditions permit and the case warrants it, treatment of shock should be initiated by the first aid man. To this end such personnel should be instructed by the Flight Surgeon in the use of the Army-Navy plasma package and how to administer the plasma in two to four times concentrated form with a syringe if this should be necessary. The amount given should be put on the EMT together with the area in percent burned. The patient is removed at once to the nearest aid station. At this point further treatment of shock should be carried on and for such treatment in burns plasma is the ideal fluid. The estimated amount needed should be administered in the first twelve to eighteen hours. The amount of plasma needed can be calculated by multiplying the percentage of surface burned by 100 (percent area burned x 100), or by giving 100 cc for every point the hematocrit is above 45. The condition of the patient as well as evidence of hemoconcentration determines later intravenous therapy. Water by mouth and other fluids parenterally should be given sparingly (not over 2000-2500 cc in the first day) and preferably during the second twelve hour period. Whole blood may be used if plasma is not available. The dangers of adding red cells and increasing viscosity are probably less than those caused by a diminished plasma volume or the dilution resulting from the unrestricted intravenous administration of solutions of electrolytes. The latter should never be given except when no other fluid is available and then with extreme caution. The burned patient can be easily drowned without showing any appreciable improvement in the shock picture under such treatment. The pulse, blood pressure, and condition of the patient are the guides to therapy, and treatment should continue until shock is well controlled.

220. LOCAL TREATMENT. a. If permanent disposition will be delayed more than 18-24 hours some form of local treatment must be instituted. The local applications used fall into four general categories: the saline compress, saline bath or Bunyan bag method; the water soluble bases with sulfonamides or other agent; the grease or oil bases with sulfonamides or other agents; the coagulants or escharotics including dyes.

b. Ideal local treatment means observance of the strictest asepsis in regard to equipment and personnel - gloves, masks and gowns for all in the operating room including a mask for the patient if the face is not involved. Debridement should be done as indicated above. Blisters of the hands, feet, and face should not be broken but cleaned with alcohol.

c. Of the local applications mentioned above the saline method is the best but is adapted only to a well equipped and staffed hospital. Of the others the water soluble jellies or ointments containing one of the sulfonamides preferably sulfathiazole, sulfadiazene, or sodium sulfadiazene 10-15% are most desirable. Next in favor are the grease or oil bases. Such applications should be covered with sterile compresses, fingers being covered separately and the whole secured with a firm pressure bandage preferably of the elastic type but muslin or cotton will serve. Extremities are sometimes more comfortable if splinted particularly for transportation.

d. Unless constitutional evidence of infection develops such dressings should be left in place until the 14th to 18th day at which time most second degree burns will be healed and the third degree areas well demarcated so that preparation for grafting may be begun.

e. In burns of the eyelids debridement should be conservative. Sulfadiazine ointment

5% (Medical Supply Item 14619), applied to the lids, is the local treatment of choice. In the absence of sulfadiazine, boric acid ointment or petrolatum may be used. The ointment should be applied several times daily, and the lids should be covered with a soft dressing under gentle pressure to hold the lids in place while healing takes place. If ointments are unavailable continuous normal saline compresses should be applied to the lids.

Mild burns of the eyeball and conjunctival sac should be gently irrigated with normal saline or saturated solution of boric acid. A mildly anesthetic ointment, such as Butyn or Pontocaine, may be instilled. (Cocaine should not be used because it causes exfoliation of the corneal epithelium). Atropine sulphate 1% should be instilled once daily to prevent secondary iritis. The patient should be instructed not to rub the eye while it is thus anesthetized.

In severe burns of the eyeball the eye should be gently irrigated with boric acid or normal saline solution. Atropine sulphate 1% should be instilled twice daily. To prevent the development of adhesions between the lids and the eyeball, the adhesions should be broken down daily with a glass applicator or a cotton-tipped applicator lubricated with petrolatum. A generous quantity of boric acid ointment or a wick of cotton soaked in liquid petrolatum and placed in the conjunctival fornix may prevent the development of adhesions. Cod liver oil instilled in the conjunctival sac will sometimes stimulate epithelialization.

If there is marked spasm of the eyelids, it may be necessary temporarily to paralyze the lids in order to examine and treat the eyes. This is most easily accomplished by infiltrating 1/2 to 1 cc of 2% procaine in each lid near its temporal end. By the time the temporary paralysis wears off the treatment will ordinarily have made the eye comfortable enough so that blepharospasm will not recur.

f. Coagulants.

(1) The use of tannic acid or silver nitrate sprays or ointments or the use of dyes is INADVISABLE if other means are available and they should NEVER be used on the hands, face, feet, flexion creases, genitalia, or perineum.

The surface of the burns and then the surrounding skin should be gently but thoroughly cleansed with a mild, unperfumed, white toilet soap and water, by means of pledgets of cotton. Do not scrub the burned surfaces. After this cleansing has been achieved, the surface should be rinsed freely with physiologic solution of sodium chloride.

The surface is now ready to be tanned. Two solutions are to be employed, (1) a freshly prepared 10 per cent solution of tannic acid, and (2) a 10 per cent solution of silver nitrate. Two spray guns should be available, one containing tannic acid solution only and the second, equal parts of tannic acid and silver nitrate solutions. Less pain is caused if the tannic acid alone is applied first, followed immediately with the tannic acid-silver nitrate spray. This mixture should again be sprayed on the burn every half hour until an adequate tan has been achieved. Usually four applications will suffice. Once the tan has been achieved, it should not be removed. The manner of dealing with suspected infection beneath the tan is considered in a later section. If the burn is of second degree, skin will regenerate beneath the tan, and the latter will separate spontaneously. If the burn proves to be of third degree, skin grafting will be necessary, but the tan should not be removed if it remains intact until six weeks have passed. It should then be cut away and the surface prepared for skin grafting. A burn more than twenty-four hours old should not be tanned but should be treated as an infected burn. Any wound grossly infected, although less than twenty-four hours old, should be similarly treated.

Tanning produced by other methods includes the use of tannic acid 20%; the use of triple dye (equal parts of brilliant green, 1-400; gentian violet, 1-400; acriflavine, 1-1000) or the use of gentian violet.

This tanning is done preferably with the patient under gas-oxygen anesthesia. The triple dye method is useful when the condition of the patient prohibits the use of a general anesthetic as with "blast lung."

(2) Infection beneath tanned surfaces.

(a) If after a burn has been tanned the patient shows systemic or local signs of sepsis, the tan should be inspected carefully for the presence of infection beneath it. If any area appears suspicious, a hole should be made through the tan.

(b) If pus is encountered, the entire area should be unroofed with sterile, sharp instruments. This should be done with as little trauma as possible, preferably without general anesthesia.

(c) The suppurating surfaces should then be cleansed, by irrigation with warm saline solution gently applied with pledgets of cotton. Crystalline sulfanilamide should then be dusted over the surface. Excessive absorption of sulfanilamide may occur if the area of infection is large. Therefore, not more than 15 Gm. of sulfanilamide should be used in any one twenty-four hour period. The area is to be covered with saline packs, which should be moistened either by the use of Dakin's tubes or by pouring physiologic solution chloride over the dressings every three to four hours.

(d) A light frosting of crystalline sulfanilamide should be applied to the infected areas whenever the dressings are changed. This should be continued up to the time that healing has been completed.

221. CHEMOTHERAPY OF BURNS. Therapy with sulfanilamide or one of its derivatives should be employed routinely for burns of more than slight extent. Sulfadiazine is the drug of choice. It should be administered orally in doses of 1.0 Gm. every six hours a day and night for ten days. If the patient is not voiding urine normally (1,000 cc. 17-24 hours), the blood concentration of sulfadiazine should be determined daily. The doses should be adjusted downward when a concentration of 10 mg per 100 cc. of blood is reached. If complete suppression of urine occurs, the drug should be omitted and fluids should be forced. Fluids should be given by mouth if possible; if not, dextrose solution and physiologic solution of sodium chloride should be given intravenously. Sulfanilamide or sulfathiazole may be used in the same dosage as sulfadiazine if the later is not available.

222. LATE THERAPY OF BURNS. a. Reconstructive treatment will be carried out in the larger base hospitals by men trained in plastic surgery. Their work and results will be greatly aided by the delivery to them of cases with a minimum of infection. If infection is present and not severe the surface will usually be ready for grafting after a few days of frequently changed saline compresses. The choice of split or full thickness grafts will depend on the extent, the location, and the depth of the injury. There should be a careful follow-up on all cases with lanolin inunctions to the affected areas and supervised physiotherapy to aid in restoration of function. Severe contractures often are not apparent for some months.

b. The biologic factors which influence the healing of burns are the same as those concerned in the healing of wounds. A diet adequate in calories, vitamins, and proteins should be maintained. For the anemia of the late stages oral iron therapy and transfusion may be necessary.

223. PREVENTION. In operational areas a very large percentage of burns are caused by accidents with no relation to combat. The Flight Surgeon should, with the cooperation of the Commanding Officer, impress on all personnel the care necessary in the storing and handling of high octane gasoline and the value of even the lightest clothing as a protection against gasoline flash burns. Policies and regulations regarding these matters should be formulated and carried out. Selected medical corps personnel should be trained in the use of the crash kit and of fireproof crash suits if such are available. The importance of preventive measures cannot be too strongly emphasized.

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SECTION III
CRANIOSPINAL INJURIES

225. GENERAL. The skull surrounds a closed cavity which contains the brain, meninges, cerebrospinal fluid and blood. Since the total volume of this cavity is fixed, any appreciable change in the volume of one of these constituents must result in corresponding changes in the volume of the other constituents. Cerebral edema, for example, if it reaches any considerable extent, would result in a decrease of blood supply and a decrease of the amount of cerebrospinal fluid. On the other hand, hemorrhage into the brain or into the ventricles or subarachnoid space would necessarily result in a diminution of the cerebrospinal fluid and possibly brain volume. As brain tissue is very sensitive to reduction in its oxygen supply, it is important to maintain its circulation. In airplane accidents, 90 per cent of physical injuries involve the head; 60 per cent affect the head alone. In a recent report from England, it is stated that by far the commonest of all injuries sustained by members of the air crew are those to the head. In airplane crashes in which the skull is fractured, there is an extremely high mortality. Damage to the brain may be classified according to the degree of severity. The mildest form is the concussion syndrome which consists pathologically of some brain edema and multiple petechial hemorrhages. The next most severe form is contusion or bruise of the brain. The most severe form is the laceration or tear of the brain. It is often very difficult to diagnose these pathological states from the clinical findings alone. Accidents in which concussion is the only apparent damage show a very high recovery rate. Presumably the importance of skull fracture is that it forms some indication of the severity of the force occasioning the brain damage. The outlook for fractures of the base of the skull is considerably worse than for fractures of the vault because of the associated damage to the more vital structures of the brain stem. Cranial and spinal injuries under conditions of warfare may differ from those occurring in civilian life by the character of the force producing them. There are two factors which have become very prominent in warfare. One is the blast injury in which a person who may have been in the neighborhood of a high explosive detonation may suffer injuries to the contents of his skull without any evidence of external damage. The second factor of importance is the fact that the projectiles which are used in warfare are propelled with a much higher velocity so that the forces with which they strike an object are greatly increased. Such a projectile striking the skull may occasion only slight external damage while causing a great amount of internal damage.

226. SIGNS AND SYMPTOMS. a. Immediate.

(1) Unconsciousness. The depth and duration of coma or stupor are the most important prognostic indices.

(2) Neurologic signs. These may include paralyses, weaknesses, pupillary changes, Babinski's sign, ankle clonus, etc.

(3) Shock. (See Par. 210-215).

(4) Irregularities of pulse, respiration and blood pressure.

(5) Evidences of fracture of the skull, such as hematoma of the mastoid process, bleeding from the ear, obvious depressed fractures, leakage of cerebrospinal fluid from the nose or ear.

(3) External evidences of injury. These may be entirely absent in the blast syndrome or very trivial in the case of ricocheting projectiles. In airplane injuries the fact that the skull has been injured is usually very obvious from the external appearances.

b. Sequelae. These may be many and varied, and no comprehensive picture may be given. Among the sequelae noted most frequently are the following:

(1) Personality changes which may include anxiety states, marked behavior difficulties, or some other type of neurotic behavior. These may or may not be the result of organic damage to the brain.

(2) Epileptoid manifestations which may include petit or grand mal seizures; these

are frequently the result of glial scars.
(3) Intellectual impairment.
(4) Headaches, transient dizziness, and bizarre symptoms may follow cranial trauma.

The importance of these late manifestations lies in the fact that they may occur any time after a sufficiently severe head injury, and it is frequently difficult to prophesy which types of head injury are most likely to demonstrate disabling sequelae. In the Air Forces most cases of cranial trauma that survive are able to return to full duty.

227. TREATMENT. a. The immediate handling of cases of head and spinal trauma is of utmost importance. In the case of the spinal cord, care should be taken NOT to lift the patient by his shoulders and knees as this may cause a complete severance of the spinal cord with resulting life-long paralyses. Patients with injured backs should be gently rolled onto a stretcher, preferably in the prone position. Patients who have suffered trauma to the nervous system should always be treated with rest. Patients who have suffered head trauma frequently have multiple injuries elsewhere in the body. These should not be neglected. Shock should be treated in the manner described elsewhere in this manual. As a general rule, in those cases showing neurologic signs or shock, and in all cases demonstrating loss of consciousness for over ten minutes, it is well to keep the patient in bed for at least one week whether there seems to be any clinical indication or not. Ordinarily there is nothing to be gained by hurried spinal tapping or vigorous palpation of the skull for depressions. The patient should be evacuated to a hospital equipped for the treatment of neurosurgical cases as soon as possible.

b. The following measures may be attempted in the field.

(1) Complete bed rest.

(2) Avoidance of morphine sulfate or other opiates. Morphine may dangerously slow an already depressed respiration. It may obscure the depth of coma, preventing adequate judgment concerning the treatment. It may also produce a miosis, masking some of the pupillary signs. The best drugs with which to control restlessness in cases of head injury are paraldehyde and chloral hydrate, but these are not effective in the presence of severe pain. When severe pain is present, morphine must be used sparingly.

(3) Treatment of shock.

(4) Dehydration may be attempted if the symptoms indicate that a severe degree of brain edema is present. Ordinarily if there is any doubt as to the advisability of the use of hypertonic agents, it is better to omit them as dehydration has many features which are not desirable, particularly in hot climates. Dehydration may be accomplished by limiting the liquid intake, or by the use of hypertonic solutions, either intravenously or by bowel.

(5) If there is a compound fracture of the skull, the amount of debridement done should be minimal. A fungating brain should be treated with the greatest respect as frequently these fungi of the brain return to the cranial cavity after edema has ceased, and again become functional. A sulfonamide powder should be dusted into the open wound, and sulfonamides should be given by mouth. Sterile sulfadiazine powder is the most desirable for local use in the brain. However, none may be available in which case any sulfonamide powder may be used. The dangers of an unsterile powder are chiefly in the direction of tetanus infection, and since all Army personnel are presumed to have had active tetanus immunization, this danger is minimized.

(6) No great attempt should be made in the field to recover penetrating missiles as many of these will be sterile, and more harm than good will be done by attempts to remove them without adequate indication or operating facilities. This same caution also applies to fragments of bone. If they are readily removable, it may be well to do so, but much harm can be done by injudicious traumatization of brain tissue in an attempt to remove foreign substances which have become imbedded in it. Frequently such substances may exist in brain tissue for years without any evidence of neurologic disability.

(7) Early evacuation to a base hospital. These patients stand careful transportation relatively well.

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SECTION IV
CHEMICAL WARFARE

229. CHARACTERISTICS OF LUNG IRRITANTS.

Name and Symbol	Chlorine (CL)	Phosgene (CG)	Chlorpicrin (PS)
Odor	Disagreeable, pungent	Disagreeable, pungent like new cut hay or cut corn	Sweetish, like fly paper
Color and state	Greenish yellow gas	First white, changing to colorless gas	Oily liquid changing slowly in open to colorless gas
Effects on body	Lung irritant. Causes choking and coughing, smarting of eyes and discomfort in chest. A two minute exposure to an average field concentration produces a casualty. Effects begin immediately.	Lung irritant. Choking, coughing, hurried breathing, pains in chest due to irritation of lower lungs. Approximately nine times more toxic than chlorine; a few breaths in average field concentration produce a casualty. Effects begin immediately but progress slowly	Lung irritant and lacrimator. Lacrimation, coughing, nausea, vomiting, lung irritation, approximately one-half as toxic as phosgene.
First-aid treatment	Keep quiet and warm. Treat for bronchial pneumonia.	Keep quiet and warm; give heart stimulants; give oxygen in severe cases.	Remove to pure air. Keep quiet and warm. Give light stimulants. Wipe off splashes of liquid on skin with alcoholic disodium sulfite.
Persistency	Vaporizes almost immediately under field conditions. Drifts as gas with the wind, but being heavier than air clings for some time in trenches, shell holes, woods, and other low or protected places	Vaporizes almost immediately under field conditions. Gas remains considerable time in low or protected places.	1 to 12 hours.

Name and Symbol	Chlorine (CL)	Phosgene (CG)	Chlorpicrin (PS)
Action on food and water	Contaminates. In some cases may be removed by ventilation and heating, but taste remains disagreeable.	Contaminates. In some cases may be removed by ventilation and heating, but taste remains disagreeable.	Contaminates. In some cases may be removed by ventilation and heating, but taste remains disagreeable.
Action on metal	Dry, none; wet, vigorous corrosion.	Dry, none; wet, vigorous corrosion.	Slight tarnish only.
How used	For casualty effects. In cloud gas attacks as substitute for phosgene or mixed with phosgene or chlorpicrin in cylinders or Livens projectors.	For casualty effects. In cloud gas attacks, in cylinders, projectors, medium artillery mortars, and aviation bombs.	For harassing and casualty effects. In shell, bombs, or airplane spray as substitute for other agents; in like manner mixed with CN; in cloud attacks mixed with CL.
Protection required	Gas mask.	Gas mask.	Gas mask.

230. CHARACTERISTICS OF VESICANTS.

Name and Symbol	Lewisite (Ml)	Mustard (HS)
Odor	Like geraniums, then biting.	Like garlic or horseradish.
Color and state in field	Dark brown liquid, changing slowly into a colorless gas.	Dark brown liquid, changing slowly into a colorless gas.
Effects on body	Vesicant, blisters skin. Skin shows slight irritation in 15 minutes, followed by grayish discoloration and blisters in 30 minutes to 1 hour. Systemic poisoning, vomiting. If breathed, powerful lung irritant effects within 1/2 hour. If unprotected, immediate irritation of eyes. Approximately six times as toxic as phosgene.	Vesicant, blisters skin. Symptoms delayed 2 to 4 hours. If exposed, eyes burn and inflame. Skin in contact with gas or liquid discolors, followed by blisters and sores. If breathed, hoarse cough develops, followed by severe pain in chest and inflammation of lungs. Approximately four times as toxic as phosgene.
First-aid treatment	Wash with running water and soap, then with 5 per cent aqueous solution of caustic soda, followed by alcohol. The use of hydrogen peroxide (8%) solution for lewisite decontamination on the skin is recommended. If this is not available, hydrogen peroxide (3%) may be substituted with excellent results. A 2% solution of sodium bicarbonate should be used for	Wash continuously with running water and strong soap, then apply carbon tetrachloride saturated with chlorine, or bleach solution. Wash eyes with boric acid or salt solution. Treatment must be given within a few minutes. A 2% solution of sodium bicarbonate should be used for irrigation of the eyes, nose, and throat after contamination with mustard. The treatment of the eyes requires immediate

Name and Symbol	Lewisite (Ml)	Mustard (HS)
First-aid treatment (contd.)	irrigation of the eyes, nose, and throat after contamination with lewisite. The treatment of the eyes requires immediate attention and any delay will result in ocular damage. Generous quantities of the solution should be used and the irrigation repeated. Hydrogen peroxide (.5%) may be used for irrigation of the eyes after lewisite contamination if used immediately. Keep warm and quiet. Treatment must be given immediately. Evacuate to hospital.	attention and any delay will result in ocular damage. Generous quantities of the solution should be used and the irrigation repeated. Protective ointment, Ml, may be used in protection against mustard or in the first-aid if used before redness appears. In the prophylaxis against mustard, dichloramine-T (20%) in triacetin is very valuable. Dichloramine-T is applied to the involved areas by means of dampened sponges and should be repeated several times. Dichloramine-T liberates chlorine and should not be used after any evidence of burning appears.
Persistency	Dispersed as liquid which slowly changes to gas. Rate of vaporization depends on temperature, vegetation, and method of dispersion. Rapidly destroyed by water. Summer: 24 hours in open; 2 or 3 days in woods. Winter: 1 week or more.	Dispersed as liquid which slowly changes to gas. Rate of vaporization depends on temperature, vegetation, and method of dispersion. Summer: 4 to 5 days in open; 1 week in woods. Winter: several weeks.
Action on food and water	Poisons unprotected food and water. Cannot be made suitable for use.	Renders unprotected food and water unfit for use.
Action on metal	Very slight.	Very slight.
How used	For casualty effect or to deny ground through threat of casualties. In artillery shell, mortar shell, airplane bombs, airplane spray, and land mines.	For casualty effect or to deny ground through threat of casualties. In artillery shell, mortar shell, airplane bombs, airplane spray, and land mines.
Protection required	Gas mask and protective clothing.	Gas mask and protective clothing. CC-1 and CC-2 are useful in neutralizing mustard on materials or in the impregnation of clothing, but are not used for personal decontamination.

231. CHARACTERISTICS OF LACRIMATORS.

Name and Symbol	Chloracetophenone (CN)	Tear Gas Solution (CNS)
Odor	Like apple blossoms.	Like fly paper.
Color and state in field	Bluish gray smoke from burning type munition; colorless from shell.	A colorless liquid, changing to colorless gas.

Name and Symbol	Chloracetophenone (CN)	Tear Gas Solution (CNS)
Effects on body	Piercing irritation of eyes causing profuse tears. Effective in extremely low concentrations.	Piercing irritation of eyes, profuse tears, followed by nausea and vomiting.
First-aid treatment	Wash affected parts with water.	First-aid same as for lung irritant cases.
Persistency	Cloud from burning mixture drifts with wind. Will remain in low and protected places for some time. Shell or solid CN may remain several weeks.	Summer: 1 hour in open; 2 hours in woods. Winter: 6 hours in open; 1 week in woods. Dispersed as liquid which changes to gas.
Action on food and water	Gives unprotected food disagreeable odor.	Contaminates. In some cases may be removed by ventilation and heating.
Action on metals	Tarnishes steel slightly.	Tarnishes steel slightly.
How used	For harassing effect. In grenades.	For harassing effect. In artillery shell, mortar shell, airplane bombs, and airplane spray.
Protection required	Gas mask.	Gas mask.

232. CHARACTERISTICS OF IRRITANT SMOKES (STERNUTATORS).

Name and Symbol	Adamsite (DM)	Sneeze Gas (DA)
Odor	Not definite, slightly like coal smoke.	
Color and state in field	A yellow smoke cloud.	Grayish smoke cloud
Effects on body	Immediate sneezing followed by headache, nausea, and vomiting. Temporary physical debility. Effective in low concentrations, but is delayed about 5 to 10 minutes.	Sneezing and burning sensation of the nose and throat. Slight lacrimation followed by occasional nausea, headache, and temporary debility. Immediately effective.
First-aid treatment	Remove to pure air.	Remove to pure air.
Persistency	While burning, drifts with the wind. Will remain in low and protected places for some time. General, 5 minutes in open.	While burning, drifts with the wind. Will remain in low and protected places for some time. General, 10 minutes in open.
Action on food and water	Poisons unprotected food and water; cannot be made safe for use.	Poisons unprotected food and water; cannot be made safe for use.

Name and Symbol	Adamsite (DM)	Sneeze Gas (DA)
Action on metals	Very slight.	Vigorous corrosion on steel.
How used	For harassing effect. In candles or generators.	For harassing effect. In candles or shell.
Protection required	Gas mask with a good filter.	Gas mask with a good filter.

233. CHARACTERISTICS OF SCREENING SMOKES.

Name and Symbol	Sulphur Trioxide Solution (FS)	HC Mixture	White Phosphorus (WP)
Odor	Acid or acrid	Acrid, suffocating.	Like phosphorus matches.
Color and state in field	Dispersed as liquid which changes to white smoke upon contact with air.	White smoke produced by burning munitions only.	Dispersed as solid which rapidly changes to flame and white smoke on contact with air.
Effects on body	Mild pricking sensation to skin; non-injurious.	None.	Smoke, none; particles produce severe fire burns which heal very slowly.
First-aid treatment	Wash with copious amounts of water, then with sodium bicarbonate and treat as for ordinary burns.	None needed.	Apply copper sulfate solution $CuSO_4$ (2 to 5 per cent). This coats the particles with copper which effectively prevents oxidation. Pull out solid particles and treat like an ordinary burn. Keep burning part under water until medical attention arrives if no $CuSO_4$ is available.
Action on food and water	Liquid renders food and water unfit for use; smoke gives disagreeable odor	Smoke gives disagreeable odor.	Smoke gives disagreeable odor; solid is poisonous.
Action on metal	Vigorous corrosion in presence of moisture.	None, if dry.	None.
How used.	Screening smoke. In airplane spray for screening; in artillery shell, mortar shell, and	Screening smoke. In smoke pots or candles, for training only.	Screening smoke and incendiary. In artillery shell and mortar shell, primarily for smoke effect; also used in same

Name and Symbol	Sulphus Trioxide Solution (FS)	HC Mixture	White Phosphorus (WP)
How used (contd.)	cylinders for training to simulate cloud gas.		munitions and airplane bombs for casualty effect and incendiary action.
Protection required	None.	None.	For smoke, none; for burning particles, none provided.

234. **REFERENCE** AND TRAINING CHART (See Table XXIII).

235. REFERENCES.

a. Memoranda.

(1) AAF Memorandum No. 25-7, August 15, 1942, Gas Defense and Treatment Program of Air Force Establishments.

b. Texts.

(1) Military Medical Manual, 4th Ed., Harrisburg, Military Service Publishing Co., 1940.

c. Manuals.

(1) TM 8-285, Treatment of Casualties from Chemical Agents.
(2) FM 21-40, Defense Against Chemical Attack.

d. Films.

(1) TF 8-304, First Aid for Gas Casualties.
(2) TF 3-216, Adjustment of the Service Gas Mask.
(3) TF 3-217, Inspection of the Service Gas Mask.

e. Circulars.

(1) WD Training Circular No. 86, November 13, 1942.

TABLE XXIII

REFERENCE AND TRAINING CHART

CHEMICAL WARFARE AGENTS

Prepared by Lt.-Col Walter P. Burn, C.W.Res.

SYMBOL	NICKNAME	NAME	FORM	BANDS COLOR	LOADING	ODOR	TACTICAL CLASS	PHYSIOLOGICAL EFFECT	PROTECTION	FIRST AID	COLOR & STATE LOADED	COLOR & STATE RELEASED	PERSISTENCE	TACTICAL USES	FIELD NEUTRALIZATION
HS	Hot Stuff	MUSTARD	Gas	2 Green		Garlic Horseradish Mustard		Burns skin or membrane. No immediate effect		Remove clothing. Wash affected parts of body with gasoline. Soapy water. Do not bandage	HEAVY DARK, OILY LIQUID	Liquid slowly evaporates	Open 1 DAY Woods 1 WK. to all winter	To neutralize areas Counter-Battery Attack on Personnel	Cover with unslaked lime and earth. 3½% sol'n of Na_2SO_3
MI	Mustard Imitator	LEWISITE	Gas	2 Green		Geraniums		Irritates nasal passages. Later skin burns, poison		Wash with oil, hot water, soap. CUT AWAY small area of flesh. 5% sol'n NaOH. Apply Ferric Hydrate paste	DARK GREEN, OILY LIQUID	Slowly evaporates	Open - 1 DAY Woods 1 WEEK	Similar to Mustard.	Wash down with water. Cover with earth. Alcohol. NaOH Spray
ED	Enemy's Delight	ETHYLDI-CHLORARSINE	Gas	2 Green		Biting Stinging		Causes blisters, sores; paralysis of hands		Wash with gasoline, hot water and soap			1 HOUR	Counter-battery Preparation fire Harassing fire	Cover with earth, caustic. NaOH solution
PS	Puking Stuff	CHLORPICRIN	Gas	3 Green	+CC, CN	Fly paper Anise		Causes severe coughing, crying, vomiting.		Wash eyes, keep quiet and warm. Do not use bandages.	YELLOW OILY LIQUID	Colorless Gas	Open 6 HOURS Woods 12 HOURS	Harassing fire	Na_2SO_3 - Sodium Sulfite in alcohol solution
DP	Di-Phos	DIPHOSGENE	Gas	2 Green		Ensilage Acrid		Causes coughing, breathing hurts, eyes water, toxic		Keep quiet and warm. Give coffee as a stimulant.	COLORLESS LIQUID	Colorless Gas	30 MIN.	Harassing fire	Alkali
CG	Choky-Gas	PHOSGENE	Gas	1 Green		Musty hay Green corn		Irritates lungs. Causes increasing doped feeling		Keep quiet and warm. Give coffee as a stimulant	COLORLESS LIQUID	Colorless Gas	10 to 30 MINUTES	Surprise attacks, projectiles Gas cloud release. For quick physical effect	Alkali
CN (CNS)	Cry Now	CLORACETO-PHENONE	Gas Solution	1 Red		Apple blossoms		Makes eyes smart, shut tightly, tears flow. Temporary.		Wash eyes with water or boric acid. Do not rub or bandage. Skin, $NaCO_3$ soln.	BROWN CRYSTALLINE POWDER	Cloud of small, solid particles	10 MIN.	Training. Mob control. CNS used in counter-battery to force mask wear.	Strong hot solution of Sodium carbonate
CA	Cry Always	BROMBENZYL-CYANIDE	Gas	1 Red		Sour fruit		Eyes smart, shut, tears flow. Effect lasts some time		Wash eyes with boric acid. Do not bandage	DARK BROWN OILY LIQUID	Slowly evaporates	SEVERAL DAYS (weeks in Winter)	To neutralize areas. Counter-battery	Alcoholic Sodium hydroxide spray.
DM	Dirty Mixture	ADAMSITE	Gas	1 Red	(DCH)	Coal Smoke		Causes sneezing, sick, depressed feeling.		Remove to pure air and keep warm and quiet.	YELLOW-GREEN GRANULAR SOLID	Yellow Smoke	10 MIN.	Gas Cloud Attacks Mob control -	Bleaching Powder Solution
DS	Dirty Smoke	SNEEZE GAS	Smoke	1 Yellow		Shoe polish		Causes sneezing, flow of tears		Remove to pure air and keep warm and quiet	BLACK VISCOUS MASS	Grey Smoke	5 MIN.	Harassing and screening.	None needed
HC	Harmless Cloud	HC MIXTURE	Smoke	1 Yellow		Sharp-acrid		Harmless.	NONE	Produces no effect requiring treatment	GREY SOLID	Grey Smoke	WHILE BURNING	To screen small operations in own lines and for training purposes.	None needed
FS	Fuming Spray	SULPHUR TRIOXIDE	Smoke	1 Yellow		Burning matches		Causes prickling of skin, flow of tears.		Wash with Soda solution	CLEAR LIQUID	Dense white Smoke	5-10 MIN.	Airplane spray for screen on broad front -	Alkaline Solution
FM	Floating Mantle	TITANIUM TETRACHLORIDE	Smoke	1 Yellow		Acrid		Harmless	NONE	Produces no effect requiring treatment	YELLOWISH LIQUID	White Smoke	10 - MIN.	Screening operations	None needed
DA	Dopey Ache	DIPHENYL-CHLORARSINE	Smoke	1 Yellow		Not pronounced		Causes sick feeling and headache		Remove to pure air, keep quiet. Sniff chlorine from bleaching powder bottle.			Summer 10 MIN.	Harassing fire.	Bleaching Powder Solution.
WP	White Phos	WHITE PHOSPHORUS	Smoke	1 Yellow		Burning Matches		Burning pieces adhere to skin, clothing.	NONE AVAILABLE	Plunge in mud to smother	PALE YELLOW SOLID	Burns to white smoke in Air	10 MIN.	To screen advancing troops Cause incendiary effect, losses Harass enemy observers -	Burns out.
TH	The Heat	THERMIT	Incendiary	1 Purple				5000 degree heat ignites materials.	Cover with earth, sand	Treat for severe burn			5 MIN	Destruction of Materiel -	Quickly cover with earth or sand
CL	Chlorine	CHLORINE	Gas	1 Green	+ PS + CG	Highly Pungent		Lung Irritant		Remove from gassed area. Keep quiet and warm. Coffee as stimulant	YELLOW LIQUID	Yellow-green gas	10 MIN.	Surprise attacks (cloud)	Alkaline Solution

CHEMICAL CYLINDER · ARTILLERY SHELL, 155 mm · ARTILLERY SHELL, 75 mm · MORTAR BOMB, 4.2 in · LIVENS PROJECTOR BOMB · AERIAL BOMB · GRENADE · CANDLE · AIRPLANE SPRAY · HOSPITAL CASUALTY AGENT · FIELD CASUALTY AGENT · SMOKE SCREEN · INCENDIARY AGENT · GAS MASK · GAS-PROOF CLOTHING

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SECTION V
SULFONAMIDE THERAPY

236. GENERAL. (Ref. Circular Letters, SGO, No. 17, February 23, 1942; No. 74, July 25, 1942). The rapid development of chemotherapeutic agents will necessitate modification from time to time in the recommendations concerning the use of the sulfonamides. It is not intended that the sulfonamides be used to the exclusion or neglect of other indicated therapeutic or nursing procedures (see also Ch. 10, Sections VI and VII on Venereal and Tropical Diseases). Therapeutic sera are to be used in patients sensitive to chemotherapeutic agents when it is believed that they may advantageously be treated with such serum.

Although sulfadiazine may have some definite advantages over sulfathiazole, it is at present not as generally available and it will be frequently necessary to substitute another sulfonamide, usually sulfathiazole.

The present distribution of powdered sulfanilamide and tablets of sulfathiazole to members of the armed forces other than the medical personnel in a combat area makes it imperative that as much information as possible be obtained by a Flight Surgeon regarding the use of the sulfonamides.

237. USE IN TREATMENT OF GONORRHEA (see par. 253).

238. USE IN HEMOLYTIC STREPTOCOCCAL INFECTIONS.

a. Mild or moderately severe such as erysipelas, mild cellulitis and tonsillitis.

(1) Specific treatment.

(a) Sulfanilamide: Initial oral dose, 2 grams; subsequent doses, 1 gram every four hours, day and night, until five days of normal temperature have elapsed.

(b) Sulfadiazine: Initial oral dose, 4 grams; subsequent doses, 1 gram every four hours, day and night, until five days of normal temperature have elapsed.

b. Otitis media. Usually caused by hemolytic streptococci. Other causes are penumococcus, staphylococcus, streptococcus faecalis, and influenza bacillus.

(1) Therapy should be continued in small doses of 0.5 gram four times a day for at least ten days after clinical cure has been effected. The treatment should be started as outlined in a. above. Bacteriologic cultures should be taken.

c. Severe hemolytic streptococcal infections, such as meningitis, septicemia, severe cellulitis, acute osteomyelitis, acute mastoiditis, and so forth.

(1) Specific treatment.

(a) Sulfadiazine: Initial oral dose, 4 to 6 grams; subsequent doses, 1 gram every four hours, day and night, until temperature is normal for seven days, and continued in small doses of 0.5 gram four times a day for at least ten days after clinical cure. If not available, use sulfanilamide in the same dose by mouth.

Special conditions: In acute streptococcal mastoiditis or osteomyelitis, sulfadiazine or sulfanilamide should be continued in small doses of 0.5 gram four times a day for at least ten days after a clinical cure has been effected.

Intravenous administration: Intravenous solutions of the sulfonamides should be prepared as follows: Sodium salts: Intravenous solutions are made up with the sodium salts of the sulfonamides except in the case of sulfanilamide. There is no sodium salt of sulfanilamide and the method of preparation of this drug is different. The sodium salts are given in 5-per cent solution. To make such a solution 5 grams of the selected salt should be measured in a sterile container and transferred with a sterile spatula to 100 cc. of sterile freshly distilled water. These solutions must not be boiled or autoclaved. The alkalinity of the solutions will kill all bacteria except spores. When given intravenously they should be administered slowly (15 minutes), care being taken not to get the alkaline material outside the vein since this may cause a slough. For this reason solutions of the sodium salts of the sulfonamides should not be administered by hypodermocylsis or intrathecally. They should never be added to transfusion blood, saline, glucose, or other intravenous fluids.

Sulfanilamide: To prepare a 1-per cent solution of sulfanilamide, 1 gram of crystalline sulfanilamide should be measured in a sterile container and transferred with a sterile spatula to 100 cc. of freshly prepared normal saline solution which has been brought to a boil. This solution is practically always given by the subcutaneous route, rarely by the intravenous route.

Sodium sulfadiazine, intravenously, may be used in severe hemolytic streptococcal infections. If it is used, the initial dose is 0.10 grams per kilo of body weight. Following the initial intravenous dose of sodium sulfadiazine it is generally sufficient to continue therapy with 1.0 gram of sulfadiazine by mouth every four hours day and night until the temperature has been normal for seven days. If, following the initial intravenous dose of sodium sulfadiazine, it is desired to continue therapy by the intravenous rather than the oral route, subsequent doses of sodium sulfadiazine based on 0.05 grams per kilo of body weight should be administered at 12-hour intervals. It is always advisable to shift to oral administration of sulfadiazine as soon as possible.

Blood concentration: A blood concentration of sulfadiazine of 15 milligrams per cent should be maintained during the febrile phase of serious hemolytic streptococcal infections.

d. Scarlet fever. Associated complications: Sulfanilamide and sulfadiazine: This has no therapeutic effect on the toxic stage. It may be used for prophylaxis of septic complications in dosage of 0.5 gram four times a day for the period of quarantine.

239. USE IN MENINGOCOCCAL MENINGITIS.

a. Specific treatment.

(1) Sulfanilamide or sulfadiazine: Initial oral dose, 4 grams; subsequent doses, 1 gram every four hours day and night, until temperature is normal seven days.

(2) Sodium sulfadiazine: Initial dose (intravenous only): 0.10 gram per kilo of body weight. Subsequent doses (usually sulfadiazine orally): 1.0 gram every four hours day and night until the temperature has been normal for seven days. If it seems desirable to continue treatment by the intravenous rather than the oral route subsequent doses of sodium sulfadiazine based on 0.05 grams per kilo of body weight should be administered at 12-hour intervals. It is always advisable to shift to oral therapy with sulfadiazine as soon as possible.

