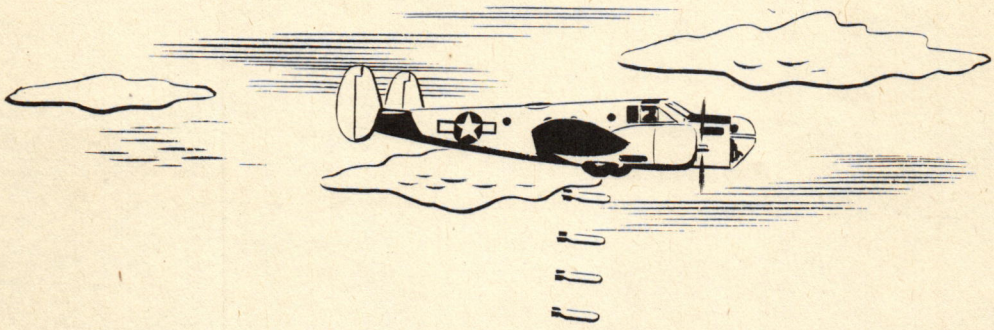
RESTRICTED

ALLIED SUBJECTS FOR BOMBARDIERS

ARMY AIR FORCES TRAINING COMMAND

Allied Subjects

FOR BOMBARDIERS



Prepared by the

ARMY AIR FORCES TRAINING COMMAND

Visual Training Department, in Collaboration with the

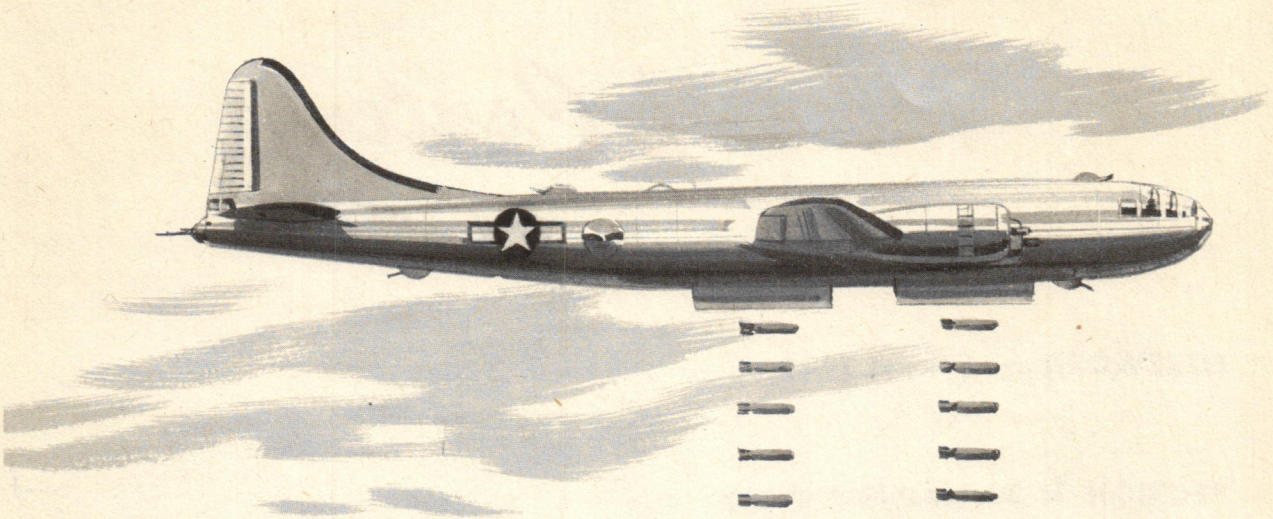
ARMY AIR FORCES INSTRUCTORS' SCHOOL (BOMBARDIER)

M.A.A.F., Midland, Texas

TO BE USED AS A SUPPLEMENT TO CURRENT AAF TRAINING COMMAND MEMORANDUM COVERING BOMBARDIER TRAINING

RESTRICTED

ARMY AIR FORCES TRAINING COMMAND



Foreword

To become a *good* bombardier there are a number of short subjects with which you must be familiar. They are all an important part of your training, but they do not properly fall into the limits of your other Training Manuals.

For example: A thorough familiarity with certain equipment in your AT-11 is necessary before you take to the air. The study of bombardment objectives and a knowledge of bombardment organization are required before you can take your place in a particular bombing unit.

This book brings together the facts that you must know about these various short subjects. They are discussed in terms of your immediate needs in training. They are related only in that they have to do with bombing. A thorough knowledge of them is necessary to prepare you for your many duties as an AAF bombardier.

H. H. Arnold

Lieutenant General, U.S.A.
Commanding

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SECTION 1

Bomb Spot Photography

PURPOSE AND IMPORTANCE

Your bombing accuracy is judged by (1) photographs of your bomb impacts and (2) your instructor's or pilot's estimate of those impacts. Of the two, bomb-spot photography is much the more exact and desirable. In many cases, when there is no photographic record of a bomb, you must drop another bomb to take its place. This is inconvenient to you and expensive to the government.

You and your bombing partner, will take pictures of each other's bombs. A close check will be made on your photographic ability. You are held responsible for poor results. Make every effort to get good pictures of all your partner's bombs. Be sure that your pictures are (1) properly focused, (2) correctly exposed, and (3) accurately centered.

TYPES OF AERIAL CAMERAS

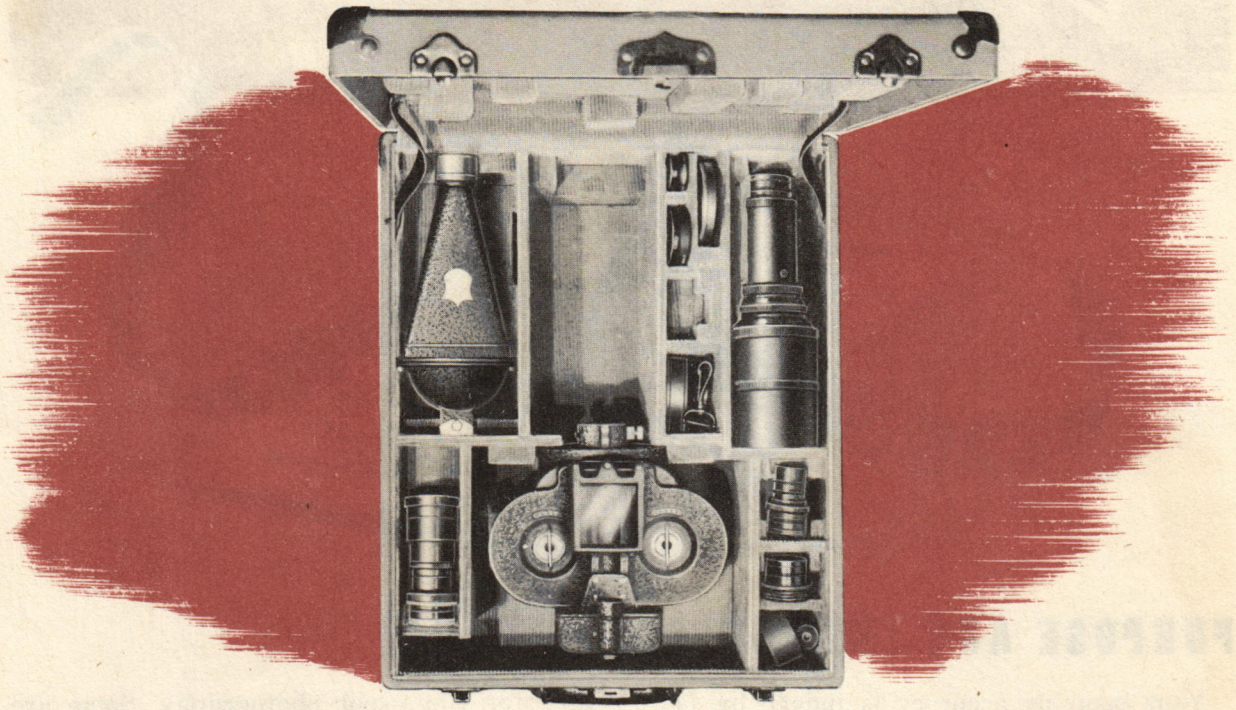
Many different kinds of cameras are suitable for bomb-spot photography. Some are semi-movie cameras like the L-2A, which has a device to record the time of each exposure. Others are still cameras, held by hand. One of the simplest is the K-20, a roll-film type which holds film for 50 pictures 4″ x 5″ in size. In contrast to these portable types, there are heavy, motor-driven cameras like the K-3B. This camera is mounted in the airplane with an intervalometer attachment which trips the shutter automatically at specified intervals.

You need to know how to operate only the A-4 camera, which is a small portable movie camera holding 100 ft. roll of film. It may be fitted with several different lenses, each for a different bombing altitude. It has various shutter speeds and lens openings. Be careful with your A-4 camera; it will cost you $526 if you lose it.

CHECK OUT THE CAMERA

Before every mission, you or your bombing partner checks out a camera. Report to the man in charge of cameras with your names and your mission number. He issues you a large case. Before you accept it, be sure that it contains the following equipment:

1. A-4 camera.
2. Camera handle.
3. Camera handle strap.
4. Cover for the view finder.
5. Telephoto lens or lenses.



THE A-4 CAMERA

The A-4 is a small, light camera mounted in a duraluminum case. A removable telephoto lens projects from the front of the case, and a handle with wrist strap can be screwed in at the bottom. To operate the camera, hold it by the handle with the right hand and steady it with the left.

On the left side of the A-4 camera, you see the view finder, a framed square of glass which folds against the case when not in use. To the rear of the view finder is the lamp house and the illuminated reticle. By turning the lamp switch on the back of the camera, you flash a cross of yellow light on the lens of the view finder. This cross indicates the center of your picture.

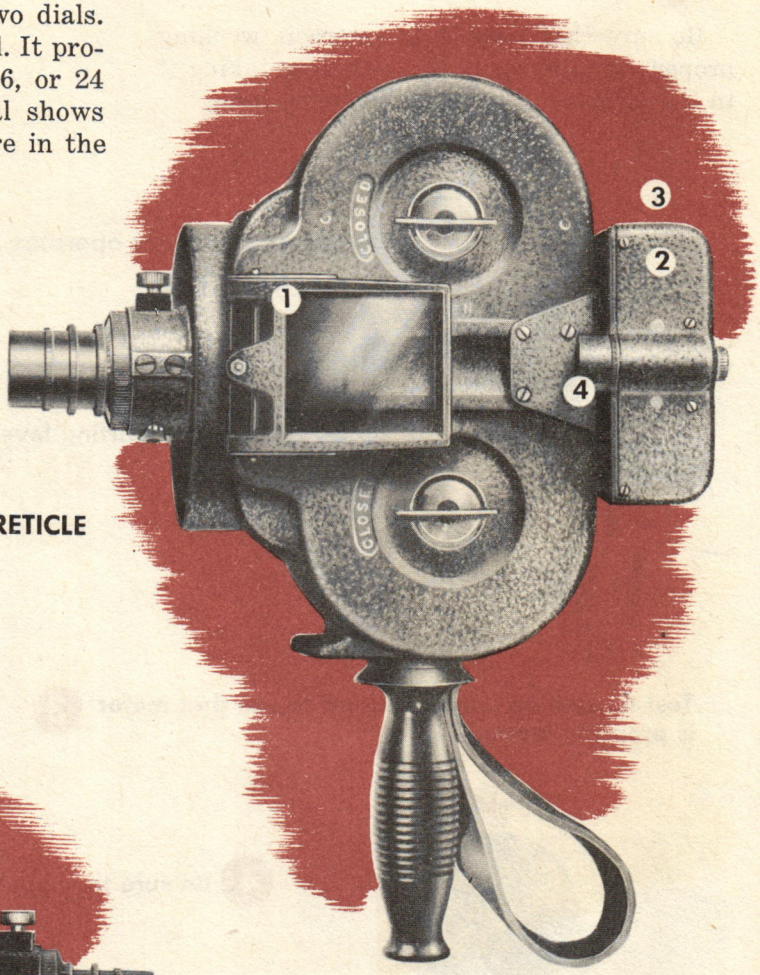
On the lower right side of the camera, you find the starting lever which operates the camera. With the fingers of your right hand grasping the handle, the starting lever is in easy reach of your right thumb.

At the center of the case is the winding crank, for winding the spring motor. When not in use, the winding crank folds against the case and is held in place by the crank latch.

The exposure calculator also is at the center of the case. This dial and marker enable

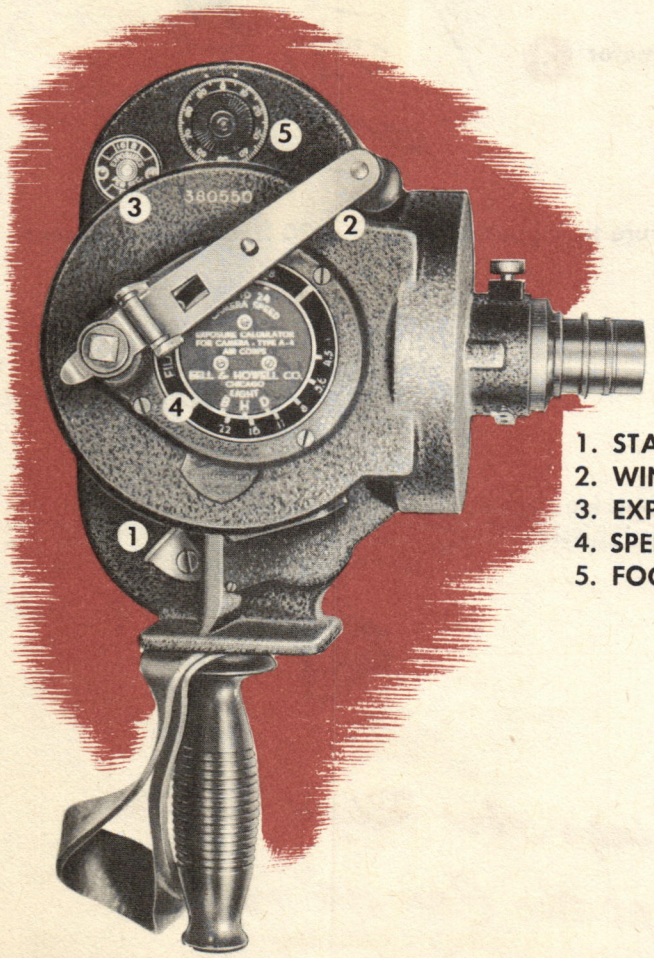
you to adjust the lens opening according to the amount of light available.

At the top of the left side are two dials. The rear one is the speed control dial. It provides for three shutter speeds: 8, 16, or 24 frames per second. The footage dial shows how many feet of unexposed film are in the camera.



Left Side

1. VIEW FINDER
2. LAMP HOUSE
3. LAMP SWITCH
4. ILLUMINATED RETICLE

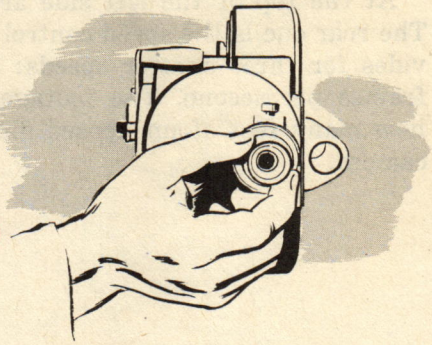


1. STARTING LEVER
2. WINDING CRANK
3. EXPOSURE CALCULATOR
4. SPEED CONTROL DIAL
5. FOOTAGE DIAL

Right Side

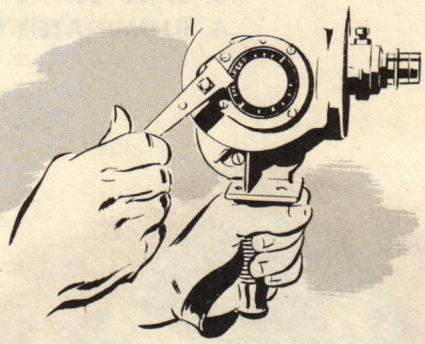
HOW TO PREFLIGHT YOUR A-4 CAMERA

Be sure that your A-4 camera is working properly and is ready to use before taking it to the airplane. Check the following items:

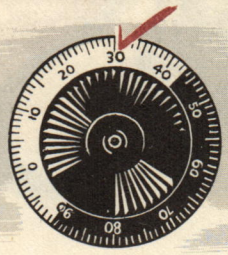


Make sure reticle light operates 1

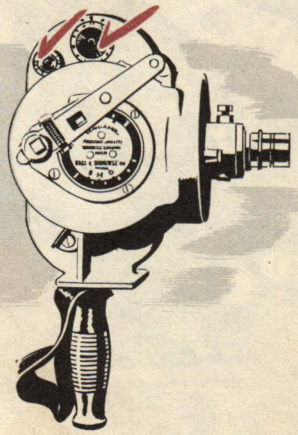
2 **Trip starting lever to see that motor runs**



Test tension on winding crank to see that motor is properly wound. 3



4 **Be sure that you have at least 30 ft. of film in camera**



Be sure that the shutter speed and lens opening are set correctly for your mission 5

Be Sure These Things Are Right Before You Accept the Camera

REPORT TO THE AIRPLANE

The first photographer to reach the airplane checks the camera hatch to see that it can be opened easily. This hatch, a round hole in the floor of the AT-11, is between the two auxiliary seats. It is covered by a square lid which is screwed down at the four corners. The lid is sometimes bent, making it difficult to raise.

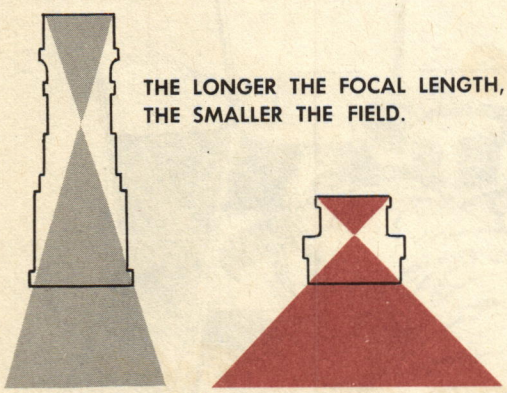
First, loosen the four corner screws. In newer airplanes, these are butterfly screws which can be easily turned by hand. Often, however, you need a dime or penny to turn the old type lock screws. Next, lift the cover by means of the ring inset. If the cover sticks, get the crew chief to loosen it before take-off.

AFTER TAKE OFF

Get the camera ready for taking pictures and open the camera hatch.

To prepare the camera, fit the wrist strap over the top end of the handle, and screw the handle into the tripod hole in the bottom of the camera.

If the proper lens is not already fitted into the camera, you must now select your lens. Four standard sizes are usually supplied with each carrying case. They have focal lengths of 1, 2, 6, and 10 inches. The longer the focal length, the greater is the magnifying power



THE LONGER THE FOCAL LENGTH, THE SMALLER THE FIELD.

of the lens and the smaller is the field that it covers from any given distance. You must know the approximate bombing altitude before selecting the proper lens for the mission.

Bombing Altitude	Proper Lens
500 to 1,000 ft.	1″
2,000 to 6,000 ft.	2″
8,000 to 11,000 ft.	6″
Above 11,000 ft.	10″

Select the proper lens, and push the rear end of it straight into the lens barrel of the camera. There are no threads to screw. Check to see that the lens is flush with the collar which holds it. Then tighten the captive lens lock set-screw on top of the lens barrel by turning it clockwise. Be sure the lens fits snugly before taking pictures.

To remove the lens, loosen the captive lock set-screw, then press the lower lens barrel lock underneath the lens barrel. Now you can pull the lens straight out of the collar.

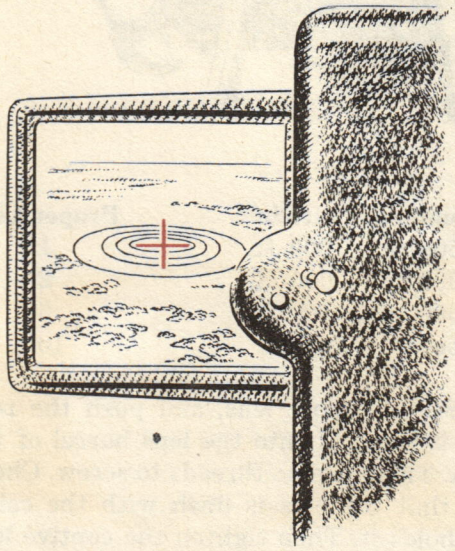
After fitting the lens, unfold the view finder so that it is at right angles to the camera case. Slip off the view finder cover and put it in the carrying case for safe keeping. **Never touch the lens of the view finder.** It is coated with a delicate chemical film which tends to keep the lens free of dust. Perspiration from your fingers is extremely harmful to this coating.

Next, turn on the lamp switch to either "Dim" or "Bright." The dimmer light is generally used on night missions.

HOLDING THE CAMERA

To hold the A-4 camera correctly, slip your right hand through the wrist strap and wrap your fingers around the handle. Your right thumb is now free to trip the starting lever. Place your left hand around the front of the camera, laying the lens between your left thumb and index finger. Keep your left elbow low so as not to interfere with your line of sight.