Blood concentration: A blood concentration of sulfadiazine of 15 milligrams per cent should be maintained during the febrile period of the disease.

240. USE IN PURULENT MENINGITIS.

a. Specific treatment. If etiology is not established, sulfadiazine or sulfathiazole may be instituted at once.

b. Sulfadiazine, or if not available, sulfathiazole. Initial dose (oral): 4.0 grams. Subsequent doses: 1.0 gram every four hours day and night. If response is not satisfactory increase to 1.5-2.0 grams every four hours until improvement is definite, then reduce dose to 1.0 gram every four hours and continue until temperature has been normal for seven days.

Sodium sulfadiazine, or if not available, sodium sulfathiazole intravenously should be

SECTION V
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Although sulfadiazine may have some definite advantages over sulfathiazole, it is at present not as generally available and it will be frequently necessary to substitute another sulfonamide, usually sulfathiazole.

The present distribution of powdered sulfanilamide and tablets of sulfathiazole to members of the armed forces other than the medical personnel in a combat area makes it imperative that as much information as possible be obtained by a Flight Surgeon regarding the use of the sulfonamides.

237. USE IN TREATMENT OF GONORRHEA (see par. 253).

238. USE IN HEMOLYTIC STREPTOCOCCAL INFECTIONS.

a. Mild or moderately severe such as erysipelas, mild cellulitis and tonsillitis.

(1) Specific treatment.

(a) Sulfanilamide: Initial oral dose, 2 grams; subsequent doses, 1 gram every four hours, day and night, until five days of normal temperature have elapsed.

(b) Sulfadiazine: Initial oral dose, 4 grams; subsequent doses, 1 gram every four hours, day and night, until five days of normal temperature have elapsed.

b. Otitis media. Usually caused by hemolytic streptococci. Other causes are penumococcus, staphylococcus, streptococcus faecalis, and influenza bacillus.

(1) Therapy should be continued in small doses of 0.5 gram four times a day for at least ten days after clinical cure has been effected. The treatment should be started as outlined in a. above. Bacteriologic cultures should be taken.

c. Severe hemolytic streptococcal infections, such as meningitis, septicemia, severe cellulitis, acute osteomyelitis, acute mastoiditis, and so forth.

(1) Specific treatment.

(a) Sulfadiazine: Initial oral dose, 4 to 6 grams; subsequent doses, 1 gram every four hours, day and night, until temperature is normal for seven days, and continued in small doses of 0.5 gram four times a day for at least ten days after clinical cure. If not available, use sulfanilamide in the same dose by mouth.

Special conditions: In acute streptococcal mastoiditis or osteomyelitis, sulfadiazine or sulfanilamide should be continued in small doses of 0.5 gram four times a day for at least ten days after a clinical cure has been effected.

Intravenous administration: Intravenous solutions of the sulfonamides should be prepared as follows: Sodium salts: Intravenous solutions are made up with the sodium salts of the sulfonamides except in the case of sulfanilamide. There is no sodium salt of sulfanilamide and the method of preparation of this drug is different. The sodium salts are given in 5-per cent solution. To make such a solution 5 grams of the selected salt should be measured in a sterile container and transferred with a sterile spatula to 100 cc. of sterile freshly distilled water. These solutions must not be boiled or autoclaved. The alkalinity of the solutions will kill all bacteria except spores. When given intravenously they should be administered slowly (15 minutes), care being taken not to get the alkaline material outside the vein since this may cause a slough. For this reason solutions of the sodium salts of the sulfonamides should not be administered by hypodermocylsis or intrathecally. They should never be added to transfusion blood, saline, glucose, or other intravenous fluids.

Sulfanilamide: To prepare a 1-per cent solution of sulfanilamide, 1 gram of crystalline sulfanilamide should be measured in a sterile container and transferred with a sterile spatula to 100 cc. of freshly prepared normal saline solution which has been brought to a boil. This solution is practically always given by the subcutaneous route, rarely by the intravenous route.

Sodium sulfadiazine, intravenously, may be used in severe hemolytic streptococcal infections. If it is used, the initial dose is 0.10 grams per kilo of body weight. Following the initial intravenous dose of sodium sulfadiazine it is generally sufficient to continue therapy with 1.0 gram of sulfadiazine by mouth every four hours day and night until the temperature has been normal for seven days. If, following the initial intravenous dose of sodium sulfadiazine, it is desired to continue therapy by the intravenous rather than the oral route, subsequent doses of sodium sulfadiazine based on 0.05 grams per kilo of body weight should be administered at 12-hour intervals. It is always advisable to shift to oral administration of sulfadiazine as soon as possible.

Blood concentration: A blood concentration of sulfadiazine of 15 milligrams per cent should be maintained during the febrile phase of serious hemolytic streptococcal infections.

d. Scarlet fever. Associated complications: Sulfanilamide and sulfadiazine: This has no therapeutic effect on the toxic stage. It may be used for prophylaxis of septic complications in dosage of 0.5 gram four times a day for the period of quarantine.

239. USE IN MENINGOCOCCAL MENINGITIS.

a. Specific treatment.

(1) Sulfanilamide or sulfadiazine: Initial oral dose, 4 grams; subsequent doses, 1 gram every four hours day and night, until temperature is normal seven days.

(2) Sodium sulfadiazine: Initial dose (intravenous only): 0.10 gram per kilo of body weight. Subsequent doses (usually sulfadiazine orally): 1.0 gram every four hours day and night until the temperature has been normal for seven days. If it seems desirable to continue treatment by the intravenous rather than the oral route subsequent doses of sodium sulfadiazine based on 0.05 grams per kilo of body weight should be administered at 12-hour intervals. It is always advisable to shift to oral therapy with sulfadiazine as soon as possible.

Blood concentration: A blood concentration of sulfadiazine of 15 milligrams per cent should be maintained during the febrile period of the disease.

240. USE IN PURULENT MENINGITIS.

a. Specific treatment. If etiology is not established, sulfadiazine or sulfathiazole may be instituted at once.

b. Sulfadiazine, or if not available, sulfathiazole. Initial dose (oral): 4.0 grams. Subsequent doses: 1.0 gram every four hours day and night. If response is not satisfactory increase to 1.5-2.0 grams every four hours until improvement is definite, then reduce dose to 1.0 gram every four hours and continue until temperature has been normal for seven days.

Sodium sulfadiazine, or if not available, sodium sulfathiazole intravenously should be

used if oral treatment is impossible. If it is used, the initial dose is 0.10 gram per kilo of body weight. Subsequent doses should be based on 0.05 gram per kilo of body weight, and should be given by the intravenous route at 12-hour intervals. Oral administration of sulfadiazine should be started as soon as it is practicable.

241. USE IN PENUMONIA. a. Caused by pneumococcus, streptococcus hemolyticus, staphylococcus, Friedlander's bacillus, and Hemophilus influenzae, streptococcus viridans.

(1) Pneumococcal pneumonia.

(a) Chemotherapy.

1. Sulfathiazole: Initial oral dose, 4.0 grams; subsequent doses, 1 gram every four hours, day and night, until seventy-two hours of normal temperature have elasped.

2. Sodium sulfathiazole: Intravenously; 5% solution in sterile, distilled water; initial dose, 4 grams; subsequent doses, 2 grams every six hours. Change to oral dose as soon as possible.

3. Sulfadiazine: Initial oral dose, 4 grams; subsequent doses, 1 gram every four hours, day and night, until seventy-two hours of normal temperature have elapsed.

4. Sodium sulfadiazine: Initial dose: 0.10 gram per kilo of body weight administered by the intravenous route. Subsequent doses: 0.05 grams per kilo of body weight administered at intervals of 12 hours by the intravenous route. Change to oral dosage as soon as possible.

(2) Hemolytic streptococcal pneumonia and Friedlander's bacillus pneumonia. Sulfathiazole and sulfadiazine: Initial dose (oral), 4.0 grams. Subsequent doses (oral): Begin with 1.0 gram every four hours. If response is not satisfactory increase to 1.5-2.0 grams every four hours until improvement is definite, then reduce dose to 1.0 gram every four hours and continue until temperature has been normal for five days.

Sodium sulfadiazine: Dosage the same as in pneumococcal pneumonia.

(3) Staphylococcal pneumonia. Sulfathiazole: Initial dose (oral), 4.0 grams. Subsequent doses (oral): Begin with 1.0 gram every four hours. If response is not satisfactory increase to 1.5-2.0 grams every four hours until improvement is definite, then reduce dose to 1.0 gram every four hours and continue until the temperature has been normal for five days.

Sodium sulfathiazole. Initial dose: 4.0 grams. Subsequent doses: 2.0 grams every six hours. Sodium sulfathiazole is given by the intravenous route as a 5 per cent solution. It is advisable to change to oral dosage as soon as possible.

b. Secondary pneumonia. Prophylaxis: The possible value of chemotherapy with sulfonamide compounds in the prevention of bacterial penumonia complicating influenza, measles, etc., is not known at present. Specific recommendations are, therefore, not justified.

c. Postoperative pneumonia. Methods of treatment, dosage, and precautions are the same as in primary pneumonia.

d. Comment. Chemotherapy with sulfonamide derivatives is of no demonstrated value in many bronchopneumonias of indeterminate (virus?) etiology; also of no demonstrated value in streptococcus viridans or Hemophilus influenza pulmonary infections. Results in secondary pneumonias, which are often mixed infections, will, therefore, be variable, often disappointing and difficult to evaluate, even when bacteria known to be susceptible to the sulfonamide compounds are present in the sputum.

242. USE IN GAS BACILLUS INFECTION. a. Prophylaxis. Sulfanilamide at present is recommended as the drug of choice. Initial dose (oral): 6.0 grams. Subsequent doses: 1.0 gram every four hours day and night. This should be continued for seven days or until definitive treatment is available. This period of therapy almost always eliminates the possibility of gas bacillus infection. Crystalline sulfanilamide should be used locally. It should be distributed evenly over the surface of the wound, approximately 0.1 gram being used per square inch but not over 10 grams for any one person.

b. Treatment. Sulfathiazole: Recommended at present as the drug of choice. Initial dose (oral): 6.0 grams. Subsequent doses: 1.0 gram every four hours day and night until temperature has been normal for 48 hours. Then 0.5 gram every four hours day and

night until convalescence is completely established.

(1) Local therapy. Crystalline sulfathiazole or sulfanilamide should be used locally. It should be distributed evenly over the surface of the wound, approximately 0.1 gram being used per square inch but not over 10 grams for any one person in a single 24-hour period. It is recognized that if this amount is used locally and the above oral dosage is given the total dosage of sulfathiazole may be considered high. However, the severe nature of the infection warrants heavy dosage and local absorption from open surface is variable depending on the amount of tissue fluid present, as well as other factors.

243. USE IN STAPHYLOCOCCAL INFECTIONS. a. Large boils and carbuncles. Administer sulfathiazole or sulfadiazine in a 4.0 gram initial dose followed by 1.0 gram every four hours thereafter for seven days. Apply hot fomentations. Incise as necessary after fluctuation develops in order to encourage evacuation of necrotic slough. Avoid incision of uninfected tissue or of diffuse cellulitis. The local application of crystalline sulfathiazole is of definite value in the treatment of large boils and carbuncles which has been incised and drained.

b. Diffuse cellulitis, lymphangitis and acute osteomyelitis.

(1) Sulfathiazole: Initial oral dose, 4 grams; subsequent doses, 1.5 grams every four hours, day and night, until localization of infection becomes evident, then 1 gram every four hours for at least seven days. Employ surgical treatment for any areas of localized infection which may develop and insufflate powdered form into the wound.

c. Staphylococcic bacteremia.

(1) Sulfathiazole: Initial oral dose, 4 grams; subsequent doses, 1.5 gram every four hours, until temperature has been normal for forty-eight hours, then 1 gram every four hours for fourteen days.

(2) Sulfadiazine: Initial oral dose, 4 grams; subsequent doses, 1 gram every four hours, until temperature has been normal for forty-eight hours, then 1 gram every six hours for fourteen days.

244. USE IN PERITONITIS: Sulfanilamide therapy is recommended as a procedure supplementary to appropriate surgical treatment.

a. Local treatment: Sulfanilamide crystals, in an amount between 4.0 and 8.0 grams, should be applied to the peritoneum in the immediate area exposed at operation, and to the layers of the abdominal wound, during its closure.

b. Systemic treatment: Parenteral sulfanilamide: 150 cc. of 1 per cent solution (1.5 grams) should be given every 6 hours by hypodermocylsis starting before, or immediately after, operation. Continue this dosage for two days. If the patient shows satisfactory progress at that time the dose may be reduced to 120 cc. (1.2 grams) every 6 hours. As soon as the patient is allowed oral feedings the sulfanilamide may be given by mouth in dosage of 1.0 gram every four hours. It is usually unnecessary to continue treatment beyond the 6th postoperative day. If no sulfanilamide is implanted locally, the initial dose of the solution by hypodermoclysis should be 400 cc.

245. USE IN URINARY TRACT INFECTIONS. a. General considerations. It has been definitely shown that obstruction due either to renal or bladder calculi or any other type of pathological obstruction of the urinary tract greatly militates against the successful use of sulfonamide and other compounds in the treatment of urinary tract infections. Hence, when such pathological conditions are present, good results in the treatment of urinary tract infections are usually not obtained and every effort should be made to eradicate the obstruction. It is advisable in the therapy of urinary tract infections to adjust the fluid intake of the patient so that his urine output is in the neighborhood of 1,000 cc. per day. If signs of renal impairment (lowered PSP) are present, doses of the drug should be decreased in size and the concentration (both free and total) of the drug in the blood be determined daily in order that concentrations of more than 10 milligrams per cent of the drug in the blood be avoided. Bacteriological cultures designed to determine the sterility of the urine should always be employed. It is desirable to include in the bacteriological procedures a culture made by placing 5 cc. of urine on a blood agar slant containing 2 milligrams per cent of para-amino-benzoid acid. This should be incubated for five days

before being discarded as sterile.

b. Infections due to E. coli, A. Aerogenes, Shigella dispar, and other gram negative organisms belonging to the so-called coli-typhoid paratyphoid group:

(1) Specific treatment: Sulfadiazine is the drug of choice. If sulfadiazine is not available, sulfathiazole is the second drug of choice, sulfanilamide the third. Dosage (oral): 1.0 gram every four hours day and night until definite clinical improvement has been noted. Then decrease the dosage to 1.0 gram four times a day until the urine is clear and two negative cultures have been obtained in medium containing para-amino-benzoid acid. Then stop the drug, wait one week, and reculture the urine. The dosage is the same for all these drugs.

c. Infections due to Staphylococcus aureus or Pseudomonas aeruginosa (B. pyocaneus).

(1) Specific treatment: Sulfathiazole is the drug of choice. Dosage (oral): 1.0 gram every four hours day and night until definite clinical improvement has occurred. Then, decrease dosage to 1.0 gram 4 times a day and maintain this until two negative urine cultures have been obtained in medium containing para-amino-benzoic acid. Then stop the drug and reculture the urine one week later.

d. Infections due to B. proteus. Sulfathiazole is the drug of choice. Dosage (oral): Same as for staphylococcal urinary tract infections.

e. Infections due to enterococcal organisms (Streptococcus fecalis). These infections do not respond to sulfonamide drugs, and hence such drugs are not used.

f. Miscellaneous urinary tract infections. If organisms other than those already described are the etiological agent of the urinary tract infection, either sulfathiazole or sulfadiazine should be used in dosage as outlined above.

246. USE IN BACILLARY DYSENTERY. a. Both sulfaguanidine and succinylsulfathiazole are used in the treatment of bacillary dysentery. They are not effective against amoebic dysentery. Their effectiveness depends upon the fact that they are absorbed to a very slight extent and it is possible to maintain a large concentration of the free drug in the gastrointestinal tract.

b. Treatment. Sulfaguanidine or succinylsulfathiazole. Dosage (oral) 0.20 gm. per kilogram per day, divided into 4 equal doses, for 10 to 14 days.

247. LOCAL USE. Sulfanilamide, sulfadiazine, and sulfathiazole may be used locally in wounds supplemented by systemic sulfonamide therapy. Crushed tablets should not be substituted for the powdered form. A suspension of microcrystalline sulfathiazole is available. Approximately 1 gm. to 4 sq. cms. of wound surface is desirable. Blood levels should be determined every other day when practicable.

248. TOXIC MANIFESTATIONS OF SULFONAMIDES (TABLE XXIV).

a. Patients receiving sulfonamide compounds should be seen at least once a day and should be questioned as to the presence of headache or malaise. These are frequently important early symptoms of toxic reaction. Patients should be inspected at each visit for the presence of jaundiced sclerae (acute hemolytic anemia or hepatitis), pale mucous membranes (acute hemolytic anemia), or rash. The temperature should be carefully recorded. With recurrent fever after normal temperature in the course of sulfonamide therapy, the drug should be discontinued immediately, or, if recently discontinued, should not be resumed unless it has been demonstrated that the fever is due to a recurrence of the infection. Whenever therapy with the sulfonamide drugs is stopped because of a drug reaction, fluids should be forced to 5,000 cc. per day in order to wash out the drug.

b. Agranulocytosis is extremely rare before the 14th day of therapy. It is imperative that total and differential white blood cell counts be made in patients still under treatment after the 14th day , every two days from the 14th to the 40th days. Stop the drug immediately if the polymorphonuclear leukocytes fall to 50 per cent or less in adult patients. Granulocytopenia without agranulocytosis may occur.

c. Any patient who has had a toxic reaction to one of the sulfonamide group of drugs may have a second and more severe toxic reaction if one of these drugs is prescribed again. In such individuals a small test dose of the drug (0.1 to 0.3 grams) should be given and the patient observed for 12 hours before intensive therapy is started following which the patient must be carefully observed and the drug immediately stopped on the

the first appearance of any toxic manifestation.

249. LABORATORY CONTROL OF SULFONAMIDE THERAPY. a. It should be constantly borne in mind that laboratory measures should be utilized as an adjunct in the effort to avoid complications from the administration of sulfonamide compounds. In view of the relatively smaller doses of sulfonamides prescribed in the treatment of uncomplicated gonorrheal urethritis or prostatitis, laboratory control may not seem indicated under these conditions. However, careful clinical observation must be carried out and hospitalization must be resorted to in case of complication.

b. Determination of the concentration of the sulfonamide compounds in the blood, body fluids, and urine.

(1) In patients who are receiving one of the sulfonamide compounds determination of the concentration of the particular drug in the blood of the patient should be made on the morning of the day following the expiration of a full twenty-four (24) hour period of sulfonamide therapy and should be repeated subsequently when in the opinion of the surgeon such a determination will aid in the clinical conduct of therapy in the patient.

(2) The method of Bratton and Marshall will be employed for the determination of sulfonamide compounds in the blood, body fluids, and urine of patients (See SGO Circular Letter No. 17, dated February 23, 1942.)

c. Blood counts and hemoglobin determinations.

(1) Red blood cell and hemoglobin determinations.

(a) Each patient to whom a sulfonamide compound is to be administered should have his hemoglobin determined before sulfonamide therapy is started, and once a week thereafter as long as sulfonamide therapy is continued. If, in the opinion of the ward surgeon, more frequent determinations of the patient's hemoglobin are advisable, these should be done.

(b) Red blood cell counts should be ordered at the discretion of the ward surgeon.

(2) White blood cell counts.

(a) The total white blood cell and differential count of the patient should be determined before therapy with sulfonamide compounds is started. Subsequent total white blood cell counts should be done on the 3rd, 6th and 9th days of therapy. If sulfonamide therapy is continued beyond 10 days, total white blood cells counts should be done every other day thereafter until therapy is discontinued.

(b) If, in the opinion of the surgeon, sulfonamide therapy is producing a leukopenia of 4,000 white cells or below and this leukopenia is not due to the infection from which the patient is suffering, a second total white blood cell and differential count should be done immediately in order to check the supposedly low count.

d. Urine examinations.

(1) The urine output should be measured and recorded daily upon the chart of all patients receiving sulfapyridine, sulfathiazole, or sulfadiazine compounds.

(2) Patients receiving sulfathiazole, sulfapyridine or sulfadiazine should have their urine examined every two days for the presence of red blood cells and albumin. The drug should always be stopped if any degree of microscopic hematuria develops in the course of sulfonamide therapy. The appearance of microscopic hematuria does not necessarily contraindicate a continuance of chemotherapy. When it is present the urine output should be carefully followed and daily urine examination performed. If the urine output falls noticeably the drug should be stopped. The finding of sulfonamide drug crystals in the urine of patients receiving these drugs does not in itself constitute an indication for stopping the drug.

e. Bacterial studies.

(1) An attempt should be made to establish in every patient, in whom sulfonamide therapy is contemplated the etiological diagnosis of the infection by bacteriological methods. However, this does not mean that sulfonamide treatment should be delayed until the bacteriological diagnosis is established. If the clinical diagnosis is that of an infection known to respond to sulfonamide therapy, then the appropriate drug should be used at once.

250. REGULATIONS ON USE OF SULFONAMIDES IN FLYING PERSONNEL. A.A.F. Re-

TABLE XXIV. TOXIC MANIFESTATIONS OF SULFONAMIDES

Reaction	Sulfanilamide	Sulfapyridine	Sulfathiazole	Sulfadiazine
Nausea or vomiting, or both	10-20%	40-55%	23-40%	5-9%
Mental disturbances * including toxic psychoses	0.5-1%	0.3-5%	0-2%	Uncommon
Skin eruption *	2-5%, may take any form, generally 5th to 9th day, may occur 1st to 30th day	4-5%, may take any form, 5th to 9th day, may occur 1st to 30th day	8-10%, nodular type, common, may take any form 5th to 9th day	2-3%
Fever *	10%, generally 5th to 9th day, may occur 1st to 30th day	2-5%, generally 5th to 9th day, may occur 1st to 30th day	5-6%, generally 5th to 9th day	1%
Mild hemolytic anemia	2%, early and late	2%	Uncommon	Uncommon
Acute hemolytic anemia **	2%, occurs 1st to 5th day	2%, occurs 1st to 5th day	Rare	Rare
Hematuria *	Not reported	8%	3%	1%
Anuria with nitrogen retention **	Not reported	0.3%	0.7%	0.7%
Leukopenia with granulocytopenia	0.1%	0.1-0.5%	Rare	1%
Cyanosis	Common	Uncommon	Uncommon	Uncommon
Sulfanilamide administration is also occasionally associated with an acidosis or hepatitis. Sulfaguanidine administration is occasionally associated with nausea and vomiting.				

* Best to stop drug and force fluids.
**Imperative to stop drug and force fluids.

gulation No. 25-13, December 3, 1942. a. The administration of these drugs may occasionally result in temporary mental confusion, visual disturbances, impaired sensory perceptions, coordination defects, and other insidious manifestations.

b. No rated officer, flying officer, aviation cadet, enlisted man, or member of an aircrew or combat crew will be permitted to participate in aerial flights while receiving sulfonamide therapy or for six days following the last dose of the drug. Physical examination will be accomplished with special reference to symptoms resulting from the administration of the sulfonamide group of drugs, and return to flying status will be in accordance with AR 40-110. Copy of WD, AGO Form No. 64 need not be forwarded to higher authority unless so specified in AR 40-110. Removal from flying status need not apply where sulfonamides have been used for local application on flying personnel.

c. The instructions and provisions of this regulation will not apply to passengers or patients being transported or evacuated by air, nor to the emergency use of sulfonamides as supplied in the individual first-aid kits.

251. REFERENCES.

a. Articles.

(1) Flippin, H.F., Rose, S.B., Schwartz, L. and Dourm, A.H.: Treatment of Pneumococcic Pneumonia with Sulfadiazine and Sodium Sulfadiazine, War Med. 2; 284, 1942.

(2) Keefer, C.S.: Toxic Reactions Following Sulfonamide Treatment, New Eng. J. Med, 226; 266, 1942.

(3) Kirby, W.M.M. and Rantz, L.A.: The Treatment of Typhoid and Dysentery Carriers with Succinylsuflathiazole, J.A.M.A. 119; 615, 1942.

(4) Kline, E.F. and Ryan, T.C.: Sulfathiazole Prophylaxis in Prevention of Gonococcus Infections, U.S. Naval Med. Bull. 40; 360, 1942.

(5) Peterson, O.L. and Finland, M.: The Effect of Food and Alkali on the Absorption and Excretion of Sulfonamide Drugs After Oral and Duodenal Administration, Am. J. Med. Sci. 204; 581, 1942.

(6) Saitterthwaite, R.W., Hill, J.H., and Huffer, V.: Sulfadiazine in the Treatment of Gonorrhea Laboratory and Clinical Studies, Vener, Dis. Inform. 23; 249, 1942.

b. Texts.

(1) Goodman, L. and Gillman, A.: The Pharmacological Basis of Therapeutics, New York, The Macmillan Co., 1941.

c. Letters.

(1) SGO, Circular Letter No. 17, February 23, 1942, Subject: Chemotherapy in Infectious Diseases and Other Infections.

(2) SGO, Circular Letter No. 74, July 25, 1942, Subject: Diagnosis and Treatment of the Venereal Diseases.

d. Regulations.

(1) AAF Regulations No. 25-13, December 3, 1942.

SECTION VI
THE VENEREAL DISEASES

252. PROPHYLAXIS. Instruction in individual prophylaxis must be given. The Flight Surgeon must make material available both for officers and for enlisted men. For the former, who are too often neglected, individual prophylactic units of various types may be recommended after investigation and determination of the local supply (see SGO/ Circular Letter No. 80, July 31, 1942). It may be desirable to set up a prophylactic station for the officers in addition to the one for enlisted personnel.

The following is the procedure to be followed at the station (TM 8-220, par. 264 (c): The prophylaxis should be administered or closely supervised by a trained attendant. It is most effective when given within an hour of exposure.

a. The exposed subject urinates and washes his hands.

b. He washes his penis, scrotum, and adjacent area of the body thoroughly with liquid soap and warm water. These parts are dried and then flushed with a 1-1000 solution of bichloride of mercury.

c. With a urethral syringe the attendant gently injects 5 c.c. of a 2% solution of protargol (prepared fresh once a week) into the anterior urethra. The subject retains this solution for five minutes by the clock by compressing the urethral orifice with his thumb and forefinger. Small amounts of the protargol are permitted to escape at brief intervals in order to keep the meatus well bathed.

d. The subject retracts the foreskin, then thoroughly rubs into the penis and surrounding body area about 4 grams of 30% calomel (mercurous chloride) ointment for a period of at least 3 minutes. The penis is then wrapped in paper or gauze. The subject should not urinate for 4 hours.

253. GONORRHEA. a. Diagnosis in the male.

(1) A diagnosis of gonorrhea must not be made in the absence of laboratory confirmation. Treatment for gonorrhea should be started at once if the patient has an acute purulent urethral discharge, but material should be obtained before treatment is begun for subsequent laboratory study (smear and/ or culture).

(2) Acute gonorrhea. The detection of gram-negative intracellular diplococci in smears of the urethral exudate, or smears of the centrifuged sediment of the first glass of urine, or fluid from conjunctival sac or joints, establishes the diagnosis of gonococcal infection. In competent hands cultures yield a high percentage of positive results and are of particular value in cases in which no gonococci are found in the smear.

(3) Chronic gonorrhea (posterior urethritis, prostatitis, seminal vesiculitis, epididymitis and arthritis). The detection of gram-negative intracellular diplococci in smears of the exudate obtained by digital stripping of the prostate, Cowper's glands, and the urethra, or in smears of the centrifuged sediment of urine passed after stripping the prostate, Cowper's glands, and the urethra, or the demonstration of gonococci in cultures of material so obtained, establishes the diagnosis of gonococcal infection.

b. Diagnosis in the female.

(1) A diagnosis of gonorrhea must not be made in the absence of laboratory confirmation. (Treatment for gonorrhea should be started at once in women who have evidence of this disease, even though laboratory studies are negative or not available. If laboratory facilities are not available, material for subsequent laboratory studies should be obtained before treatment is begun.)

(2) The detection of gram-negative intracellular diplococci in smears of material

obtained from any of the following: the urethra, Skene's glands, or the cervix (or from Bartholin's glands or the rectum, when clinical symptoms exist); or positive cultures of such material establishes the diagnosis of gonococcal infection. (Caution: The normal genital bacterial flora and the flora of nonspecific infections may contain organisms that in smear closely resemble gonococci. Therefore, cultural methods should be utilized when possible.)

c. Gonorrheal ophthalmia. The diagnosis is made on the basis of an acute purulent conjunctivitis, pus containing gonococci, and rapid involvement of the external coats of the eye. (Sulfonamide therapy should be instituted immediately. Prompt ophthalmological consultation is imperative.)

d. Serologic tests for syphilis. All patients with gonorrhea should be given a serologic test for syphilis on admission, a test before being discharged to duty, and if possible a final test two months after discharge.

e. Treatment of gonorrhea in males and females.

(1) Local treatment of any kind (injections, irrigations, massages, instrumentations) is contraindicated in uncomplicated acute gonorrhea.

(2) Treatment should consist of not more than two courses of chemotherapy. A careful inquiry should be made as to previous sulfonamide therapy, recent self-administered chemotherapy for gonorrhea, and for previous drug reactions. (See note 1, page 1; paragraph 14, and table 1, Chemotherapy in infectious diseases and other infections, SGO Circular Letter No. 17, February 23, 1942.)

(a) Sulfathiazole and sulfadiazine are each highly efficient, and in the doses recommended cause toxic manifestations very infrequently. Either of these compounds is recommended. Sulfapyridine, although nearly as efficient as sulfathiazole or sulfadiazine, is more toxic and should be used only if the other compounds are not available. Sulfanilamide is far less effective than the other sulfa compounds in gonorrhea and is not recommended.

(b) The recommended dosage for sulfathiazole and sulfadiazine is 1 gram (15 grains) four times a day for five days. The recommended dosage for sulfapyridine is 1 gram (15 grains) three times a day for five days.

(c) A second course of the drug, in the same dosage, should be given if there is evidence of persistence or recurrence of the disease. There should, however, be a lapse of five days between the two courses of medication.

(d) Patients in whom the gonococcus is present after the second course, or who have not made a satisfactory clinical response, generally should be transferred to a general hospital.

(e) In males, local treatment to the urethra generally should be administered only in a general hospital.

(f) In the female, hot vaginal douches (under no more than 2 feet of water pressure) afford comfort and promote cleanliness. Acute pelvic inflammatory disease is an indication for bed rest, ice bags to the abdomen, and analgesics. If enemas are necessary, preliminary bathing of the perineum is indicated before inserting the rectal tube in order to avoid inducing gonococcal proctitis.

f. Treatment of sulfonamide-resistant gonorrhea in males and females (general hospitals).

(1) It is recommended that carefully selected patients with sulfonamide-resistant infections be given ten hours of sustained fever therapy, where such therapy is available, preceded by chemotherapy consisting of sulfathiazole, 1 gram every six hours for eight doses. This program should be preceded by one week of freedom from sulfonamide therapy. Patients who are not subjected to this form of treatment, and those who are not cured by this means, should be placed upon local treatment.

(2) Local treatment in the male (sulfonamide-resistant cases only).

(a) When the infection is confined to the anterior urethra, an anterior urethral injection, once daily, of not more than 6 cc. of a 5-percent solution of mild protein silver or 0.5 percent of strong protein silver is advised. (Retain for five minutes.) It should be kept in mind that prolonged use of chemicals tends to perpetuate urethral discharge. Discharge caused by overtreatment of this type may be recognized by the presence of many epithelial cells.

(b) All urethral injections are to be administered by a medical officer or a trained

attendant; not by the patient.

(c) Stop all local treatment if the patient develops acute symptoms of posterior urethral infection, such as urgency, painful or marked frequency of urination, or perineal or rectal pain; and confine treatment to hot Sitz baths. When acute symptoms have subsided, resume anterior urethral injections and continue until prostatic stroking is begun.

(d) Extremely gentle prostatic stroking should be tried when the second glass of urine has been clear, and the first glass nearly so, for two weeks. If gentle massage is painful or causes a recrudescence of other symptoms, it should not be repeated for one week, or until the symptoms have subsided. If it is not painful and if no recrudescence of symptoms occurs, the gland should be gently stripped at three or four days intervals, and smears of the prostatic secretion examined every two weeks. (When prostatic massage is instituted too soon or applied too vigorously it often induces complications and retards cure.)

(e) Infections of Cowper's glands should be searched for in resistant cases. If these glands are palpable, they should be gently kneaded. This can be accomplished at the time prostatic massage is practiced, by placing the thumb against the perineum and gently massaging first one and then the other gland with the index finger.

(f) No instruments of any type should be passed into the urethra while gonococci are present.

(3) Local treatment in the female.

(a) (See e(2) (f))

(b) The persistence of infection in Skene's glands, Bartholin's glands or the endocervical glands in spite of the use of measures recommended above constitutes a special problem beyond the province of this handbook. Such patients require skilled gynecological treatment.

g. Determination of cure in the male (uncomplicated cases).

(1) Cure is determined by the inability to demonstrate gonococci in any of the urogenital fluids including prostatic secretions, by smears or cultures.

(2) Patients whose symptoms have disappeared as the result of sulfonamide medication may have the first test of cure on the third day after disappearance of symptoms. Thus, for example, patients clinically well on the third day of chemotherapy, whose urethral cultures or smears are negative for gonococci, may have on the sixth day prostatic massage and may then be discharged to duty if smears of the urogenital fluids are normal. When feasible these patients should return to the hospital for two subsequent examinations at weekly intervals and should be discharged as cured after three negative examinations.

h. Determination of cure in the male (sulfonamide-resistant cases).

(1) Cure is determined by the inability to demonstrate the gonococcus in any of the urogenital fluids by repeated smears or cultures. Material for these studies should be obtained in the manner previously described in a.3. The prostatic secretion should be included in the study of all types of infection. Three successive negative studies at weekly intervals constitute practical evidence of cure. Tests for cure may be carried out after the patient has returned to duty.

(2) Patients whose symptoms disappear as the result of fever therapy may have tests of cure started on the second day following the treatment.

i. Determination of cure in the female (uncomplicated cases).

(1) Patients whose symptoms have disappeared as the result of chemotherapy may have tests of cure begun on the third day after disappearance of symptoms.

(2) Cure is determined by:

(a) Absence of tender masses or points of tenderness in the pelvis.

(b) Inability to demonstrate the gonococcus by smears or cultures in material obtained from the urethra, Skene's glands, Bartholin's glands, or the cervix. Such tests should be repeated every two weeks for three months, and if all are found to be negative, the patient should be discharged from observation. These tests should be carried out on an ambulatory basis.

(c) To obtain material for smears and cultures, massage the urethra, Bartholin's glands, and Skene's glands, obtaining secretion with small cotton-wrapped applicator or a platinum loop. Pass bivalve vaginal speculum without lubricant, expose cervix

clean vagina and cervical canal, squeeze cervix between ends of speculum blades, and obtain expressed fluid on cotton applicators or platinum loops for smear and culture.

j. Determination of cure in the female (sulfonamide-resistant cases).

(1) Patients whose symptoms have disappeared as the result of prolonged artificial fever may have tests of cure begun on the second day after treatment. The tests of cure are the same as those recommended for female patients in uncomplicated gonorrhea.

(2) Patients under local treatment should have smears and cultures done at least every two weeks. If these tests remain consistently negative for three months, and if there are no demonstrable complications, the patient should be discharged from observation.

254. SYPHILIS. a. Diagnosis of syphilis.

(1) It is of the utmost importance that the diagnosis in early syphilis (primary and secondary stages) be established at the earliest practicable moment and that treatment be instituted as soon as the diagnosis is made.

(2) All ulcerative genital lesions, extragenital lesions characterized by indolence, induration, and regional lymphadenopathy, and cases of urethritis accompanied by indolent enlargement of related lymph glands are to be regarded as probable cases of syphilitic infection until this possibility has been excluded by repeated darkfield examinations and repeated serologic tests. In these cases routine serologic tests will be done not less often than:

On admission to sick report.
Second week.
About the end of the first month.
About the end of the second month.

(3) Routine serologic tests will also be made in all cases of gonorrhea at least as often as follows:

On admission to sick report.
Before return to a duty status.
About the end of the second month.

(4) Antisyphilitic treatment will not be started until the diagnosis of syphilis is definitely established. The demonstration of the Treponema pallidum by darkfield examination is conclusive as to the necessity for the immediate institution of treatment. A persistent completely positive serology even in the absence of confirmatory clinical signs or a history of infection is also diagnostic of syphilis, and usually is an indication for treatment. Positive serologic tests on a single specimen should never be made the basis of treatment in the absence of unmistakable clinical evidence of syphilis. A completely positive precipitation or complement-fixation test (Kahn or Wassermann) confirmed by a positive complement-fixation test (Wassermann) on a second specimen indicates syphilis provided no negative reactions have been obtained. Acute infections, particularly malaria and possibly vaccination procedures, are believed to give rise at times to transient false positive serologic tests. The presence of these complicating factors should be excluded before making a definite diagnosis of latent syphilis. In the event of incompletely positive or contradictory serologic reactions the test should be repeated until the possibility of technical error is excluded.

b. Treatment of syphilis.

(1) General principles of treatment.

(a) No treatment is to be given for suspected early syphilis until the diagnosis is made either by darkfield examination or confirmed serologic tests. No therapeutic tests are to be used.

(b) Arsenoxide (mapharsen) will be used as the standard arsenical. Neoarsphenamine or other arsenicals cannot be substituted in the treatment schedule outlined in Table XXV.

(c) If it is necessary to use neoarsphenamine, because of the nonavailability of arsenoxide, the former drug should be given only at weekly intervals in courses of not more than eight consecutive weekly doses.

(d) Tryparsamide and fever therapy are not to be used outside of a hospital.

(e) Each treatment is to be recorded on the syphilis register of the patient or if

for any reason a syphilis register (Form 78 MD) is not available, a written record is to be kept and transferred to the standard form as soon as possible. Each entry will include date, drug, dose, and reaction.

(f) It cannot be too strongly emphasized that regularity of treatment schedule without long or short time variations or lapses is critically important to both infection control and cure. Every effort must be made to impress this fact on enlisted men and officers as well as medical personnel.

(g) Emphasis should also be placed on thecompletionby each patient of the full schedule of treatment in the time called for regardless of early serologic reversal.

(2) Treatment of early and latent syphilis.

(a) In view of recent advances in knowledge regarding the toxicity and therapeutic efficiency of arsenoxide, the following recommendations regarding the treatment of early and latent syphilis have been prepared by the Subcommittee on Venereal Diseases of the National Research Council and approved by the Surgeon General.

(b) Early (primary and secondary) and latent syphilis of any duration should be treated by an identical treatment system. This treatment may be completed within twenty-six weeks. (See Treatment Schedule - Table XXV)

(c) Patients with syphilis, early or latent, should, as a rule, be hospitalized initially to the end that a careful examination may be made and antisyphilitic treatment started. The period of hospitalization ordinarily need not be prolonged more than five to seven days. Thereafter, treatment should be continued by unit medical officers; or, in areas where concentration of patients is feasible, in centralized ambulatory clinics established in hospitals. Whenever possible and to minimize loss of time from duty, treatment of nonhospitalized patients should be given after duty hours.

(d) At reception centers vaccinations and other procedures incident to induction may be carried out, during the initial period of hospitalization for syphilis, by local arrangements between the commanding officers of the reception center and the station hospital.

(3) Technical suggestions.

(a) Discard discolored drugs and solutions and damaged ampules.

(b) Dissolve arsenoxide in sterile distilled water in the proportion of 10 mg. of drug per 2 cc. of water; a dose of 60 mg. will then be contained in 12 cc. of solution, 50 mg. in 10 cc., and 70 mg. in 14 cc.

(c) Shake and aerate arsenoxide; do not shake or aerate the other arsenicals.

(d) Inject arsenoxide rapidly to avoid thrombosis; there is little danger of speed shock or nitritoid crisis. Other arsenicals should be injected slowly to avoid speed shock or nitritoid crisis.

(e) Thoroughly shake oily suspensions.

(f) Attempt aspiration after insertion of needle before making any injection, especially intramuscularly.

(g) Inject bismuth intramuscularly into upper outer quadrant of buttock. Alternate sides.

(h) Massage firmly after withdrawing needle from buttock and have patient prolong massage to three minutes.

(i) Advise rest if practicable after arsenicals.

(j) Warn patient to report his reactions.

(k) Watch mouth and gums for bismuth stomatitis.

(4) Treatment is to be stopped and the patient hospitalized if the following appear:

(a) An itchy dermatitis of the face or flexures.

(b) Jaundice

(c) Petechial or other hemorrhagic lesions.

(d) Evidence of cerebral injury, even though slight.

(5) General antireaction therapy.

(a) Epinephrin solution 1:1000, 1/2 - 1 cc. subcutaneously for speed shock or nitritoid crisis.

(b) Glucose 500 cc. 5-percent solution intravenously supplemented with thiamine chloride 5 mgm., for jaundice. (See Notes on the treatment of jaundice, SGO Circular Letter No. 55, June 11, 1942.)

(c) Vitamin B complex is recommended in suspected liver damage.

TABLE XXV. TREATMENT SCHEDULE: EARLY AND LATENT SYPHILIS

Week		
1		
2		
3		Bismuth subsalicylate intramuscularly once weekly, 5 doses
4	Arsenoxide (mapharsen) intravenously twice weekly, total 20 injections	
5		
6		
7		
8		Omit bismuth - 5 weeks
9		
10		
11		
12		
13	Omit arsenoxide (mapharsen) - 6 weeks	Bismuth subsalicylate - intramuscularly Once weekly - 6 doses
14		
15		
16		
17		
18		
19		Omit bismuth - 5 weeks
20	Arsenoxide (mapharsen) as in first course, twice weekly total 20 injections	
21		
22		
23		
24		Bismuth subsalicylate intramuscularly once weekly, 5 doses
25		
26		

Arsenoxide (mapharsen) dosage: Adjusted approximately to body weight; average dose 60 mg., minimum dose 50 mg., maximum 70 mg.
Bismuth subsalicylate in oil dosage: The standard dose is 0.2 gm. of bismuth subsalicylate intramuscularly (not 0.2 gm. of elemental bismuth metal).

(d) In cerebral vascular accidents measures to be considered are venesection, and hypertonic saline solution intravenously (500 cc. of a 1.5 percent solution.)

(e) In blood dyscrasias, transfusions.

(f) Sodium thiosulphate for any type of treatment reaction is considered valueless.

(6) Serologic control of treatment. In patients with early syphilis a serologic test will be done at the beginning and end of the schedule of treatment outlined in Table XXV, but treatment may be stopped whether the serologic test for syphilis (STS) is positive or negative. After the completion of treatment the STS should be repeated three and six months later. If the test is negative after six months, the case may be classified as "Result Satisfactory" and the Syphilis Register may be closed. If the test is positive after six months, the patient should be referred to a station or general hospital.

In patients with latent syphilis the STS should be repeated at the completion of treatment outlined in Table XXV, but the Syphilis Register may be closed when this treatment is completed, regardless of the result of serologic test.

(7) Spinal fluid examination should be performed in a hospital in patients with early syphilis at the end of the course of treatment outlined in Table XXV, or as soon as possible thereafter; but in any event before the Syphilis Register is closed. In apparent latent syphilis, spinal puncture should be performed in a hospital before treatment or as soon as possible thereafter, but in any event before the Syphilis Register is closed.

(8) Control of relapse and infectiousness.

(a) Early syphilis is to be regarded as infectious until the second injection of arsenoxide has been given.

(b) Physical inspection of skin (including palms and soles), mucosae, anus, and genitalia should be performed as often as circumstances permit during treatment and and at each probationary inspection.

(c) The involution of the chancre or secondaries should be watched to detect treatment-resistant cases.

(d) Patients should be warned to look for and report mouth, skin, and genital lesions. Darkfield examination is of great help in recognizing relapsing lesions of the skin, mucosa, and genitalia.

(9) Complications or relapse. In the event of any complication of treatment (serious treatment reactions) or any evidence of relapse, clinical or serologic, the patient should be at once transferred to a station or general hospital.

(10) Cardiovascular, visceral, and neurosyphilis require special treatment in hospital. For additional details see standard texts.

(11) Treatment of precocious late syphilis (tertiarism). As soon as possible precocious late syphilis (early gummatous and rupial lesions and bone lesions) should be hospitalized for combined fever and arsenical therapy.

(12) Treatment of congenital syphilis. On recognition or on appearance of active lesions, congenital syphilis should be treated on the schedule for early and latent syphilis.

(13) Separation from the service. When practicable, the physical status of every patient with syphilis, whether the disease was acquired before or after induction into the service, will be completely reevaluated when discharge from the Army is contemplated.

c. Diagnostic nomenclature for syphilis in the Army.

Syphilis, primary.
Syphilis, secondary.
Syphilis, early latent (less than four years since infection)
  Spinal fluid negative.
  Spinal fluid not performed (diagnosis tentative).
Syphilis, late latent (four or more years since infection).
  Spinal fluid negative.
  Spinal fluid not performed (diagnosis tentative).
Syphilis, tertiary - otherwise unclassified.
  Mucocutaneous.
  Osseous.
Ocular (except optic atrophy).
Visceral (except cardiovascular).

Cardiovascular - other.
Aneurysm (saccular).
Aortic regurgitation (insufficiency).
Aortitis (uncomplicated).
Neurosyphilis - otherwise unclassified.
Asymptomatic.
Acute syphilitic meningitis.
Diffuse meningovascular.
Optic atrophy.
Tabes dorsalis.
Taborparesis.
Psychosis with syphilitic meningoencephalitis (general paresis).
Psychosis with neurosyphilis other than paresis or taborparesis.
Syphilis, type undetermined - to include cases in which accurate diagnosis has not been made.
Syphilis, congenital - include all manifestations.
Arsenical poisoning.
Bismuth poisoning.
Iodine poisoning.
Mercury poisoning.
Spinal puncture for diagnosis or progress.
Special therapeutic practices.
Fever therapy (malaria, artificial).
(1) Definition of terms and explanations of their use. Primary. To include those cases presenting the primary lesion of syphilis (the chancre), which have not yet developed secondary manifestation. This diagnosis must be confirmed by darkfield examination, serologic test of the blood, or both. If blood serologic test is negative, the diagnosis of primary syphilis is not permissible without the demonstration of T. pallidum by darkfield.

Secondary. To include only those cases of early syphilis which show one or more of the manifestations of systemic dissemination of the spirochete; for example, generalized enlargement of lymph glands, cutaneous eruption, mucous patches, condylomata lata, patchy alopecia, largyngitis, bone pains, febrile reaction, and so forth. The chancre may or may not be present and if present may be in any stage of evolution. In early secondary cases the manifestations of systemic spirochetal dissemination are increasing, have attained their maximum, or are waning. This diagnosis must be confirmed by darkfield examination, serologic test, or both.

In early secondary syphilis and in addition to the manifestations listed above, ocular or neurologic complications (iritis, neuroretinitis, acute syphilitic meningitis) should be specially recorded as: "Syphilis, secondary, manifested by ....."

Latent. Secondary symptoms have subsided and the active manifestations of late syphilis have not yet supervened. There are no evidences of syphilis other than a positive serologic test of the blood. Cases will be classified as : "Latent (early or late) - spinal fluid negative" or " Latent (early or late) - spinal fluid not performed (diagnosis tentative)". The date of the negative examination of the spinal fluid will be stated in all cases.

Tertiary. - This classification is to be limited to cases that show active lesions of late syphilis. The lesion may be a gumma, or it may be a diffuse process and may involve any organ or tissue of the body. The majority of all patients with tertiary syphilis will fall within six categories:

Mucocutaneous. Late syphilitic gummatous lesions of skin or mucous membrane.

Osseous. Periostitis, osteomyelitis, arthritis, synovitis.

Ocular. Iritis, uveitis, keratoiritis, keratitis, choroiditis, but not including optic atrophy.

Visceral. Hepatic, gastric, etc., but not including cardiovascular.

Cardiovascular. To include all lesions of the heart and great vessels. Classify as follows:

Aneurysm (Saccular). Do not use for a fusiform dilation of the aorta. Specify artery involved.

Aortic regurgitation (aortic insufficiency). Specify whether with or without cardiac decompensation.

Aortitis, uncomplicated. To be used only for those patients with symptoms and physical or x-ray signs of syphilitic aortic involvement in the absence of aneurysmal sacculation or aortic regurgitation.

Neurosyphilis. To include all cases with involvement of the central nervous system, classified as follows:

Asymptomatic. To be used only for those patients with early or late syphilis who have no symptoms or detectable physical signs of central nervous system involvement, and in whom the diagnosis is based on the routine finding of abnormalities in the spinal fluid.

Acute syphilitic meningitis. Usually occurs within the first two years of the disease, most commonly as a relapse phenomenon (neurorecurrence), manifested by the usual signs of low grade meningeal involvement, with or without cranial nerve palsies.

Diffuse meningovascular. This is a catch basket category to include all patients with neurosyphilis who do not fit into other diagnostic categories enumerated. Manifestations to be stated in each instance.

Optic atrophy. Primary of secondary.

Tabes dorsalis. Manifestations to be stated.

Taboparesis. To be used only in patients with definite psychiatric signs of paresis complicated by definite clinically demonstrable evidence of damage to the posterior columns of the spinal cord.

Psychosis with syphilitic meningo-encephalitis (general paresis). To be limited to cases which show psychic changes in addition to neurologic signs and the characteristic changes in the spinal fluid. Cases with paretic type spinal fluid but without psychic changes will be reported as: "Syphilis, diffuse meningovasucular, manifested by ....."

Psychosis with neurosyphilis. To include neurosyphilis with psychosis other than cases of paresis and taboparesis.

If tertiary manifestations occur which do not fit into one of these categories, diagnose as:

"Syphilis, tertiary, otherwise unclassified" - Specify.

Type undetermined. To include cases in which accurate diagnosis has not been made. Every effort should be made to make a complete examination and proper diagnostic classification in all cases.

Congenital. To be limited to cases that show definite evidence of the former existence of the characteristic changes of congenital syphilis, such as interstitial keratitis, Hutchinson's teeth, saber shins and other bone changes, saddle nose, eighth nerve deafness, and so forth. The congenital origin of syphilis is not to be assumed merely because the time and the circumstances of the infection cannot be ascertained and there is no scar of a primary lesion.

The suggested terms for various drug poisonings are intelligible as they stand.

Spinal puncture for diagnosis or progress. This should be used in all cases (syphilitic or otherwise) routinely hospitalized for purpose of a spinal puncture.

Special therapeutic practices. This diagnostic grouping has been included for it seemed desirable to indicate special therapeutic practices which necessitate hospitalization.

255. CHANCROIDAL INFECTION. a. Definition. Chancroid is a venereal disease transmitted only by direct contact and characterized by single or multiple genital ulcers. The latter possess irregular crater-form margins, are usually not indurated, and exhibit a tendency toward the formation of complicating suppurating inguinal adenitis. The incubation period is usually three to fourteen days.

b. Diagnosis. It is important to rule out the presence of mixed syphilitic and chancroidal infection. For this purpose at least three darkfield examinations should be made on successive days; a blood serologic test for syphilis should be made on admission to the hospital, during the second week, and at monthly intervals for two months following healing of the chancroidal lesions. Laboratory tests for the diagnosis of chancroid (Ito-

Reenstierna skin test or the staining or cultural isolation of the Ducrey bacillus) are not recommended.

c. Treatment.

(1) Chemotherapy.

(a) Local. Accessible lesions should be cleansed with soap and water and dried. They should then be completely covered with powdered sulfanilamide and a loose, dry dressing applied. This should be repeated at daily intervals until the lesion heals. Other local medication is not recommended. In patients with tight phimosis and underlying ulcerative lesions, the phimotic preputial cavity should be irrigated twice daily with 1-5000 potassium permanganate solution.

(b) Systemic. Administer sulfathiazole or sulfadiazine 1 gram (15 grains) four times a day for five days. Sulfanilamide 1 gram (15 grains) three times a day for five days, may be utilized instead of sulfathiazole or sulfadiazine, but is less well tolerated.

Practically all chancroidal infections will respond to the above routine. In fact, if the lesion does not heal, doubt is cast on the correctness of the diagnosis of chancroid, and the patient should be restudied from the diagnostic standpoint, and, if necessary treated surgically.

(2) Surgical therapy

(a) Surgical procedure designed to relieve phimosis or paraphimosis should be resorted to only on the basis of sound clinical judgment.

(b) Chancroidal bubo. Most of these will subside with systemic sulfonamide therapy. If extensive suppuration is present, the bubo may be opened by a small incision, the pus aspirated, and the cavity packed with sulfanilamide powder.

256. LYMPHOGRANULOMA VENEREUM. a. Definition. This disease concept includes the conditions formerly known as lymphogranuloma inguinale, lymphopathia venereum, climatic bubo, esthiomene, and inflammatory rectal stricture.

b. Etiology. A filtrable virus, probably multiple strains.

c. Geographic distribution. World-wide.

d. Clinical picture. A systemic disease of the lymphatic system, usually originating in a trivial and transitory lesion of the penis, vulva, vagina, or rectum, which frequently escapes the patient's notice.

The invasion of the lymphatic glands usually occurs from ten to thirty days after infection, occasionally is delayed months. Inguinal adenitis is often bilateral, and occasionnaly subsides without suppuration. During this stage, constitutional symptoms may be observed. Lymph nodes may fuse to skin, resulting in multiple areas of softening, followed by numerous fistulae. Extensive scarring accompanies healing. The anorectal syndrome usually is found only in the female, and is characterized by rectal pain, discharge of blood and pus from the anus, a tendency toward extreme chronocity, and the production of rectal stricture.

e. Differential diagnosis. Differentiate from malignant tumors, Hodgkins disease, tularemia, tuberculosis, pyogenic infections, chancroidal bubo, and syphilis. Mixed venereal infections should be ruled out by the darkfield examination of material from genital lesions for the causative organism of syphilis. Frequent serologic examinations should be continued for at least two months after the disappearance of the lymphatic symptoms.

f. Laboratory tests in lymphogranuloma venereum.

(1) Only one diagnostic procedure for lymphogranuloma venereum, the intradermal test of Frei, has as yet come into general use. Other methods used in confirming the diagnosis are either impractical (animal inoculation, artificial cultivation of the virus), nonspecific (alterations in serum protein), or their value not yet established (complement fixation).

(2) Frei antigens.

(a) Chick embryo antigen. This is the preparation recommended for Frei testing. Nonspecific reactions occur, so that simultaneous inoculation of control material must always be made.

(b) Human bubo-pus antigen. Pus is obtained from an unruptured bubo from an acute case of lymphogranuloma venereum. This pus must be diluted 1:5 or 1:10,

cultured for sterility, heated for 1-2 hours on consecutive days at 58° C, following which a preservative is added. This material is placed in sterile rubber stoppered vials and is then tested upon known positive cases and known negative controls to determine its potency. Pus from different patients differs in antigenic potency. When human bubo-pus antigens are locally available they may be used, but are not generally recommended for use by the armed forces because of the uncertainty of sources of supply and the variability of antigens.

(c) Mouse brain antigen. This preparation is commercially available. However, it is not recommended for use because it yields a high proportion of nonspecific results.

(3) The Frei test.

(a) Method of use of chick-embryo antigen. This preparation is supplied in two ampules, one of which is the virus containing antigen, the other the nonvirus containing yolk sac control. For use in Frei testing, 0.1 cc. of antigen and 0.1 cc. of control material are injected intradermally into different areas on the flexor surface of the forearm. These areas chosen should be at least 4 cm. apart, or the virus antigen and control may be injected in opposite forearms. Separate tuberculin syringes and 26-gauge needles should be used.

(b) Reading of results. The injected areas must be inspected forty-eight and seventy-two hours later. A positive reaction consists in a more or less indurated papule 7 mm. or more in diameter (disregarding the surrounding zone of erythema) with or without central vesiculation or ulceration. A doubtful reaction consists in a papule roughly from 5 to 7 mm. in diameter, without central ulceration or vesiculation. A negative reaction consists in no change at the injected site, or erythema only, or a papule less than 5 mm. in diameter. If the control material likewise yields a positive papule (7 mm. or over), the Frei test should be repeated with human bubo-pus antigen if it is available. The test may be read as positive or doubtful if the papular reaction described occurs only with the virus-containing antigen, the control remaining negative.

(4) Interpretation of results of Frei test. The Frei test is of greatest value in patients with the acute bubonic form of lymphogranuloma venereum where a negative test may be observed to develop gradually into a positive one.

There is reason to believe that in certain instances there are nonspecific cross-reactions in the presence of other venereal diseases, e.g., chancroid, granuloma inguinale, syphilis; and a positive Frei test with any antigen must be interpreted with caution when suspected lymphogranuloma venereum coexists with these diseases.

Moreover, a positive Frei test cannot be relied upon absolutely to establish the lymphogranulomatous nature of any clinical condition, since it is known that, in untreated infections with lymphogranuloma venereum, skin sensitivity persists for many years, probably for a life time. A positive test may, therefore, mean only that the patient has had lymphogranuloma venereum at some time in the past, rather than that his presenting symptoms are caused by this disease.

In short, the Frei test is of most diagnostic value when it is negative, since under these circumstances lymphogranuloma venereum, past or present, may be excluded with reasonable certainty. A diagnosis of lymphogranuloma venereum should not be made on the basis of a positive Frei test in the absence of clinical signs.

g. Treatment.

(1) Local. Patients with acute inguinal adenitis should be hospitalized whenever possible. The fluctuant nodes may be aspirated, but incision and drainage should be delayed until the effect of chemotherapy has been observed. Radical excision is inadvisable because of the risk of elephantiasis of the scrotum or vulva.

(2) Chemotherapy.

(a) The value of the sulfonamide compounds in lymphogranuloma venereum has not been definitely established, but preliminary reports indicate that they may be effective. Sulfathiazole and sulfadiazine are probably the drugs of choice, although sulfanilamide may be used.

1. Sulfathiazole or sulfadiazine should be administered in doses of 1 gram (15 grains) four times daily for five days. It may be necessary to prolong this medication to ten to fourteen days, in which case the dose should be reduced to 0.5 grams four times

a day.

2. Sulfanilamide, if used, should be administered in doses of 1 gram (15 grains) three times a day for five days, followed by a reduction to 0.5 - 0.75 gram three times daily for an additional five to seven days.

(b) The acute anorectal syndrome should be treated in the same manner as the inguinal manifestations. Stricture or other later complications should receive special consideration.

257. GRANULOMA INGUINALE. a. Definition. Granuloma inguinale is a chronic disease due to infection with a filterable virus. It involves primarily skin and mucous membranes, rarely with coincident adenopathy; it is characterized by vivid-hued, shining verrucous, vegetating nodules of granulating tissue with a hemorrhagic surface surrounded by a thin, easily excoriated epidermis. The condition spreads by peripheral extension and autoinfection, often involving the entire genital area. It may involve large adjacent areas of the lower abdomen and thighs. The lesions show little or no tendency to spontaneous healing and may persist for months or years.

b. Diagnosis. The clinical appearance of a chronic process involving the groin and genital areas with little involvement of the lymph nodes is characteristic of the disease. The finding of Donovan bodies by Wright stain in deep tissue scrapings or biopsy of a peripheral area of diseased tissue (including a section of normal adjacent skin) confirms the diagnosis.

Lymphogranuloma venereum, chancroid infection, and syphilis should be considered in the differential diagnosis, and appropriate diagnostic tests should be performed.

c. Treatment.

(1) Tartar emetic administered intravenously in doses of 0.03 to 0.12 gram . Patient should remain recumbent for one hour following an injection. Drug intolerance is indicated by nausea, vomiting, cough, tachycardia, hypotension. Initiate treatment with 3 cc. of a freshly prepared 1-percent solution. Each subsequent dose, freshly prepared, should be increased 3 cc. if tolerated until the maximum dose, 12 cc., is attained. The maximum tolerated dose is given three times weekly for fifteen treatments.

(2) Fuadin 1-3 cc. (0.06-0.18 grams) or anthiomaline 1-3 cc. (0.06-0.18 grams) (both of these are complex antimony compounds) may be given intramuscularly two or three times weekly for twenty to twenty-five doses when the patient has difficulty in taking tartar emetic, or when the lesions have not improved satisfactorily under the former drug.

(3) Courses of tartar emetic, fuadin, or anthiomaline, separated by "rest periods" of two weeks, should be continued for at least four months after all lesions are completely healed, otherwise relapse is almost certain to occur.

(4) Local treatment of the lesions may be limited to daily dressings, or surgical excision of the entire area may be necessary. Large areas may be treated with solid carbon dioxide pencils. Deep x-ray therapy in expert hands has yielded promising results.

258. REFERENCES. a. W. D. Directives.

(1) S.G.O. Circular Letter No. 74, July 25, 1942, Subject: Diagnosis and Treatment of Venereal Diseases.

(2) S.G.O. Circular Letter No. 80, July 31, 1942, Subject: Individual Venereal Disease Prophylactic Packets.

(3) S.G.O. Circular Letter No. 17, February 23, 1942, Subject: Chemotherapy in Infectious Diseases and Other Infections.

(4) S.G.O. Circular Letter No. 32, February 1, 1943, Subject: Duty Status Treatment of Gonorrhea.

b. Manuals.

(1) TM 8-220, Medical Department Soldier's Handbook.

c. Regulations.

(1) AR 35-1480, Aviation Pay - Officers and Enlisted Men.

(2) AR 40-235, The Prevention of Communicable Diseases of Man - Venereal Diseases.

d. Texts.

(1) Moore, J. E.,: Modern Treatment of Syphilis, 2nd Ed, Springfield, C.C. Thomas, 1941.

SECTION VII
TROPICAL MEDICINE

259. SUBJECT MATTER. Tropical medicine deals with diseases which occur in warm climates. These diseases are not confined to the geographic tropics, but tend to originate or have greater prevalence there. Certain clinical aspects of tropical medicine are dealt with in the present outline. Further information will be found in the references cited in par. 273.

260. HEALTH IN THE TROPICS. The general health of those from temperate zones has a tendency to deteriorate in the tropics. Resistance to infection is lowered at the same time that exposure occurs to diseases against which the newcomer has little or no natural or acquired immunity. Inadequate standards of public health and sanitation expose the resident of many parts of the tropics to further dangers, while diseased natives, animals, and insects provide large reservoirs of infection.

261. DIET IN THE TROPICS. Fresh meats, fruits, vegetables and dairy products are frequently unobtainable, of poor quality, and of doubtful cleanliness. Synthetic vitamin supplements are often, although not inevitably, needed. Chloride depletion from excessive sweating is common in the tropics and at least one well-salted dish should appear in each day's dietary. One-tenth per cent saline solution is not briny in taste and can be used as drinking water. Alcohol is particularly harmful to residents of the tropics and its use should be discouraged. Many Americans have an equal or greater preference for carbonated beverages, and these should be made available.

262. DISEASE IN THE TROPICS. Many common diseases of the temperate zones occur frequently in the tropics and are major health problems there (influenza, meningitis, tuberculosis, pneumonia, diphtheria, typhoid, syphilis, neoplastic disease). Some diseases once common but now rare in northern zones are much more often encountered in warm climates (smallpox, rabies, tetanus). Other conditions, many of parasitic origin transmitted by arthropods, have become known as tropical diseases. Some of these are widespread (malaria, filariasis) while others occur only in more or less well defined endemic areas (yellow fever, leishmaniasis, trypanosomiasis).

263. EFFECTS OF HEAT. a. Heat exhaustion.
(1) Cause: Vasomotor collapse.
(2) Occurrence: General.
(3) Diagnosis: Unconsciousness; moist skin; weak pulse; low blood pressure. Differentiate from malaria.
(4) Treatment: Horizontal posture. Mild stimulants.
(5) Prevention: Good general hygiene. Avoidance of alcohol. Protection from sun.
b. Heat cramps.
(1) Cause: Excessive loss of sodium and chloride in sweat. (Same syndrome may

develop in cholera or dysentery from chloride loss in bowel discharges).
(2) Occurrence: General.
(3) Diagnosis: Gradual onset of symmetrical cramps in extremities.
(4) Treatment: Physiological or hypertonic saline solution by mouth.
(5) Prevention: Add 1 Gm. NaCl to each liter of drinking water.

c. Heat stroke.
(1) Cause: Inefficiency or failure of heat dissipating mechanism of the body.
(2) Occurrence: Common among troops or in hospitals in the tropics and among urban populations in certain temperate zone areas.
(3) Diagnosis: Fever developing into hyperpyrexia. Unconsciousness deepening into coma. Dry skin. Examine blood for plasodium of malaria.
(4) Treatment: Wrap patient in sheet. Dash with cold water every fifteen minutes. Use fans to promote evaporation during intervals. Dextrose 10 per cent solution in physological saline 500-1000 cc. intravenously, repeated as necessary.
(5) Prevention: Good general hygiene. Caution in the use of atropine. Anticipatory treatment of patient with abnormally dry skin.

264. PLANT POISONINGS. a. Ackee poisoning; vomiting sickness of Jamaica.
(1) Cause: Ingestion of unripe fruit of ackee tree.
(2) Occurrence: Jamaica and other islands of the West Indies.
(3) Diagnosis: Abdominal pain and vomiting about two hours after ingestion. Coma and death may supervene after brief remission.
(4) Treatment: Symptomatic.
(5) Prevention: Avoidance.

b. Mandioca poisoning:
(1) Cause: Ingestion of improperly prepared sweet and bitter cassava root.
(2) Occurrence: West Indies, South America and Africa.
(3) Diagnosis: Severe gastroenteritis following ingestion.
(4) Treatment: Symptomatic.
(5) Prevention: Avoidance.

265. ANIMAL POISONINGS. a. Snake bite.
(1) Cause: Implied. The danger of snake bite in the tropics is overrated, except for agricultural workers, and for soldiers engaged in jungle fighting.
(2) Occurrence: Colubrine snakes predominate in Australia and India. Viperine snakes of the United States include the rattlesnake, copperhead, and water moccasin.
(3) Diagnosis: Fang marks. Local edema.
(4) Treatment: Colubrine or viperine antivenin 100-300 cc. intramuscularly or intravenously. Local suction through rubber dam, cruiciate incisions, local antivenin.
(5) Prevention: Wear appropriate footgear or puttees when unusual exposure can be anticipated.

b. Spider bite.
(1) Cause: Implied. Large, hairy tarantulas are harmless. Black widows can be recognized by red hourglass on ventral surface of abdomen.
(2) Occurrence: General. Many instances of bites occurring on genitalia during use of outdoor privies, the spiders lurking under seats.
(3) Diagnosis: Severe generalized myalgias half hour after bite. Pain and muscular rigidity may suggest acute abdominal accident, but pulse slow, shock not manifested.
(4) Treatment: Calcium gluconate 10% sol. 10 cc. intravenously. Deaths chiefly among children. Latrodoctus antivenin (Sharp and Dohme).
(5) Prevention: Inspection prior to use of facilities where spiders may lurk.

c. Scorpion sting.
(1) Cause: Implied.
(2) Occurrence: General.
(3) Diagnosis: Immediate burning, local pain lessening in about fifteen minutes. Nausea and vomiting. Profuse sweating.
(4) Treatment: Symptomatic. Deaths chiefly among children.
(5) Prevention: Shake out shoes and clothing before dressing.

266. VIRUS INFECTIONS. a. Yellow fever.
(1) Occurrence: Endemic in Amazon basin and adjacent areas and in central Africa. Epidemic in Anglo Egyptian Sudan, 1940. (Figure 32).
(2) Transmitting agent: Endemic form: Aëdes leucocelaenus, Haemagogus capricorni. Epidemic form: Aëdes Aegypti.
(3) Diagnosis: Abrupt onset. Prostration. Initial tachycardia followed by fall in pulse while fever rises (Faget's sign). Albuminuria second day. Jaundice fourth day. Bloody vomit. Differentiate from malaria, Weil's disease. Mouse inoculation before fifth day for recovery of virus; protection test after second week for demonstration of immune bodies in serum of convalescents.
(4) Treatment: Nonspecific and supportive.
(5) Prevention: Screening of sick. Vaccination of non-immunes. Mosquito control. Quarantine of exposed personnel in screened quarters for 10-day period of observation. Anti-amaryl measures applied to airdromes and planes.

b. Dengue.
(1) Occurrence: Widespread in tropics and subtropics, particularly in Far East and Australasia. (Figure 33).
(2) Transmitting agent: Aëdes aegypti, Aëdes albopictus.
(3) Diagnosis: Sudden onset. Fever. Backache. Ocular pain. Remission fourth day. Characteristic eruption sixth day with febrile relapse. Differentiate from influenza, yellow fever.
(4) Treatment: Analgesics and sedatives.
(5) Prevention: Mosquito control.

c. Sandfly fever.
(1) Occurrence: Widespread, especially in Near and Middle East.
(2) Transmitting agent: Sandfly (Phlebotomus).
(3) Diagnosis: Resembles dengue except for shorter course without febrile relapse or eruption.
(4) Treatment: Nonspecific.
(5) Prevention: Sandfly control.

267. RICKETTSIAL INFECTIONS. a. Rocky Mountain spotted fever group.
(1) Occurrence: United States; Colombia, S.A.; Sao Paulo, Brazil; Western Mediterranean basin; East and South Africa.
(2) Transmission: Bite of wood tick or dog tick (Dermacentor).
(3) Diagnosis: Abrupt onset. Headache, malaise, prostration. Myalgias. Eruption first on ankles and wrists third or fourth day, macolopapular becoming petechial, spreading over body. Coalescence of hemorrhagic areas. Necrosis of skin of ankles or elbows. Fever persists about three weeks. Weil-Felix positive (OX19).
(4) Treatment: Care of mouth and skin. Maintain nutrition and fluid balance. Intravenous treatments contraindicated. Serum treatment still in experimental stage.
(5) Prevention: After exposure to infestation remove ticks with tweezers. In highly endemic areas, prophylactic vaccination.

b. Old World typhus group.
(1) Occurrence: Epidemic: Highlands of South America; Central Europe; North Africa; Asia. Endemic: Southeastern United States, Africa, Near East, Far East (Figure 34).
(2) Transmission: Epidemic: body and head louse; endemic: rat flea.
(3) Diagnosis: Sudden onset. Prostration. Headache. Macular eruption fifth or sixth day appearing first on chest or abdomen, in epidemic disease becoming petechial, spreading to back, arms, and legs. Fever continues about 2 weeks. Weil-Felix positive (OX19).
(4) Treatment: As for Rocky Mountain spotted fever.
(5) Prevention: Epidemic: Louse control. Endemic: Rat control.

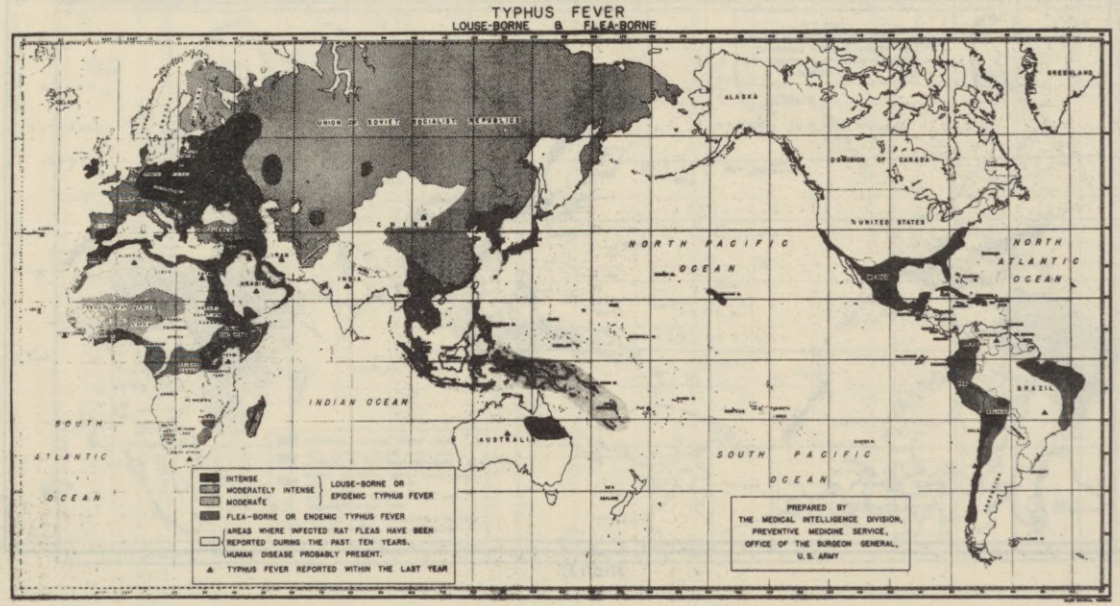
c. Japanese river fever group.
(1) Occurrence: Japan, Federated Malay States; Sumatra; Australia.
(2) Transmission: Bite of hereditarily infected larval mite.
(3) Diagnosis: Sudden onset. Macular or maculopapular rash fifth to seventh day appearing first on face (Strong) or trunk (Dyer). Local ulcer at site of bite with re-


YELLOW FEVER
UNION OF SOVIET SOCIALIST REPUBLICS
ALASKA
GREENLAND
DOMINION OF CANADA
UNITED STATES
CHINA
NORTH PACIFIC OCEAN
NORTH ATLANTIC OCEAN
IRAN
ARABIA
INDIA
INDIAN OCEAN
AUSTRALIA
SOUTH PACIFIC OCEAN
SOUTH ATLANTIC OCEAN
POTENTIAL YELLOW FEVER AREA
AREA WHERE YELLOW FEVER HAS APPEARED IN THE PAST 10 YEARS
SEVERE OUTBREAK 1940 — 15,000 CASES 1500 DEATHS
AREA WHERE YELLOW FEVER HAS APPEARED DURING 1941
DISTRIBUTION OF MOSQUITOES CAPABLE OF TRANSMITTING YELLOW FEVER
PREPARED BY
THE MEDICAL INTELLIGENCE DIVISION,
PREVENTIVE MEDICINE SERVICE,
OFFICE OF THE SURGEON GENERAL,
U.S. ARMY

FIGURE 32.


DENGUE
UNION OF SOVIET SOCIALIST REPUBLICS
ALASKA
GREENLAND
DOMINION OF CANADA
UNITED STATES
CHINA
IRAN
ARABIA
INDIA
NORTH PACIFIC OCEAN
NORTH ATLANTIC OCEAN
INDIAN OCEAN
AUSTRALIA
BRAZIL
SOUTH ATLANTIC OCEAN
SOUTH PACIFIC OCEAN
PREPARED BY
THE MEDICAL INTELLIGENCE DIVISION,
PREVENTIVE MEDICINE SERVICE,
OFFICE OF THE SURGEON GENERAL,
U.S. ARMY

FIGURE 33.


TYPHUS FEVER
LOUSE-BORNE & FLEA-BORNE
ALASKA
GREENLAND
DOMINION OF CANADA
UNITED STATES
NORTH PACIFIC OCEAN
NORTH ATLANTIC OCEAN
INDIAN OCEAN
SOUTH ATLANTIC OCEAN
SOUTH PACIFIC OCEAN
AUSTRALIA
BRAZIL
INTENSE
MODERATELY INTENSE
MODERATE
LOUSE-BORNE OR EPIDEMIC TYPHUS FEVER
FLEA-BORNE OR ENDEMIC TYPHUS FEVER
AREAS WHERE INFECTED RAT FLEAS HAVE BEEN REPORTED DURING THE PAST TEN YEARS. HUMAN DISEASE PROBABLY PRESENT.
TYPHUS FEVER REPORTED WITHIN THE LAST YEAR
PREPARED BY
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PREVENTIVE MEDICINE SERVICE,
OFFICE OF THE SURGEON GENERAL,
U.S. ARMY

FIGURE 34.

gional lymphadenitis and later general glandular enlargement. Fever lasts about 2 weeks. Weil-Felix positive, (OX19).
(4) Treatment: Symptomatic.
(5) Prevention: Avoidance of infested areas. Early removal of attached mites.