SIGHTING THE CAMERA



Brace the camera against the right side of your forehead. With your left eye, look through the view finder. Jockey the camera in your hands until the cross of yellow light from the reticle lines up with the crosslines etched on the view finder. Now sight these two sets of crosslines on some object. When the crosslines intersect the middle of the object you wish to photograph, you have correctly sighted the camera.

YOUR POSITION WHEN TAKING PICTURES

Every cameraman has his own favorite position when taking pictures. The most comfortable position usually produces the best results. You may find the following procedure satisfactory:

Facing the rear of the airplane, lie on the floor in such a manner that your left forearm reaches the rim of the camera hatch. Turn on your left side, and pull your left knee up toward your chest. Now rest your right elbow on your left knee. Flip your oxygen tube and headset wires over your left shoulder to get them out of the way.

This position keeps your feet clear of the bomb bays and allows you free movement. Now you are ready to take pictures.

DAYTIME PROCEDURE

As soon as your partner's bomb drops from the rack, turn on the reticle light and take your position over the camera hatch. So that the airplane's direction may be determined from the picture, make sure that the handle of the camera points toward the nose of the airplane. You will see the target a few seconds before the bomb hits, according to the altitude at which you are flying. Center the target in the view finder and wait for the impact. As soon as you see it, trip the starting lever. At normal speed, the camera is set to expose one foot of film every two seconds. A single frame is all that the statistical department needs for any one bomb. So, just flick the starting lever, and then let go.

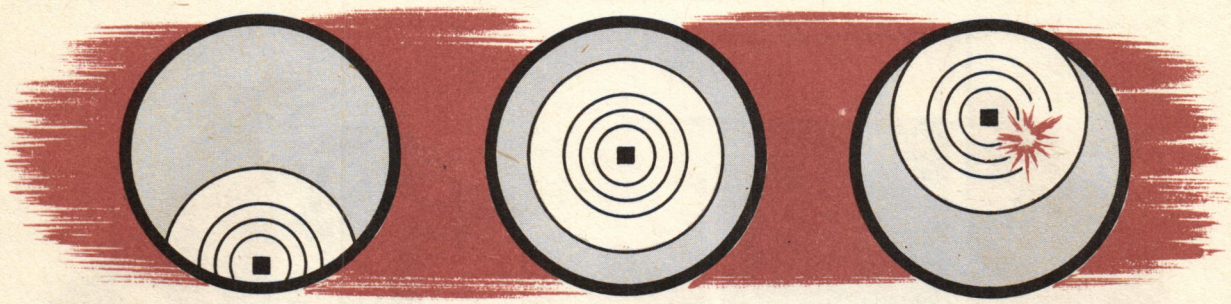
After you've taken the picture, turn off the reticle light. Then put your left hand over the lens and trip the starting lever again for an instant. This separates the picture of one bomb from the next.

Now take out your photo slip. Under the heading "Bombardier" write your partner's name on the first line and your own on the second. The name of the first bombardier, not the first photographer, always appears on the first line. Next, mark the record of your first picture under the column headed "1." If you got the picture, mark an "X." If you did not get it, mark an "O." If the bomb was a dud, write "D."

After you have taken a picture of your partner's final bomb, point the camera out the window at the sky and press the starting lever a little longer than usual. This produces several inches of over-exposed film and separates the pictures of your partner's bombs from yours.

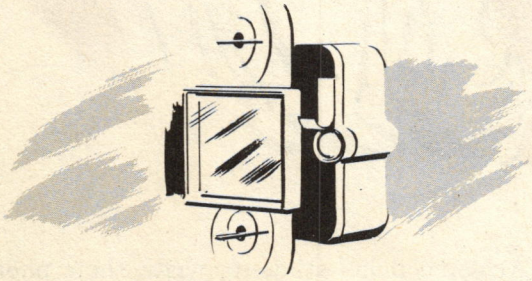
Next, slip the cover over the view finder and lay the camera in the carrying case.

EXPECT BOMB IMPACT—



NOT NOW . . . *NOT NOW . . .* ***NOW!***

PROCEDURE AT NIGHT

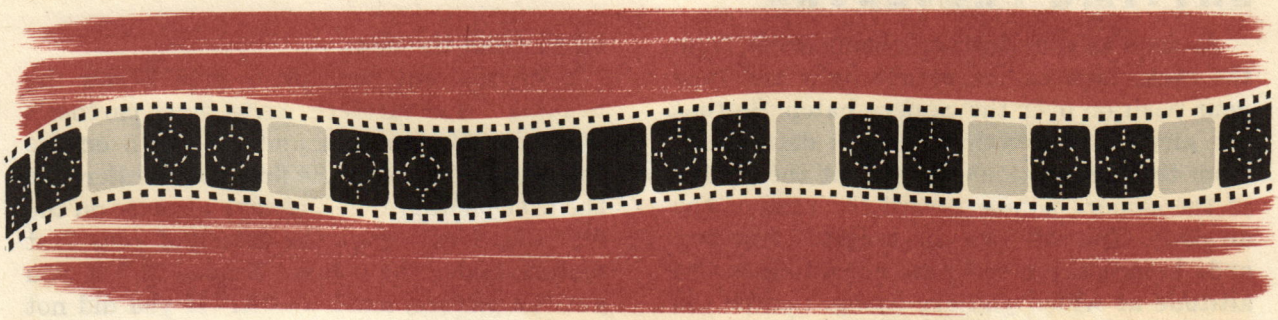


In most respects, the way you take bomb-spot pictures at night is no different from your daytime procedure.

One thing which may trouble you, on night missions, however, is the brightness of the reticle light. You can dim it by pasting a strip of translucent tape over the window of the lamp house. The man who issues your camera often has tape suitable for this purpose.

You must be very quick to catch pictures of bomb impacts at night. The flash rarely lasts longer than three-fourths of a second, but this is ample time if you are ready and waiting. To insure getting the picture, you may use one of these methods:

1. Sight the camera on the target and start it running as soon as the airplane is directly over the target. If the reticle light is not too bright, you can easily see the flash of the bomb through the view finder. Stop the



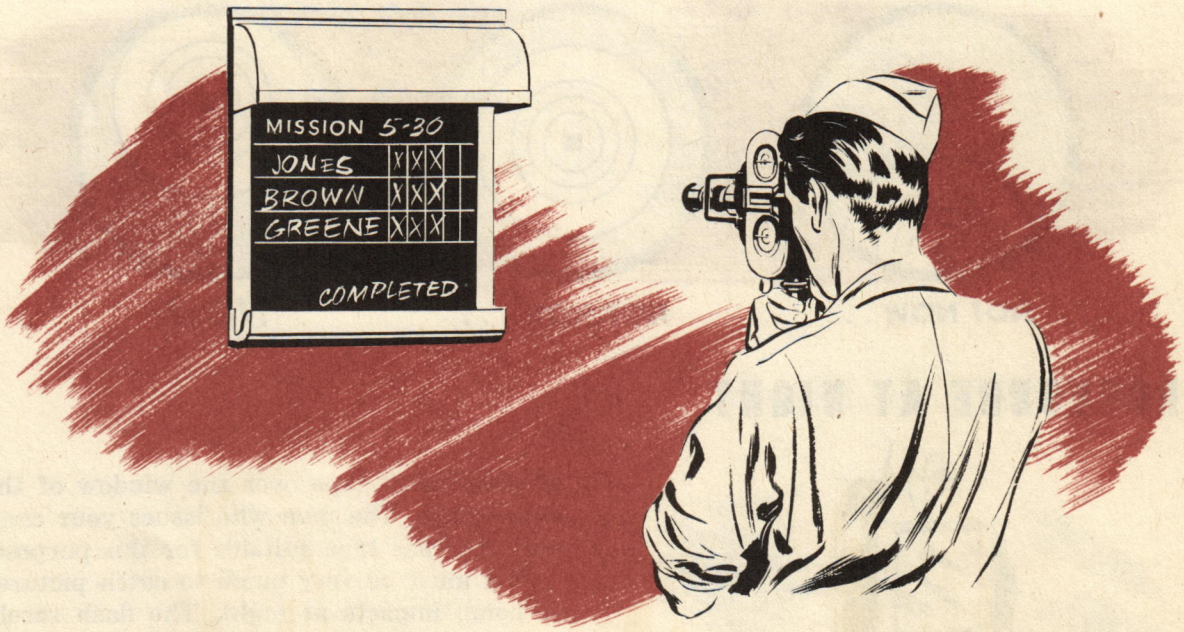
camera as soon as the flash disappears.

2. You can count the expected actual time of fall, depending on the bombing altitude at which you are flying, and start the camera an instant before your ATF expires.

3. Have the bombardier signal you by calling "camera!" about ten seconds before the sighting angle index reaches zero, and then "picture" one or two seconds before the index reaches zero.

Between bombardiers, point the camera at the dome light and expose several frames.

CHECK IN THE CAMERA



The first thing you do after a mission is check in your camera and photo slip. The attendant will inspect your carrying case to see that all equipment is there. Be sure that your photo slip is filled out completely, and that your and your bombing partner's names appear in the correct order.

At some fields students write their photo information on a blackboard, which is photographed with their camera. In this way, their record of pictures appears on the same film as the pictures themselves. This system may make it unnecessary to turn in a photo slip with your camera.

SECTION 2

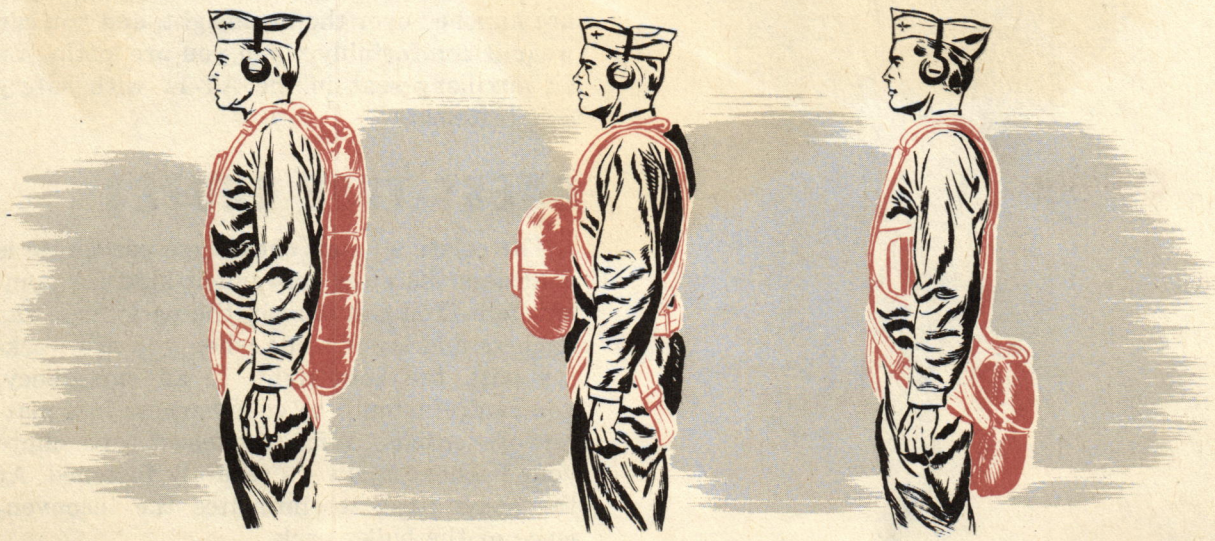
Parachutes

AAF Regulations, 95-15, par. 46: "Use mandatory.—a. Pilots and passengers . . . in Army aircraft will be equipped with parachutes of standard type on all flights."