268. BACTERIAL INFECTIONS. a. Dysentery.
(1) Occurrence: General.
(2) Transmission: Ingestion of contaminated food or water. Flies.
(3) Diagnosis: Onset may be abrupt or condition may develop insidiously over several days. Bowel discharges loose, then watery, consisting only of mucus, pus and blood in later stages, without feculent material. Dehydration. Emaciation. Dysentery due to Shigella dysenteriae may have accompanying arthritis, iridocyclitis, due to exotoxin. Differentiate dysentery due to protozoa (Endamoeba, Balantidium), helminths (Strongyloides, Schistosoma) and dysentery accompanying systemic infections (malaria, typhoid, tuberculosis, leishmaniasis) or bowel neoplasm. Bacterial causes of bacillary dysentery:
(a) Shigella dysenteriae (highly pathogenic because of exotoxin).
(b) Organisms of paradysentery group.
(c) Organisms of Salmonella group.
Stool culture and proctoscopy important in diagnosis.
(4) Treatment.
(a) Nonspecific: Restore fluids and chlorides. Treat acidosis. Provide rest by flushing lower bowel 2-3 times daily with enemata of warm physiological saline solution. Adsorbents such as charcoal or kaolin 50-100 Gm. suspended in water q. 3-4 hours often helpful. Fatal perforations have resulted from use of kaolin in excessive doses.
(b) Specific: Sulfaguanidine 0.05 Gm. per Kg. followed by 3.5 Gm. q. 4 h. until number of stools in 24 hrs. is 5 or less; then give 3.5 Gm. q. 8 h. continuing for 96 hours after stools become normal. Succinylsulfathiazole (Sulfasuxidine) 0.25 Gm. per Kg. initially; then give 1/6 of this dose q. 4 h. until stools in 24 hrs. 5 or less; continue dose q. 8 h. until stools have been normal for 96 hours.
(c) Antitoxin: In bacteriologically diagnosed Shigella dysenteriae infections, monovalent antitoxin, 40-80 cc. intravenously after sensitivity tests.
(5) Prevention: Personal supervision of kitchen personnel. Avoidance of uncooked foods liable to contamination. Drink only recently boiled water from clean glassware. Acute alcoholism followed by enteritis may develop into frank dysentery. Resistant infections may respond to sulfadiazine or sulfathiazole.

b. Cholera.
(1) Occurrence: Endemic in India and China (Figure 35). Epidemics often follow natural disasters (flood, famine) or religious gatherings (pujas, pilgrimages).
(2) Transmission: Ingestion of contaminated food or water. Flies.
(3) Diagnosis: Violent onset. Diarrhea. Bowel discharges soon consist of cloudy white fluid containing epithelial cells, pus, and large numbers of V. cholerae. Dehydration and chloride loss become extreme. Suppression of urine. Differentiate from acute bacillary dysentery. Stool culture.
(4) Treatment: Restore fluids and chlorides (hypertonic saline). Treat circulatory collapse, acidosis and anuria. Plasma infusions.
(5) Prevention: Vaccination with killed organisms of local origin confers partial immunity lasting 6-12 months.

c. Plague.
(1) Occurrence: Widespread in the tropics (Figure 36).
(2) Transmission: Rat to man by bite of rat flea (bubonic plague). Man to man by droplet infection (pneumonic plague).
(3) Diagnosis: Abrupt onset of fever. Prostration. Buboes second to fifth day after onset. Rapid feeble pulse. Petechiae. Differentiate from typhus, severe pneumonia. Culture of gland juice, blood culture.
(4) Treatment: Supportive. Sulfonamide derivatives. (See par. 108, 236, 248-251).
(5) Prevention: Rat control. Rigid isolation of infected individuals. Quarantine contacts seven days. Vaccination with living avirulent strains (Otten).

CHOLERA

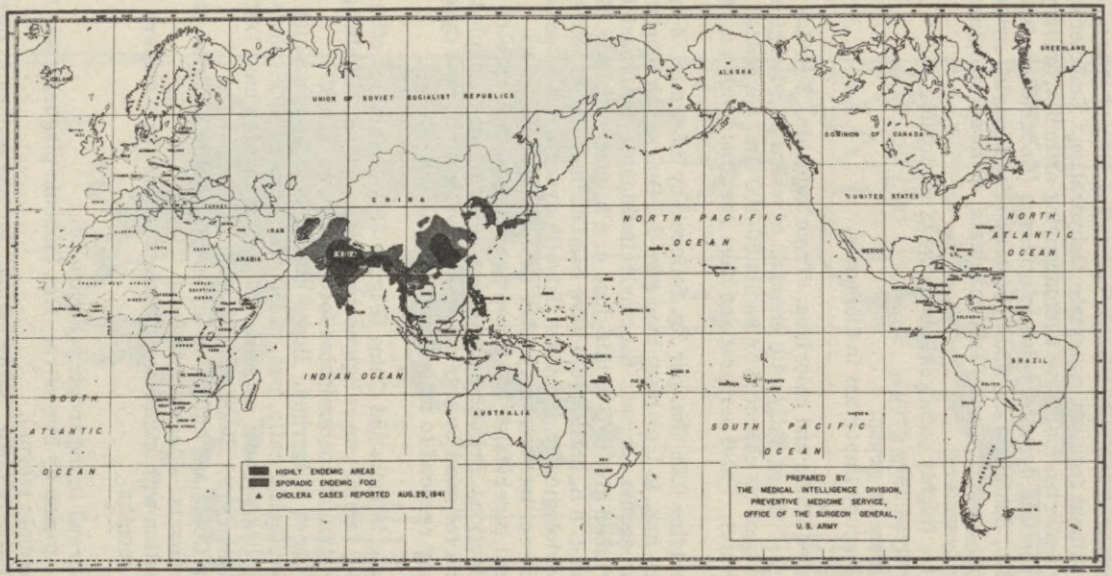


FIGURE 35.

PLAGUE

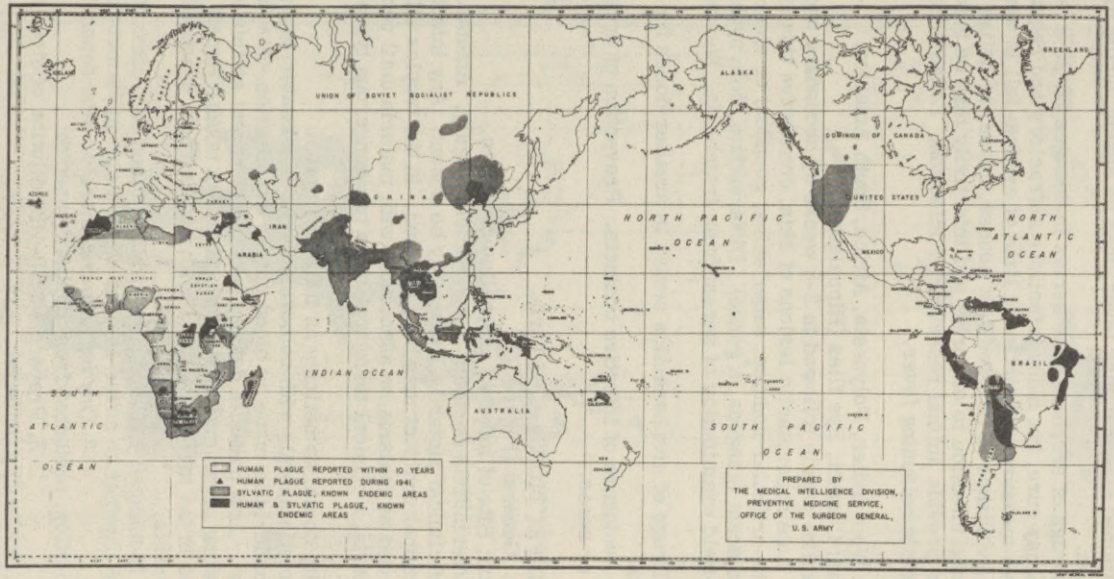


FIGURE 36.

269. SPIROCHETAL INFECTIONS. a. Relapsing fever.

(1) Occurrence: General throughout tropics.

(2) Transmission: Endemic: Soft ticks (Ornithodorus) infest dwellings or caves feeding on successive human visitors. Epidemic: Louse. Epidemics of relapsing fever often accompany epidemics of typhus.

(3) Diagnosis: Abrupt onset of fever continuing for period of 3-6 days with intermissions of equal or greater length. Headache. Mylagias, Jaundice developing with first relapse. Signs of bronchitis. Moderate hepatomegaly, splenomegaly. Differentiate from malaria, typhus, other infectious diseases with jaundice. Spirochete in fresh blood or stained smear during fever; may be absent during intermissions. Mouse inoculation.

(4) Treatment: Drugs of arsphenamine series in dosages 20-25% less than in syphilis. Single injection may cure, but many infections refractory and require prolonged treatment. Supportive measures important at time of critical fall in temperature.

(5) Prevention: Avoidance of infested rest houses, caves, or native huts in endemic areas. Ticks pass infection to offspring and infectivity may be retained 8 years or longer. Rodents provide animal reservoir of infection. Louse control measures necessary in epidemic relapsing fever.

b. Yaws.

(1) Occurrence: West Indies, Polynesia, Africa, South America.

(2) Transmission: Contact, Eye flies (Hippelates).

(3) Diagnosis: Initial papule followed in 2-8 weeks by secondary papular or frambesiform eruption. Late hyperplastic lesions of skin, connective tissue or periosteum (crab yaws, juxta-articular nodules, saber shins, goundou) or ulcerative lesions where bone and skin adjacent (gangosa, n'gonde). Differentiate from syphilis, leishmaniasis, leprosy. Dark-field examination of serum from frambesia. Wassermann or Kahn test.

(4) Treatment: Drugs of arsphenamine series in smaller doses for shorter period than usual in syphilis.

(5) Prevention: Avoidance of infective contacts. Prevention of access of eye flies to open wounds or sores.

270. PROTOZOAL INFECTIONS. a. Malaria.

(1) Occurrence: General (Figure 37).

(2) Transmission: Bite of infected anopheline mosquito.

(3) Diagnosis: Intermittent periodic fever. Splenomegaly. Anemia. Innumerable modifications of clinical picture. Fever may be absent. Any infectious disease or acute intraabdominal accident may be simulated. In the tropics all febrile illnesses should be regarded as malaria or associated with malaria until proved otherwise. Pernicious malaria, a clinical term applied to two dangerous types usually due to Pl. falciparum:

(a) malaria with coma, sometimes as initial symptom.

(b) acute hemolytic anemia with hemoglobinuria (blackwater fever).

Diagnosis of malaria is made by blood smear examination. May be negative in blackwater fever. Low parasite density because of recent antimalarial treatment may prevent finding organisms in first blood smear taken. Repeat blood examination at another phase in the malarial cycle. With experience, examination of thick smears is always preferable.

(Thick smear technique: 1. Place four drops of blood on a clean 25x75 mm. glass slide and smear together to cover an area about 2 cm. in diameter.

2. Dry for 2 hours (more or less depending on humidity) in horizontal position, protected from dust and insects.

3. Prepare a 1:10-1:20 dilution of stock Giemsa stain in distilled water, preferably buffered.

4. Flood slide and stain for 30-45 minutes.

5. Wash briefly in tap water.

6. Dry and examine. Plasmodia in these smears will differ in appearance from plasmodia found in the usual thin blood smear, but they can be easily recognized if search is made for dots of red chromatic, bits of blue cytoplasm

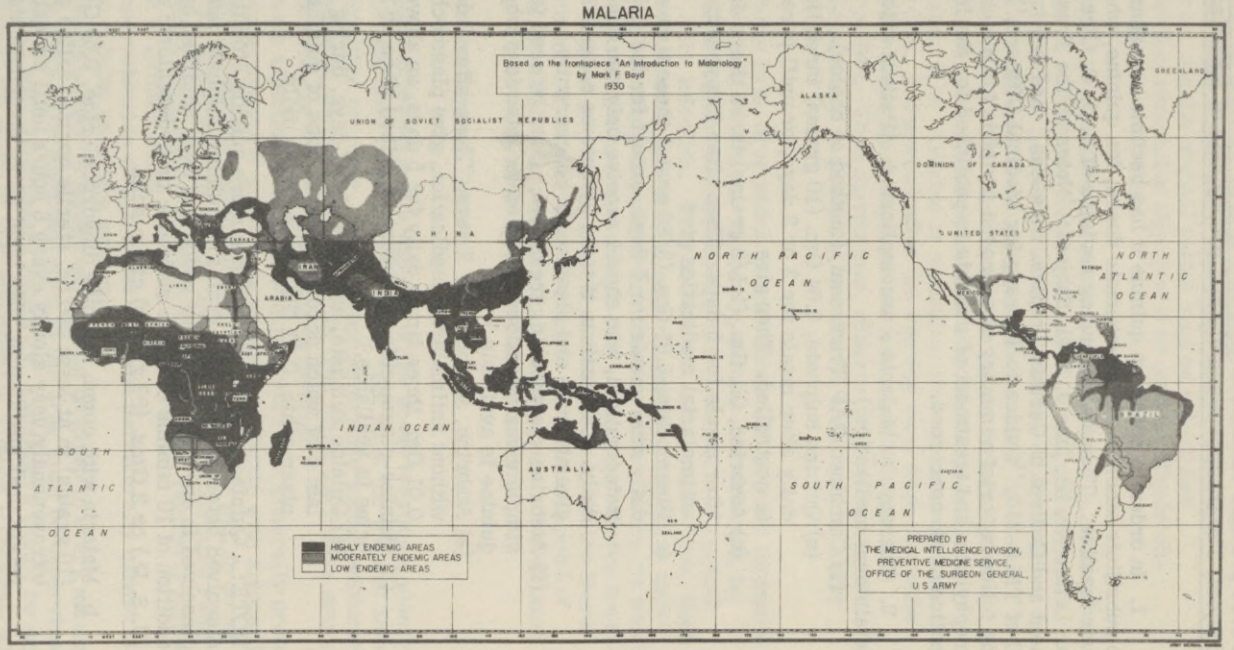

MALARIA
Based on the frontispiece "An Introduction to Malariology"
by Mark F Boyd
1930
UNION OF SOVIET SOCIALIST REPUBLICS
ALASKA
GREENLAND
DOMINION OF CANADA
UNITED STATES
CHINA
NORTH PACIFIC OCEAN
NORTH ATLANTIC OCEAN
ARABIA
INDIA
INDIAN OCEAN
AUSTRALIA
SOUTH ATLANTIC OCEAN
SOUTH PACIFIC OCEAN
HIGHLY ENDEMIC AREAS
MODERATELY ENDEMIC AREAS
LOW ENDEMIC AREAS
PREPARED BY
THE MEDICAL INTELLIGENCE DIVISION,
PREVENTIVE MEDICINE SERVICE,
OFFICE OF THE SURGEON GENERAL,
U S ARMY

FIGURE 37.

and the golden brown or gun-metal granules of pigment. These will be seen against a background of amorphous material representing the remains of hemolyzed cells, dotted with dark, pyknotic white-cell nuclei.)

(4) Treatment.

(a) Malaria.

1. Approved practice outlined in WD, SGO Circular Letter No. 135, October 21, 1942, Subject: The treatment and clinical prophylaxis of malaria:

1. In order to conserve quinine it has become necessary to substitute atabrine, in appropriate doses, for quinine, whenever feasible. Therefore, pending revision of S. G. O. Circular Letter No. 56, June 9, 1941, Subject: "Notes on the Treatment and Control of Certain Tropical Diseases," and Section VI of TM 8-210, "Guides to Therapy for Medical Officers," the following brief summary of approved methods for the chemoprophylaxis and treatment of malaria is published for the information of all concerned.

2. Therapy. a. Malaria - uncomplicated. (Patient able to retain oral medication.)

(1) Combined QAP Treatment, (method of choice).

(a) Quinine sulphate, 0.64 Gm. (10 grains) three times daily after meals for 2 or 3 days, or until pyrexia is controlled. Then give

(b) Atabrine, 0.1 Gm. (1 1/2 grains) three times daily after meals for 5 days. Then after 2 days without antimalarial medication give

(c) Plasmochin, 0.01 Gm. (3/20 grain) three times daily after meals for 5 days, except for the debilitated patient, who should receive only two doses daily. (Discontinue if toxic symptoms occur. Never give atabrine and plasmochin concurrently.)

(2) Atabrine-plasmochin treatment. (May be used for simple vivax infections and in other infections when no quinine is available.)

(a) Atabrine, as above for 7 days. Then, after 2 days without antimalarial medication, give plasmochin, 0.01 Gm. three times daily for 5 days, as above.

(3) Quinine-plasmochin treatment. (Method when no atabrine is available.)

(a) Quinine sulphate, as above, for 7 days, during the last 5 of which accompany each dose of quinine with plasmochin, 0.01 Gm. three times daily.

NOTE: - Quinine sulphate tablets are more quickly effective if dissolved before taken. Ten grains of quinine sulphate may be dissolved in one ounce of water which has been acidified by the addition of 10 minims of dilute sulphuric or hydrochloric acid. (U. S. P.) or 2 Gms. (30 grains) citric acid.

b. Malaria with coma. Quinine dihydrochloride, 0.64 Gm. (10 grains) in at least 200 cc. sterile normal saline given intravenously very slowly every 8 hours until patient can retain oral medication; then treat as an uncomplicated case. (see 2a.)

c. Malaria with vomiting (unable to retain oral medication).

(1) Quinine dihydrochloride, 01.0 Gm. (15 grains) in 10 cc. sterile normal saline injected carefully into the gluteal

muscles of one buttock; site of injection then massaged thoroughly for 2 minutes. Care must be taken to avoid the sciatic nerve. Dose may be repeated if necessary in 8 hours in other buttock. As soon as patient can retain oral medication treat as an uncomplicated case. (see 2a.)

(2) Atabrine dihydrochloride, 0.2 Gm. (3 grains) in 5 cc. sterile normal saline may be substituted for intramuscular injection if no quinine dihydrochloride is available.

3. Clinical Prophylaxis (suppressive treatment). a. Atabrine. Give 0.1 Gm. (1 1/2 grains) twice daily after meals on two days a week, allowing a 2 or 3 day interval between days of medication. Continue only while need for emergency suppressive treatment exists. (See note below). Then watch for indications of malaria, and, if required, give curative treatment as above (par. 2).

b. Quinine. If no atabrine is available, give quinine sulphate 0.64 Gm. (10 grains) after the evening meal each day while need for emergency suppressive treatment exists, (see note below). Then discontinue, observe for indications of malaria, and if required, give curative treatment as above (par. 2).

NOTE: - There is no drug which in safe doses will prevent mosquito borne infection with malaria. However, quinine and atabrine, in small doses, are useful in suppressing the appearance of clinical symptoms after infection. They are almost equally effective. Such suppressive treatment will enable malaria-infected troops to maneuver and fight actively in spite of an infection which otherwise would incapacitate them. When these troops stop taking suppressive treatment many of them may develop clinical malaria and require therapeutic treatment. It may be wise to stagger the terminal point of prophylactic medication so that hospital facilities are not overtaxed when a large force returns from a hyperendemic area.

For the Surgeon General:

2. Attention is called to the following aspects of the above treatment plan:

(a) The recommended dose of plasmochin (0.01 Gm. t.i.d. for 5 days) should not be exceeded in treating air crew. Overdosage may cause methemglobinemia and lower tolerance to anoxia. A dose of 0.01 Gm. b.i.d. for 3 days may prove sufficient for the needs of Air Forces flying personnel.

(b) The intravenous injection of quinine dihydrochloride is generally preferable to the intramuscular injection of the drug except in patients with myocardial disease. Inability to swallow, persistent vomiting, urgency and, in some instances, a need for the application of a rigid therapeutic test constitute valid indications for intravenous treatment. A fall in blood pressure regularly follows intravenous injection of quinine salts.

(c) Atabrine dihydrochloride should never be given parenterally except in an emergency when no quinine salts are available.

(d) If suppressive treatment is instituted, it must be given to every member of the exposed command. The administration of the drug must be supervised, preferably by an officer with disciplinary authority. Defaulters should be exposed by testing for quinine the urine of men suspected of evading treatment, and of men selected at random from the personnel of the unit.

(e) In British usage, atabrine is referred to as mepacrine or quinacrine, while plasmochin is known as pamaquin or praequine.

(b) Acute hemolytic anemia. Mild cases occur without evident hemoglobinuria. Severe ones show jaundice and hemoglobinuria (blackwater fever). Anuria makes the prognosis worse. Individualize treatment considering the following needs:

1. Shock (See par. 210-215).
2. Dehydration and acidosis (buffer solutions, alkalis).
3. Anemia (transfusion).
4. Anuria (hypertonic dextrose). Specific antimalarial treatment is contraindicated until the acute stage is past, and renal function has returned to normal.

(5) Prevention: Malaria control is mosquito control. Pernicious symptoms (coma, hemolytic anemia) can often be prevented by prompt treatment if blood smear examinations are routinely made and malaria always suspected, whatever the patient's complaint. Maintenance of normal fluid balance and alkalinization of urine are important in preventing pernicious complications. The control of malaria is outlined in the following WD, SGO Circular Letter No. 22, dated January 16, 1943, Subject: Military Malaria Control:

1. Introduction. The purpose of this letter is to provide Medical and Sanitary Corps officers with some practical details of measures for the control of malaria under military conditions.

2. Classification of control measures. Military malaria control requires the protection of troops in movement as well as in fixed positions. In each of these two situations both group and individual control measures must be considered. This is the basis for the following classifications.

a. Measures applicable to fixed installations.
   (1) Environmental measures.
      (a) Protection against adult mosquitoes.
         (1) Selecting camp site.
         (2) Screening buildings.
         (3) Spray-killing with pyrethrum extract.
      (b) Control of mosquito larvae.
         (1) Draining.
         (2) Filling.
         (3) Using larvicides.
         (4) Miscellaneous.
   (2) Individual measures.
      (a) Curative treatment.
      (b) Sleeping nets (mosquito bars).
      (c) Repellents.
      (d) Protective clothing.
      (e) Malaria instruction and discipline.

b. Measures applicable to field operations.
   (1) Individual measures.
      (a) Sleeping nets (mosquito bars).
      (b) Repellents.
      (c) Protective clothing.
      (d) Prophylactic treatment.
      (e) Malaria instruction and discipline.
   (2) Environmental measures.
      (a) Protection against adult mosquitoes.
         (1) Spray-killing with pyrethrum extract.
         (2) Selecting suitable camp sites.
      (b) Control of mosquito larvae.
         (Should be carried out whenever feasible)

3. Fixed installations. Effective control of malaria in permanent and semipermanent camps, posts, fields, and stations requires a high degree of cooperation and malaria discipline. Responsibility for malaria control is vested in the commanding officer who depends on Medical and Sanitary Corps officers for surveys, recommendations, and supervision, on Quartermaster and Engineer Corps officers for antimalaria supplies, equipment, and labor, and frequently on the latter corps for prosecution of control measures. Adequate protection in highly endemic areas is not possible without teamwork in planning, accomplishment, and maintenance of the antimalaria measures outlined below.

4. Proper selection of camps. The selection of a suitable camp site is an important antimalaria measure. Malaria is a communicable disease, with mosquitoes acting as the vectors. A native village in which there are numerous infected persons is a health hazard to troops that camps within flight distance of the malaria-carrying mosquito. So, too, a large breeding place of these mosquitoes, if located within easy flying distance of a camp is a menace. The effective flying range of malaria mosquitoes rarely exceeds a mile in the tropics but is apt to be more than this in temperate zones, or under exceptional conditions of wind or terrain in the tropics. As a rule, camps should always be located a mile from malarious villages or important breeding places of malaria mosquitoes. The importance of a breeding place depends not on its appearance or altogether on its size, but on the malaria-carrying capacity of the mosquitoes breeding on it. It is equally important, where feasible, not to allow natives to live on a military reservation, or within a mile of military quarters, for they provide an active pool of gametocytes.

5. Screening. The following general principles should be observed if screening is to give its full value as an antimalaria measure.

a. Suitable wire of proper mesh should be used. Many types of wire screening are made. Steel wire cloth is most common, either painted or electrogalvanized. The quality of paint and of galvanizing may vary greatly in different lots of wire. Pure copper wire, bronze wire (90 percent copper, 10 percent tin), monel wire (nickel-cobalt alloy), stainless steel, and aluminum have all been used. In most areas a good quality electrogalvanized screen will be satisfactory but in the tropics, especially along the sea, it is better to use wire of a noncorrosive material, such as bronze or aluminum. A hard drawn wire, 99.8 percent copper, and of heavy grade (having a diameter of 0.015 inch) is suitable. Aluminum wire screening is also good.

The diameters of wire and aperture are important. In general, it is not safe to use screening which has apertures larger than 0.0475 inch in diameter. Heavy grade copper wire screening, having 16 meshes to the inch, will have a wire diameter of 0.0150 inch and a mesh diameter of 0.0475 inch, but regular 16-mesh wire screening has an aperture of mesh measuring 0.0512 inch, which will not exclude all malaria vectors and will not keep out Aedes species. Standard 18-mesh wire screening has a wire diameter of 0.0090 to 0.0100 inch and a mesh which is 0.0456 inch in diameter.

b. The screening must be so applied that breakage will be minimal, and that the doors and windows will not facilitate mosquito passage. Screen doors should open outwards, and should be on the windward side of a building, if possible. They should be strongly constructed so that they will not sag or warp. They require springs so that they will close automatically. The places where a foot or hand would naturally be applied to open a screen door should be protected with a cross strip of wood or metal. Screen doors should shut against battens, which are strips of wood or metal, to block entry of mosquitoes through the space between door frame and door.

The zinc in certain paints sometimes used on door or window screen

night may be sprayed advantageously at dusk and again at midnight. It is not necessary, however, to spray native villages oftener than twice a week, since the aim here is to kill fed mosquitoes before they become infective, 9 to 12 days or more after feeding on a gametocyte carrier.

b. Pyrethrum insecticides. Pyrethrum flowers contain certain active principles which are grouped under the term pyrethrins, and which are extracted by kerosene or other solvents. These pyrethrins kill all species of mosquitoes and certain other insects by destructive action on the central nervous system. The sprays are nontoxic to man and animals (although liberal application of a kerosene-pyrethrum spray to the skin may cause local irritation and inflammation). Pyrethrins rapidly disintegrate by a photochemical catalytic reaction when exposed to sunlight and oxygen. Pyrethrum concentrate and sprays should be kept in tightly stoppered, light-proof containers. Containers should never be left open or in the sun. In sealed containers pyrethrum extracts will maintain their potency for a year or more even in the tropics. If a pyrethrum spray fails within three minutes to kill all the adult mosquitoes with which it comes into contact it no longer contains the standard amount of pyrethrins and is not suitable for use.

Three types of pyrethrum products are supplied by the Quartermaster. There is first a 20-1 concentrate, each gallon containing the oleoresins of approximately 20 pounds of flowers, with not less than 75 to 100 grams of total pyrethrins per gallon, or 2 to 2 1/2 grams per 100 cc. This 20-1 concentrate in Army practice is diluted with 14 parts of a good qualify of water-white, preferably odorless, kerosene and may be sprayed from various types of mechanical sprayers, such as are described below.

Secondly, in areas where there may be difficulty in obtaining kerosene for diluting the concentrate, a prepared ready-to use pyrethrum spray supplied. This conforms to Class AA rating, as defined in the Department of Commerce Standard Specifications. This rating is based on actual performance killing tests and these AA sprays will contain 150 to 180 mg. of pyrethrins or their equivalent per 100 cc. With either of the above sprays, about one-half ounce is required to spray effectively 1,000 cubic feet.

Finally, pyrethrum is supplied in containers holding a mixture of 20-1 concentrate, oil of sesame; and liquid freon, as described below.

c. Freon-pyrethrum aerosol. Pyrethrum may be dispersed from pressure cans or cylinders containing a mixture of 1 percent pyrethrins, 2 percent oil of of sesame, and 97 percent freon. (Freon 12 is dichloro-difluoromethane) The oil of sesame is a synergist or activator, and enhances the killing power of the pyrethrins. The vapor pressure of the freon produces the necessary spraying pressure, which does not decrease as long as a drop of liquid is present in the closed container. As the freon containing the insecticide is sprayed it forms a fine mist from which the solvent evaporates almost immediately, leaving the pyrethrum and sesame suspended in the air as a cloud of fine droplets called an aerosol. The freon is nontoxic to man and mosquito and it is noninflammable. It is used simply as an expellent to disperse the pyrethrum and oil of sesame.

The pressure in freon cylinders varies with temperature. For example, it is 37 lbs. per sq. in. at 40 degrees F., 84 lbs. at 80 degrees F., 116 lbs. at 100 degrees F., and 205 lbs. at 140 degrees F. Various types of freon-pyrethrum pressure cans and cylinders are available. One pound of freon-pyrethrum mixture is sufficient to spray about 150,000 cubic feet of space when properly used. It is liberated in 12 to 14 minutes of continuous use. To spray a room, hutment, or native dwelling, the can is carried rapidly toward all corners of roof, ceiling, or floor while the spray is allowed to escape. No direct spraying of mosquitoes should be attempted, as this wastes spray. About 4 seconds of spraying per 1,000 cubic feet is usually sufficient in military huts. Somewhat longer spraying for the same cubage is generally required for native huts. It is best to spray under the eaves of a hut before going inside. The freon-pyrethrum spray is so effective that it can be used sparingly and without wastage.

frames and the iron in galvanized nails sometimes used to fasten screening to a frame will react with copper screening and cause splitting at the point of contact.

In highly malarious areas it is desirable to have double screen door barriers with a vestibule between.

c. Careful attention must be paid to the closing of all possible apertures not screened, such as cracks and knotholes, spaces where floor or wallboards have separated, openings between flooring and walls, corner openings where joists come together, holes where window shutter prop sticks extend into a room for easy handling, ventilating pipes and shafts, etc. Holes may be covered with tin shingles or pieces cut from ordinary tin cans. A filler for holes and cracks may be made by boiling shredded paper and flour into a fairly homogenous mass and then adding sand and cement to form a plastic which may be moulded into the holes. This filler is somewhat pliable and will retain its place fairly well. Toilet paper is a suitable tissue for use in making this filler.

d. Not only sleeping quarters but also washrooms, latrines, theaters, post exchanges, and all places for evening recreation should be screened.

e. So far as possible, especially in the tropics, hutments and buildings should be so constructed that there is four-way ventilation. The screened buildings must not be so poorly ventilated that occupants are driven out into the open by excessive discomfort. It is wise to provide electric fans or punkas where possible in the tropics because they tend to make screening less irksome.

f. Proper routine maintenance of screening is essential, with prompt and effective repair of rents and tears, and discovery and blocking of new cracks and knotholes. In malarious areas the great importance of these apertures for mosquitoes is out of proportion to their seeming insignificance. The soldiers who occupy hutments and barracks should be taught to make all minor repairs. Strict supervision of screening is essential. Under some conditions it may be desirable to assign an enlisted man as mosquito-proofing maintenance orderly whose duties it would be to inspect all screening at regular intervals, making such repairs as are within his capabilities and reporting others to proper authorities.

6. Spray-killing adult mosquitoes. a. General principles. One of the most important measures of malaria control is the spray-killing of adult mosquitoes with pyrethrum extracts. This measure, when used against malaria vectors which rest indoors in the daytime, will (1) immediately destroy a high percentage of infective mosquitoes of an area, (2) destroy many potential vectors before they can become effective. The use of pyrethrum sprays will also have a repelling effect, deterring mosquitoes from entering sprayed dwellings or even circumscribed outdoor areas which have been sprayed. Finally, if applied often enough, spray-killing will reduce the density of a mosquito population in an area.

In malaria seasons, it is essential to spray all types of adult mosquito resting places. Whenever possible, such spraying should be extended to native villages within a radius of a mile. Shelters may include not only barracks, houses, hutments, and tents, but also outbuildings, latrines, storehouses, stables, cowsheds, empty boxes and barrels, etc. If troops are operating in hostile areas, local villagers may abandon their homes, leaving behind infective mosquitoes. It may be even more important to spray such villages than the actual quarters of the troops. If the malaria vectors tend to leave houses, tents, and barracks at sunrise the spraying should be done either before dawn or after sunset. When applied after sunset the spray will have both a killing and repelling effect.

In military installations in highly malarious areas daily spraying is advisable. Huts at road blocks, sentry huts, huts used by beach patrols, antitank gun emplacements, pill boxes, and similar places when occupied at

When a mixture of freon and the usual pyrethrum concentrate freezes, a wax is precipitated which may block the tube of the dispenser. The wax goes back into solution after a few days at 70 degrees F. or higher so that this freezing effect is rarely troublesome in actual practice, especially since the dispenser is generally used in warm countries. Within a few months a wax-free concentrate will be available.

d. Hand atomizers or spray guns. Small household-type spray guns are useful for casual spraying of quarters. Where mosquitoes are a nuisance small spray gun atomizers should be issued at the rate of one per 20 men. They consume relatively greater amounts of insecticide than other types of sprayers but may be used to advantage by the troops themselves for occasional spraying.

e. Paint gun sprayer assemblies. Pyrethrum insecticides can be effectively sprayed through any ordinary paint gun if a source of air pressure of 15 pounds or more is supplied. The source of the pressure may be in tanks pumped up by hand or by gasoline or electric motor-driven compressors. Solidified carbon dioxide (dry ice) when available, in suitably constructed pressure tanks is a good expedient.

7. Drainage. It is highly important that fixed installations have suitable antimosquito drainage, integrated with the usual system of drains designed to carry the normal surface water runoff. Drainage should be undertaken early, during the actual construction period. It is desirable to have it well in hand, before the camp or station is occupied. It is also important to avoid blocking an existing draining system by new constructions.

No drainage scheme should be undertaken without careful preliminary surveying and planning. Drainage to control mosquitoes may be accomplished by the use of surface ditches, subsurface drains, vertical drains, pumps, tide gates, and other devices. In every case the aim is to drain an area in such a way that regardless of weather or tide there will be no mosquito breeding. Ditches and drains may be unlined, lined, or rock filled. The lining may be precast sectional inverts, concrete or stone slabs, rip rap, or other material. For subsurface drains many materials have been utilitized, as for example, baked clay or concrete tile, rock, bamboo, and brush.

Drains should be as few as will accomplish the purpose. Drainage requires that careful levels be run and that well-though-out plans be made as to the relation of a drainage system to existing water supplies, to other sanitary improvements, to disposal of sewage, and to maximum amount of water to be carried in the rainiest season. In some areas, where the vector breeds in seepage or in slowly running water, open ditches may cause a greater malaria nuisance than the swamp they drain.

Where a satisfactory outlet is not available, land may sometimes be graded so that surface water accumulates in one or more pools which can be periodically treated with larvicides.

Ditch maintenance is a very important item for which adequate provision must be made.

8. Filling. It is usually necessary to do a considerable amount of filling on the site of a new permanent installation. Frequently, there will be a man-made depressions under buildings, beside roadways, and in other places where earth has been borrowed for various purposes. When large hydraulic fills are contemplated for construction purposes, it is necessary to make adequate plans to avoid blocking natural drainage and to control with larvicides the breeding places, such as pools and cracks, created by filling operations.

9. Larvicidal oiling. a. Discussion. Suitable oils, properly applied, will kill the aquatic stages of all species of mosquitoes and will also destroy sheltering vegetation at the edges of breeding places. The chief killing factor is a toxic action following contact with the tracheal cells of larvae and pupae.

Consequently, the best larvicidal oils are those which penetrate most quickly, and with the greatest toxic effect, into the spiracles and thence into the tracheae, of larvae and pupae. What is required is a cheap but toxic oil or mixture of oils of suitable toxicity and viscosity which, when sprayed on the surface of the water, spreads well in a uniform, persistent, and stable film. The best larvicidal oils will kill in less than 30 minutes under these conditions.

Kerosene or gasoline may be used as larvicides and will give a good kill but they form transitory films, are expensive, and may constitute a fire hazard. Occasionally it may be desirable to kill all larvae in a well by a film of gasoline, which soon evaporates, leaving no taste in the water. Leaded gasoline should not be used in wells the water of which is used for drinking.

Waste motor oils are not highly toxic to larvae, as they are relatively nonvolatile. But they are sometimes used effectively when applied as a fairly thick film. Better results are possible when waste motor oil is mixed with kerosene, generally in the proportion of 1 to 3, respectively, adding if possible about 2 percent of castor oil. However, the amount of kerosene to be added will have to be determined by experiment.

Diesel Oil No. 2, as supplied by the Corps of Engineers, is preferable to a mixture of waste oil and kerosene.

The ideal specifications for a larvicidal oil are the following:

Specific gravity 20/4	0.83 - 0.86
Viscosity (Saybolt Universal at 100° F.)	31 - 43
Initial boiling point	297° - 414° F. (165° - 230° C.)
Final boiling point	Max. 800° F. (426.7° C.)
Spreading coefficient	Min. 17.0

b. Application of oil. General. Oil may be effectively applied to small collections of water by means of an oil-soaked broom, an oil mop, or oil-soaked waste tied to a stick. An ordinary waterpot may be used to pour oil on small collections of water.

c. Sprayers. The knapsack sprayer consists of oil container, hand pump, and spray nozzle, and is carried and operated by one man. The ordinary sprayer has a capacity of 4 to 5 gallons and a spraying range of about 25 feet. The knapsack sprayer is a practical and economical apparatus for applying oil to ditches, small ponds, or other collections of water which can be reached by the spray. Large power sprayers may be employed to oil extensive areas such as the borders of lakes, or, in some instances, swampy places. Such sprayers usually consist of a barrel or tank container and a motor activated pump mounted on a vehicle or boat. Air planes may be equipped to oil extensive breeding areas.

d. Continuous oilers. Where oil will be dispersed by currents, as in streams or ditches, it may be better to attempt constant application of oil. There are at least three types of continuous oilers, none of which is entirely satisfactory. It must be pointed out that continuous oilers require a good deal of attention, generally use more oil than would be dispensed for the same area from a knapsack sprayer, and should not be used unless other methods are found impractical.

Drip oilers consist of a tin or drum of about 5 gallons capacity, placed on supports over a stream or ditch so that oil will drip on the water surface. Size of hole will govern amount of oil dropping from the container. In homemade containers a nail hole may be used, with a nail left loosely in the hole. It may be necessary to use some string to form a washer around the nail head. The can should be several feet higher than the stream surface so that oil will spread quickly when drops strike the water. The rate of flow required to furnish a satisfactory film depends on circumstances. Generally, an average flow of from 10 to 20 drops per minute will suffice for each foot of width of water in the stream.

Submerged oilers are containers having two small openings. They are designed so that when sunk to the bottom of a stream or pond their oil will

escape through one opening and be replaced by water which enters through the other. These cans have the disadvantage that they are difficult to adjust so that oil will flow properly, as the openings are easily clogged.

Oil may be applied continuously by means of a weighted submerged bag of oil-soaked sawdust. Or oil-soaked sawdust may be scattered over the surface of a breeding place.

Oil booms may be used to combat larval drift, which is sometimes troublesome when there is intense breeding in a stream above the area being controlled. These booms may be constructed of locally obtained materials and placed across a water channel, supported by stakes. The booms are so built that, while holding back larvae, the flow of water is not obstructed. The larvae are killed by oil-soaked sawdust or chaff thrown on the water surface above the boom.

e. Amounts of oil required. Using Diesel Oil No. 2, about 9 gallons are required per acre of water surface for complete coverage with a uniform, stable oil film. With an ordinary knapsack sprayer of the Panama type one laborer can oil about five acres of breeding area per day, if the terrain is not difficult. In usual practice the amount of oil necessary to produce a uniform film may vary from 10 to 20 gallons per acre. The amount of floatage and vegetation will make a considerable difference. It is usually necessary to spread oil once a week.

10. Spreading Paris green on mosquito breeding places. a. Nature of Paris green. Paris green (an aceto-arsenite of copper) is a micro-crystalline powder. It should be emerald green, with at least 50 percent arsenious oxide. Its solubility should not exeeed 3 percent. Paris green should pass a 300 to 325-mesh sieve. The latter has a mesh opening measuring 0.043 mm. As mixed, ready for distribution in the field, Paris green should kill all 2d, 3d, and 4th stage larvae in a laboratory jar in two hours. It has a specific gravity greater than that of water, but certain types float longer than others. The longer it floats the better it is as an anopheline larvicide.

The usefulness of Paris green depends on the fact that it is a gut poison for larvae. Larvae feeding at the surface will ingest Paris green particles. This is especially true of Anopheles larvae, but when Paris green floats long enough in still water it will be ingested by Aedes and some Culex larvae, which feed some of the time at the surface. Sometimes when Paris green is mixed with wet sand and taken to the bottom it will be ingested by bottom feeding larvae. Paris green, however, has its greatest usefulness against Anopheles larvae.

Paris green, after sinking, is usually volatilized by various moulds in the water. As ordinarily used in mosquito control procedure, it is harmless to man, animals, fishes, and bankside or floating vegetation. Paris green does not repel ovipositing mosquitoes and in this respect is inferior to oil.

b. Dust dilutions of Paris green. When dust mixtures are used it is advisable to prepare a diluent which will pass a 30-mesh screen, or finer. This diluent may be road dust, powdered charcoal, slaked lime, powdered soapstone, or some other dust. The diluent must be well mixed with Paris green, the required dilution varying from 1 to 5 percent by volume for hand operated blowers to 25 percent or more for dusting from airplanes. When lime is used Paris green may be added in the proportion of 10 percent by weight. This is equivalent to about 5 percent by volume.

However distributed, it is essential to test the efficacy of Paris green in the field from time to time. This may be done by ascertaining the kill in petri dishes containing larvae and placed at strategic points in the dusted area, or by dipping for larvae 10 to 24 hours after application of the Paris green and noting the survivals.

c. Types of dust distributors. Paris green mixtures can be applied to ponds, lakes, and larger streams by putting the dust into the air from the windward side so that it will form a cloud and be carried out over the

water. The large hand or motor operated dust blowers ordinarily employed for dusting trees in horticultural work, may be used to throw the larvicidal dust into the air. These may be knapsack, rotary, or some other type. For large bodies of water a slowly settling dust cloud carried along by a light wind will give best results. In the case of small bodies of water where vegetation is heavy or where ditches and streams are too narrow to be dusted by the cloud method handfuls of dust mixture should be thrown directly on or into the vegetation or onto the surface of the water. There are also automatic distributors for small canals or streams. Airplanes may be used to apply the dust over large areas, such as extensive swamps. Generally, the best results will be obtained on a sunny day after the dew has evaporated from vegetation.

It should be remembered that, when special distributors are not available, Paris green mixed with wet or dry sand, gravel or small pebbles, and thrown by hand is often quite effective.

The amount of larvicide required to treat an area of given size will vary according to the amount of vegetation present. When the surface of the water is clear, about one-half ounce of Paris green, mixed with 99 parts of dust by volume, is sufficient for 1,000 square feet of water surface. Greater quantities of Paris green must be used where there is vegetation, such as grass or reeds. The percentage of Paris green in such places should be from 2 to 5 percent by volume, as determined by experiment.

One man can usually prepare and spread Paris green mixture along about 1 1/4 miles of bank in one day, depending, of course, on local conditions.

Since Paris green will kill 2d, 3d, and 4th stage larvae within a few hours it need be applied only at such intervals as are necessary to prevent the development of the remaining 1st stage larvae or of new broods of larvae. Under average conditions Paris green should be applied at intervals of from 5 to 7 days in warm weather. Dusting should be repeated without delay whenever examination of the water reveals the presence of 4th stage larvae.

d. Dustless application of Paris green. The need for preparing and transporting dust diluents is obviated by using a dustless method with the following stock suspension:

Kerosene oil	1 pint
Paris green	1/2 pint
Egg albumen (dry powdered)	1/4 teaspoonful

(If no powdered egg albumen is available an albumen solution can be prepared by using 4 to 6 egg whites in a pint of water. Use one-fourth of a pint of this solution to one pint of kerosene. The egg albumen is not absolutely essential but it tends to make the Paris green more evenly distributed in the final spray.) The ingredients are put into a bottle in the order named and thoroughly shaken. This stock suspension, again thoroughly shaken, may be put into vials, each holding 6 teaspoonfuls (about 27 cc.). These stoppered vials may be taken to the field by the spraying laborer in a specially made belt.

To prepare the final spray one vial, or 25 to 27 cc. of stock suspension, is mixed with 5 quarts of water. It reduces the labor of transportation if the mixing is done at the breeding place to be sprayed. The water should be strained through a sieve and the mixing may be done in the usual knapsack sprayer , which generally has about 4-gallon capacity. By using only 5 quarts of final spray at one time in this sprayer it is possible by frequent agitation to keep the spray well mixed while it is being applied. About 500 square feet can be sprayed with 5 quarts of this spray.

About 2 teaspoonfuls of castor oil in 5 quarts of spray will add to the effectiveness of this dustless Paris green larvicide.

When it is not possible to prepare the above stock suspension, fairly good results may be had with a simple mixture of 5 teaspoonfuls (about 22.5 cc.) of Paris green in 5 quarts of water, using an ordinary knapsack sprayer. Almost continuous agitation of the sprayer while spraying is advisable.

Some 500 square feet of breeding area can be sprayed with 5 quarts of this larvicide.

11. Care of equipment. Equipment for spreading oil or Paris green larvicides requires careful maintenance. It should be overhauled and thoroughly cleaned at reasonable intervals. Full sets of replacement parts should be stocked.

12. Phenothiazine. It has been shown that phenothiazine is an effective substitute for Paris green. If available, in the absence of Paris green, it may be used. It is less stable than Paris green but lighter in weight.

13. Miscellaneous measures to deal with breeding places. In some areas effective larva control may be had by shading a stream or canal, using some rapidly growing plant which will give a dense cover.

In other areas, stream breeding anopheline vectors may be controlled by periodically sluicing the stream. A small dam is built to impound water which can be released by the hand or mechanical removal of a barrier, or by use of automatic siphons. Where irrigation water in rice fields or canals is at fault, effective mosquito control is sometimes possible by intermitting the supply of of water so that the fields become just dry enough each week to remove the surface film of moisture without drying the roots of the plants. Fluctuation of water level in ponds and reservoirs is sometimes very effective in controlling mosquito breeding.

All wet cultivation, such as sugar cane or rice, within two miles of any fixed Army installation, should be eliminated, if feasible.

When larvicides such as oil and Paris green are not available, control of breeding is sometimes possible by tightly packing a ditch or small pool with fresh green-cut vegetation. Unless tightly packed and renewed as required, the rotting vegetation may create conditions leading to increased culicine breeding.

In some areas routine attention must be paid to artificial breeding places such as wells, cisterns, roof gutters, and various types of household water containers, tin cans, coconut shells and the crotch of banana leaves where they join the trunk. These may be screened, emptied, oiled, or destroyed, as indicated.

In wells and in pools without much vegetation somehelp in larva control may be had by using larva-eating fishes, such as Gambusia affinis

14. Treatment (curative). (See par. 270a.(4)(a)1.).

15. Malaria control in the field. "Fighting" malaria, or the prophylaxis of malaria among troops in combat or maneuver areas in the field, is one of the most difficult of all malaria control problems. It requires constant attention to the application of individual protective measures against mosquitoes and to the use of suppressive antimalarial drugs. There must be the greatest accent on personal prophylaxis. The soldier must himself apply measures which will protect him from malaria. Under combat conditions the need for freedom from malaria is greatest. Under these conditions the risk of infection is maximal. Therefore, it is highly important to apply effectively such measures as suppressive treatment and the use of sleeping nets, repellents, sprays, and protective clothing.

16. Use of sleeping nets. Nets to protect sleeping individuals are useful in preventing malaria but they must be properly employed and properly maintained. They must be so adjusted and used that mosquitoes cannot feed through the mesh because the net touches the individual. The lower edge must be so tucked in that no opening is available for mosquitoes to enter. Overhead frames should be provided for bed and cot nets. These

should not have sharp points which will catch and tear the netting. Nets used in small tents should be suspended from and conform to the shape of the interior of the tent. Shelter tent nets should not be used over the outside of the tents but hung inside. Nets should be folded up by day. When the net is entered at night the interior should be inspected for stray mosquitoes.

It is highly important that nets be available for use from the first night spent in malarious areas. There are places in the tropics where a single night of exposure to mosquito bites may result in a 20 percent or greater infection rate among the exposed troops. Nets should therefore be carried as items of personal equipment by all personnel proceeding to malarious zones. Even in the forward areas it is highly important to utilize this protective measure whenever feasible.

The best material for nets is a stiff bobbinet. Such materials as cheesecloth, tobacco cloth and butter cloth, are not suitable because they almost completely prevent proper ventilation. The size of the holes should not exceed 0.0500 inch in any dimension to exclude all species of mosquitoes. To exclude sandflies the largest permissible diameter is 0.0334 inch. The top as well as sides should be of netting to allow for a better circulation of air. Strong reinforcing at corners is necessary and repairs should be prompt and complete. Adhesive tape, sewing, or patching may be used to repair rents in the netting. Frequent inspection is required.

17. Use of chemical repellents. Various essential oils and synthetic products have been used, as creams or lotions applied to the skin, to repel mosquitoes. Most mosquito repellents have had one or both of two major defects: (1) very transitory or weak effect, and (2) risk of toxic poisoning by absorption through the skin, especially when the repellent must be used liberally during extended periods of time. For example, diethyleneglycol is a mosquito repellent but it is reported to be toxic when absorbed through the skin and apt to damage kidney and liver tissue if used freely for a considerable time.

There are three good repellents (612, indalone, and dimethylphthalate) which are being issued by the Quartermaster. Of these 612 will give good protection against mosquitoes for about four hours after liberal application, even under sweating conditions. Indalone will be about as well, except under sweating conditions when it should be renewed half-hourly. Dimethylphthalate is slightly less effective than 612, but more effective than indalone. All are better than any repellents available heretofore.

Certainly, very much greater use than ever before should be made of these repellents when troops are in forward areas. All exposed skin surface should be covered with the repellent. It is also important to apply the repelleneto to the clothes where they are so thin or so taut that mosquitoes can feed through the cloth as, for example, over the shoulders and seat. Repellents should not be applied to the lips, nor allowed to reach the eyes.

18. Use of protective clothing. Men on guard duty or forced to remain out after dusk where malaria-carrying mosquitoes are common, may wear approved head nets and gloves as supplementary protective measures. Head nets have certain disadvantages. They impair vision and add to discomfort in the tropics. Vision is least impaired by black nets. Shirt sleeves should be kept down after sunset. Slacks, not shorts, should be worn. By keeping the trouser legs encased in leggings, or tucked into high boots, mosquitoes are kept from biting the ankles. Mosquito boots of canvas, suede, or goatskin may be useful if long enough to protect the leg nearly to the knee. Such light boots are not suitable for marching, which requires service shoes with leggings.

The efficiency of protective clothing varies directly with the amount of inspection and discipline which can be applied.

19. Pyrethrum sprays. (See par. 6, this letter, and par. 180 of text).

20. Instruction of personnel. The instruction of all ranks in regard to malaria and malaria control is important, and it should begin in the continental training bases, even if these are not malarious. The nature of malaria, cycle of development of plasmodium, role of Anopheles mosquitoes, and the fact that the disease can be prevented only by special measures, should be explained briefly in simple terms. Full use should be made of moving pictures and of locally prepared talks, bulletins, and directives. An important point to be stressed is that malaria cannot be prevented by routine camp sanitation or personal hygiene. Specific control measures are essential. In permanent and semipermanent posts and camps a high degree of protection against malaria is afforded by employing measures outlined above. In forward or combat zones and while maneuvering or holding defense positions in the field away from fixed installations, especially in tropical countries, the most feasible malaria control measures are those for which the individual soldier himself must be responsible to a very large extent.

21. Drug prophylaxis or suppressive treatment. (See par. 270a.(4)(a)1.3).

22. Miscellaneous. a. Nocturnal visits to unprotected places. In some areas a high percentage of all malaria infections is acquired while soldiers are visiting unprotected towns or villages after dark. In such areas it is advisable to consider a change in the usual leave hours whereby passes are issued which will require the soldier to return to his protected camp by nightfall.

b. Malaria discipline. Malaria discipline is defined as a state of orderly and effective conduct or action on the part of soldiers in respect to malaria control. It implies ability and readiness to practice malaria control, as outlined above, particularly the individual measures. When there is malaria discipline in a company, screens, and bed nets are in good repair and are properly used, protective clothing and repellents are employed to the fullest practical extent, suppressive treatment is faithfully taken as ordered, and men do not expose themselves heedlessly to mosquito bites. Good malaria discipline reduces to a minimum such dangerous practices as loitering, fishing, or swimming after dusk in malarious places.

Malaria discipline is developed by careful indoctrination of officers and enlisted men, and it presupposes constant supervision by those in command.

Malaria control is never automatic. In highly infested areas it requires of the Medical and Sanitary Corps officers concerned unremitting attention to small detials. Success is possible only when there is a high degree of cooperation among all ranks and all branches in outwitting the Anopheles mosquito.

For the Surgeon General:

b. Amebiasis.
(1) Occurrence: General, especially in hot, wet climates.
(2) Transmission: Contaminated food or drink. Flies.
(3) Diagnosis: Symptoms may be absent (chronic carrier) or may vary from mild abdominal discomfort to those of active dysentery with marked tenesmus. Some cases resemble acute appendicitis. Laparotomyiif performed is often fatal. Invasion of liver by amebae leads to hepatitis, later to abscess. Pyogenic infection of abscess given signs of sepsis, in tropics often mistaken for malaria. Differentiate from other types of dysentery, acute abdominal conditions, fevers.

(4) Treatment:
(a) Asymptomatic carriers.
1. Carbarsone 0.25 Gm. b.i.d. for 10 days.
2. Chiniofon (yatren, anayodin) 1.0 Gm. t.i.d. for 10 days. The drug itself may cause diarrhea. Do not confuse this toxic symptom with relapse of the amebic infection.
3. Diodoquin 1.5-2.0 Gm. daily for 2-3 weeks.
(b) Acute or chronic amebic dysentery.
1. Emetine hydrochloride 0.06 Gm. i.m. daily for 6 days unless symptoms relieved in shorter time; followed by 0.03 Gm. b.i.d. for 6 days if needed. Watch for symptoms of toxicity (myocarditis, neuritis).
2. Follow emetine with one of drugs mentioned in par. (4)(a) above. Relapse is frequent and treatment must often be prolonged.
(c) Liver abscess.
1. Emetine hydrochloride as above followed by other drugs if needed. Aspirate only if, despite treatment, pain or fever continues (secondary infection) or rupture threatens.
(5) Prevention: As given under bacillary dysentery.

c. Leishmaniasis.
(1) Occurrence.
(a) Visceral (kala-azar): Mediterranean basin, Northern Africa, Near East, India, China and parts of South America.
(b) Cutaneous (oriental sore): Mediterranean basin, North Africa, Near East, but not in same areas as visceral leishmaniasis.
(c) Mecocutanous (espundia): Mexico, Central and South America.
(2) Transmission: Bite of sandfly (Phlebotomus).
(3) Diagnosis:
(a) Visceral: Insidious onset of fever. Progressive hepatosplenomegaly with anemia and marked leucopenia. Emaciation. Culture or smear of peripheral blood, bone marrow, or of material obtained by spleen or liver puncture.
(b) Cutaneous, mucocutaneous: Papule developing into spreading indolent phagedenic ulcer. Culture or smear of material from ulcer margin.
(4) Treatment:
(a) Visceral.
1. Stibamine glucoside (neostam): Freshly prepared 2% solution given intravenously alternate days. Initial dose 0.05 Gm. Increase each dose by 0.05 Gm. to level of 0.2 Gm.
2. Antimony and potassium tartrate (tarter emetic): Fresh 2% solution intravenously on alternate days. Initial dose 0.04 Gm. Increase each dose by 0.02 Gm. to level of 0.1 Gm. Continue at this level to a total dose of 4.0 Gm.
3. Fuadin (stibophen, neoantimosan): 6.3% sol., 1.5, 3.5 and 5.0 cc. intramuscularly successive days followed by 5.0 cc. on alternate days for a total of 10 doses.
(b) Cutaneous and mucocutaneous leishmaniasis: Local treatment: Berberine sulfate 1% solution 2 cc. injected into margins of ulcer. Systemic treatment as outlined above.
(c) Toxic symptoms: Neostam:gastroenteritis, nepatitis, anaphylactoid reaction, occasionally collapse, after 6 or 7 injections. Tartar emetic and fuadin: cough, vomiting, arthralgias, late in course. Bradycardia occasionally necessitates discontinuance.
(5) Prevention: Avoidance of contacts. Screening to exclude sandflies (46 count bobbinet).

d. Trypanosomiasis.
(1) Occurrence: Africa - South of 15° N. Lat.; South America - in Brazil and adjacent states.
(2) Transmission:
(a) African type: Bite of tsetse fly (Glossina).
(b) South American type: Bite of assassin bug (Triatoma).
(3) Diagnosis:

(a) African type. Gradual onset of remittent fever. Tachycardia. Erythematous dermatitis. General glandular enlargement. Occipital adenopathy common. Hepatosplenomegaly. Deep hyperesthesia (Kerandel's sign). Increasing somnolence. Examine fresh blood or stained smear, gland juice or CSF for trypanosomes.
(b) South American type (Chagas' disease); Severity varies. Often seen in infants. Edema of the lids and face. Conjunctivitis and other ocular symptoms. Bradycardia. Myocarditis. General glandular enlargement. Examine blood (early cases only) for trypanosomes; bone marrow or tissue for leishmania forms.

(4) Treatment:

(a) African trypanosomiasis: Bayer 205 (moranyl, entrypol, suramin, naphuridine Winthrop, germanin) 1.0 Gm. intravenously in 10 cc. of distilled water weekly for 10 weeks. Tryparsamide 0.45 Gm. per Kg. of body weight intravenously, once weekly for 15 weeks. Toxic effects of tryparsamide: hepatitis, optic neuritis.
(b) South American trypanosomiasis: No effective treatment.

271. HELMINTHIC INFECTIONS.

a. Filariasis.

(1) Occurrence: General.

(2) Transmission: Varies with species. Bancroft's filariasis (commonest type) - Mosquito. In Central America and in Africa the small black fly (Simulium) transmits onchocerciasis. In Africa, a large horse fly (Chrysops) carries infective larvae of loiasis.

(3) Diagnosis:

(a) Bancroft's filariasis: Adults develop in lymph glands. Are essentially asymptomatic until occurrence of lymphatic obstruction (lymphocele) caused by host tissue reaction to presence of dead adults. Superimposed bacterial infection gives elephantoid fever. Microfilariae in peripheral blood during night (nocturnal periodicity).
(b) Onchocerciasis: Adults in subcutaneous nodules (Guatemala nodules). Dermatitis and ocular complications (keratitis) caused by migration of microfilariae. Biopsy of nodule shows adults or microfilariae in adjacent skin.
(c) Loiasis: Adult worms in subcutaneous tissue or beneath conjunctivae. Fugitive swellings. Microfilariae in peripheral blood by day (diurnal periodicity).

(4) Treatment: Surgical removal of adult worms when accessible, especially applicable in onchocerciasis.

(5) Prevention: Protection from bites of infected insects.

b. Schistosomiasis.

(1) Occurrence: Widespread, especially in great tropical river valleys.

(2) Transmission: Viable ova in urine or feces find access to water. Miracidium hatches and enters intermediate snail host. In snail there develop cercariae which, after emergence from snail, are infective for man by ingestion or by penetration of unbroken skin. Adults develop in venules of portal system, or of urinary bladder later depositing ova which excite local fibrosis. Papillomata develop in rectum or bladder which ulcerate, releasing ova into bowel or bladder lumen.

(3) Diagnosis: Dermatitis at site of entry. Fever, urticaria 2-8 weeks later. Hepatosplenomegaly, ascites; rectal polyps, melena; vesical papillomata, hematuria. Diagnosis by demonstration of ova in stool or urine.

(4) Treatment:

(a) Antimony and potassium tartrate as described in 270c.(4)(a)2.).
(b) Fuadin. (See par. 270c.(4)(a)3.).

(5) Prevention:

(a) Avoid swimming or wading in infected water.
(b) Boil or keep water for 36 hours before drinking.
(c) Copper sulfate 1:200,000 will kill snails which are obligate intermediate hosts of cercariae.

272. MILITARY PROBLEMS. a. Effective preventive measures must be taken before exposure to tropical infection actually occurs. Under ordinary conditions, success in pre-

vention will largely depend upon the equipment, training, discipline, and education of the military unit concerned.

b. Equipment. Adequate supplies of food are necessary to the health of a military unit on duty in the tropics, more so than for units serving in temperate zones. Drugs are needed, as are nets, screens, and other items of equipment. Adequate supplies must be available, or disease will result. When circumstances of combat interrupt the regular supply lines disease occurs, as on Bataan.

c. Training. Health in the tropics is in large part a matter of successful adaptation to a new environment, an adaptation which is partly physiologic, partly psychologic and to a very large degree hygienic. Previous to exposure to jungle or desert conditions troops should be rigorously conditioned by prolonged training under simulated combat conditions. The medical personnel should be included in the training program and medical officers should acquire experience in preparing sanitary orders. These must be enforced in every detail, but enforcement is not enough. For scrupulous observance of sanitary orders a high standard of discipline affecting every member of the unit is required.

d. Discipline. Poorly disciplined troops suffer heavily from disease and death in the tropics. Good discipline is essential to:

(1) Camp sanitation. The proper disposal of waste matter as prescribed in FM 8-40 is necessary in the tropics to prevent the breeding of flies and dissemination of diseases. In the moist heat of the jungle the rate of development of the fly is so greatly accelerated that a camp will swarm with them within a few days unless adequate measures for waste disposal are taken. Mosquito breeding must similarly be controlled by the elimination of drainage of natural or artificial collections of water.

(2) Personal hygiene.

(a) Native contacts. Contact with native populations must be reduced to a minimum or there will be a rise not only in the venereal disease rate but in the incidence of malaria, dysentery, and other infections.

(b) Skin care. Soldiers in the tropics must give particular attention to the care of the skin because of the excessive sweating which favors the development and spread of skin infections. Fungus infections are especially prevalent and tend, through exchange of clothing and towels, to become epidemic in military units. It is important that the feet be completely and thoroughly dried after bathing and that clothing be frequently changed. Bacterial infections are also common and impetigo has a high incidence in the tropics when standards of personal cleanliness are low. Secondary infections of open wounds are extremely common and minor injuries such as those inflicted by leeches or ticks should receive early antiseptic treatment. When neglected, incapacitating ulcerations may develop, particularly on the legs. The specific cause of tropical ulcers of this type is unknown, but may be spirochetal infection of the vincenti type of may perhaps in some cases be due to a microaerophilic streptococcus. Treatment should include rest, elevation of the limb and local application of oxidizing agents such as hydrogen peroxide, zinc peroxide, or sodium perborate. Under other circumstances ulcerative lesions occur in the tropics as a manifestation of infections of known etiology, either local or systemic in nature. These must be considered in differential diagnosis of the type of tropical ulcer described above. They are:

1. Tropical sore (cutaneous leishmaniasis).
2. Veldt sore (diptheria of the skin).
3. Yaws.
4. Syphilis.

(c) Foot care.

1. Epidermophytosis. This condition if neglected frequently involves the nails and reaches a stage where cure becomes a matter of the greatest difficulty. It is important that all cases be treated early and dissemination within a unit be prevented by rigid enforcement of recognized methods for control through the use of foot baths, by careful drying of the skin between the toes, by frequent changes of socks and by other measures.

2. Sand fleas. These are prone to burrow into the skin particularly of the feet.

They should be removed surgically by trained medical personnel. The addition of precipitated sulphur to G.I. foot powder will prevent infection.

3. Red bugs. Control of these mites is difficult but the use of standard issue insect repellents is indicated. The dermatitis resulting from red bugs may be a serious annoyance but it is significant principally because scratching leads to secondary infection and these infected areas may develop into tropical ulcers.

(d) Dress. Rolled up shirt sleeves and shorts should not be permitted during the early or late hours of the day. Exposure to the bites of malaria carrying mosquitoes should be reduced by requiring men to wear their sleeves rolled down to change into long trousers during the period when Anopheles mosquitoes are biting. Puttees will protect the ankles if mosquito boots are not available. Sentries should wear headnets and mosquito-proof gloves when on duty during the hours of dawn or early evening. The glare of the sun can be reduced if sun goggles are worn. Protection of the head from the sun contributes to comfort but probably has little relation to the prevention of sun stroke. In the tropics most "touches of sun" are malaria.

(e) Bed nets. Bed nets should always be used whether barracks are screened or not. Men must be trained to spray beneath their beds and inside the net before getting into bed. They must then tuck the net under the entire mattress, sides, head, and foot and search the interior for trapped mosquitoes before retiring. Nets should be inspected regularly by responsible officers for holes or evidence of neglect. Barrack inspections should be made during the night to awaken men who in their sleep have rolled against the nets thus exposing themselves to infective mosquito bites. From a practical standpoint it is difficult to enforce the use in the tropics of nets of sufficiently fine mesh to exclude sandflies.

(f) Alcohol. Use of alcohol should be prohibited during the day but permission for its moderate use after sundown is often an important factor in maintaining morale, particularly in isolated stations.

(g) Anti-malarial drugs. Poorly disciplined men will attempt to evade the taking of quinine or atabrine unless closely watched during every stage of the routine administration of the drug. Some will attempt to palm the capsules because of their distaste for the drug or from a wish to sell or exchange the quinine.

e. Education. Under the provision of AAF Memo 25-1, May 25, 1942, unit commanders have been ordered to institute under the supervision of unit surgeons, a medical training program which should be of the greatest value to unit stations in the tropics. Education should not stop with a single course of formal lectures but ought to continue informally during the entire period of residence in the tropics. The medical officer should train himself in the simple presentation of subjects of general concern in language easily understood by all. Adequate supplies, training and discipline will accomplish much but education of every member of the military unit is necessary to secure intelligent and spontaneous cooperation without which full fighting efficiency cannot be maintained (See par. 158-162).

273. REFERENCES.

a. Manuals.

(1) FM 8-40 Field Sanitation.

(2) TM 8-210 Guides to Therapy for Medical Officers.

(3) TM 31-20 Jungle Warfare.

(4) TM 31-25 Desert Operations (Restricted).

b. Memorandum, AAF Memo 25-1, May 21, 1942.

c. Texts.

(1) Strong's Stitt's "Diagnosis, Prevention and Treatment of Tropical Diseases", 6th Ed., 2 vols. Philadelphia, Blakiston, 1942.

(2) Dunham, G.C., "Military Preventive Medicine", 3rd Ed., 1928, Carlisle, Pa., Medical Field Service School (Army Medical Bulletin No. 23).

d. System. Byam and Archibald's Practice of Medicine in the Tropics, 3 vols., London, Frowde, 1921-23.

e. Letters.

(1) SGO Circular Letter No. 135, October 21, 1942, Subject: The Treatment and

Clinical Prophylaxis of Malaria.
(2) SGO Circular Letter No. 22, January 16, 1943, Subject: Military Malaria Control.

SECTION VIII
BLAST INJURY

274. GENERAL. "Blast" or explosions may be described as consisting of a wave of high pressure or compression followed immediately by a wave of low pressure or suction due to the fact that the wave of increased pressure has reduced the density of air behind it to a point below normal atmospheric pressure. Both waves last only a fraction of a second, but this is sufficient to produce instant death in many cases. A person fifteen to fifty feet from the site of the explosion will receive the maximum effect. The effect of the suction wave is always less than the wave of compression.

275. PARTS INJURED. Injuries to the brain and central nervous system, lungs and heart, and the abdomen are most common injuries found.

a. Head (Blast concussion).

(1) Etiology - it is thought that the action of the waves of compression and suction upon the elastic abdomen causes fluids to be instantly displaced into the skull. This causes an increase in pressure and may cause shock to the centers located in the floor of the fourth ventricle. It is believed that death in these cases is due to respiratory paralysis.

(2) Symptoms - extreme restlessness, severe headache, dizziness, altered emotionality, nausea, confusion, and unconsciousness.

(3) Pathology - punctate hemorrhages have been demonstrated in the meninges, spinal cord, and throughout the brain substance. Because there is no evidence of external injury these cases may go unrecognized and permanent damage may be done before proper treatment has been instituted.

(4) Treatment: It is the same as for any cerebral concussion due to trauma.

(a) Rest in bed.

(b) Limit fluids.

(c) Mild sedation may be necessary.

(d) Morphine should not be given.

b. Lungs.

(1) Etiology - after the detonation of high explosives, the lungs are most frequently involved. Earlier investigation led to the erroneous belief that sudden death following blast injury was due to carbon monoxide poisoning. It is due to the effect of sudden pressure upon the gas containing organs.

(2) Pathology - necropsy shows varying degrees of congestion and hemorrhage. The lesions are usually bilateral and have a tendency to be symmetrical. The alveolar walls are torn and alveoli and bronchioles are filled with blood. Occasionally, a bronchus may be torn or the lung tissue itself may be ruptured.

The three possible explanations for the pathology as suggested by Fulton are:

(a) Rapid lowering of alveolar pressure by the suction wave acting through the respiratory passages.

(b) Rapid increase of alveolar pressure acting in the same manner.

(c) The impact of the pressure wave against the chest wall.

(3) Symptoms - respiratory distress, cyanosis, hemoptysis, unconsciousness and even complete cessation of the respiratory movements. Bloody frothy expectoration accompanied by varying degrees of shock and absence of external injury is practically diagnostic.

(4) Treatment.

(a) Prophylaxis. Covering the chest with thick covering such as an overcoat or sponge rubber jacket offers definite protection. Taking cover in a shell hole or ditch, or falling face downward on the ground offers some protection.

(b) Palliative - after injury has been sustained treatment consists of complete rest, oxygen, and therapy of shock. Anesthesia and surgery should be deferred.

c. Abdomen.

(1) Etiology - abdominal injuries are seen after land operations, but most of the cases reported are of men swimming within one hundred feet of an exploding bomb or mine.
(2) Symptoms - acute sudden onset of severe abdominal pain, similar to that seen after acute intestinal perforation. This is usually followed by board-like rigidity and collapse.
(3) Pathology - the most common lesion found at operation is subperitoneal hemorrhages over the abdominal cavity. There are a few cases on record of ruptured intestines, and of laceration of a solid viscus.
(4) Treatment: In case of doubt an exploratory laparotomy is indicated provided the associated injuries to the brain and lung are not sufficient to interfere. General treatment consists of morphine, heat, rest, and nothing by mouth until a definite diagnosis has been made. (A silent abdomen is usually a surgical abdomen).

276. REFERENCES.

a. Fulton, John F., "Blast and Concussion in the Present War", in War Medicine, New York, New York Philosophical Library, 1942.
b. King, J.D., and Curtis, G.M., "Lung Injury Due to Detonation of High Explosives", in War Medicine, New York, New York Philosophical Library, 1942.
c. Further Experimental Studies of Blast Injuries (Editorial), J.A.M.A., 121:1220, 1943.

CHAPTER 11
REFERENCE LIBRARIES FOR THE FLIGHT SURGEON

277. THE PERMANENT LIBRARY. The Flight Surgeon will have need to refer more often, as time goes on, to the original and newer work in Aviation Medicine. The following lists of texts and manuals has been prepared with this in mind. It will be noted that general and specialized texts, monographs and journals have been omitted.

a. Texts.

(1) Anderson, H.C.: The Medical and Surgical Aspects of Aviation, New York, Oxford Medical Publications, 1919.

(2) Air Service Medical (Parts I and II), War Department, Air Service Division of Military Aeronautics, Washington, U.S. Government Printing Office, 1919.

(3) Aviation Medicine in the A.E.F., War Department, Director of Air Service, Washington, U.S. Government Printing Office, 1920.

(4) Cruchet, R. and Moulinier, R.: Air Sickness: Its Nature and Treatment (translated by J.R. Earp), New York, William Word Co., 1920.

(5) Bauer, L.H., Aviation Medicine, Baltimore, Williams and Williams Co., 1926.

(6) The National Geographic Society - U.S. Army Air Corps Stratosphere Flight of 1935 in the Balloon "Explorer II", Stratosphere Series No. 2, Washington, National Geographic Press, 1936.

(7) Ocker, W.C., and Crane, C.J.: Blind Flight in Theory and Practice, San Antonio, Naylor Printing Co., 1932.

(8) Armstrong, H.G.: Principles and Practice of Aviation Medicine, Baltimore, Williams and Williams Co., 1939.

(9) Ruff, S., and Strughold, H.: Grundriss der Luftfahrtmedizin, Leipzig, J.B. Barth, 1939.

(10) von Diringshofen, H.: Medical Guide for Flying Personnel (translated by V.E. Henderson), University of Toronto Press, 1940.

(11) Grow, M.C., and Armstrong, H.C.: Fit to Fly; a Medical Handbook for Fliers, New York, D. Appleton-Century Co., 1941.

(12) Henderson, V.E.: Air Crew in Their Element, University of Toronto Press, 1942.

(13) Van Liere, E.J.; Anoxia; Its Effect on the Body, Chicago, University of Chicago Press, 1942.

(14) Hoff, E.C., and Fulton, J.F.: A Bibliography of Aviation Medicine, Springfield, Charles C. Thomas, 1942.

(15) Gemmill, C.: Physiology of Aviation, Springfield, Charles C. Thomas, 1942.

b. Manuals.

(1) Flight Surgeon's Handbook,2nd Ed.Randolph Field, School of Aviation Medicine, 1943.

(2) Field Manual for Medical Officers, Warner Robins Army Air Depot, Ga., Medical Training Section, Air Service Command, 1942.

(3) War Department TM 1-705, Physiological Aspects of Flying and Maintenance of Physical Fitness. Washington, U.S. Government Printing Office, 1941.

(4) Physiology of Flight, Human Factors in the Operation of Military Aircraft, Wright Field, Aero Medical Research Laboratory, 1942.

(5) Outline of Course of Instruction in High Altitude Physiology, Wright Field, Aero Medical Research Laboratory, 1941.

(6) War Department, TM 8-300, Notes on Eye, Ear, Nose, and Throat in Aviation Medicine, Washington, U.S. Government Printing Office, 1940.

(7) War Department, TM 8-305, Notes on Cardiology in Aviation Medicine, Washington, U.S. Government Printing Office, 1940.

(8) War Department TM 8-310, Notes on Physiology in Aviation Medicine, Washington, U.S. Government Printing Office, 1940.

(9) War Department TM 8-320, Notes on Psychology and Personality Studies in Aviation Medicine, Washington, U.S. Government Printing Office, 1941.

(10) War Department TM 8-325, Outline of Neuropsychiatry in Aviation Medicine,

Washington, U.S. Government Printing Office, 1940.

c. Journals.

(1) Journal of Aviation Medicine, The Aero Medical Association, Louis H. Bauer, Editor, Hempstead, N.Y.

(2) Journal of the Aeronautical Sciences, Institute of the Aeronautical Sciences, N.Y., N.Y.

278. THE FIELD LIBRARY. a. In preparing a field library for a Flight Surgeon one of the important considerations is the weight of the material, for in large part travel in the combat zone will be by air in aircraft already loaded with the accoutrements of war. The following manuals weigh less than 5 lbs. and are considered to be the most useful in the field.

(1) The Flight Surgeon's Handbook, 2nd Ed., Randolph Field, School of Aviation Medicine, 1943.

(2) WD, FM 8-40, Field Sanitation.

(3) WD, FM 8-45, Record of Morbidity and Mortality (Sick and Wounded).

(4) WD, TM 8-210, Guides to Therapy for Medical Officers.

(5) WD, FM 8-50, Splints, Appliances, and Bandages.

(6) TM 12-250, Administration.

(7) FM 8-35, Transportation of the Sick and Wounded.

(8) AR 40-100, AR 40-105, AR 40-110 , MR 1-9

(9) Physiology of Flight, Wright Field, Aero Medical Research Laboratory, 1942.

b. If space permits a text on surgical anatomy, on general surgery, and on therapeutics will be found to be of inestimable value.

CHAPTER 12
APPENDIX

279. SOME ASPECTS OF MEDICAL CARE, EVACUATION, AND SUPPLY WITH ARMY AIR FORCES FIELD UNITS. a. Medical Dispensary Detachment, Aviation: The function of this unit is to provide beds for one combat group at air fields where hospital facilities are not available. The personnel consists of two medical officers, one dental officer, and seventeen enlisted men, including non-commissioned officers, and technicians. The unit is able to operate an infirmary of twelve hospital beds. It is highly mobile and can be transported by air wherever needed. It may serve an isolated air field or may be placed near a centrally located field and thus serve a group of several tactical units. Patients will be received from the combat and ground crews of the group served by the unit and in emergencies from aid, collecting and clearing stations in the vicinity. Patients requiring evacuation from the dispensary will be evacuated by ground ambulances to Ground Force or Army Service Forces installations or by air to general or station hospitals in the zone of communications.

b. The Air Evacuation Squadron, Light: This unit is planned for air evacuation operations in the forward combat zones. The personnel consists of eight commissioned officers including 1 MAC officer, one service pilot (engineering officer), twenty flight officers and one hundred forty seven enlisted men, including air force technicians, medical department technicians, cooks and clerks. The unit is equipped with twenty liaison type planes capable of carrying a pilot and one to four litter patients. The motorized equipment consists of two 3/4-ton ambulances; one 1-ton trailer, water tank (250 gal.); two 1-ton trailers, cargo; three 2 1/2 ton trucks; one 1/4-ton truck, and one 3/4-ton truck. This unit could evacuate clearing stations and collecting stations. It is particular adapted to evacuate isolated medical installations which are inaccessible to large airplanes and to evacuate casualties from armored units.