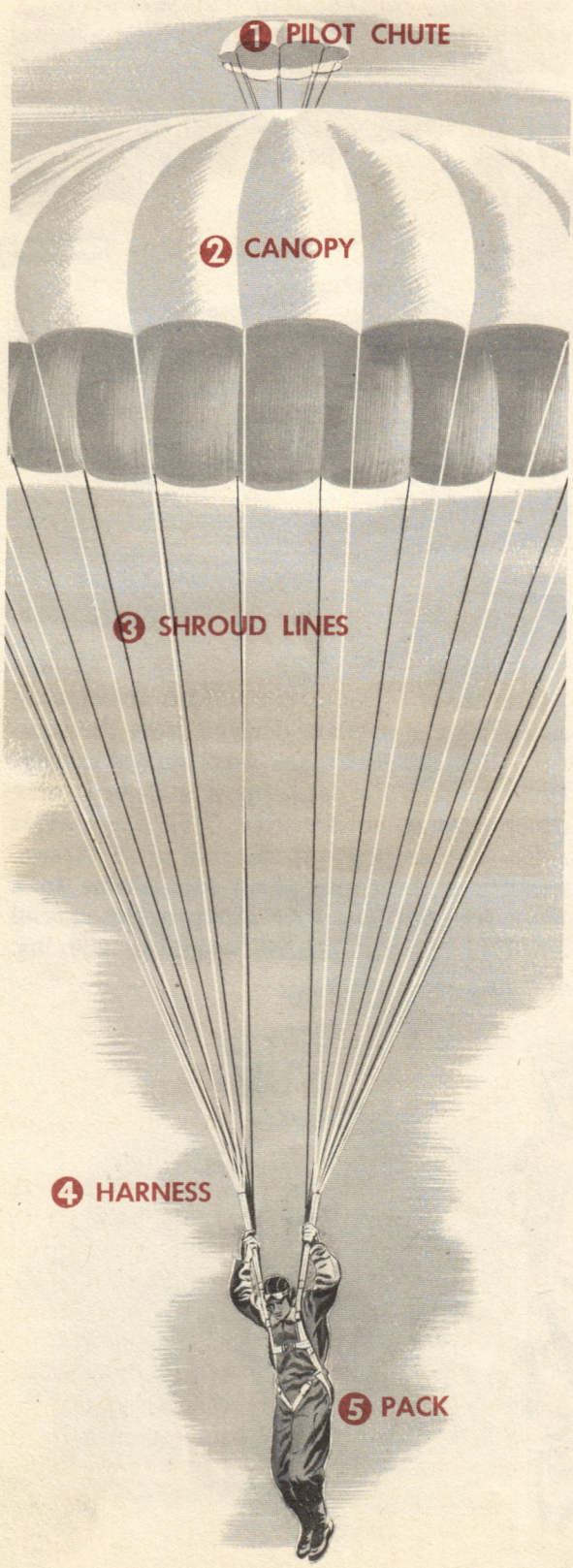
TYPES OF AAF PARACHUTES

There are three types of parachutes in general use by AAF crew members. They are (1) the seat-type, (2) the back-type, and (3) the chest-type chute. Although Technical Orders indicate a preferred type chute for each position in many airplanes, you may frequently get a chance to choose the type you prefer, particularly if one is issued to you for regular use. Until graduation, however, you must use whatever type is supplied by your field.

The three types of parachutes are equally safe. Their names are derived from the position that the packs are worn on your body. Each parachute contains a standard size canopy, 24 ft. in diameter. This size carries a 175-lb. man down at the rate of 21 ft/sec., making a parachute jump comparable to a 14 ft. free fall. The AAF also provides special 28-ft. chutes for airmen weighing 200 lbs. or more.



Each Chute Has Five Main Parts



The harnesses for all three types are similar in general construction and function. Made of heavy webbing, they consist of a strap across the chest, two suspender-like straps (risers) over the shoulders and crisscrossing in back, a seat strap, and two leg straps which pass between the legs and fasten to the risers in front. This harness is firmly held about your body by steel fasteners.

The ripcord ring on seat and back type chutes is generally held in place by a cloth pocket mounted on the riser over your heart. A few chutes have the ripcord rings on the right riser, however, and all the chest packs have them on the front side of the chute pack. **Therefore, always check the position of your ripcord before take-off.**

SEAT-TYPE CHUTES

The seat-type parachute is far and away the most common pack. Primarily a pilot's chute, it is designed to fit into the bucket seats found in single-engine trainers and fighters. Most bombardiers find seat-type chutes cumbersome.

BACK-TYPE CHUTES

The back-type chute is more convenient for bombardiers. It is out of the way when you are hunched over the bombsight, and you can wear it comfortably when you are sitting on an auxiliary seat in the AT-11 with safety belt fastened.

CHEST-TYPE CHUTES

The relatively new chest-type parachute is doubtless the most convenient kind for bombardiers. You can unsnap the pack from the harness and lay it aside when you are working with the bombsight. In an emergency, you can refasten it to your harness in a matter of seconds. With the chest-type chute your harness is always securely fastened. At the same time, it eliminates the inconvenience of the bulky pack.

FITTING, HANDLING, AND PREFLIGHTING YOUR CHUTE

Your parachute is your best friend in an emergency, if you take good care of it. Pamper your chute, and it will ease you down gently. It deserves good treatment at all times.

Before you check out a parachute, make sure that you are getting the correct size harness. There are three sizes: small, medium, and large. If you are a small man, don't wear a large chute. You'll have a hard time hanging on if you have to jump.

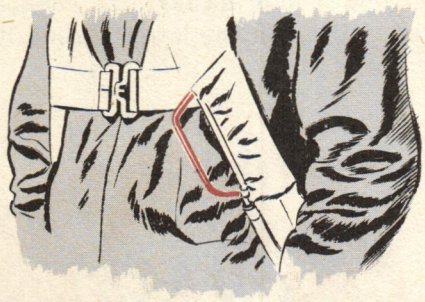
Regardless of the size marked on your chute harness, try it on before taking it—the sizes sometimes vary. Then make sure that the straps are adjusted correctly. Leg straps must be snug when fastened. Shoulder straps must be tight enough not to slip down your arms.

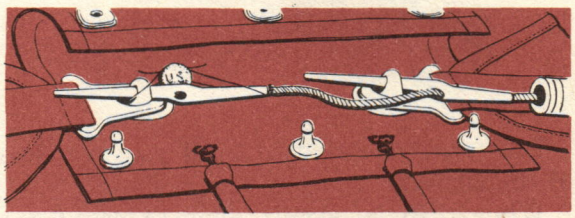
Be especially careful how you carry your chute. Either wear it or carry it over your shoulder by the leg straps. A seat-type chute should be tucked up against your back when you walk.

When laying down your chute, place it so that no weight rests on the pack. Seat-type chutes should be laid down back first.

Never leave your chute in an airplane overnight. Never expose it to moisture. A wet parachute is as useful as an iron life preserver.

Before any flight, inspect the ripcord apparatus. See that the lead wire is securely fastened to the ripcord ring. Make sure you know which way to pull the ring. Open the ripcord protector flap on the pack itself and inspect the ripcord seal and the fastener pins. **If the seal is broken or the pins bent, get another parachute.**





HOW TO BAIL OUT OF THE AT-11

Know the four means of escape from the AT-11 before your first take-off. They are:

1. The left rear door through which you enter the airplane. In an emergency, use the red emergency handle on the right to open the door. Pull up the handle, and the door flies off its hinges and out of the way. Dive head first and forward, toward the nose of the airplane. Keep as low as possible, and don't pull your ripcord until you are clear of the tail surfaces.

2. The emergency exit in the right wall of the baggage compartment in the rear of the airplane. This is a crash exit for use when the left side of the airplane is obstructed. If necessary, it can be used in flight. Pull the locking pins, push the door out, and keep as low as possible when you jump.

3. The bombardier's escape hatch in the nose. This exit is through the floor on the right side. Lift up the metal crossbar and turn the handle underneath. The trap door swings down and to the right. Be sure the airplane is flying straight and level before you jump. Then face the rear of the airplane and ease yourself down feet-first with your arms.

4. The bomb bays. With no bombs in the racks, a small man can get out of the AT-11 through the bomb bays. Use this exit only in cases of extreme emergency.

WHEN AND HOW TO MAKE A PARACHUTE JUMP

Never bail out of an airplane until the pilot tells you to. Then don't stop to ask questions; your pilot won't be there to answer them.

Whenever possible, go out head first with your legs straight. Dive **with** the airplane; that allows more time for the tail surfaces to clear you.

Don't pull the ripcord until you are clear of the airplane.

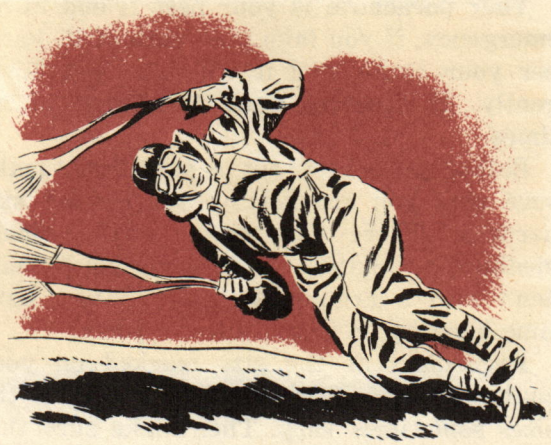
When altitude permits, allow at least 6 seconds after jumping before pulling the ripcord. In this time your body will slow down to 125 mph regardless of its initial speed. At greater speeds, the shock of an opening chute can be painful and dangerous.

Turn over and get falling feet first before you pull your ripcord. **Under no circumstances somersault.** You won't want the shroud lines between your legs when your chute opens.

Don't have your hand on the ripcord when you jump unless your are jumping from an altitude less than 600 ft.

Don't try to steer the chute unless you are an expert.

As you are about to land, face the direction in which you are drifting.



Flex your knees as you land. Break your fall by pulling up on the shroud lines. **Keep relaxed!**

Unless wind is strong, roll or run as you land.

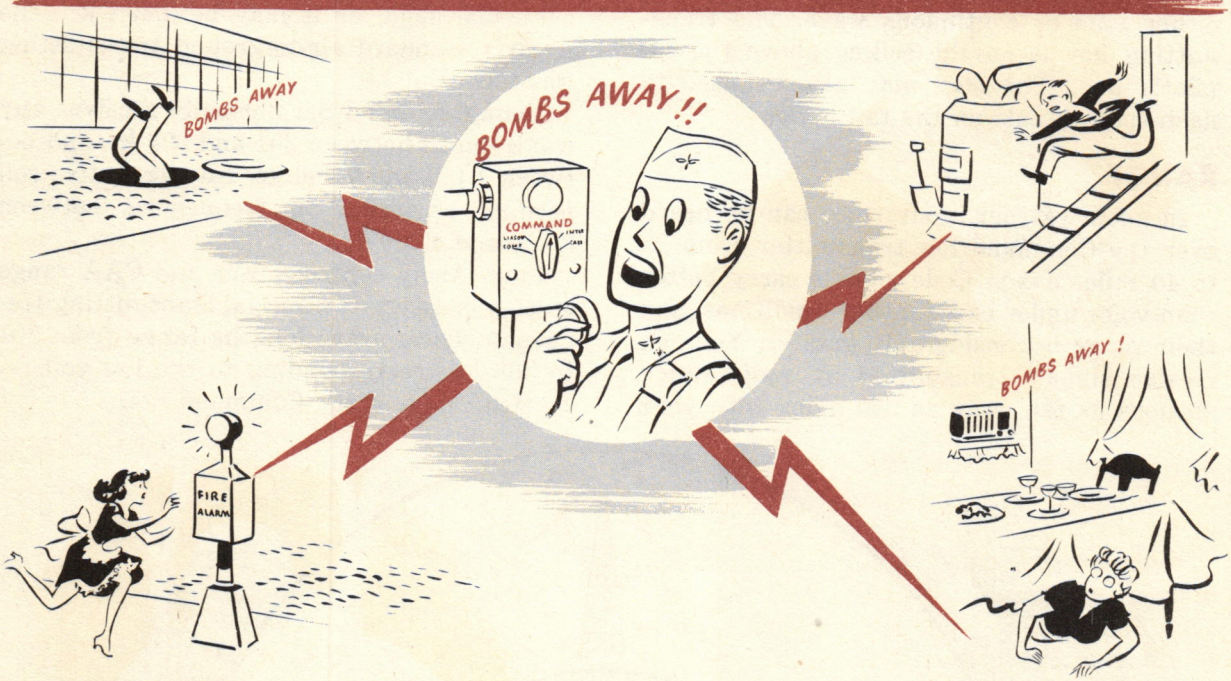
In strong winds either (1) collapse the chute by pulling on the lower shroud lines or

(2) slide out of the harness as you land. To do the latter, sit way back on the seat strap while descending. Unfasten the chest and leg straps and hold on by clasping your arms across your chest. As your feet near the ground slide out of the seat and release the harness.

Follow this same procedure when landing in water, and you will not become entangled while swimming or inflating your life jacket.

SECTION 3

Interphone Communication Procedure



RADIO EQUIPMENT YOU WILL USE

Every bombing plane has radio equipment which permits communication with the ground, with other aircraft, and from one crew member to another within the airplane.

This equipment consists of at least one transmitting set and one receiving set, together with the necessary rectifiers, microphones, earphones, outlet boxes, etc.

Combat bombers usually have several transmitters and receivers, for two reasons. (1) The extra equipment often is needed if some part fails or is damaged by enemy fire, and (2) long-range navigation often requires the use of more than one radio.

Training airplanes, such as the AT-11, usually have only one complete radio. This is the so-called Command Set, a low-powered radio suitable for short range communication. It is also used to power the interphone system. The Command Set is the heart of the radio equipment in most bombing airplanes. To it are added higher powered sets for more specialized assignments, such as long-range communication and radio direction finding. Newest AT-11's have some of this additional equipment, permitting use of the radio compass and allowing simultaneous communication on several frequencies.

THE COMMAND SET IN THE AT-11

Your pilot is in charge of the Command Set in your AT-11. He turns it on, tunes the receiver to the desired frequency, and adjusts the volume output as he sees fit. He uses the Command Set to communicate with the tower on take-offs and landings, to determine his position and to follow radio beams on cross-country hops, and finally, to give instructions over the interphone to his crew members.

While the Command Set is used mainly to communicate by voice, it is also equipped for transmitting code. This may be done on either tone or continuous wave. The transmitting key is on the ceiling above the co-pilot's seat. This key may also be used to flash code signals on the tail lamp.

RANGE

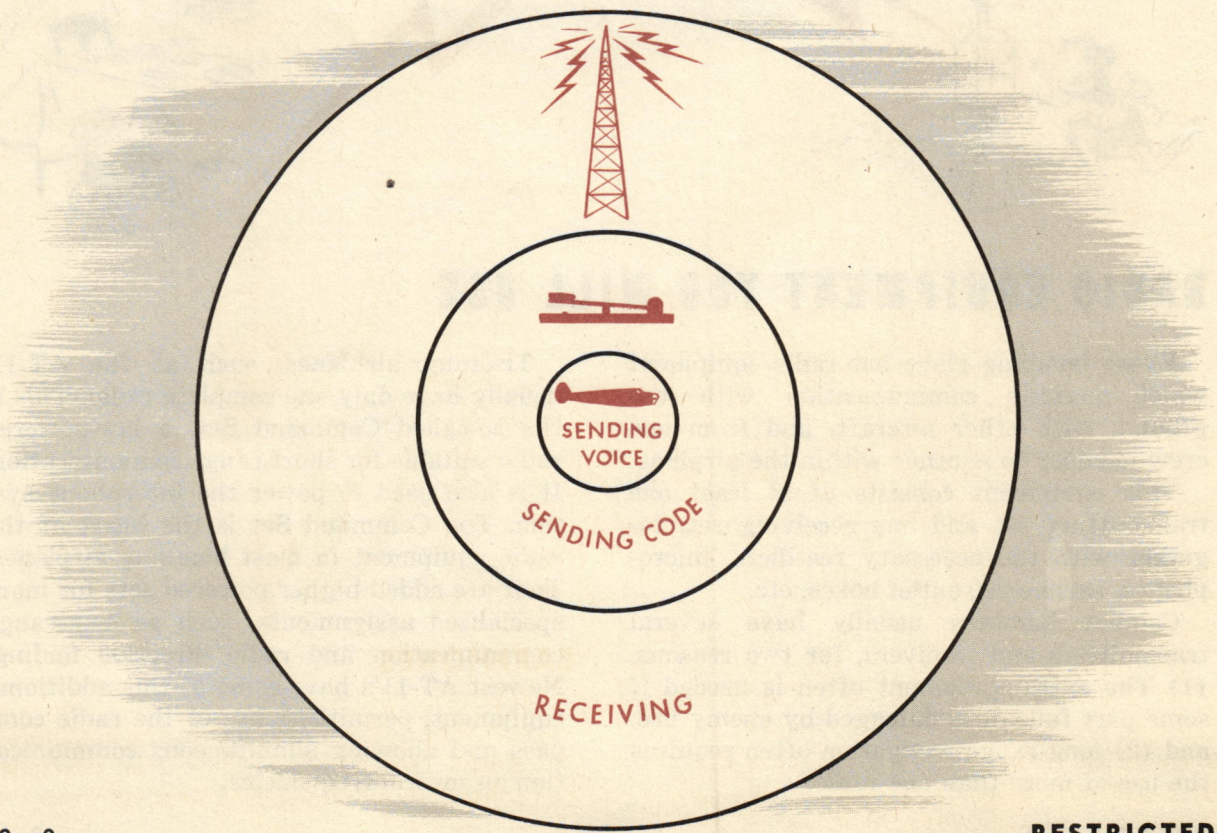
In good weather, your voice can be heard over the Command Set transmitter from 25 to 40 miles away. Code signals carry better than voice under bad weather conditions, and their range is considerably greater. You can receive signals transmitted by radio range stations as far away as 250 miles with your Command Set, but do not expect to hear another airplane farther away than 25 miles.

FREQUENCY

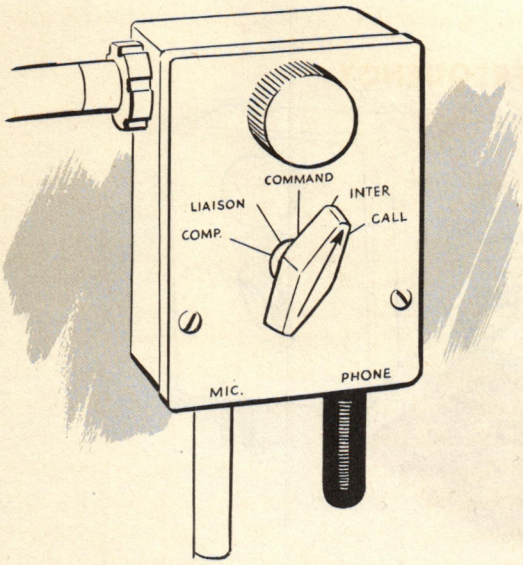
The radio mechanic can adjust the Command Set to transmit on any wave length between 2,500 and 7,700 kilocycles. Because these adjustments cannot be conveniently made in flight the radio man usually keeps the transmitter tuned to a specified frequency. This may be either a special one assigned for training missions out of your particular field, or it may be 4,495 kc., the Army's standard air-to-ground transmitting wave length.

Your Command Set normally receives any wave length between 201 and 398 kc. and between 4,150 and 7,700 kc. An alternative coil permits reception on frequencies between 2,500 and 4,700 kc.

Each Army control tower and CAA range station is assigned a special transmitting frequency. These wave lengths range from 201 to 398 kc., corresponding to the low coil reception range of the Command Set.