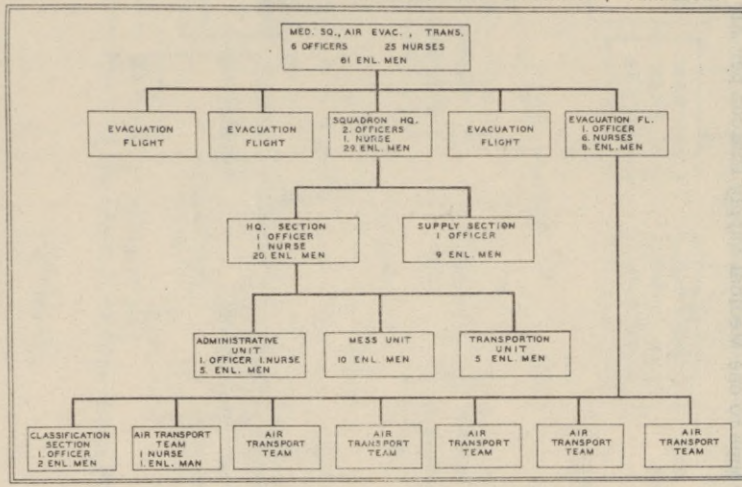
c. Medical Squadron, Air Evacuation, Transport: This unit is organized for the purpose of providing personnel and equipment for operation with the Army Air Forces in the process of evacuation of sick and wounded aboard large transport planes. The unit is composed of headquarters and four evacuation flights. Each evacuation flight contains six air transport teams. Each air transport team is composed of one nurse and one staff sergeant (surgical technician). Each evacuation flight is composed of one medical officer (flight surgeon). six nurses, and eight enlisted men. The evacuation flight contains, in addition to the six air transport teams, a classification section consisting of one medical officer and two corporals. The squadron is equipped with nine 1/4-ton trucks, one 1-ton trailer, one 1-ton water tank trailer (250 gal.), and seven 1/4-ton trailers.

The squadron headquarters is composed of headquarters section and a supply section. The headquarters section may be divided into three units: (1) administrative, (2) mess, and (3) transportation.

One air transport team provides medical service during flight aboard one transport plane caring for from 18 to 60 patients. This permits the air evacuation flight to provide medical service aboard six transport planes. The whole squadron, can, therefore, provide service aboard 24 transport planes which will usually be provided by two Carrier Squadrons of 13 planes each. The two additional planes will be used for housekeeping and supplies. (Table XXVI)

When not employed in the process of air evacuation, personnel of the evacuation flights may be employed on temporary duty at medical installations of the Air Forces, Ground Forces, or Army Service Forces. They will be available at any time for their primary duty

MEDICAL SQUADRON, AIR EVACUATION, TRANSPORT



	SQUADRON HEADQUARTERS					EVACUATION FL'S.			TOTAL
	HQ. SECTION					EVACUATION FLIGHT			
	ADMINISTRATIVE UNIT	MESS UNIT	TRANSPORTATION UNIT	SUPPLY SEC.	TOTAL SQUADRON HQ	CLASSIFICATION SECTION	AIR TRANSPORT TEAMS	TOTAL EVACUATION FLIGHTS	
MAJOR	1(A)				1				1
CAPTAIN						1(A)		4	4
FIRST LIEUTENANT				(D)	1				1
TOTAL COMMISSIONED	1			1	2	1		4	6
NURSES	1(B)				1		6	24	25
MASTER SGT. INCLUDING	1				1				1
MEDICAL NCO	1(C)				(1)				(1)
TECHNICAL SGT. INCL.	1				1				1
ADMINISTRATIVE NCO	(1)				(1)				(1)
STAFF SGT. INCL.		1			1		6	24	25
MESS SERGEANT		(1)			(1)				(1)
SURGICAL TECHNICIAN							(6)	(24)	(24)
SERGEANT, INCLUDING		2		1	3				3
COOK		(2)			(2)				(2)
MEDICAL SUPPLY SGT.				(1)	(1)				(1)
CORPORAL INCL.		3	2		5	2		8	13
AUTOMOBILE MECHANIC			(1)		(1)				(1)
CLERK						(1)		(4)	(4)
COOK		(3)			(3)				(3)
MOTOR TRANSPORTATION NCO			(1)		(1)				(1)
SUPPLY CORPORAL						(1)		(4)	(4)
PRIVATES FIRST CLASS, PRIVATES	3	4	3	8	18				18
CLERK ADMINISTRATIVE	(1)			(2)	(3)				(3)
COOKS HELPER		(4)			(4)				(4)
ORDERLY	(2)				(2)				(2)
TRUCK DRIVER			(3)	(6)	(9)				(9)
TOTAL ENLISTED	5	10	5	9	29	2	6	32	61
AGGREGATE	7	10	5	10	32	3	12	60	92

(A) FLIGHT SURGEON
(B) CHIEF NURSE
(C) ALSO SPECIAL SERVICES REPRESENTATIVE
(D) MEDICAL ADMINISTRATIVE CORPS

EMPLOYMENT OF THE SQUADRON

ASSIGNMENT: THE SQUADRON IS ASSIGNED OR ATTACHED TO THE AIR TRANSPORT COMMAND, THE TROOP CARRIER COMMAND, AN AIR FORCE OR TO ONE OF THEIR COMPONENT PARTS. EVACUATION FLIGHTS MAY BE ASSIGNED OR ATTACHED TO COMPONENTS OF AIR TRANSPORT COMMAND WINGS OR TO TROOP CARRIER SQUADRONS. PLANES UTILIZED, OF THE TRANSPORT OR TROOP CARRIER TYPE, ARE QUICKLY CONVERTED TO AMBULANCE PLANES BY THE INSTALLATION OF LITTER SUPPORTS.

EVACUATION OF CASUALTIES: AIR EVACUATION OF COMBAT AREAS IS FEASIBLE ONLY WITH AIR SUPERIORITY. THE CLASSIFICATION SECTION SORTS PATIENTS AND PLACES THEM ON PLANES RETURNING TO THE REAR. AN AIR TRANSPORT TEAM ACCOMPANIES EACH PLANE ON ITS RETURN FLIGHT, PROVIDING NURSING CARE FOR ITS 12 TO 40 PATIENTS. IN EMERGENCY ONE EVACUATION FLIGHT MAY MAN 13 PLANES BY SPLITTING EACH AIR TRANSPORT TEAM AND USING THE CLASSIFICATION SECTION AS A TEAM.

MEDICAL PROPERTY EXCHANGE: EACH AIR TRANSPORT TEAM ACCOMPLISHES THE USUAL MEDICAL PROPERTY EXCHANGE AT BOTH FORWARD INSTALLATIONS AND RECEIVING HOSPITALS

TABLE XXVI.

of air evacuation.

d. Echelons of air evacuation: Two echelons of evacuation are contemplated in the theater of operations: (1) From division clearing stations and other installations by light ambulance (Air Evacuation Squadron, Light) to evacuation field or convalescent hospitals, (2) From these points by large transport airplanes (Medical Squadron, Air Evacuation, Transport) to general hospitals in the communications zone.

The decision for the utilization of the Medical Squadron, Air Evacuation, Transport within a theater, base or defense command will be that of the Air Force commander.

The Medical Squadron, Air Evacuation, Transport will also function in the evacuation of patients from the zone of communications to the zone of the interior. Air evacuation from the theater, base or defense command to the zone of the interior and air evacuation within the zone of the interior is the responsibility of the Air Transport Command.

e. The Medical Supply Platoon, Aviation: This unit is composed of two officers, and nineteen enlisted men. Its function is to procure, store, and issue medical supplies to the unit medical sections of the Air Force. The assignment and location of this unit is flexible, depending upon the situation. It may be attached to an Air Service Group, augmenting the medical supply section of this group. In this location it will serve two tactical units. The medical supply platoon, aviation may be split in half and used to establish sub-depots, if required. Normally two Air Service Groups are supplied by an Air Depot Group. When the Medical Supply Platon, Aviation is attached to the Air Depot Group it will furnish supplies to airdromes directly or through the Air Service Groups. Normally the medical supply platoon, aviation will maintain a level of supplies for ten days which will be replenished from Army, communications zone or base supply depots. The number of Supply Platoons will vary with the dispersion of the Air Force. The requirement will vary from one Medical Supply Platoon per two Air Depot Groups to one Medical Supply Platoon per Air Service Group (Figure 38).

MEDICAL SUPPLY CHAIN (AAF TACTICAL UNITS)

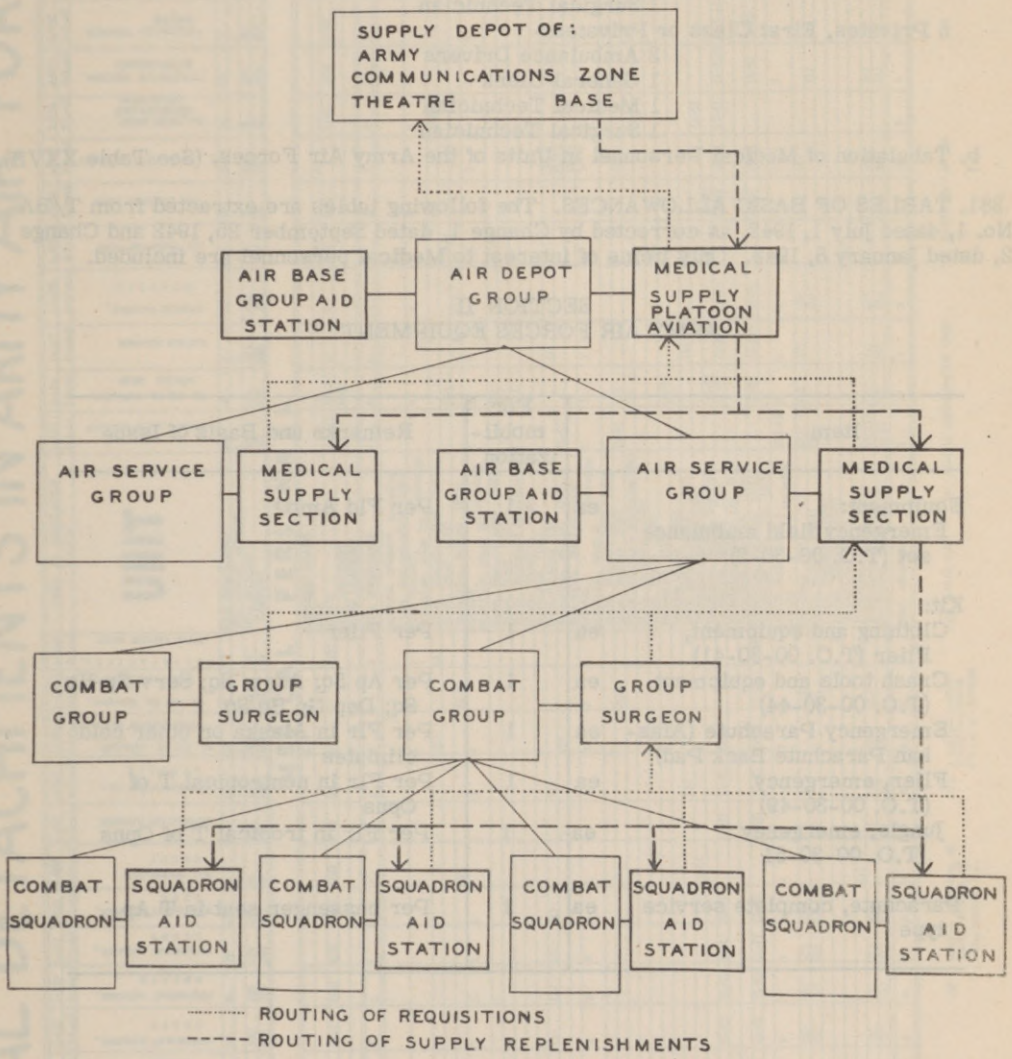


FIGURE 38.

280. TABLES OF ORGANIZATION.

a. Typical Squadron Medical Detachment. The Medical Detachment of a typical combat squadron consists of one medical officer and eight enlisted men.

The Medical Officer, who is the squadron surgeon, is either a Flight Surgeon or Aviation Medical Examiner, and is normally assigned to the Air Echelon of the Squadron.

The eight enlisted men comprise:

1 Sergeant - Section Leader
2 Technicians, Grade V - 1 Medical Technician
1 Surgical Technician
5 Privates, First Class or Privates -
2 Ambulance Drivers
1 General Clerk
1 Medical Technician
1 Surgical Technician

b. Tabulation of Medical Personnel in Units of the Army Air Forces. (See Table XXVII).

281. TABLES OF BASIC ALLOWANCES. The following tables are extracted from T/BA No. 1, dated July 1, 1942, as corrected by Change 1, dated September 25, 1942 and Change 2, dated January 8, 1943. Only items of interest to Medical personnel are included.

SECTION II
ARMY AIR FORCES EQUIPMENT

Item		For mobilization	Remarks and Basis of Issue
Equipment: Emergency field ambulance set (T.O. 00-30-3)	ea	1	Per Fld Amb
Kit:			
Clothing and equipment, Flier (T.O. 00-30-41)	ea	1	Per Flier
Crash tools and equipment (T.O. 00-30-44)	ea	1	Per Ap Sq; Adrm Sq; Serv Gp Hq Sq; Dep Gp Hq Sq
Emergency Parachute (Alaskan Parachute Back Pad)	ea	1	Per Flr in Alaska or other cold climates
Flier, emergency (T.O. 00-30-49)	ea	1	Per Flr in nontropical T of Opns
Jungle, emergency (T.O. 00-30-51	ea	1	Per Flr in tropical T of Opns
Parachute, complete service type	ea	1	Per passenger seat in T Ap

MEDICAL DETACHMENTS IN ARMY AIR FORCES

TABLE 27.

UNIT	Hq., Fighter Group, Single Engine or Twin Engine	Fighter Squadron, Single Engine	Fighter Squadron, Twin Engine	Hq. and Hq. Squadron, Bomb. Wing, Heavy or Medium	Hq., Bomb. Group, Heavy, Medium, Light or Dive	Bombardment Squadron, Heavy	Bombardment Squadron, Medium	Bombardment Squadron, Light	Bombardment Squadron, Dive	Hq., Observation Group	Observation Squadron	Air Observation Sq., Special	Hq. and Hq. Squadron, Troop Carrier Command	Hq. and Hq. Squadron, Troop Carrier Wing	Headquarters, Troop Carrier Group
TABLE OF ORGANIZATION	1-12	1-27	1-37	1-110-1	1-112	1-117	1-127	1-137	1-147	1-252	1-267	1-287	1-300-1	1-310-1	1-312
DATE	7-1-42	7-1-42	7-1-42	8-10-42	7-1-42	7-1-42	7-1-42	7-1-42	7-1-42	8-15-42	7-1-42	2-21-42	7-1-42	7-1-42	7-1-42
TOTAL COMMISSIONED	10	38	38	43	18-20	68	84	35	43	21	37	25	47	32	19
TOTAL WARRANT OFFICERS													5	4	
TOTAL ENLISTED	19	249	278	116	35-38	335	289	263	280	76	231	171	208	122	59
AGGREGATE	29	287	316	159	55-56	403	373	298	323	97	268	196	260	158	78
MEDICAL PERSONNEL															
LIEUTENANT COLONEL				1									1	1	
MAJOR	1				1					1					1
CAPTAIN	1(D)	1(A)	1(A)	1	1(D)	1(A)	1(A)	1(A)	1(A)	1(D)	1(A)	1	1	1	1(D)
FIRST LIEUTENANT															
SECOND LIEUTENANT															
TOTAL COMMISSIONED	2	1	1	2	2	1	1	1	1	2	1	1	2	2	2
TECHNICAL SERGEANT, including	1														
Clerk, Administrative (502)	(1)														
STAFF SERGEANT, TECHNICIAN, GRADE III } including				1						1			1	1	1
Clerk, Administrative (502)				(1)									(1)		(1)
Clerk, Chief (052)															
Technician, Medical (673)										(1)				(1-T)	
SERGEANT, TECHNICIAN, GRADE IV } including		1	1	1	1	1	1	1	1		1	1	1		
Clerk, Administrative (502)					(1)										
Clerk, Chief (052)															
Clerk, Shipping & Receiving (186)															
Clerk, Technical (186)															
Pharmacist (149)															
Section Leader (652)		(1)	(1)	(1)		(1)	(1)	(1)	(1)			(1)			
Technician, Medical (123)											(1)		(1)		
Technician, Surgical (225)															
CORPORAL, TECHNICIAN, GRADE V } including	2	2	2	4	2	2	2	2	2	1	2	3	3	2	1
Clerk, Administrative (502)				(1)											
Clerk, General (055)														(1-T)	
Clerk, Shipping & Receiving (186)															
Clerk, Technical (186)															
Clerk, Typist (405)															
Pharmacist (149)															
Section Leader (652)															
Ass't Section Leader (652)												(1)			
Technician, Dental (067)										(1-T)					
Technician, Dental, Lab. (067)	(1-T)				(1-T)										
Technician, Medical (123)		(1-T,A)	(1-T,A)			(1-T)	(1-T)	(1-T)	(1-T)		(1-T)	(1-T)	(1-T)		
Technician, Medical Lab. (123)				(1-T)											
Technician, Sanitary (196)															
Technician, Surgical (225)	(1)	(1-T)	(1-T)	(1-T)	(1-T)	(1-T)	(1-T)	(1-T)	(1-T)		(1-T)	(1-T)	(2-T)	(1-T)	(1-T)
Automotive Equip. Opr. (929)				(1)											
PRIVATE FIRST CLASS, PRIVATE } including		5	5	1		5	5	5	5	1	5	4	3	3	1
Chauffeur (345)		(2)	(2)	(1)		(2)	(2)	(2)	(2)		(2)	(2)		(1)	
Clerk, General (055)		(1)	(1)			(1)	(1)	(1)	(1)		(1)			(1)	
Clerk, Technical (186)															
Packer, Shipping (203)															
Stenographer (213)															
Technician, Dental (067)										(1)					(1)
Technician, Medical (123)		(1)	(1)			(1)	(1)	(1)	(1)		(1)	(1)	(2)	(1)	
Technician, Surgical (225)		(1)	(1)			(1)	(1)	(1)	(1)		(1)	(1)	(1)		
TOTAL ENLISTED	3	8	8	7	3	8	8	8	8	3	8	8	8	6	3

UNIT	Troop Carrier Squadron	Hq. and Hq. Squadron, Service Group	Service Squadron	Airdrome Squadron (Special)	Air Transport Wing	Air Transport Group	Air Transport Squadron	Hq., Photo Group, Reconnaissance and Mapping	Photographic Squadron, Reconnaissance	Photographic Squadron, Mapping	Hq. and Hq. Squadron, Air Depot Group	Depot Repair Squadron	Depot Supply Squadron	Medical Supply Platoon, Aviation
TABLE OF ORGANIZATION	1-317	1-412	1-417	1-487	1-450-1	1-452	1-457	1-752	1-757	1-758	1-852	1-857	1-858	8-497
DATE	7-1-42	7-1-42	7-1-42	8-15-42	7-1-42	7-1-42	7-1-42	7-1-42	7-1-42	7-1-42	7-1-42	7-1-42	7-1-42	6-3-42
TOTAL COMMISSIONED	16	26	7	12	53	27	102	16	28	70	19	10	8	2
TOTAL WARRANT OFFICERS	1		2		3			1		2				
TOTAL ENLISTED	299	111	213	270	173	54	288	34	197	209	150	140	129	19
AGGREGATE	316	137	222	282	229	81	390	51	225	281	169	150	137	21
MEDICAL PERSONNEL														
LIEUTENANT COLONEL					1									
MAJOR		1			3(B)	1	2	1			1			
CAPTAIN	2(1-A)	2(1-D)	1	1	1(M)	1(D)		1(D)	1(A)	1(A)	3(C)	1	1	1(M)
FIRST LIEUTENANT		1(M)												
SECOND LIEUTENANT														1(M)
TOTAL COMMISSIONED	2	4	1	1	5	2	2	2	1	1	4	1	1	2
TECHNICAL SERGEANT, including					1									
Clerk, Administrative (502)					(1)									
STAFF SERGEANT, TECHNICIAN, GRADE III } including		1		1	3	1		1			1			1
Clerk, Administrative (502)						(1)		(1)						
Clerk, Chief (052)		(1)			(3)						(1)			(1)
Technician, Medical (673)				(1)										
SERGEANT, TECHNICIAN, GRADE IV } including	1	3	1				3		1	1	2	1	1	4
Clerk, Administrative (502)		(1)									(2-T)	(1)	(1)	
Clerk, Chief (052)		(1)												
Clerk, Shipping & Receiving (186)		(1)												[illegible]
Clerk, Technical (186)														(1)
Pharmacist (149)														(1)
Section Leader (652)			(1)				(1)		(1)	(1)				
Technician, Medical (123)	(1-T)						(1-T)							
Technician, Surgical (225)							(1-T)							
CORPORAL, TECHNICIAN, GRADE V } including	1	7	3	2	1	6	3	2	2	2	6	3	3	2
Clerk, Administrative (502)						(1)					(2)			
Clerk, General (055)	(1-T)	(1)					(1)							
Clerk, Shipping & Receiving (186)		(1)												
Clerk, Technical (186)														(2)
Clerk, Typist (405)					(1)									
Pharmacist (149)		(1-T)												
Section Leader (652)		(1)												
Ass't Section Leader (652)			(1)											
Technician, Dental (067)								(1-T)						
Technician, Dental, Lab. (067)		(1-T)				(1-T)					(1-T)			
Technician, Medical (123)		(1-T)	(1-T)	(1-T)		(2-T)	(1-T)	(1-T)	(1-T,A)	(1-T,A)	(1-T)	(3-T)	(3-T)	
Technician, Medical Lab. (123)														
Technician, Sanitary (196)											(1-T)			
Technician, Surgical (225)		(1-T)	(1-T)	(1-T)		(2-T)	(1-T)		(1-T)	(1-T)	(1-T)			
Automotive Equip. Opr. (929)														
PRIVATE FIRST CLASS, PRIVATE } including	7(3-A)	8	4	5	1		6		3	2	7	4	4	12
Chauffeur (345)	(2)	(2)	(2)	(2)			(2)				(3)	(2)	(2)	(4)
Clerk, General (055)	(1)			(1)					(1)	(1)				(2)
Clerk, Technical (186)														(4)
Packer, Shipping (203)														(2)
Stenographer (213)					(1)									
Technician, Dental (067)														
Technician, Medical (123)	(2)(1-A)	(3)	(1)	(1)			(2)		(1)		(2)	(1)	(1)	
Technician, Surgical (225)	(2-A)	(3)	(1)	(1)			(2)		(1)	(1)	(2)	(1)	(1)	
TOTAL ENLISTED	9	19	8	8	6	7	12	3	6	5	16	8	8	19

(a) IN AIR ECHELON (B) 1 MEDICAL INSPECTOR, MC; 1 DENTAL SURGEON, DC; 1 VETERINARIAN, V.C. (C) 1 MEDICAL OFFICER; 1 DENTAL SURGEON; 1 M. A. C. OFFICER (D) DENTAL CORPS (A) MEDICAL ADMINISTRATIVE CORPS (T) TECHNICIAN'S RATING

November 23, 1942

SECTION III
CHEMICAL WARFARE EQUIPMENT

Item		For mobilization	Remarks and Basis of Issue
Impregnite, shoe	Oz	8	Per ind when directed by higher auth
*Mask, gas, service	ea	1	Per ind
*Ointment, protective	tube	1	Per ind when directed by higher auth
Respirator, dust M1	ea	1	Per ind when atzd by high auth
*Sack, gas, resistant M1	ea	1	Per ind when atzd by CO

*Expendable

SECTION V
MEDICAL EQUIPMENT

Part 1. - Individual equipment

Item		For mobilization	Remarks and Basis of Issue
Brassard, Geneva Convention	ea	1	Per chaplain; ind (Med and Dent Serv) asgd to T of Opns
Brassard, Green Cross	ea	1	Per ind (Vet asgd to T of Opns)
Kit:			
Dental officer's	ea	1	Per Dent O
Dental private's	ea	1	Per Tech, Pvt 1cl or Pvt, MD on Dent duties
Medical officer's	ea	1	Per Med O
Medical noncommissioned officer's	ea	1	Per NCO, MD on Med Serv
Medical private's	ea	1	Per Tech, Pvt 1cl or Pvt, MD on Med Serv
Packet, first aid, parachute	ea	1	Per parachute

Part 2. - Organizational equipment

Item		For mobilization	Remarks and Basis of Issue
Air Base Group Aid Equipment	ea	1	Per Dep Gp Hq Sq; Serv Gp Hq Sq
Blanket, OD	ea	8	Per Field Amb
Case, meat and dairy inspection	ea	1	Per Vet Off (Asgd to T of Opns)

Chest, MD No. 60, Dental	ea	1	Per Med Det with Gp Hq (except A Dep Gp and Serv Gp)
Kit:			
First-aid, arctic	ea	1	Per Bomb Ap (H), Bomb Ap (M) or T Ap when flying over Arctic Regions
First-aid, aeronautic	ea	1	Per single place Ap
		2	Per two place Ap
		3	Per Bomb Ap (L), T Ap, small
		4	Per Bomb Ap (M), Bomb Ap (H)
		5	Per T Ap (Large), Bomb Ap (H) (Larger than B-17 and B-24 type)
First-aid, motor vehicle, 12 unit	ea	1	Per four (4) fuel consuming motor vehicles or fraction thereof
First-aid, jungle	ea	1	Per Bomb Ap (H), Bomb Ap (M), or T Ap when flying over tropical regions
Litter	ea	(a)	a. Per type Ap as directed by higher auth
		10	Per 10 litter capacity Amb Ap
		18	Per 18 litter capacity Amb Ap
		33	Per 33 litter capacity Amb Ap
Litter, steel pole (99376)	ea	4	Per field Amb
Strap, securing	ea	(a)	a. Per type Ap as directed by higher auth
		10	Per 10 litter capacity Amb Ap
		18	Per 18 litter capacity Amb Ap
		33	Per 33 litter capacity Amb Ap
Machine, imprinting (for use with individual identification tag)	ea	1	Per Med Det AF Repl Dep (Overseas)
Squadron Aid Station	ea	1	Per Med Det w/Sq (except Serv Gp Hq Sq; Dep Gp Hq Sq)

SECTION VI
ORDNANCE EQUIPMENT

Item		For mobilization	Remarks and Basis of Issue
Pistol, automatic, cal. 45, M1911A1	ea	1	Per O, WO

SECTION VII
QUARTERMASTER EQUIPMENT

Part 1. - Organization Equipment - Other Than Clothing

Item		For mobilization	Remarks and Basis of Issue
Ax, single bit, 4-pound	ea	1	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq
Bag, canvas, water sterilizing	ea	1	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq
Container, round, insulated, M1941	ea	1	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq
Container, water, 5-gallon capacity	ea	5	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq
Cot, canvas, folding	ea	(a) 1	(a) Per Ind as directed by higher auth
Drum, gasoline, 5-gallon capacity	ea	2	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq
Glasses, sun, with case	pr	1	Per Ind stationed in Arctic, sub-arctic or desert regions (not issued AF glasses, sun, flying)
Headnet, mosquito	ea	1	Per Ind when atzd by higher auth; Fliers jungle emerg kit
Lantern, gasoline	ea	3	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq
Paulin, canvas, 12 by 17 feet, khaki	ea	3	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq
Pickmattock, intrenching	ea	1	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq
Range, field, M1937, 1 unit cabinet	ea	1	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq
Screen, latrine, complete with pins and poles	ea	2	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq
Shovel, D-handled, round point No. 2	ea	1	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq
Sledge, blacksmiths' double-faced, 8-pound	ea	1	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq
Stove, tent, M1924	ea	3	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq

Tent, hospital ward, complete with pins and poles	ea	1	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq
Tent, wall, large, complete with fly, pins, and poles	ea	1	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq
Tent, wall, small, complete with fly, pins, and poles	ea	3	Per Med Sec Dep Gp Hq Sq; Med Sec Serv Gp Hq Sq

Part 2. - Motor Transport Equipment

Item		For mobilization	Remarks and Basis of Issue
Ambulance, 3/4 ton, 4x4	ea	1	Per AAF Hq Sq; AF Hq Sq; Comd Hq Sq; Wing Hq Sq; Serv Gp Hq Sq; Dep Gp Hq Sq; Dep Rep Sq; Dep Sup Sq; Serv Sq; Fi Control Sq; Avn Sq; Tow Target Sq
	ea	2	Per Bomb Sq; Fi Sq; Obsv Sq; Transport Sq; Adrm Sq; Photo Sq; Map Sq; Ferrying Sq

SECTION VIII
SIGNAL EQUIPMENT

Item		For mobilization	Remarks and Basis of Issue
Flashlight, TL-122-A	ea	1	Per O; WO
Headset, HS-38	ea	1	Per Flr
Headset, HS-33	ea	1	Per Flr

SECTION X
OFFICER'S AND WARRANT OFFICER'S CLOTHING AND EQUIPMENT

The items listed in this section are for the most part a repetition of items given in other sections of the table; such items are repeated here for convenience and are not to be duplicated. Items under "Purchase" column may be purchased commercially.

Part 1. - Army Air Forces Equipment

1		2	3	4	5
Item		Issue	Purchase: Required	Purchase: Optional	Remarks and Basis of Issue
Bag, clothing	ea	1	---	---	Per O Flr
Equipment, field, shelter	ea	1	---	---	Per O as directed by higher auth
Kit, clothing and equipment officer and enlisted pilot	ea	1	---	---	Per O Flr

Part 2. - Chemical equipment

1		2	3	4	5
Item		Issue	Purchase: Required	Purchase: Optional	Remarks and Basis of Issue
Mask, gas, service	ea	1	---	---	Issued only for FId Serv or as ordered by WD

Part 3. - Medical equipment

1		2	3	4	5
Item		Issue	Purchase: Required	Purchase: Optional	Remarks and Basis of Issue
Packet, first-aid		1	---	---	Per O Per WO

Part 4. - Ordnance equipment

1		2	3	4
Insignia, cap, WO's	ea	1	----	Per WO when cap is auth
Insignia, collar, O's	pr	2	----	Per O (state arm, service)
Insignia, collar, O's "U.S"	pr	2	----	Per O, WO
Insignia, collar, WO's	pr	2	----	Per WO
Insignia, grade	ea	2	----	Per O, according to grade
Insignia, shoulder, sleeve	ea	1	----	Per O, WO (AR 600-40 and later directives)
Jacket, field	ea	----	1	Per O, WO
Kit, sewing	ea	----	1	Do
Laces, shoe, extra	pr	1	----	Do
		----	1	Add per O, WO
Leggings, canvas, dismounted	pr	1	----	Per O, WO (only when auth by CO)
Locker, trunk	ea	----	1	Per O, WO
Mattress	ea	----	1	Do
Mirror, trench	ea	----	1	Do
Necktie, cotton, mohair, olive drab	ea	1	----	Do
		----	1	Add per O, WO
Overcoat, olive drab, O's or	ea	1	----	Per O, WO
Overcoat, short, O's	ea	----	1	Do
Pajamas	pr	----	2	Do
Pen, fountain	ea	----	1	Do
Pillow, feather and cotton	ea	----	1	Do
Pillowcase	ea	----	2	Do
Raincoat	ea	1	----	Do
Razor	ea	1	----	Do
Shirt, cotton, khaki	ea	1	----	Do
		----	2	Add per O, WO
Shirt, wool, olive drab	ea	2	----	Per O, WO
		----	1	Add per O, WO
Shoes, Army, russet	pr	1	----	Per O, WO
		----	1	Add per O, WO
Slippers or gymnasium shoes	pr	----	1	Per O, WO
Soap, hand	ea	1	----	Do
Soap, shaving	ea	1	----	Do
Socks, cotton	pr	6	----	Per O, WO (at least one pair to be plain tan or brown)
Socks, wool	pr	----	6	Per O, WO
Towel, face	ea	2	----	Do
		----	2	Add per O, WO
Trousers, cotton	pr	2	----	Per O, WO
Trousers, wool	pr	2	----	Do
Undershirts, cotton	ea	3	----	Do
Undershirts, wool	ea	3	----	Do
Watch, 7 jewel or better	ea	1	----	Do

1	2	3	4	5
Item	Issue	Purchase: Required	Purchase: Optional	Remarks and Basis of Issue
Cartridge, ball, pistol, cal. .45 (round) ea	21	---	---	Per pistol
Holster ea	1	---	---	Do
Magazine, extra ea	2	---	---	Do
Pistol, automatic, cal. 45 ea	1	---	---	Per O
	1	---	---	Per WO

Part 5. - Quartermaster clothing and equipment

The clothing and equipment shown in this section are not issued, these articles are obtained by purchase.

Articles issued are provided for under proper sections of appropriate Tables of Basic Allowances.

Authorization: AR 600-35, AR 600-40, AR 600-38, AR 600-95.

1	2	3	4
Item	Re-quired	Op-tional	Remarks and Basis of Issue
Belt, cloth ea	1	----	Per O, WO
Belt, web, waist ea	1	----	Do
Book, memorandum, pocket, with pencil ea	1	----	Do
Brush, clothes ea	----	1	Do
Brush, hair ea	----	1	Do
Brush, shaving ea	----	1	Do
Brush, shoe ea	----	1	Do
Brush, tooth ea	1	----	Do
Bucket, canvas, folding ea	----	1	Do
Cap, garrison, O's ea	1		Do
Cap, service, O's ea	----	1	Do
Coat, wool, service ea	1	----	Do
	----	1	Added per O, WO
Comb ea	1	----	Per O, WO
Drawers, cotton pr	3	----	Do
Drawers, wool pr	3	----	Do
Gloves, dress, chamois leather or chamois-colored material pr	1	----	Do
Gloves, dress, white pr	----	1	Per O, WO (for formal occasions)
Gloves, wool, Olive drab pr	----	1	Per O, WO (for Field Serv as directed by CO)
Handkerchief, cotton, white ea	6	----	Per O, WO
Insignia, cap, O's ea	1	----	Per O when cap is auth

Part 6. - Signal Equipment

1		2	3	4	5
Item		Issue	Purchase: Required	Purchase: Optional	Remarks and Basis of Issue
Knife, pocket	ea	---	---	1	Per O, WO
Message, book, M-105-A	ea	1	---	---	Do

Current T/BA No. 21, Quartermaster Clothing and Individual Equipment, will be used as a basis of requisitioning clothing and individual equipment.

Abbreviations:

Adrm - Airdrome
Amb - Ambulance
Ap - Airplane
Asgd - Assigned
Atzd - Authorized
Bomb - Bombardment
Comd - Command
Dep - Depot
Det - Detachment
Fi - Fighter
Fld - Field
Flr - Flier
Gp - Group
H - Heavy
Hq - Headquarters
L - Light
M - Medium
O - Officer
Obsn - Observation
Serv - Service
Sq - Squadron
T Ap - Transport Airplane
T of Opns - Theater of Operations
Tech - Technician
WO - Warrant Officer

282. AIR BASE GROUP AID STATION EQUIPMENT (97195). The items of equipment enumerated below are components of the Air Base Group Aid Station Equipment, issued to Medical Detachments of Headquarters Squadrons of both Air Depot Groups and Air Service Groups:

Refer to Paragraph	Item No.	Item	Quantity
a.	77510	Chest, Tool, Small	1
b.	95025	Chest, MD, No. 60, Dental	1
(1)	97905	Tray Set, Type 5	
(2)	95093	Syringe, Hypodermic, Cartridge Type	
c.	97450	Box of Bedpans	1
d.	97465	Blanket Set, Small	3
e.	97565	Chest, MD, No. 1	1
(1)	97540	Chest, Field, Modified	
f.	97570	Chest MD, No. 2	1
(1)	93085	Case, Operating, Small, Improved	
(2)	97890	Tray Set, Type 1	
g.	97575	Chest, MD, No. 4	1
(1)	97895	Tray Set, Type 3	
h.	97757	Gas Casualty Set, Complete	1
(1)	97758	Gas Casualty Case, Aprons and Gloves	
(2)	97759	Gas Casualty Chest	
i.	97775	Lantern Set	1
j.	97793	Pajama Set, Coat, Winter	1
k.	97794	Pajama Set, Trouser, Coat	1
l.	97795	Physical Examination Set, Flight Surgeons	1
(1)	30770	Case, Diagnostic, Eye, Ear, Nose, and Throat	
(2)	38800	Vision Test Set	
(3)	93098	Case, Trial Lens, Pocket Set	
m.	97812	Pillow Case Set	1
n.	97814	Sheet Set	1
o.	97815	Splint Set	2
p.	97825	Surgical Dressings	1
q.	97847	Towel Set, Bath	1
r.	97848	Towel Set, Hand	1
s.	-----	Items not included in Chests, Cases, etc.	

The detailed contents of each of the items is as follows:

a. 77510 Chest, Tool, Small.

77511	Chest, Tool, Small, Empty	each	1
76570	Stencil Set	set	1
76590	Tag, Shipping, Linen	bndl	5
77182	Bit, Auger, 5/16-inch	each	1
77183	Bit, Auger, 1/2-inch	each	1
77184	Bit, Auger, 3/4-inch	each	1
77185	Bit, Auger, 1-inch	each	1
77190	Bit, Screwdriver, 3/8-inch	each	1
77245	Box Opener	each	1
77290	Brace	each	1
77485	Chalk Line with Reel and Awl, Complete	each	1
77520	Chisel, Cold, 1/2-inch	each	1
77526	Chisel, Socket Firmer 1/2-inch	each	1
77540	Chisel, Socket Firmer, 1-1/2 inch	each	1
77990	File, 5-inch	each	1
77993	File, Mill Bastard	each	1
78170	Hammer	each	1
78180	Hatchet	each	1
78192	Hone, Oil, 8 by 2 inches, Carborundum	each	1
78810	Plane, Smoothing	each	1
78820	Pliers, Combination	each	1
78850	Rule	each	1
78860	Saw, Crosscut, 20-inch	each	1
78880	Saw, Rip	each	1
78922	Screws, Assorted	box	1
78930	Screw Driver, 3-inch	each	1
79050	Spokeshave	each	1
79267	Tacks and Brads, Assorted	tin	1
79300	Tape Measure, 50 feet	each	1
79420	Try Square	each	1

b. 95025 Chest, MD, No. 60, Dental.

97535	Chest, Field, Plain, Equipped with	each	1
97905	Tray Set, Type 5 (See Par. 282b(1))	each	1
10510	Alcohol, Denatured	quart	1
11570	Creosote, USP	ounce	1
11840	Eugenol, USP	ounce	1
12830	Mercury, USP	1/4 lb	1
13205	Oil, Theobroma, Modified	tube	1
13835	Procaine Hydrochloride, Cartridge, 2%, 2.4 cc	boxes	2
13850	Pumice, Fine, Powder	pound	1
14070	Silver Nitrate and Formaldehyde, USP	box	1
20130	Cotton, Absorbent, Compressed	ounce	2
50020	Alloy, 1 oz.	bottle	2
50180	Blower, Chip	each	1
50350	Bur, No. 2, Angle Handpiece	pkg	1
50360	Bur, No. 4, Angle Handpiece	pkg	1
50370	Bur, No. 6, Angle Handpiece	pkg	1
50390	Bur, No. 9, Angle Handpiece	pkg	1
50430	Bur, No. 35, Angle Handpiece	pkg	1
50440	Bur, No. 37, Angle Handpiece	pkg	1
50450	Bur, No. 39, Angle Handpiece	pkg	1
50520	Bur, No. 557, Angle Handpiece	pkg	1
50550	Bur, No. 560, Angle Handpiece	pkg	1
50610	Bur, No. 1/2, Straight Handpiece	pkg	1
50630	Bur, No. 2, Straight Handpiece	pkg	1

50640	Bur, No. 4, Straight Handpiece	pkg	1
50650	Bur, No. 6, Straight Handpiece	pkg	1
50710	Bur, No. 35, Straight Handpiece	pkg	1
50720	Bur, No. 37, Straight Handpiece	pkg	1
50820	Bur, No. 557, Straight Handpiece	pkg	1
50830	Bur, No. 558, Straight Handpiece	pkg	1
51035	Burnisher, Stellite, "H"	each	1
51045	Burnisher, Stellite, "J"	each	1
51055	Burnisher, Stellite, "5-7"	each	1
51070	Burnisher, Stellite, "1-2"	each	1
51220	Cement, Permanent, Pearl Gray	box	1
51240	Cement, Silicate, Case	each	1
51250	Cement, Silicate, Liquid, Caulk	bottles	2
51265	Cement, Silicate, Shade 20	bottle	1
51275	Cement, Silicate, Shade 21	bottle	1
51285	Cement, Silicate, Shade 22	bottle	1
51295	Cement, Silicate, Shade 23	bottle	1
51305	Cement, Silicate, Shade 24	bottle	1
51315	Cement, Silicate, Shade 25	bottle	1
51325	Cement, Silicate, Shade 26	bottle	1
51335	Cement, Silicate, Shade 27	bottle	1
51345	Cement, Silicate, Shade 28	bottle	1
51355	Cement, Silicate, Shade 29	bottle	1
51385	Cement, Silicate, Measuring Device	each	1
51390	Cement, Silicate, Shade Guide, Caulk	each	1
51410	Cement, Silicate, Varnish, 1 oz	bottle	1
51422	Cement, Temporary, Anodyne	pkg	1
51550	Chisel, No. 5	each	1
51580	Chisel, No. 48	each	1
51585	Chisel, Wedelstaedt, No. 41	each	1
51587	Chisel, Wedelstaedt, No. 42	each	1
51660	Cleaners, No. 0	pkg	1
51680	Cleaners, No. 2	pkg	1
52300	Disk, Paper	box	1
52500	Elevator, Winter, No. 122	each	1
52510	Elevator, Winter, No. 123	each	1
52520	Elevator, Winter, No. 135	each	1
52560	Engine, Oil, 1 oz	bottle	1
52570	Engine, Foot	each	1
52610	Engine, Handpiece, Angle (Doriot)	each	1
52630	Engine, Handpiece, Straight (Doriot)	each	1
52650	Excavator, No. 8	each	1
52660	Excavator, No. 17	each	1
52670	Excavator, No. 23	each	1
52680	Excavator, No. 34	each	1
52695	Excavator, No. 49	each	1
52697	Excavator, No. 50	each	1
52720	Excavator, No. 63	each	1
52730	Excavator, No. 64	each	1
52772	Excavator, No. 77	each	1
52773	Excavator, No. 78	each	1
52780	Excavator, No. 81	each	1
52790	Explorer, No. 5	each	1
52800	Explorer, No. 6	each	1
52810	Explorer, No. 23	each	1
53110	Floss, 100 Yards	spool	1
53190	Forceps, No. 18R	each	1
53200	Forceps, No. 18L	each	1
53220	Forceps, No. 65	each	1

53240	Forceps, No. 150A	each	1
53250	Forceps, No. 151A	each	1
53260	Forceps, No. 210	each	1
53262	Forceps, No. 215	each	1
53490	Gutta-Percha, Temporary, 1 oz.	box	1
53580	Holder, Cotton	each	1
53590	Holder, Mercury	each	1
53600	Holder, Napkin	each	1
53610	Holder, Nerve Broach	each	1
53800	Lamp, Alcohol, SSW-1	each	1
53810	Lamp, Alcohol, SSW-1, Wick	each	2
53910	Lancet, Volland, No. 2	each	1
54010	Mallet, Plugging	each	1
54030	Mandrel, No. 303, for Angle Handpiece	each	6
54050	Mandrel, No. 303, for Straight Handpiece	each	6
54070	Mandrel, Morgan-Maxfield, for Angle Handpiece	each	2
54080	Mandrel, Morgan-Maxfield, for Straight Handpiece	each	2
54120	Mechanical Dam	each	1
54170	Mirror, Mouth	each	1
54180	Mirror, Mouth, Plane Glass	each	2
54205	Mortar and Pestle, 3 cm.	each	1
54260	Pliers, No. 2, Dressing	each	1
54275	Pliers, No. 104	each	1
54360	Plugger, Black, No. 1	each	1
54370	Plugger, Black, No. 3	each	1
54400	Plugger, Ladmore, No. 3	each	1
54500	Plugger, Woodson, No. 1	each	1
54510	Plugger, Woodson, No. 2	each	1
54520	Plugger, Woodson, No. 3	each	1
54740	Point, No. 183, Straight Handpiece	each	6
54741	Point, No. 184, Straight Handpiece	each	6
54800	Point, No. 226, Straight Handpiece	each	6
54830	Point, No. 241, Straight Handpiece	each	6
55000	Polisher, Rubber Cup	boxes	3
55020	Pot, White	each	2
55040	Probe	each	1
55190	Retainer, Matrix, No. 1	each	1
55200	Retainer, Matrix, Bicuspid Band, Medium	pkg	1
55220	Retainer, Matrix, Molar Band, Medium	pkg	1
55400	Saw, Ribbon	each	3
55440	Scaler, No. 33	each	1
55450	Scaler, No. 34	each	1
55495	Scaler, Pyorrhea, Towner, No. 01-5	each	1
55497	Scaler, Pyorrhea, Towner, No. 02-6	each	1
55499	Scaler, Pyorrhea, Towner, No. 04-8	each	1
55593	Shears, Crown, Universal	each	1
55620	Slab, Caulk-6	each	1
55680	Spatula, Cement	each	1
55700	Spatula, Stellite	each	1
55760	Stick	bundle	1
55780	Strip, Celluloid	box	1
55800	Strip, Polishing, Coarse	box	1
55810	Strip, Polishing, Fine	box	1
55820	Strip, Polishing, Medium	box	1
55970	Syringe, Water	each	1
56830	Wheel, No. 301	each	1
56840	Wheel, No. 302	each	1
56850	Wheel, No. 304	each	1

56860	Wheel, No. 305	each	1
56960	Wire, Brass, Ligature	box	1
71780	Towel, Hand	each	24
74560	Brush, Hand	each	1
74930	Soap, White, Floating	bar	1
75150	Book, Blank, 8 Vo	each	1
75400	Envelope, No. 189	pkg	1
76100	Paper, Typewriter, Bond, 8 by 10 1/2 inches	sheets	50
76240	Pencil	each	1
79320	Thermometer, Clinical	each	1
93770	Sutures, Silk, Braided, Non-Capillary, 3 sizes	pkg	1
95021	Chair, Dental, Field	each	1
95093	Syringe, Hypodermic, Cartridge Type, complete (see par. 282b(2))	set	1
97675	Container, Metal, No. 1 (for 99610)	each	2
99070	Basin, Canvas	each	1
99215	Cup, Enamelware	each	2
99285	Hone, Oil, 3 1/2 inch	each	1
99515	Sterilizer, Hypodermic Needle	each	1
99540	Sterilizer, Instrument, 9-3/4 inch	each	1
99610	Vial, Glass-Stoppered	each	6
Form 57	Report of Dental Service	each	25
Form 79	Register of Dental Patients (card)	each	250

(1) 97905 Tray Set, Type 5.

97840	Table Top	each	1
97875	Tray, No. 8	each	1
97880	Tray, No. 9	each	1
97920	Tray, tool	each	1

(2) 95093 Syringe, Hypodermic, Cartridge Type, Complete.

55930	Syringe, Hypodermic, Cartridge Type, Complete	each	1
55938	Needle, 25 gage, 1-inch Canula	each	10
55940	Needle, 23 gage, 1-7/8 inch Canula	each	10

c. 97450 Box of Bedpans.

77170	Bedpans	each	9
78837	Pot, Chamber	each	3
79440	Urinal, Enamelware	each	9

d. 97465 Blanket, Set, Small.

97470	Blanket Set, Small, Case, Empty	each	1
99090	Blanket, O.D.	each	12

e. 97565 Chest, MD, No. 1.

97540	Chest, Field, Modified (see par. 282e(1))	each	1

Packed in Top Drawer

34680	Scissors, Bandage	each	2
75150	Book, Blank, 8 Vo.	each	1
76240	Pencil	each	1
77010	Apron, Rubberized	each	2
78770	Pin, Safety, Large	cards	4

78780	Pin, Safety, Medium	cards	4
92050	Dressing, First-aid, Large	pkgs	50
99070	Basin, Canvas	each	2
99110	Book, Note, Manifolding, Binder	each	1
99115	Book, Note, Manifolding, Filler	each	1

Packed in Bottom Drawer

20090	Bandage, Muslin, 5-inch	dozen	1
20130	Cotton, Absorbent, Compressed	ounces	25
20240	Gauze, Plain, Sterilized	pkgs	25
20340	Plaster, Adhesive, 1-inch	spools	6
20350	Plaster, Adhesive, 3-inch	spools	6
91120	Iodine Swab, 1 1/2 cc	boxes	12
92010	Bandage, Gauze, Compressed, 3-inch	box	1
92040	Bandage, Triangular, Compressed	each	20
92060	Dressing, First-Aid, Small	pkgs	60

(1) 97540 Chest, Field, Modified.

97535	Chest, Field, Plain (less one handle), equipped with bracket table board and containing:	each	1
97530	Chest, Field, Drawer	each	2
97790	Litter Support Bracket	each	2

f. 97570 Chest, MD, No. 2.

97535	Chest, Field, Plain: equipped with tray set, type 1 (97890) (see par. 282f(2))	each	1

Packed in Top Tray

11790	Ether (for anesthesia)	1/4 lb	4
11800	Ethyl Chloride, USP	3 oz.	1
11840	Eugenol, USP	ounce	1
12750	Mercuric Oxide, Yellow, Ointment, USP	1/4 oz	4
12854	Mercury Bichloride, Large Poison Tab, USP	250	1
13340	Petrolatum, USP	pound	1
14636	Sulfanilamide, Crystalline, 5 grams in Sterile. Individual Double-Wrapped Envelope	pkgs	4
20130	Cotton, Absorbent, Compressed	ounces	2
20350	Plaster, Adhesive, 3-inch	spool	1
34680	Scissors, Bandage	each	1
36110	Applicator, Wood	carton	1
75150	Book, Blank, 8 Vo	each	1
76240	Pencil	each	4
77280	Box, Tablet, Folding	each	72
78770	Pin, Safety, Large	cards	2
78780	Pin, Safety, Medium	cards	2
91010	Acid, Boric, Ointment, 1 oz, USP	tubes	6
91025	Ammonia, Aromatic, 1/3 cc	pkgs	2
91110	Iodine, 15 Gr,and Potassium Iodide,22.5 Gr,USP	box	1
91140	Mercurial ointment, Mild, 1/2 Oz, USP	tubes	6
91155	Morphine Tartrate, USP, 1/2 Gr Solution	boxes	10
91230	Zinc Oxide Ointment, 1 oz. USP	tubes	6
92010	Bandage, Gauze, Compressed, 3-inch	each	12
97700	Container, Metal, No. 7 (12 oz) 1 each for the following:	each	7
10100	Acid, Acetylsalicylic, USP, 5 Gr Tab	500	

10660	Ammonium Chloride Troches, USP X . . . 250		
91030	Bismuth Subcarbonate USP, 5 Gr Tab . . . 1000		
14180	Sodium Bicarbonate and Peppermint Tab. 1000		
14637	Sulfanilamide, USP, 5 Gr Tab 500		
14641	Sulfathiazole, USP, 7.7 Gr Tab 350		
1K75825	Sodium Amytal, NNR, 0.2 Gm.(3 Gr)Tab . 500		
97710	Container, Metal, No. 9 (3 oz) 1 each for the following: . . . . . each		6
10570	Aloin Compound, Pill or tablet 250		
10845	Atabrine Tablets, 100 Mgm 200		
11490	Codeine Sulfate, USP, 1/2 Gr Tab 500		
13396	Phenobarbital, USP, 1/2 Gr Tab 500		
13730	Potassium Permanganate, USP, 5 Gr . . . Tab 300		
14622	Sulfadiazine, 0.5 Gm (7.7 Gr) Tab 100		
99270	Graduate, 60 cc . . . . . each		2
Form 52b	Emergency Medical Tab (20 in book in duplicate) book		1

Packed in Middle Tray

37200	Razor, Safety . . . . . each		1
37210	Razor, Safety, Blades . . . . . pkg		1
40580	Bottle, Wide Mouth, 50 cc, Cork Finish: with Cork No. 14 (77682) . . . . . each		2
77950	Dropper, Medicine . . . . . dozen		1
91015	Acid, Salicylic, Ointment, 1 oz . . . . . tubes		6
91145	Mercuric Ointment, Ammoniated, 1 oz, USP . . . tubes		12
91215	Sulfur Ointment, 1 oz, USP. . . . . tubes		6
93780	Tourniquet, Field . . . . . each		4
99285	Hone, Oil, 3-1/2 inch . . . . . each		1
99585	Tray, Instrument, Approximately 10 inch. . . . . each		1

For Prophylaxis

38610	Syringe, Urethral, Prophylaxis . . . . . each		6
74930	Soap, White, Floating . . . . . bars		2
77205	Box, Cash, containing the following: . . . . . each		1
10730	Apomorphine Hydrochloride, 1/10 gr. . . Hypo Tab, USP	20	1
10860	Atropine Sulfate, USP, 1/150 Gr Hypo Tab.	20	1
11105	Caffeine with Sodium Benzoate, 7.5 Gr Amp . . . dozen		1
11760	Epinephrine, Soluble Salt, 3/200 Gr Hypo Tab. .	20	3
12955	Morphine Sulfate, USP, 1/4 Gr Hypo Tab	20	20
13840	Procaine Hydrochloride and Epinephrine Hypo . Tab	20	5
37800	Suture, Catgut, Chromic, Size 2 . . . . . tubes		12
37860	Suture, Catgut, Plain, Size 1. . . . . tubes		12
37870	Suture, Catgut, Plain, Size 2 . . . . . tubes		12
38440	Syringe, Luer, 2 cc. . . . . each		3
38450	Syringe, Luer, 10 cc . . . . . each		1
38470	Syringe, Luer, Needle, 25 gage, 1/4 inch Canula each		4
38490	Syringe, Luer, Needle, 23 gage, 3/4 inch Canula each		4
38510	Syringe, Luer, Needle, 19 gage, 1-3/4 inch Canula . . . . . each		2
38520	Syringe, Luer, Needle, 17 gage, 3-inch Canula . . each		2
38530	Syringe, Luer, Needle, 15 gage, 3-inch Canula . . each		2
74040	Spoon, Tea . . . . . each		2
79320	Thermometer, Clinical . . . . . each		6

99200	Corkscrew, Folding	each	1
99515	Sterilizer, Hypodermic Needle	each	1
78680	Paper, Toilet	roll	1
91150	Mercurous Chloride Ointment, 1 oz	tubes	12
91190	Protein Silver, Mild, USP, 4-6/10 Gr Tab	bottle	1
91200	Protein Silver, Strong, USP, 4-6/10 Gr Tab	bottle	1
99225	Cup, Paper, Noncollapsible	each	40

Packed in Bottom Tray

12040	Foot Powder	1/4 lb	4
12640	Magnesium Sulfate, USP	4 lbs	1
14619	Sulfadiazine Ointment, 5%	4 oz	18
14636	Sulfanilamide, Crystalline, 5 Grams in Sterile. Individual Double-Wrapped Envelope	pkgs	8
32760	Forceps, Towel 5-1/4 inch	each	2
35510	Tube, Breathing, Large	each	2
35570	Tube, Trachea, Size 4.	each	1
36830	Gloves, Medium, Size 7-1/2	pair	2
36850	Gloves, Medium, Size 8-1/2	pair	2
36960	Inhaler, Yankauer	each	1
40580	Bottle, Wide Mouth, 50 cc., Cork-Finish, with Cork No. 14 (77682)	each	2
71780	Towel, Hand	each	6
74560	Brush, Hand	each	2
77010	Apron, Rubberized	each	1
77060	Bag, Hot Water and Syringe	each	1
77130	Basin, Pus	each	1
77160	Battery, Dry Cell	each	2
78010	Flashlight: with Lamp	each	1
78020	Flashlight Lamp	each	2
93085	Case, Operating, Small, Improved, Complete (see par. 282f. (1)	each	1
94295	Chlorine Test Set	set	1
97690	Container, Metal, No. 5: containing the following	each	1
31070	Catheter, Urethral, Rubber, 14F	each 2	
31080	Catheter, Urethral, Rubber, 16F	each 2	
31090	Catheter, Urethral, Rubber, 18F	each 2	
31100	Catheter, Urethral, Rubber, 22F	each 2	
97730	Container, Metal, No. 14: containing the following	each	2
10480	Alcohol, USP	qts 2	
99070	Basin, Canvas	each	2
99215	Cup, Enamelware	each	3
99265	Gloves, Rubber, Pouch.	each	1
99540	Sterilizer, Instrument, 9-3/4 inch: containing the following	each	1
37730	Stethoscope	each 1	
38750	Tube, Stomach	each 1	

(1) 93085 Case, Operating, Small, Improved.

93086	Case, Operating, Small, Improved, Empty	each	1
31590	Depressor, Tongue, Bosworth	each	1
31730	Director, Grooved	each	1
32230	Forceps, Dressing, Bozeman, Straight	each	1
32240	Forceps, Ear, Angular	each	1
32300	Forceps, Hemostatic, Rankin-Kelly, Straight	each	4

32310	Forceps, Hemostatic, Rochester, Pean, Curved	each	2
32500	Forceps, Mastoid, Rongeur, Bane	each	1
32695	Forceps, Tissue, Spring, 4-1/2 inch	each	1
32700	Forceps, Tissue, Spring, 5-1/2 inch	each	1
32967	Holder, Needle, Hegar-Mayo	each	1
33250	Knife, Ear, Myringotome	each	1
33365	Knife, Operating, Handle, No. 3	each	1
33369	Knife, Operating, Detachable Blade, No. 10	pkg	1
33370	Knife, Operating, Detachaleb Blade, No. 11	pkg	1
33371	Knife, Operating, Detachable Blade, No. 12	pkg	1
33373	Knife, Operating, Detachable Blade, No. 15	pkg	1
33560	Needle, Aneurism, Cooper	each	1
33631	Needle, Catgut, Size 2, Half-Circle	pkg	1
33641	Needle, Catgut, Size 4, Half-Circle	pkg	1
33670	Needle, Catgut, Size 3, 3/8 Circle	pkg	1
33791	Needle, Intestinal, Size 2, Half-Circle	pkg	1
33802	Needle, Intestinal, Size 4, Half-Circle	pkg	1
33821	Needle, Intestinal, Size 1-3/4 inches, straight	pkg	1
33925	Needle, Surgeon's Regular, Size 2, 3/8 Circle	pkg	1
33935	Needle, Surgeon's Regular, Size 6, 3/8 Circle	pkg	1
33945	Needle, Surgeon's Regular, Size 10, 3/8 Circle	pkg	1
33950	Needle, Surgeon's Regular, Size 12, 3/8 Circle	pkg	1
33961	Needle, Surgeon's Regular, Size 16, 3/8 Circle	pkg	1
33971	Needle, Surgeon's Regular, Size 20, 3/8 Circle	pkg	1
33991	Needle, Uterine, Size 1, Half-Circle	pkg	1
34011	Needle, Uterine, Size 5, Half-Circle	pkg	1
34021	Needle, Uterine, Size 7, Half-Circle	pkg	1
34240	Probe, 8-inch	each	1
34690	Scissors, Dissecting, Curved, 5 1/2 inch	each	1
34750	Scissors, 1 Point Sharp, 5 1/2 inch	each	1
35150	Speculum, Ear	Set	1
35210	Speculum, Nasal	each	1
35360	Spud, Eye	each	1
36890	Headband, Leather Strap	each	1
36910	Headband, Mirror	each	1
37996	Suture, Silk, Dermal, Medium	pkg	1
38050	Suture, Silkworm Gut, Coarse	coil	1
38130	Syringe, Ear, 2 ounces	each	1
93705	Shield, Mirror, Metal	each	1

(2) 97890 Tray Set, Type 1.

97840	Table Top	each	1
97850	Tray, No. 1	each	1
97855	Tray, No. 2	each	1
97860	Tray, No. 3	each	1

g. 97575 Chest, MD, No. 4.

97535	Chest, Field, Plain, equipped with Tray Set Type 3 (97895) (see par. 282g.(1))		each	1
75150	Book, Blank, 8 Vo	each	1	
75360	Clip, Paper, Gem, No. 1	box	1	
75400	Envelope, No. 189	pkgs	6	
75420	Envelope, No. 36	pkg	1	
75430	Envelope, No. 84	pkg	1	
75870	Mucilage, 4 oz. bottle	bottle	1	
75940	Pad, Prescription	each	1	
75960	Pad, Memorandum, 6 by 9 inches	each	4	

75970	Pad, Memorandum, 8 by 10-1/2 inches	each	2
76020	Paper, Blotting, 3 by 9-1/2 inches	pieces	4
76040	Paper, Carbon, Black, 8 by 10-1/2 inches	box	1
76100	Paper, Typewriter, Bond, 8 by 10-1/2 inches	ream	1
76110	Paper, Typewriter, Manifold, 8 by 10-1/2 inches	reams	2
76240	Pencil	dozen	2
76250	Pencil, Blue	each	1
76270	Pencil, Indelible	each	2
76280	Pencil, Red	each	1
76310	Penholder	each	4
76370	Ribbon, Typewriter	each	1
76390	Ruler, 12-inch	each	1
76580	Tack, Thumb	each	24
76590	Tab, Shipping, Linen	bundle	1
78760	Pin, Common	paper	1
99110	Book, Note, Manifolding, Binder	each	2
99115	Book, Note, Manifolding, Filler	each	4
99290	Ink Bottle, Hard Rubber	each	1
99295	Ink Powder, Black	tube	1
99435	Pens, Steel, Assorted	dozen	1
99595	Typewriter, Portable	each	1

(1) 97895 Tray Set, Type 3.

97510	Cabinet, Stationery (one drawer & 4 document files)	each	1
97835	Table and Stool Set	each	1
97845	Table, Typewriting	each	1

h. 97757 Gas Casualty Set, Complete.

97758	Gas Casualty Case, Aprons and Gloves (see par. 282h.(1)	each	2
97759	Gas Casualty Chest (see par. 282h.(2)	each	1

(1) 97758 Gas Casualty Case, Aprons and Gloves.

97470	Blanket Set, Small, Case, Empty	each	1
99030	Apron, Impermeable	each	20
99263	Gloves, Impermeable	pair	29

(2) 97759 Gas Casualty Chest.

97535	Chest, Field, Plain: equipped with tray set, type 8 (97917)	each	1
10100	Acid, Acetylsalicylic, USP, 5 Gr Tab	1000	1
10690	Amyl Nitrite, USP, 5 Minim, Amp	pkgs	15
11380	Chloroform (for anesthesia)	1/4 lb	4
11615	Cupric Sulfate, USP	pound	1
12291	Hydrogen Peroxide Solution, 8%	pounds	12
14150	Sodium Bicarbonate, USP	pound	1
14619	Sulfadiazine Ointment, 5%	4 oz	2
1K24810	Eye Solution M-1, 1/2 oz	pkgs	10
1K61100	Pontocaine Compound Ointment, 1 oz	tubes	10
1K76525	Sodium Sulamyd, 1 Gram, 25	pkg	1
74930	Soap, White, Floating	bars	2
77950	Dropper, Medicine	dozen	1

91026	Amyl Salicylate	pint	1
91053	Calcium Hypochlorite	3 3/4 lb	4
91085	Dichloramine-T, 20% in Triacetin	pint	11
91090	Eye and Nose Drops, 1 oz	bottles	2
91187	Protective Ointment, CWS	tubes	60

i. 97775 Lantern Set.

97780	Lantern Set, Crate, Empty	each	1
97717	Container, Metal, No. 11	each	1
99320	Lantern	each	2
99325	Lantern, Globe, White	each	1
99330	Lantern, Globe, Green	each	2
99335	Lantern, Wick	each	6
99620	Waste	pound	1

j. 97793 Pajama Set, Coat, Winter.

71640	Pajama Coat, winter (30 medium, 20 large, 10 small)	each	60
97470	Blanket Set, Small, Case, Empty	each	1

k. 97794 Pajama Set, Trousers, Winter.

71660	Pajama trousers, Winter (30 medium, 20 large, 10 small)	each	60
97470	Blanket Set, Small, Case, Empty	each	1

l. 97795 Physical Examination Set, Flight Surgeon's.

97800	Physical Examination Set, Flight Surgeon's Chest, Empty	each	1
12280	Homatropine Hydrobromide, USP	vial	1
20130	Cotton, Absorbent, Compressed	ounces	16
30770	Case, Diagnostic, Eye, Ear, Nose & Throat (see Par. 2821(1))	each	1
32240	Forceps, Ear, Angular	each	1
36110	Applicator, Wood	carton	1
36160	Bag, Politzer	each	1
36525	Color Test Book, Ishihara type	each	1
36680	Depressor, Tongue	carton	1
36685	Depth Perception Apparatus	each	1
36870	Hammer, Percussion	each	1
37080	Lantern, Muscle Test	each	1
37145	Perimeter, Hand	each	1
37147	Perimeter Charts, Schweigger, Left	each	2
37148	Perimeter Charts, Schweigger, Right	each	2
37152	Phorometer, with Chair Attachment	each	1
37160	Pin, White Head	each	24
37340	Rule, Ivory	each	1
37350	Rule, Prince	each	1
37370	Sphygmomanometer, Aneroid	each	1
37730	Stethoscope	each	1
38626	Tangent Curtain, Folded	each	1
38690	Tube, Diagnostic, Ear	each	1
38800	Vision Test Set (see par. 2821(2))	each	1
38860	Watch, Stop	each	1
71780	Towel, Hand	each	3
77950	Dropper, Medicine	dozen	1

79290	Tape Measure, 60 inches	each	1
79320	Thermometer, Clinical	each	2
93098	Case, Trial Lenses, Pocket Set. (see par. 282 1(3)	each	1
-----	Switch Box and Bracket	each	1

(1) 30770 Case, Diagnostic, Eye, Ear, Nose, and Throat.

-----	Container, Leather	each	1
AOC-1077	Cords: with male fittings at transformer end & plug at handle end	each	1
AOC-1096	Cord Adapter: to permit use of battery handle thru cords	each	1
AOC-1074	Cord Handle: Detachable plug type	each	1
31595	Depressor, Tongue, Electric	each	1
-----	Handle: for 2 cell Eveready-950	each	1
34029	Ophthalmoscope, Electric	each	1
34040	Otoscope, Electric	each	1
34405	Retinscope, Electric	each	1
-----	Lamp: Mazda Flashlight Screw Base 2-1/2 volts	each	6

(2) 38800 Vision Test Set.

38810	Dial: Triple Line, Astigmatic	each	1
38820	Pamphlet of Instructions	each	1
38830	Test Type Card: Jaeger, Indestructible	each	1
38840	Test Type Card: Snellen	each	1
38850	Test Wools, Holmgren	set	1

(3) 93098 Case, Trial Lens, Pocket Set.

	Container, Leather	each	1
	Lens, Cylindrical, Concave: .25: .50; .75; 1.00; 2.00; 3.00	pair	1
	Lens, Cylindrical, Convex: .25; .50; .75; 1.00; 2.00; 3.00	pair	1
	Lens, Spherical, Concave: .25; .50; .75; 1.00; 2.00; 3.00; 4.00	pair	1
	Lens, Spherical Convex: .25; .50; .75; 1.00; 2.00; 3.00; 4.00	pair	1
	Disc, Red: Glass	each	1
	Disc, Opaque; Fiber	each	1

m. 97812 Pillow Case Set.

71690	Pillow Case	each	100
97470	Blanket Set, Small, Case, Empty	each	1

n. 97814 Sheet Set.

71720	Sheet	each	60
97470	Blanket Set, Small, Case, Empty	each	1

o. 97815 Splint Set.

97820	Splint Set, Case, Empty	each	1
37386	Splint, Basswood	set	1
37455	Splint Strap	each	6
37480	Splint, Thomas, Arm, Hinged	each	6

37500	Splint, Army, Leg, Half-Ring	each	6
37515	Splint Support and Foot Rest	each	12
37540	Splint, Wire Ladder	each	6
79230	Strap and Buckle, 3-feet	each	6

p. 97825 Surgical Dressings.

14120	Soap, Soft	pound	1
14619	Sulfadiazine Ointment, 5%	4 oz	8
14636	Sulfanilamide, Crystalline, 5 Grams in Sterile Individual Double-Wrapped Envelopes	pkgs	4
14641	Sulfathiazole, USP, 7.7 Gr. Tab	1000	2
20130	Cotton, Absorbent, Compressed	ounces	44
20240	Gauze, Plain, Sterilized	pkgs	140
20340	Plaster, Adhesive, 1-inch	spools	12
37386	Splint, Basswood	set	1
78770	Pin, Safety, Large	cards	2
78780	Pin, Safety, Medium	cards	2
78790	Pin, Safety, Small	cards	2
91010	Acid, Boric, Ointment, 1 oz. USP	tubes	12
91015	Acid, Salicylic, Ointment, 1 oz	tubes	12
91110	Iodine, 15 Gr. and Potassium Iodide, 22.5 Gr. USP	boxes	6
92010	Bandage, Gauze, Compressed, 3-inch	box	1
92060	Dressing, First-Aid, Small	pkgs	48
93750	Splint, Wire Gauze	rolls	6
Form 52b	Emergency Medical Tag	books	16

q. 97847 Towel Set, Bath.

71770	Towel, Bath	each	50
97470	Blanket Set, Small, Case, Empty	each	1

r. 97848 Towel Set, Hand.

71780	Towel, Hand	each	150
97470	Blanket Set, Small, Case, Empty	each	1

s. Items not included in Chest, Cases, Etc.

1K00700	Epinephrine (Adrenalin) in peanut oil	doz	2
1K02800	Amytal, 1 1/2 gr Tab	500	1
1K07502	Atabrine, 0.2 Gm Amp	5	5
1K17800	Chinofon, NNR (Yatren) 0.25 Gm, 4 Gr Tab	50	100
1K20615	Nikethamide, (Coramine)	100	1
1K34710	Mapharsen, NNR, 0.06 Gm Amp	10	10
1K60100	Plasmochin, 0.01 Gm (1/6 Gr) Tab	500	1
10405	Acid, Tannic, Ointment, 10% with Sulfadiazine, 5%	4 oz	136
10610	Ammonia, Water, Stronger, USP	lb	2
10845	Atabrine, Tablets, 100 Mgm	100	250
11110	Calamine, Prepared, NF V I	lb	25
13530	Pituitary Solution, Posterior Lobe, USP	6	4
13890	Quinine Dihydrochloride, USP, 5 Gr Amp	doz	8
13910	Quinine Sulfate, USP, 5 gr Tab	1000	48
14160	Sodium Bicarbonate, USP	10 lb	1
14530	Starch, Corn, Commercial	lb	25
14619	Sulfadiazine Ointment, 5%	4 oz	36
14620	Sulfadiazine Ointment, 5%	lb	4

14622	Sulfadiazine, 0.5 Gm (7.7 Gr) Tab	1000	3
14623	Sulfadiazine, Sodium, 5 Gm Vial	6	12
14635	Sulfanilamide, USP, Powder	lb	10
14637	Sulfanilamide, NNR, 5 Gr Tab	1000	12
14639	Sulfapyradine, 7.7 Gr Tab	1000	5
14641	Sulfathiazole, 7.7 Gr Tab	1000	10
14670	Sulfur, Precipitated, USP	lb	25
14700	Talc, Purified, USP	lb	25
14850	Tincture, Opium, USP	1/4 pt	2
14860	Tincture, Opium, Camphorated, USP	pt	10
15010	Zinc Oxide, USP	lb	25
71296	Lamp, Therapeutic, Ultra-Violet, Small	each	1
71530	Bar, Mosquito	each	12
71670	Pillow, Feather	each	12
72170	Bowl, Soup, Enamelware	each	29
72890	Fork, Table	each	25
73090	Knife, Butcher, 12 inch	each	1
73160	Knife, Table	each	25
73180	Ladle, Small	each	1
73320	Opener, Can, Small	each	1
73510	Pitcher, 1 pt.	each	1
73890	Shaker, Pepper	each	2
73910	Shaker, Salt	each	2
74035	Spoon, Table, Medium (Dessert)	each	25
74270	Tray, Serving	each	4
77360	Can, 33-Gallon	each	2
77550	Clothesline	feet	50
78800	Pitcher, 4 Quart	each	1
78820	Pliers, Combination	each	1
91010	Acid, Boric, Ointment, 1 oz, USP	tube	210
91015	Acid, Salicylic, Ointment, 1 oz	tube	144
91030	Bismuth Subcarbonate, USP, 5 Gr Tab	btl	50
91140	Mercurial Ointment, Mild, 1/2 oz, USP	tube	10
91145	Mercurial Ointment, Ammoniated, 1 oz., USP	tube	360
91150	Mercurous Chloride Ointment, 1 oz	tube	210
91155	Morphine Tartrate, USP, 1/2 Gr Solution	box	100
91190	Protein, Silver, Mild, USP, 4-6/10 Gr Tab	btl	5
91200	Protein, Silver, Strong, USP, 4-6/10 Gr Tab.	btl	5
91215	Sulfur Ointment, 1 oz, USP	tube	360
91230	Zinc Oxide Ointment, 1 oz., USP	tube	360
96060	X-Ray Field Unit, Generator, Gasoline, Elec.	each	1
96175	X-Ray Field Unit, Tent, Darkroom	each	1
96206	X-Ray Field Unit, Fluoroscopic, Foreign Body Localization, Complete	each	1
96215	X-Ray Field, Unit, Fluoroscopic	each	1
99145	Buckets, 3 in nest	nest	3
99185	Chair, Common, Folding	each	5
99205	Cot, Folding, Canvas	each	12
99215	Cup, Enamelware	each	25
99380	Litter, Folding	each	12
99395	Mattress Pad	each	12
99465	Plate, Dinner, Enamelware	each	25
99540	Sterilizer, Instrument, 9-3/4 inch	each	1
99570	Table, Dining, Folding	each	2
99575	Table, Instrument,, Folding	each	1
99580	Table, Operating, Folding	each	1
99387	Machine, Imprinting	each	1
99600	Unit, Power, Electric	each	1
TBA, QM	Ax, single Bit, 4-pound	each	1

TBA, QM	Bag, Canvas, Water, Sterilizing	each	1
TBA, QM	Container, Round, Insulated, M1941	each	1
TBA, QM	Container, Water, 5-gallon capacity	each	5
TBA, QM	Drum, Gasoline, 5-gallon capacity	each	2
TBA, QM	Lantern, Gasoline	each	3
TBA, QM	Paulin, Canvas, 12 by 17 feet, Khaki	each	3
TBA, QM	Pickmattock, Intrenching	each	1
TBA, QM	Range, Field, M1937, 1 unit cabinet	each	1
TBA, QM	Screen, Latrine, complete with pins and poles	each	2
TBA, QM	Shovel, D-handled, round point No. 2	each	1
TBA, QM	Sledge, Blacksmiths', double-faced, 8-pound	each	1
TBA, QM	Stove, Tent, M1924	each	3
TBA, QM	Tent, Hospital Ward, complete with pins and poles	each	1
TBA, QM	Tent, Wall, large, complete with fly, pins, and poles	each	1
TBA, QM	Tent, Wall, small, complete with fly, pins and poles	each	3

283. SQUADRON AID STATION EQUIPMENT (97305). The items of equipment enumerated below are components of the Squadron Aid Station Equipment, issued to Medical Detachments with Squadrons, except Detachments with Headquarters Squadrons of Service Groups and Depot Groups:

	No.	Item	Quantity
	97465	Blanket Set, Small (see par. 282d.)	1
a.	97545	Chest, Flight Service	1
	97575	Chest, MD, No. 4 (see par. 282g)	1
b.	97740	Crash Splint Unit	2
	97757	Gas Casualty Set (see par. 282h.)	1
	97825	Surgical Dressings (see 282p.)	1
	99380	Litter, Folding	8
	99387	Machine, Imprinting	1
	TBA-AAF	Lamp, Gasoline, Coleman Type	1
	TBA-QM	Tent, Wall, Large, complete with ropes and pins	1
	TBA-QM	Guidon, Red Cross	1

a. 97545 Chest, Flight Service.