RADIO EQUIPMENT IN BOMBING AIRPLANES



OUTLET BOX

Each man's duty station has a small box mounted on the wall of the fuselage. This outlet box connects his microphone and headphone wires to the airplane's radio system. At the top of the box is a volume dial marked "Increase." By turning it you can increase the volume of your outlet box up to the maximum output of the receiver, which is regulated by the pilot.

A pointer at the center of the outlet box can be turned to select any one of five different settings. These are (1) Compass, (2) Liaison, (3) Command, (4) Interphone, and (5) Call.

Without additional radio equipment, the "compass" and "liaison" settings are dead. You probably will never use them in an AT-11. In Combat bombers, you can listen to the radio beam when you select "compass," and you plug into the airplane's long-range radio set when you select "liaison."

On "command," you hear whatever radio conversation is being received or transmitted by the Command Set. You can broadcast through the set with your own microphone.

On "interphone," you are connected to all other crew members who are also tuned to interphone. Your microphone enables you to speak with them. Your conversation will not be heard outside the airplane.

On "call," your voice can be heard at every duty station, regardless of the setting of the other outlet boxes. You will not be heard outside the airplane. Call is used to interrupt. After you have contacted the crew member to whom you wish to speak, both of you should switch to interphone to converse.

MICROPHONES

There are two types of microphones in general use with the Command Set.

1. The throat mike is perhaps the more convenient for bombardiers. You buckle it around your neck in such a manner that the two rubber contact buttons are held firmly on either side of your Adam's apple. The wire to the outlet box is connected to a switch which must be depressed before you can be heard over the mike. Speak **slowly, distinctly,** in your **natural** voice. Release the switch when you finish speaking. Otherwise, you cannot hear anyone else.

A connection plug enables you to unfasten your throat mike from the wall and wear it from one station to another.

2. The hand mike cannot be moved from station to station. It hangs from a hook beside the outlet box and must be held close to your lips whenever you want to use it. The switch is in the handle of this mike, but it works the same way as the other. Speak each word slowly and distinctly. Do not raise your voice.

EARPHONES

A set of earphones is provided at each duty station. The set is plugged into the bottom of the outlet box, and care should be taken to see that they are connected firmly.

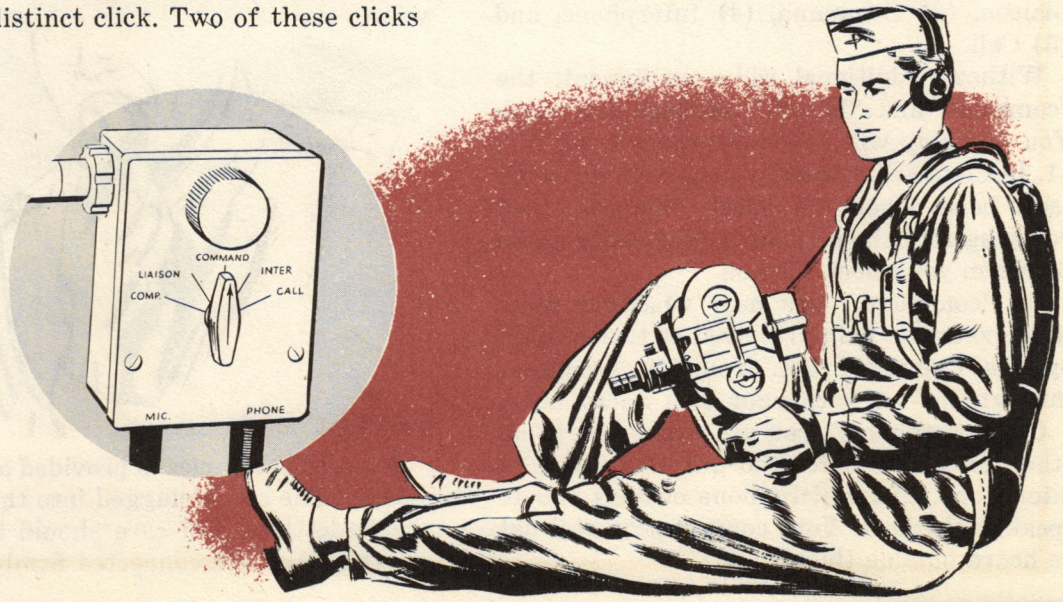
YOUR PROCEDURE IN AT-11

The first thing you do after climbing into the nose to bomb is to put on the bombardier's earphones. Do this **before you do anything else!** Neither your pilot nor your instructor can reach you until your earphones are on and your outlet box is switched to interphone.

If you have a throat mike, put it on as soon as you have put on your headset. If you have a hand mike, put it in some convenient place where you can reach it with minimum effort.

Opening and closing the microphone switch produces a distinct click. Two of these clicks are often used to signify the receipt of an instruction.

When you are photographer, tune your outlet box to command. Regulations require at least one crew member to be on command to receive instructions from the nearest Army radio tower. You are the one to receive any instruction which may be directed to your airplane. After receiving such a message, switch over to interphone and relay the report to your pilot. Preface your remarks with the words "Photographer to pilot," so that he will know who is speaking.



RADIO AND RADIO-TELEPHONE PROCEDURE

Combined allied operations have made necessary the use of an international radio code, a mutual vocabulary of key words, and a standardized radio/telephone procedure.

You must know radio code thoroughly and be familiar with authorized radio/telephone procedure before you are ready for combat communication.

International Code and Phonetic Alphabet

Letter	Phonetic Word	Code Symbol	Code Sound
A	ABLE	• —	dit da
B	BAKER	— • • •	da dit dit dit
C	CHARLIE	— • — •	da dit da dit
D	DOG	— • •	da dit dit
E	EASY	•	dit
F	FOX	• • — •	dit dit da dit
G	GEORGE	— — •	da da dit
H	HOW	• • • •	dit dit dit dit
I	ITEM	• •	dit dit
J	JIG	• — — —	dit da da da
K	KING	— • —	da dit da
L	LOVE	• — • •	dit da dit dit
M	MIKE	— —	da da
N	NAN	— •	da dit
O	OBOE	— — —	da da da
P	PETER	• — — •	dit da da dit
Q	QUEEN	— — • —	da da dit da
R	ROGER	• — •	dit da dit
S	SUGAR	• • •	dit dit dit
T	TARE	—	da
U	UNCLE	• • —	dit dit da
V	VICTOR	• • • —	dit dit dit da
W	WILLIAM	• — —	dit da da
X	XRAY	— • • —	da dit dit da
Y	YOKE	— • — —	da dit da da
Z	ZEBRA	— — • •	da da dit dit
1	WUN	• — — — —	dit da da da da
2	TOO	• • — — —	dit dit da da da
3	THUH-REE	• • • — —	dit dit dit da da
4	FO-WER	• • • • —	dit dit dit dit da
5	FI-YIV	• • • • •	dit dit dit dit dit
6	SIX	— • • • •	da dit dit dit dit
7	SEVEN	— — • • •	da da dit dit dit
8	ATE	— — — • •	da da da dit dit
9	NI-YEN	— — — — •	da da da da dit
0	ZERO	— — — — —	da da da da da

STANDARD RADIO-TELEPHONE VOCABULARY

KEY WORD	MEANING
Roger	"I have received all of your last transmission."
Acknowledge	"Let me know that you have received and understood this message."
Wilco	"I have received and understood your last message and will comply with it."
How do you hear me?	
Speak slower	
Wait	"I must pause for a few seconds."
Wait. Out	"I must pause for a longer time."
Say again	"Repeat."
I say again	"I shall repeat."
Verify	"Check coding and text with the originator and send correct version."
Message for you	"I wish to transmit a message to you."
Send your message	"I am ready for you to transmit."

KEY WORD	MEANING
Read back	"Repeat all of this message back to me exactly as received."
Over	"Come in, please."
Out	"End of message. No reply expected."
That is correct	"You are correct."
Words twice	"Please send every phrase in message twice" or "Since communication is difficult, I shall repeat every phrase."
Correction	"An error has been made in this transmission. The correct version is:"
Wrong	"What you have just said is incorrect. The correct version is as follows:"
Groups	"The number of groups in this code or cipher message is:"
Break	"I hereby indicate the separation of the text from other portions of the message."

RADIO-TELEPHONE MESSAGES

Speech over the radio-telephone must be clear and slow, with equal emphasis on each word. Speak in natural tones and phrases. Keep your messages as short as possible without confusing your meaning.

Every radio-telephone message must be composed of three basic parts: (1) the call, (2) the text, and (3) the ending.

Identify your call letters and those of the station you want to contact by phonetic words. You would designate RQ, the call letters of Randolph Field, Texas, with the phrase: "ROGER QUEEN."

Conclude the text of your message with the time of origin. Use the word "TIME," then the appropriate four numbers, and finally the key letter of the appropriate time zone. Hence, "TIME 1630 C" means that the preceding message was written for transmission at 4:30 p.m. Central War Time.

A TYPICAL RADIO-TELEPHONE MESSAGE MIGHT RUN AS FOLLOWS:

Call	"Able Baker. This is Peter Three."
Text	"Words twice. Convoy has arrived. Convoy has arrived. Time 1620 C. Time 1620 C."
End	"Over."
Call	"Peter Three. This is Able Baker."
Text	"Roger."
End	"Out."

SECTION 4

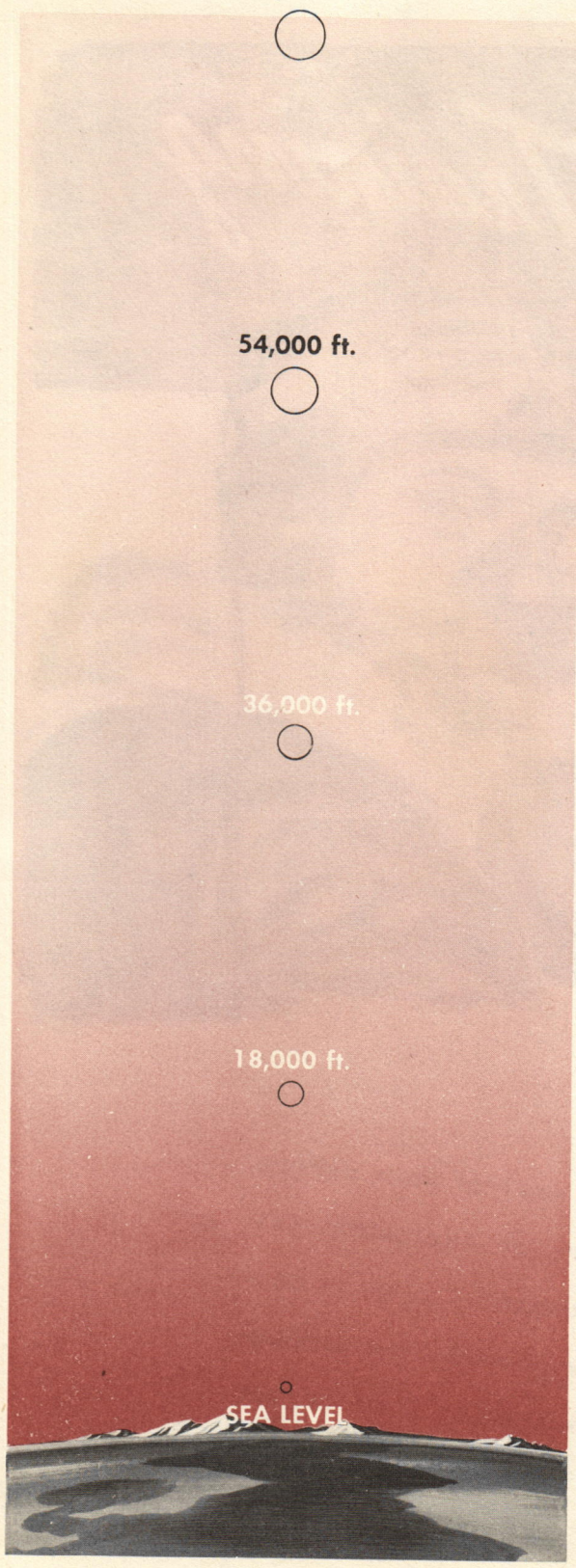
Altitude Training

OXYGEN

WARNING

Never use oil or grease on any part of your oxygen system, including the mask. Fire or explosion may result if slight traces of such lubricants come in contact with oxygen under pressure. Under no circumstances smoke or light a match near an open oxygen system.

OXYGEN IN THE ATMOSPHERE



The air you breathe is a mixture of nitrogen, oxygen, carbon dioxide, and a few other gases. So far as animal life is concerned, oxygen is the all-important ingredient. Your lungs absorb oxygen from the air you breathe, and supply it to your blood stream, which carries it to all parts of your body in order to sustain the life of each individual cell.

Oxygen represents about 21% of the earth's atmosphere by volume. This percentage holds for all altitudes. There is the same **proportion** of oxygen in the air one mile deep in the earth as there is at 50,000 ft.!

But your body requires a certain **amount** of oxygen, just as your automobile requires a certain amount of gasoline in order to go a given distance. The amount of oxygen required to sustain your life depends on (1) the size of your body, (2) your physical condition, and (3) most important of all, your mental or physical activity.

Since the atmosphere is greatly expanded at high altitudes, there is a great deal less oxygen by **weight** in any given volume of air at high altitudes. Unfortunately, your lungs hold only so much air **by volume.** In order to get the required amount or **weight** of oxygen, you would have to fill your lungs many, many times. There comes a point when the amount of oxygen taken from each lungful of air is not sufficient to keep you alive during the time it takes you to breathe that lungful. Then you would lose consciousness and die.

This need or want or oxygen is called **anoxia.** The chief symptoms are:

1. Loss of insight and failure to realize danger.

2. An early false sense of well being.

3. Smaller field of vision and decreased hearing.

4. Sluggishness and clumsiness.

5. Lack of emotional balance.

6. Greatly reduced ability to see in dim light.

Up to 10,000 ft., the effects of anoxia are definitely present but hard to notice. At 20,000 ft. without oxygen equipment most people suffer impaired vision, loss of muscular coordination, fatigue, and finally unconsciousness. At 25,000 ft., very few can retain consciousness for even a few minutes, and above this altitude death results quickly.

There are two methods of supplying sufficient oxygen to airmen at high altitudes:

1. By hermetically sealing airplane cabins and maintaining near-normal air pressures inside.

2. By supplying air for breathing which has a greater than normal percentage of oxygen.

As a general policy, the AAF has adopted the second method. At high altitudes you wear a mask which is connected to a supply of pure oxygen under pressure. When you breathe pure oxygen, your lungs can hold almost five times as much oxygen as they could if you breathed the same volume of ordinary air at the same pressure.

Oxygen is supplied to you either in a continuous flow to your mask, or it is mixed with air as your needs require.

PRESENT OXYGEN EQUIPMENT

There are two types of oxygen systems in use in present AAF airplanes: (1) demand and (2) continuous flow. Both usually are low pressure systems, but there are many high pressure continuous flow systems in training airplanes.

In addition, portable walk-around and bail-out bottles are provided for times when you must be out of reach of your regular equipment.

THE DEMAND SYSTEM

It is so called because it supplies oxygen to your air-tight mask only as you demand it—that is, as you inhale. The regulator, which controls the flow of oxygen, opens when you inhale and closes when you exhale. Your expired breath escapes from your mask through a special vent.

Secondly, for any given altitude the regulator automatically mixes just the right amount of air with the oxygen you breathe. This proportion is controlled by an evacuated bellows like the one in an aneroid barometer.

At sea level, the bellows is contracted; the air port is open and the oxygen port is closed. As altitude increases, the bellows expands, due to lessening pressure. Accordingly, the flow of air decreases and the oxygen flow increases. Finally, at an altitude of about 28,000 ft., only pure oxygen is supplied to your mask.

Two manual controls are provided for special use. They are marked "Auto-Mix" and "Emergency."

When you turn the auto-mix to "off" position, you get a 100% flow of oxygen into your mask, regardless of the altitude. This is

sometimes done on medical advice for extended flights at 30,000 ft. Breathing pure oxygen from the ground up denitrogenates your body, thus tending to prevent aeroembolism or the "bends."

The emergency valve supplies pure oxygen **at a greatly increased pressure.** It should be opened only in cases of extreme emergency, such as to revive an unconscious crew member, and should be used for very brief intervals. Otherwise, you would drain your airplane's oxygen supply in a matter of minutes!

All combat airplanes are now delivered with demand systems already installed.

THE CONTINUOUS FLOW SYSTEM

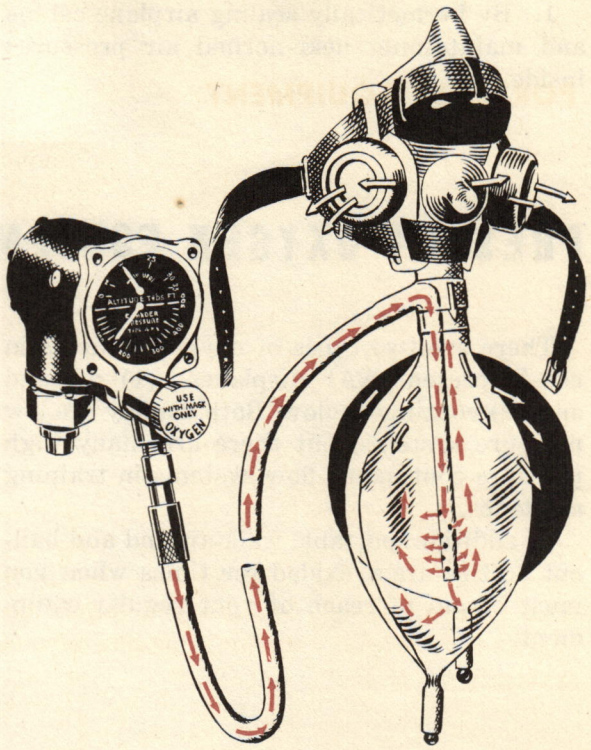
This system provides a steady stream of oxygen to your mask at all times, regardless of whether you are inhaling or exhaling. You control the amount of oxygen you get by turning the regulator manually, and adjustments must be made whenever you change altitude.

With this system, you wear a mask having a rubber bag attached. This is called a **rebreather** bag, because you rebreathe its contents over and over again. When you exhale, the first part of your breath fills the bag. The part you exhale last contains the most waste materials and is forced out of the mask through an escape vent. Pure oxygen continuously flows into the bag, enriching its contents. When you inhale, you empty the rebreather bag; and the process begins again.

One disadvantage of the rebreather type mask is its tendency to freeze at high altitudes. Rebreathed air contains abnormal amounts of moisture, which causes ice to form at the exhaust valves. Most of these valves are made of sponge rubber, so that you can break the ice loose by crushing the valves between your fingers. In addition, protective shields are provided for use whenever the temperature falls below 10°F.

You will notice two scales on the regulator dial. One indicates the pressure in the oxygen cylinders; the other shows the rate of oxygen flow into your mask. Both register as soon as you turn the regulator knob.

Gages on high pressure systems read as high as 2,000 lbs/in.^{2} Gages on low pressure systems read up to 450 lbs/in.^{2} Never take off with pressure below the minimum prescribed for your particular airplane. These are about 800 lbs. for high pressure systems



and 200 lbs. for low pressure systems. Never allow a high pressure cylinder to fall much below 200 lbs. or a low pressure cylinder to fall below 50 lbs. Otherwise, moisture from the atmosphere may seep into the system, freeze, and cause great damage.

The flow indicator is the dial at the top of the gage. It is graduated at intervals of 5,000 ft. Regulate your flow of oxygen according to the altitude at which you are flying. If active, allow yourself an additional supply of oxygen. When flying at 10,000 ft., for example, set your gage to read 15,000.

Always Remember:

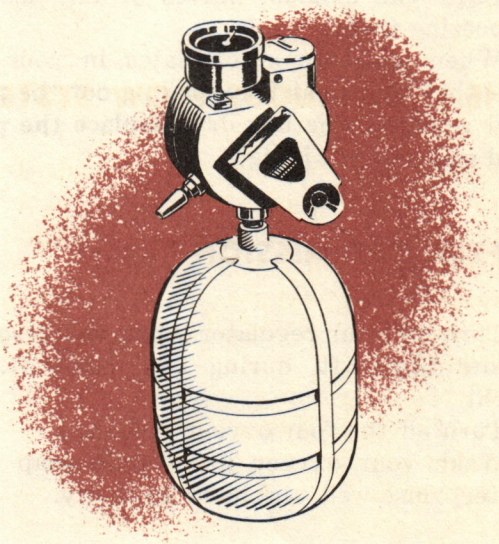
The amount of oxygen you need depends upon the PRESSURE ALTITUDE at which you are flying, not the true altitude. Only the barometric reading of your altimeter counts, since it registers the PRESSURE of the oxygen available for your needs in the atmosphere in which you are flying.

PORTABLE EQUIPMENT

This equipment enables you to move around freely in an airplane flying at high altitude.

Walk-around bottles about the size of a large cantaloupe contain from a 6- to 10-minute supply of oxygen. They can be filled from the airplane's regular system and attached to your mask. A clip fastens the portable bottle to your clothing.