97550	Chest, Flight Service, Empty	each	1

Packed in Top Tray

11675	Digitalis Hypo Solution, 1 Ampule Equals 1 USP XII Unit	doz	1
12040	Foot Powder	1/4 lb	1
12750	Mercuric Oxide, Yellow Ointment, USP	1/4 oz	2
20130	Cotton, Absorbent, Compressed	ounces	4
33590	Needle, Paracentesis	each	1
34680	Scissors, Bandage	each	1
37850	Suture, Catgut, Plain, Size 0	tubes	3
37860	Suture, Catgut, Plain, Size 1	tubes	4
37870	Suture, Catgut, Plain, Size 2	tubes	4
37880	Suture, Catgut, Plain, Size 3	tube	1
38410	Syringe, Luer, 2 CC	each	2
38490	Syringe, Luer, Needle, 23 Gage, 3/4 inch Canula	dozen	1
38550	Syringe, Luer, Needle, Wire	bndls	2
38610	Syringe, Urethral Prophylaxis	each	3
74040	Spoon, Tea	each	1
74560	Brush, Hand	each	1
74930	Soap, White, Floating	bars	2
76240	Pencil	dozen	1
77280	Box, Tablet, Folding	each	24
77950	Dropper, Medicine	dozen	1
78770	Pin, Safety, Large	card	1
78780	Pin, Safety, Medium	card	1
79320	Thermometer, Clinical	each	4
99105	Book, Note, Approximately 2-1/2 inch	each	1
99200	Corkscrew, Folding	each	1

Packed in Middle Tray

97700	Container, Metal, No. 7: (12 oz.) 1 each for the following:	each	2
10100	Acid, Acetylsalicylic, USP, 5 Gr Tab	500	
12640	Magnesium Sulfate, USP	12 oz.	
97710	Container, Metal, No. 9: (3 oz.) 1 each for the following:	each	5
10570	Aloin Compound Pill	250	
10660	Ammonium Chloride Troches, USP X	100	
11290	Cascara Sagrada Extract, USP, 2 Gr Tab.	250	
12410	Ipecac and Opium Powder, USP, 5 Gr Tab	200	
14180	Sodium Bicarbonate and Peppermint Tab.	300	
10730	Apomorphine Hydrochloride, 1/10 Gr Hypo Tab, USP	20	1
10860	Atropine Sulfate, USP, 1/150 Gr Hypo Tab	20	1
11100	Caffeine with Sodium Benzoate, USP, 1 Gr. Tab	100	1
11490	Codeine Sulfate, USP, 1/2 Gr Tab	500	1
11760	Epinephrine Soluble Salt, 3/200 Gr Hypo Tab.	20	1
11790	Ether (For Anesthesia)	1/4 lb.	2
11840	Eugenol, USP	ounce	1
12854	Mercury Bichloride, Large Poison,Tab, USP.	250	1
12955	Morphine Sulfate, USP, 1/4 Gr Hypo Tab	20	4

13396	Phenobarbital, USP, 1/2 Gr Tab.	100	1
13730	Potassium Permanganate, USP, 5 Gr Tab	100	1
13840	Procaine Hydrochloride and Epinephrine Hypo . Tab	20	1
14619	Sulfadiazine Ointment, 5%.	4 oz	4
20350	Plaster, Adhesive, 3-inch	spools	3
31080	Catheter, Urethral, Rubber, 16F.	each	1
31100	Catheter, Urethral, Rubber, 22F.	each	1
36840	Gloves, Medium, Size 8	pairs	2
37370	Sphygomomanometer, Aneroid	each	1
91010	Acid, Boric, Ointment, 1 oz. USP	tubes	2
91015	Acid, Salicylic, Ointment, 1 oz.	tubes	4
91030	Bismuth Subcarbonate, USP, 5 Gr Tab.	bottle	1
91070	Cocaine Hydrochloride, USP, 2 Gr Hypo Tab . .	tube	1
91110	Iodine, 15 Gr, and Potassium Iodide, 22.5 Gr, USP	box	1
91140	Mercurial Ointment, Mild, 1/2 oz, USP	tubes	2
91145	Mercuric Ointment, Ammoniated, 1 oz, USP. . .	tubes	4
91150	Mercurous Chloride Ointment, 1 oz	tubes	10
91155	Morphine Tartrate, USP, 1/2 Gr Solution	boxes	4
91190	Protein Silver, Mild, USP, 4 6/10 Gr Tab	bottle	1
91200	Protein Silver, Strong, USP, 4 6/10 Gr Tab . . .	bottle	1
91215	Sulfur Ointment, 1 oz, USP	tubes	4
91230	Zinc Oxide Ointment, 1 oz, USP	tubes	4
99515	Sterilizer, Hypodermic Needle.	each	1

Packed in Bottom of Chest

36110	Applicator, Wood.	carton	1
36680	Depressor, Tongue	carton	1
36960	Inhaler, Yankauer	each	1
37730	Stethoscope	each	1
71780	Towel, Hand	each	4
77060	Bag, Hot Water and Syringe.	each	1
77160	Battery, Dry Cell.	each	4
77780	Cup, Paper.	carton	1
78010	Flashlight (with lamp).	each	1
78020	Flashlight Lamp	each	4
79460	Vial, 1 oz.	dozen	1
91020	Alochol, Denatured, 1 pt..	tins	2
91025	Ammonia, Aromatic, 1/3 cc.	pkgs	2
91120	Iodine Swab, 1-1/2 cc.	boxes	6
92000	Bandage, Gauze, Adhesive, 1 by 3 inches	pkgs	6
92004	Bandage, Gauze, Compress, 2 by 2 inches	pkgs	25
92010	Bandage, Gauze, Compressed, 3-inch.	each	12
92040	Bandage, Triangular, Compressed	each	4
92050	Dressing, First-Aid, Large.	pkgs	4
92060	Dressing, First-Aid, Small	pkgs	10
93085	Case, operating, Small, Improved, Complete (see par. 282f(1)).	each	1
93780	Tourniquet, Field	each	1
99070	Basin, Canvas	each	1
99215	Cup, Enamelware	each	3
99540	Sterilizer, Instrument, 9 3/4 inch.	each	1

b. 97740 Crash Splint Unit.

97820	Splint Set, Case, Empty: for the following	each	1
37386	Splint, Basswood	set 1	

37455	Splint, Strap . . . . . each 2		
37480	Splint, Thomas, Arm, Hinged. . . . each 2		
37500	Splint, Army, Leg, Half-Ring. . . . each 2		
37515	Splint Support and Foot Rest . . . . each 4		
37540	Splint, Wire Ladder . . . . . each 2		
97515	Case, Tent Pin, for the following	each	1
20080	Bandage, Muslin, 3-inch . . doz 1		
20130	Cotton, Absorbent, Compressed . . oz 12		
20340	Plaster, Adhesive, 1-inch . . . . . Spools 2		
92010	Bandage, Gauze, Compressed, 3-inch	each	36
99040	Axe, Hand, Fire	each	1
99090	Blanket, O.D.	each	2
99277	Hacksaw, Frame, Adjustable.	each	1
99278	Hacksaw, Blade, 10 inch.	each	1
99380	Litter, Folding	each	1
99410	Pad, Heat, Complete	each	1
99493	Shovel, Entrenching	each	1

284. CONTENTS OF MISCELLANEOUS KITS AND CASES.

a. Equipment, Emergency Field Ambulance Set (TO 00-30-3).

-----	Blanket, Gray, M.D.	each	4
78440	Litter, Complete with slings.	each	4
QM	Axe, Fire	each	1
QM	Extinguisher, Fire, CO_2, 15 lb.	each	1

b. Kit, Crash Tools and Equipment, Ground, (TO 00-30-44).

Class 03-F

-----	Extinguisher, fire, type A-2, Spec. 85-2	each	2

Class 13

-----	Suit, asbestos, type A-1, Spec. 3109	each	2

Class 17-B

-----	Axe, fire, pick head, 6 lb., handled	each	2
-----	Bar, wrecking, gooseneck, 3/4" x 30"	each	1
-----	Bar, wrecking, offset, 3/4" by 30"	each	1
-----	Blade, saw, hack, hand, 10", 32 point, H.S. . . .	each	12
-----	Chisel, cold, flat, 3/4", cutting edge	each	1
-----	Clipper, bolt, rigid head, shear cut, 5/8" cap . .	each	1
-----	Frame, hacksaw, 8" to 12", adjustable.	each	1
-----	Hammer, machinist's, ball peen, 20 oz	each	1
-----	Hatchet, hunter's 3-5/8" cutting edge, in leather sheath	each	1
-----	Knife, hunting, in leather sheath, 5" blade	each	1
-----	Pliers, lineman's, side cutting, 8"	each	1
-----	Saw, hand, hack, 24", 15 point	each	2
-----	Sledge, blacksmith's, cross peen, 6 lb.	each	1
-----	Snip, tinner's, hand, straight cut, 4" cut	pair	1

Class 19

41K1586	Box Assembly, crash tools	each	1
41D7287	Box Assembly, flashlight, crash tools	each	1
-------	Extinguisher, fire, CO_2, 15 lb. cap., Spec. 40222	each	1

32B3686	Hook Assembly, grappling, (Consists of one grappling hook with 60 ft. length of 5/16" extra flexible aircraft cable and tow hook attached) . . . . . each		1

Signal Corps

3A30	Battery, BA-30, (2 in use and 4 spare)	each	6
6Z4002A	Flashlight, TL-122-A.	each	1
-----	Lamps, LM-35, (1 in use, 1 spare).	each	2

c. Kit, Jungle, Emergency (TO 00-30-51)

Class 05-A

---	-----	Compass, pocket type, hunting case . . . . . each	1

Class 13

41A9711	Box, emergency container, fish tackle, 3" x 1" x 3/4" . . . . . each		1
35A5510	Case, waterproof, match. . . . . each (One containing vial of iodine) (One containing vial of quinine) (One containing matches)		3
41D4293	Container assembly, emergency rations (L rations) each		2
38J5271	Container assembly, jungle emergency, parachute back pad . . . . . each		1
-----	Headnet, mosquito. . . . . each		1

Class 17-B

-----	Machete, in leather sheath . . . . . each		1
-----	Stone, sharpening, India, medium 4" by 3/8" x 3/8" . . . . . each		1

Class 21

-----	Line, linen, fish, braided, 30 lb. test . . . . . feet		30

Class 29

-----	Hook, fish (2 each of sizes No. 2, 4, and 6) . . . . each		6

Ordnance Equipment

-----	Cartridge, pistol ball, caliber .45. . . . . each		20

Note: In addition to the items carried in the kit, one pistol, automatic, .45 caliber, will be carried on the individual during flights over jungles).

d. 80210 Case, Meat and Dairy Inspection.

80211	Case, Meat and Dairy Inspection, Empty. . . . . each		1
71780	Towel, Hand . . . . . each		2
73145	Knife, Skinning . . . . . each		2
74090	Steel, Butcher's . . . . . each		1
74930	Soap, White, Floating. . . . . bar		1
75980	Pad, Stamp, Dry. . . . . each		1

77160	Battery, Dry Cell	each	1
78010	Flashlight	each	1
78020	Fashlight Lamp	each	1
80032	Box and Crate Opener	each	1
80528	Container, ink	each	1
80800	Hook, Gland	each	1
80995	Opener, Can, Special	each	1
81115	Stamp, Meat Inspection, Metal	each	1
81121	Stone, Carborundum	each	1
81270	Thermometer, Clinical	each	1
81280	Thermometer, Dairy	each	1
81290	Trier, Cheese, Lard and Butter	each	1
81320	Trier, Lard and Butter, 18-inch	each	1
81330	Trier, Meat, 8-inch	each	2
94330	Magnifier, Folding	each	1
99110	Book, Note, Manifolding,Binder	each	1
99115	Book, Note, Manifolding, Filler	each	1
99130	Box, Soap	each	1

e. 97100 Kit, Dental Officer's.

97065	Kit Component, Cantle Ring Strap	each	1
97070	Kit Component, Insert, Type I	each	1
97080	Kit Component, Litter Strap	each	1
97085	Kit Component, Pouch	each	1
13835	Procaine Hydrochloride, Cartridge, 2%, 2.4 CC	box	1
20130	Cotton, Absorbent, Compressed	ounce	1
20340	Plaster,Adhesive,1-inch	spools	2
44150	Stopper, Rubber, Solid, No. 2 (for 99605)	each	1
51550	Chisel, No. 5	each	1
51580	Chisel, No. 48	each	1
52500	Elevator, Winter, No. 122	each	1
52510	Elevator, Winter, No. 123	each	1
52720	Excavator, No. 63	each	1
52730	Excavator, No. 64	each	1
52790	Explorer, No. 5	each	1
53240	Forceps, No. 150A	each	1
53250	Forceps, No. 151A	each	1
54170	Mirror, Mouth	each	1
54260	Pliers, No. 2, Dressing	each	1
54500	Plugger, Woodson, No. 1	each	1
76240	Pencil	each	1
78770	Pin, Safety, Large	card	1
78780	Pin, Safety, Medium	card	1
91120	Iodine Swab, 1 1/2 CC	boxes	2
95093	Syringe, Hypodermic, Cartridge Type, Complete (see par. 282b(2))	set	1
97040	Case, Cotton, for Dental Instruments	each	1
97050	Case, Instrument, Medical Officer's (see par. 284e(1))	each	1
97675	Container, Metal, No. 1 (for 91120, 99610)	each	2
97685	Container, Metal, No. 4 (for 99605)	each	1
99515	Sterilizer, Hypodermic Needle	each	1
99605	Vial, Glass 60 CC	each	1
99610	Vial, Glass- Stoppered	each	3
Form 52b	Emergency Medical Tab	book	1

(1) 97050 Case, Instrument, Medical Officer's.

	97051	Case, Instrument, Medical Officer's Empty. . .	each	1
	97052	Case, Instrument, Medical Officer's, Container Metal, for 2 knives	each	1
	30085	Bistoury, Sharp-Pointed, Straight, 1-5/16 inch	each	1
	32288	Forceps, Hemostatic, Abbey	each	1
	32295	Forceps, Hemostatic, Jones	each	1
	32695	Forceps, Tissue, Spring, 4 1/2 inch	each	1
	33356	Knife, Operating, 1 1/4 inch blade.	each	1
	33935	Needle, Surgeon's Regular , Size 6, 3/8-Circle	pkg	1
	33945	Needle, Surgeon's Regular, Size 10, 3/8 Circle	pkg	1
	34011	Needle, Uterine, Size 5, Half-Circle	pkg	1
	34745	Scissors, 1 Point Sharp, 4 1/2-inch	each	1
	93770	Sutures, Silk, Braided, Non-Capillary, 3 Sizes	pkgs	3

f. 97105 Kit, Dental, Private's.

	97065	Kit Component, Cantle Ring Strap	each	2
	97085	Kit Component, Pouch, with Lace	each	2
	97095	Kit Component, Suspender	each	1

In Right Hand Pouch

51422	51422	Cement, Temporary, Anodyne	pkg	1
	54275	Pliers, No. 104	each	1
	55593	Shears, Crown, Universal	each	1
	55680	Spatula, Cement.	each	1
	55970	Syringe, Water	each	1
	56960	Wire, Brass, Ligature	box	1
	71780	Towel, Hand	each	2
	76240	Pencil	each	1
	92060	Dressing, First-Aid, Small	pkgs	2
	95090	Slab, Square	each	1
	97080	Kit Component, Litter Strap	each	2
	Form 52b	Emergency Medical Tag	book	1

In Left Hand Pouch

	20340	Plaster, Adhesive, 1-inch	spool	1
	34680	Scissors, Bandage	each	1
	78780	Pin, Safety, Medium	card	1
	91025	Ammonia, Aromatic, 1/3 CC	pkg	1
	91120	Iodine Swab, 1 1/2 CC	boxes	2
	92010	Bandage, Gauze, Compressed, 3-inch	each	12
	92040	Bandage, Triangular, Compressed	each	3
	97070	Kit Component, Insert, Type I, with Lace	each	1
	97675	Container, Metal, No. 1 (For 91120)	each	1

g. 97765 Kit, First Aid, Aeronautic. (This item is expendable).

	97770	Kit, First Aid, Aeronautic, Container	each	1
	1K27505	Halazone, NNR, 1/16 Gr Tab, 100	bottle	1
	91042	Burn-Injury Set, Sulfadiazine Ointment	set	1
	91095	Eye-Dressing Set.	set	1
	91157	Morphine Tartrate, USP, 1/2 Gr Solution	each	2
	91204	Sulfadiazine, 0.5 Gm (7.7 Gr) Tab	pkg	1
	91211	Sulfanilamide, Crystalline, 5 Grams in Sterile Individual Double-Wrapped Envelope	pkg	1
	92060	Dressing, First-Aid, Small	pkgs	3

93692	Scissors, 1 Point Sharp, 5 1/2 inch Straight	each	1
93780	Tourniquet, Field	each	1

Outside Envelope of Kit to Contain:

91122	Iodine Swab, 10 Min	pkg	1
92000	Bandage, Gauze, Adhesive, 1 by 3 inches. . . .	pkg	1

h. 97762 Kit, First Aid, Arctic.

97662	Container, for kit, First Aid, Arctic.	each	1
1K24817	Foille, 3/4-Ounce Tube, 2 Tubes in Package	pkgs	3
1K27507	Halazone, NNR, 1/16 Gr Tab, 200	bottle	1
20130	Cotton, Absorbent, Compressed	ounce	1
20340	Plaster, Adhesive, 1-inch	spool	1
91010	Acid, Boric, Ointment, 1 oz , USP	tube	1
91122	Iodine Swab, 10 Min	pkgs	2
91145	Mercuric Ointment, Ammoniated, 1 oz. USP	tubes	2
99157	Morphine Tartrate, 1/2 Gr Solution	each	24
91202	Sodium Chloride, 8 Gr Tablet, 100	bottle	1
91204	Sulfadiazine, 0.5 Gm(7.7 Gr) Tab	pkgs	12
91211	Sulfanilamide, Crystalline, 5 Grams in Sterile Individual Double-Wrapped Envelope	pkgs	2
92000	Bandage, Gauze, Adhesive, 1 x 3"	pkgs	2
92002	Bandage, Gauze, Compress, 4 by 4 inches . .	each	9
97734	Container, Paper (Cardboard), 1 1/2 x 4". . .	each	5
10100	Acid, Acetylsalicylic, USP, 5 Gr Tab	150	
10570	Aloin Compound, Pill or Tblet	200	
14180	Sodium Bicarbonate and Peppermint Tab . . .	200	
91030	Bismuth Subcarbonate, USP, 5 Gr Tab	200	
91190	Protein, Silver, Mild, USP, 4-6/10 Gr Tab . .	100	
97734	Container, Paper (Cardboard), 1 1/2 x 4". . .	each	2
1K61500	Vitamins, Multivitamin Capsule	300	
97734	Container, Paper (Cardboard) 1 1/2 x 4". . .	each	2
91205	Sulfaguanidine, 0.5 Gm (7.7 Gr) Tab.	150	

i. 97764 Kit, First Aid, Gas Causalty.

97663	Container, for Kit, First Aid, Gas Casualty. .	each	1
10690	Amyl Nitrite, USP, 5 Minim, Amp.	pkg	1
91086	Dichloramine-T, 20%, in Triacetin, 2 1/2 oz	bottle	1
91091	Eye and Nose Drops, 1/2 ounce	pkg	1
91105	Hydrogen Peroxide, Solution, 8%, 2 1/2 oz	bottle	1
91172	Phosphorus Burn Set	set	1
91187	Protective Ointment, CWS	tube	1
92118	Pad, Cotton, Approximately 1 1/4 by 2 inches	pkg	1
1K24810	Eye Solution, M1, 1/2 oz	pkg	1
1K61100	Pontocaine Compound Ointment, 1 oz	tube	1

j. 97763 Kit, First Aid, Jungle.

97664	Container, Kit, First Aid, Jungle	each	1
1K27507	Halazone, NNR, 1/16 Gr Tab, 200	bottles	2
1K31205	Insect Repellent, 2 1/2 oz.	bottles	12
37055	Kit, Suction.	each	1
91122	Iodine Swab, 10 min	pkgs	4
91157	Morphine Tartrate, USP, 1/2 Gr Solution . . .	each	24
91202	Sodium Chloride, 8 Gr Tablet, 100.	bottle	1

91204	Sulfadiazine, 0.5 Gm(7.7 Gr) Tab	pkgs	12
92000	Bandage, Gauze, Adhesive, 1 by 3 inches	pkgs	5
97734	Container, Paper (Cardboard), 1 1/2 by 4 inches	each	3
10100	Acid, Acetylsalicylic, USP, 5 Gr Tab 150		
10570	Aloin Compound, Pill or Tablet 200		
10845	Atabrine Tablets, 100 MGM 100		
97734	Container, Paper (cardboard), 1 1/2 by 4 inches	each	2
14180	Sodium Bicarbonate and Peppermint Tab 400		
97734	Container, Paper (cardboard), 1 1/2 by 4 inches	each	10
91205	Sulfaguanidine, 0.5 Gm(7.7 Gr) Tab 750		

k. 97771 First Aid Kit, Motor Vehicle, 24-Unit.

97772	Kit, First Aid, Motor Vehicle, 24-unit, container	each	1
78780	Pin, Safety, Medium	card	1
91025	Ammonia, Aromatic, 1/3 cc	pkg	1
91042	Burn-Injury Set, Sulfadiazine Ointment	set	4
91095	Eye-Dressing Set	set	2
91122	Iodine Swab, 10 Min	pkg	1
91211	Sulfanilamide, Crystalline, 5 Grams in Sterile Individual Double-Wrapped Envelope	pkgs	2
92000	Bandage, Gauze, Adhesive, 1 by 3 inches	pkg	1
92002	Bandage, Gauze, Compress, 4 by 4 inches	each	3
92004	Bandage, Gauze, Compress, 2 by 2 inches	pkgs	2
92015	Bandage, Gauze, 4-inch	pkg	1
92040	Bandage, Triangular, Compressed	each	1
92050	Dressing, First-Aid, Large	pkgs	2
93797	Tourniquet-Scissors-Forceps Set	set	1

l. 97773 First Aid Kit, Motor Vehicle, 12-unit.

97774	Kit, First-Aid, Motor Vehicle, 12-unit, container	each	1
78780	Pin, Safety, Medium	card	1
91025	Ammonia, Aromatic, 1/3 cc	pkg	1
91042	Burn-Injury Set, Sulfadiazine Ointment	set	2
91095	Eye-Dressing Set	set	1
91122	Iodine Swab, 10 Min	pkg	1
91211	Sulfanilamide, Crystalline, 5 Grams in Sterile Individual Double-Wrapped Envelope	pkg	1
92000	Bandage, Gauze, Adhesive, 1 by 3 inches	pkg	1
92002	Bandage, Gauze, Compress, 4 by 4 inches	each	1
92004	Bandage, Gauze, Compress, 2 by 2 inches	pkg	1
92015	Bandage, Gauze, 4-inch	pkg	1
92040	Bandage, Triangular, Compressed	each	1
93797	Tourniquet-Scissors-Forceps Set	set	1

m. 97107 Kit, Jungle, Medical, Individual.

97108	Kit, Jungle, Medical, Individual, Canvas Roll	each	1
10100	Acid, Acetylsalicylic, USP, 5 Gr Tab	each	24
10845	Atabrine, Tablets, 100 Mgm	each	30
1K27507	Halazone, NNR, 1/16 Gr Tab, 200	bottle	1
1K31200	Insect Repellent, 1 oz	bottles	2
20300	Packet, First Aid	each	1
20340	Plaster, Adhesive, 1-inch	spool	1
91096	Foot Powder, 2 oz	can	1
91098	Frazer's Solution, Half-Strength, 1 oz	bottle	1

91118	Iodine, 2%, 2 cc	vials	2
91202	Sodium Chloride, 8 Gr, Tablet, 100	bottle	1
91204	Sulfadiazine, 0.5 Gm(7.7 Gr) Tab	pkg	1
92000	Bandage, Gauze, Adhesive, 1 x 3"	pkg	1
99615	Vial, Hard Rubber, 1/2 oz (for 10100 and 10845)	each	4

n. 97110 Kit, Medical Non-Commissioned Officer's.

97065	Kit Component, Cantle Ring Strap	each	2
97085	Kit Component, Pouch, with Lace	each	2
97095	Kit Component, Suspender	each	1

In Right Hand Pouch

99615	Vial, Hard Rubber, 1/2 oz	each	6
10060	Acetophenetidin, USP, 5 Gr Tab . . 16		
10100	Acid, Acetylsalicylic, USP, 5 Gr Tab .16		
11505	Compound Cathartic, Pill or Tab, NF VI .36		
12230	Glycyrrhiza and Opium Compound Mixture USP, Tab .25		
12410	Ipecac and Opium Powder, 5 Gr Tab. .25		
20340	Plaster, Adhesive, 1 inch	spools	2
38490	Syringe, Luer, Needle, 23 Gage, 3/4-inch Canula	dozen	1
76240	Pencil	each	1
77280	Box, Tablet, Folding	each	12
78770	Pin, Safety, Large	card	1
78780	Pin, Safety, Medium	card	1
79320	Thermometer, Clinical	each	1
91120	Iodine Swab, 1 1/2 cc	boxes	2
93550	Case, Hypodermic, Complete (see Par. 284n(1))	each	1
93780	Tourniquet, Field	each	1
97050	Case, Instrument, Medical Officer's (see par. 284e(1))	each	1
97075	Kit Component, Insert, Type II, with Lace	each	1
97080	Kit Component, Litter Strap	each	2
97675	Container, Metal, No. 1 (For 91120)	each	1
99515	Sterilizer, Hypodermic Needle	each	1
Form 52b	Emergency Medical Tag	book	1

In Left Hand Pouch

20130	Cotton, Absorbent, Compressed	ounces	4
20240	Gauze, Plain, Sterilized	pkgs	4
92010	Bandage, Gauze, Compressed, 3-inch	each	8
92040	Bandage, Triangular, Compressed	each	4

(1) 93550 Case, Hypodermic, Complete.

97680	Container, Metal, No. 2	each	1
10860	Atropine Sulfate, USP, 1/150 Gr Hypo Tab	20	1
12955	Morphine Sulfate, USP, 1/4 Gr Hypo Tab	20	2
14580	Strychnine Sulfate, USP, 1/60 Gr Hypo Tab	20	1
38440	Syringe, Luer, 2 cc	each	1
38490	Syringe, Luer, Needle, 23 Gage, 3/4-Inch Canula	each	2
38550	Syringe, Luer, Needle, Wire	bndls	2

o. 97115 Kit, Medical Officer's.

97065	Kit Component, Cantle Ring Strap	each	1
97085	Kit Component, Pouch, with Lace	each	1
99615	Vial, Hard Rubber, 1/2 oz	each	6
10060	Acetophenetidin, USP 5 Gr Tab ... 16		
10100	Acid, Acetylsalicylic, USP, 5 Gr Tab 16		
11505	Compound Cathartic Pill or Tab, NF, VI 36		
12230	Glycyrrhiza & Opium Compound Mixture USP, Tab .25		
12410	Ipecac and Opium Powder, 5 Gr Tab .. 25		
20340	Plaster, Adhesive, 1-inch	spool	1
38490	Syringe, Luer, Needle, 23 Gage, 3/4-inch Canula	dozen	1
76240	Pencil	each	1
77280	Box, Tablet, Folding	each	24
78780	Pin, Safety, Medium	card	1
79320	Thermometer, Clinical	each	1
91120	Iodine Swab, 1 1/2 cc	boxes	2
92010	Bandage, Gauze, Compressed, 3-inch	each	5
93550	Case, Hypodermic, Complete (see par. 284n(1)).	each	1
93780	Tourniquet, Field	each	1
97050	Case, Instrument, Medical Officer's (see par. 284e(1))	each	1
97075	Kit Component, Insert, Type II, with Lace	each	1
97080	Kit Component, Litter Strap	each	1
97675	Container, Metal, No. 1 (for 91120)	each	1
99515	Sterilizer, Hypodermic Needle	each	1
Form 52b	Emergency Medical Tag;(20 in book in duplicate)	book	1

p. 97120 Kit, Medical Private's.

97065	Kit Component, Cantle Ring Strap	each	2
97085	Kit Component, Pouch, with Lace	each	2
97095	Kit Component, Suspender	each	1

In Right Hand Pouch

20340	Plaster, Adhesive, 1-inch	spool	1
34680	Scissors, Bandage	each	1
78780	Pin, Safety, Medium	cards	2
91025	Ammonia, Aromatic, 1/3 cc	pkg	1
91120	Iodine Swab, 1 1/2 cc	boxes	2
92010	Bandage, Gauze, Compressed, 3-inch	each	12
92040	Bandage, Triangular, Compressed	each	3
93780	Tourniquet, Field	each	1
97070	Kit Component, Insert, Type I, with Lace	each	1
97675	Container, Metal, No. 1 (For 91120)	each	1

In Left Hand Pouch

76240	Pencil	each	1
92060	Dressing, First-Aid, Small	pkgs	8
97080	Kit Component, Litter Strap	each	2
Form 52b	Emergency Medical Tag.	book	1

q. 97785 Packet, First Aid, Parachute.

97786	Packet, First Aid, Parachute, Container	each	1
91157	Morphine Tartrate, USP 1/2 Gr Solution	each	1

92060	Dressing, First Aid, Small	pkg	1
93780	Tourniquet, Field	each	1

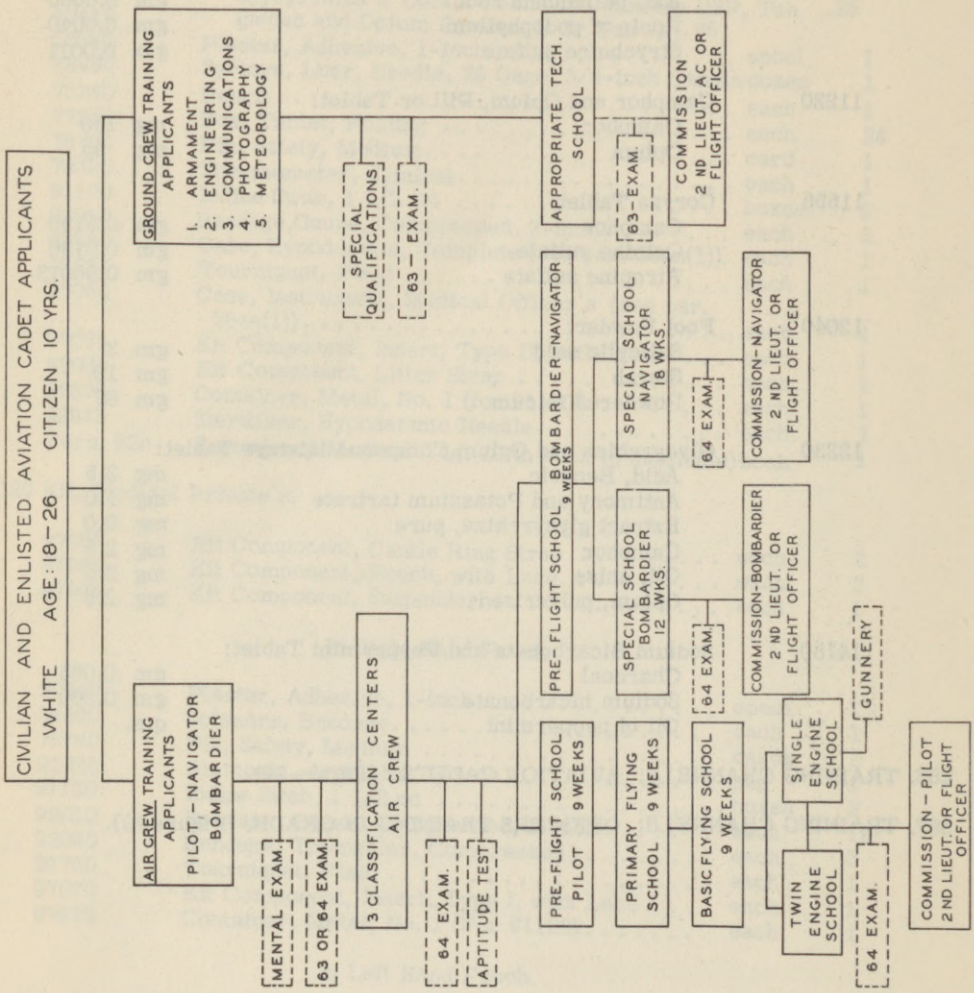
285. FORMULAE OF FREQUENTLY USED PHARMACEUTICALS.

10570	Aloin Compound, Pill or Tablet		
	Aloin	gm	0.0130
	Ext. belladonna root	gm	0.0080
	Rosin of podophyllum	gm	0.0040
	Strychnine sulfate	gm	0.0011
11220	Camphor and Opium, Pill or Tablet:		
	Camphor	mg	130
	Opium	mg	65
11555	Coryza Tablet:		
	Camphor	gm	0.0130
	Quinine sulfate	gm	0.0130
	Atropine sulfate	gm	0.00013
12040	Foot Powder:		
	Salicylic acid	gm	3
	Starch	gm	10
	Powdered talcum	gm	87
12230	Glycyrrhiza and Opium Compound Mixture Tablet:		
	Acid, Benzoic	mg	2.5
	Antimony and Potassium tartrate	mg	1.0
	Extract glycyrrhiza, pure	mg	6.0
	Camphor	mg	2.5
	Oil, anise	mg	2.5
	Opium, pulverized	mg	2.5
14180	Sodium Bicarbonate and Peppermint Tablet:		
	Charcoal	gm	0.065
	Sodium bicarbonate	gm	0.260
	Oil of peppermint	q.s.	

286. TRAINING CHANNELS: AVIATION CADETS. (Figure 39).

287. TRAINING CHANNELS: OFFICERS TRAINING IN GRADE. (Figure 40).

FIGURE 39.


CIVILIAN AND ENLISTED AVIATION CADET APPLICANTS
WHITE AGE: 18-26 CITIZEN 10 YRS.
AIR CREW TRAINING APPLICANTS
PILOT - NAVIGATOR BOMBARDIER
MENTAL EXAM.
63 OR 64 EXAM.
3 CLASSIFICATION CENTERS AIR CREW
64 EXAM.
APTITUDE TEST
PRE-FLIGHT SCHOOL PILOT 9 WEEKS
PRIMARY FLYING SCHOOL 9 WEEKS
BASIC FLYING SCHOOL 9 WEEKS
64 EXAM.
TWIN ENGINE SCHOOL
SINGLE ENGINE SCHOOL
GUNNERY
64 EXAM.
COMMISSION - PILOT 2ND LIEUT. OR FLIGHT OFFICER
PRE-FLIGHT SCHOOL BOMBARDIER-NAVIGATOR 9 WEEKS
SPECIAL SCHOOL BOMBARDIER 12 WKS.
64 EXAM.
COMMISSION-BOMBARDIER 2 ND LIEUT. OR FLIGHT OFFICER
SPECIAL SCHOOL NAVIGATOR 18 WKS.
64 EXAM.
COMMISSION-NAVIGATOR 2 ND LIEUT. OR FLIGHT OFFICER
GROUND CREW TRAINING APPLICANTS
1. ARMAMENT
2. ENGINEERING
3. COMMUNICATIONS
4. PHOTOGRAPHY
5. METEOROLOGY
SPECIAL QUALIFICATIONS
63 - EXAM.
APPROPRIATE TECH. SCHOOL
63 - EXAM.
COMMISSION 2 ND LIEUT. A.C. OR FLIGHT OFFICER

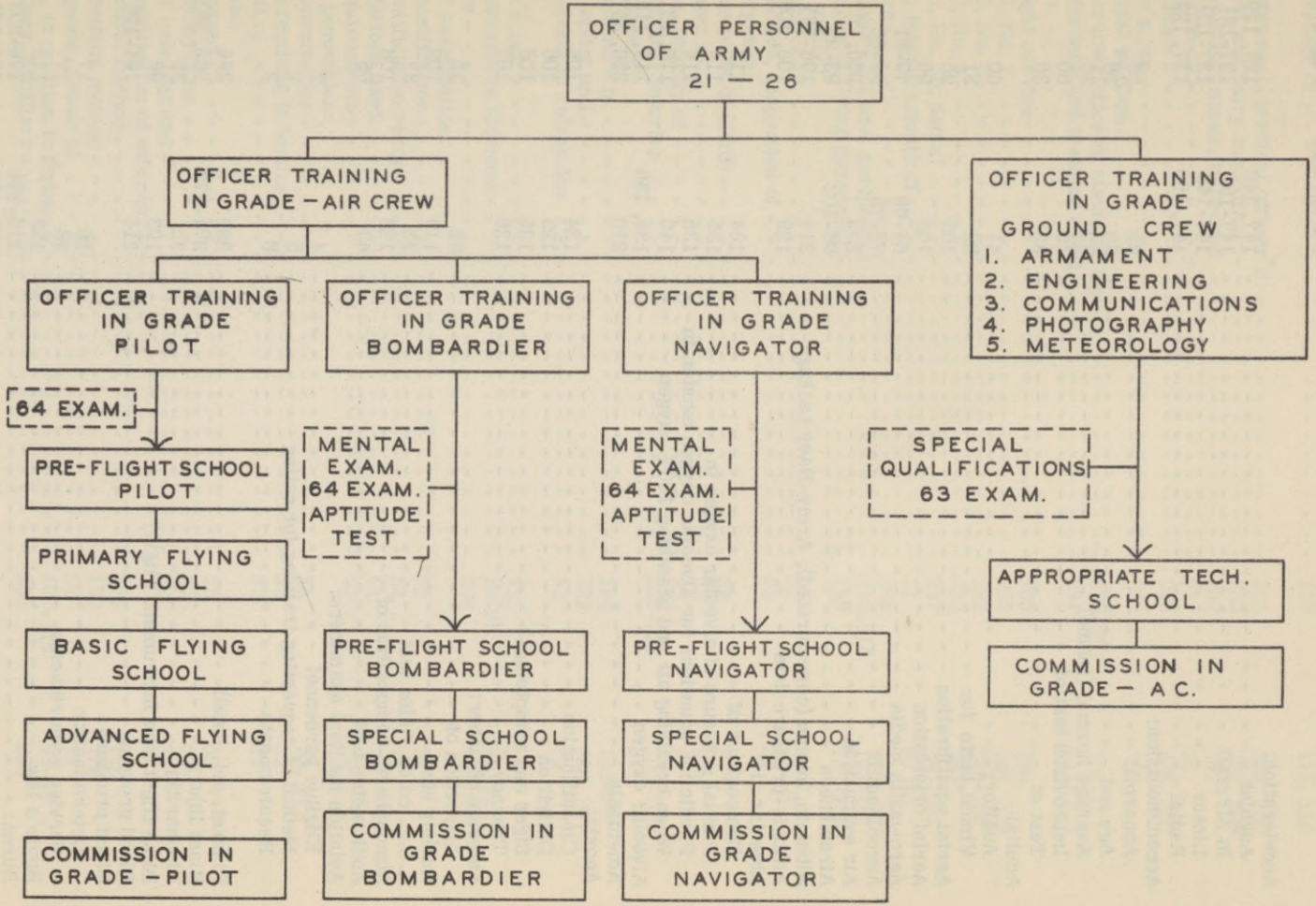

OFFICER PERSONNEL OF ARMY 21 — 26
OFFICER TRAINING IN GRADE — AIR CREW
OFFICER TRAINING IN GRADE GROUND CREW
1. ARMAMENT
2. ENGINEERING
3. COMMUNICATIONS
4. PHOTOGRAPHY
5. METEOROLOGY
OFFICER TRAINING IN GRADE PILOT
OFFICER TRAINING IN GRADE BOMBARDIER
OFFICER TRAINING IN GRADE NAVIGATOR
64 EXAM.
PRE-FLIGHT SCHOOL PILOT
PRIMARY FLYING SCHOOL
BASIC FLYING SCHOOL
ADVANCED FLYING SCHOOL
COMMISSION IN GRADE — PILOT
MENTAL EXAM. 64 EXAM. APTITUDE TEST
PRE-FLIGHT SCHOOL BOMBARDIER
SPECIAL SCHOOL BOMBARDIER
COMMISSION IN GRADE BOMBARDIER
MENTAL EXAM. 64 EXAM. APTITUDE TEST
PRE-FLIGHT SCHOOL NAVIGATOR
SPECIAL SCHOOL NAVIGATOR
COMMISSION IN GRADE NAVIGATOR
SPECIAL QUALIFICATIONS 63 EXAM.
APPROPRIATE TECH. SCHOOL
COMMISSION IN GRADE — A C.

FIGURE 40.

AMENDMENTS