High pressure bail-out bottles are provided for jumps from great altitude. No mask is worn. Instead, you slip the intake hose into your mouth and breathe directly from the bottle. **Be sure that your bail-out bottle is filled before take-off, because you cannot recharge it from your airplane's regular oxygen system.**



HOW TO USE THE OXYGEN EQUIPMENT IN THE AT-11

PREFLIGHT PROCEDURE

Check your own oxygen equipment before taking off on a high altitude mission.

Most AT-11's are equipped with high pressure continuous flow systems with outlets for the pilot, bombardier, instructor, and photographer. Each station has its own regulator and is supplied by a separate oxygen cylinder.

The procedure is as follows:

First, turn on the regulators at these four stations to exhaust the stale oxygen from each system. Turn off the regulators when the pressure gages register zero.

Second, turn on the four oxygen cylinders. You find them against the right wall of the fuselage between the bomb bays and the navigator's work table. If you cannot turn the valve handles by hand, get the crew chief to help you. **Be sure these cylinders can be turned on before taking off!**

Third, check the pressure in each system. If one of the cylinders is low, have the crew chief replace it before take-off.

AIR PROCEDURE

On daytime missions, turn on your oxygen equipment at 10,000 ft. For night flights above 5,000 ft., use oxygen from the ground up. Oxygen improves your ability to see in dim light.

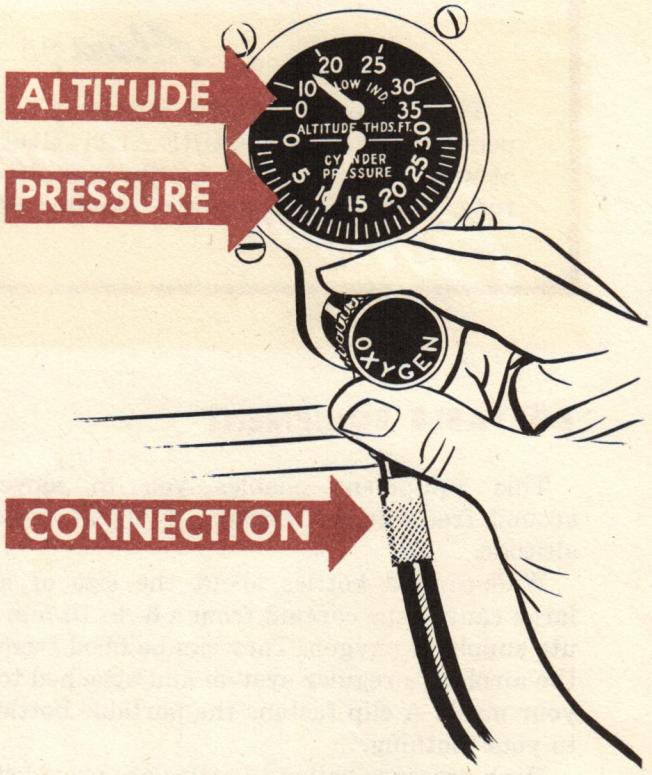
Put on your mask and fasten the hose to your regulator outlet. **Be sure that the bayonet connection is firm.**

Regulate your oxygen flow according to the altitude at which you are flying.

Check the pressure in your oxygen system from time to time.

Clear the exhaust valves of any ice by squeezing them.

When moisture accumulates in your rebreather bag, clear it by pulling out the plug and wringing the bag dry. **Replace the plug and make sure it is tight.**



AFTER THE MISSION

Turn off your regulator when you descend below 10,000 ft. during day, 5,000 ft. at night.

Turn off the four oxygen cylinders.

Wash your oxygen mask with soap and water, rinse well, and hang up to dry.

Never lend your mask to anyone else except in an emergency.

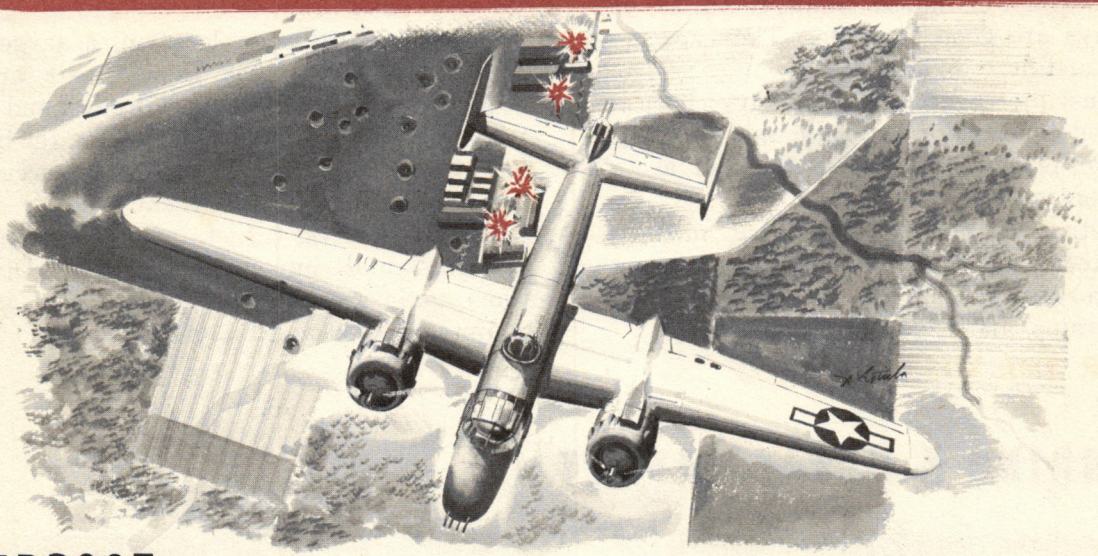
Check for holes in the rebreather bag and hose. Be sure that all connections are air tight.

WARNING

Never use oil or grease on any part of your oxygen system, including the mask. Fire or explosion may result if slight traces of such lubricants come in contact with oxygen under pressure. Under no circumstances smoke or light a match near an open oxygen system.

SECTION 5

Bombardment Aviation



PURPOSE

Aerial warfare, like any other kind of warfare, is both offensive and defensive.

Unlike armies and navies, however, an air force requires different weapons for each type of operation. Battleships are equally formidable whether protecting a friendly harbor or attacking an enemy fleet. Flying Fortresses, on the other hand, are almost useless as pursuit planes.

Bombardment aviation is the **offensive** power of an air force. Its purpose is to destroy the enemy's power and will to resist. Its operations fall into two groups: (1) tactical and (2) strategic.

BOMBARDMENT OPERATIONS

Tactical operations have to do with striking the enemy in the field: bombing supply dumps, strafing ground troops, destroying lines of communication.

Strategic operations strike the enemy at home, behind the lines: bombing factories, crippling transportation, destroying civilian morale.

Bombardment operations are further classified according to the branch of the enemy's armed forces that these offensive thrusts are directed against:

1. Operations against enemy air forces.
2. Operations against enemy ground forces.
3. Operations against enemy naval forces.
4. Operations against joint enemy forces, such as a ship convoy guarded by naval forces but carrying ground troops.

Bear in mind that any one of these operations can be either tactical or strategic. Bombing a war plant producing naval guns is a strategic operation against enemy naval forces. Strafing an air field is a tactical operation against enemy air forces.

You classify a given bombing operation according to the specific target attacked.

BOMBARDMENT OBJECTIVES

Targets for bombing operations are classified according to their (1) mobility, (2) size, and (3) location.

MOBILITY

A target is either fixed, transient, or fleeting.

Fixed targets are permanent structures which cannot be moved. Dams, factories, and railways are good examples. They are here today and here tomorrow.

Transient targets are temporary: here today and gone tomorrow. Ammunition dumps, pontoon bridges, and ships at anchor are all transient targets.

Fleeting targets possess great mobility. Here today and gone today, they are targets of opportunity. Such are truck convoys, railroad trains, and troops on the march.

SIZE

Area targets are those of considerable size with no single vulnerable point, such as landing strips, railroad yards, and oil fields.

Precision targets are concentrated enough to be destroyed by a relatively few direct hits. Power plants, suspension bridges, and railroad roundhouses are of this type.

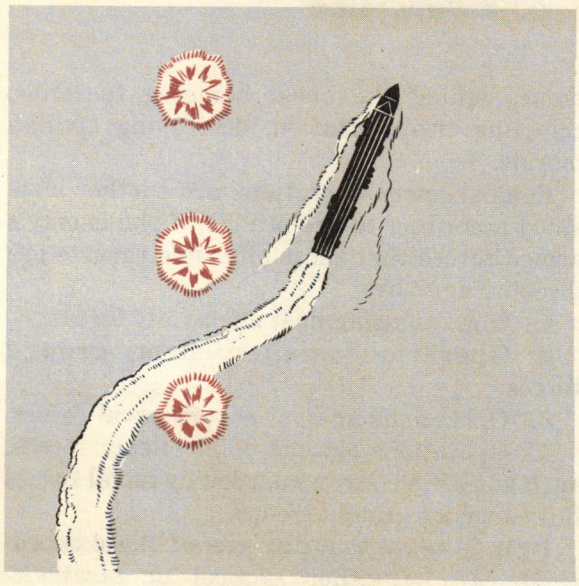
LOCATION

Depending upon its location, a target is considered either a land, naval, or air target.

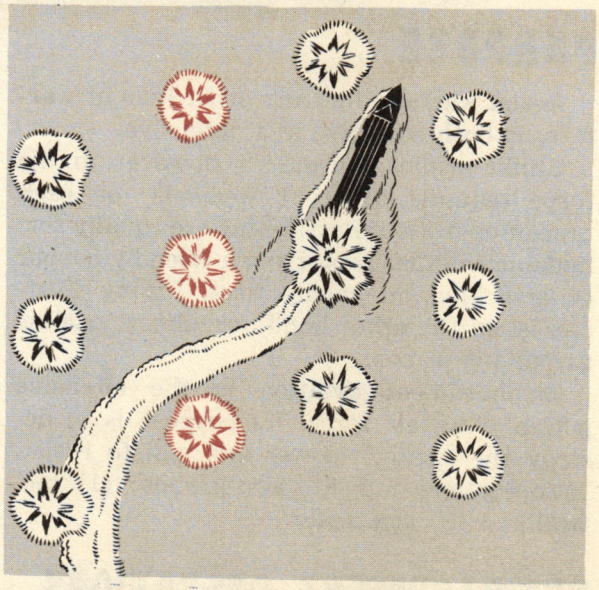
Air targets, such as other aircraft and balloon barrages, make poor objectives for bombardment operations. To date, few successes have been scored against them.

Land and naval targets are bombardment aviation's most important objectives. Operations against each type differ widely as to equipment used and tactics employed.

BOMBING A NAVAL TARGET



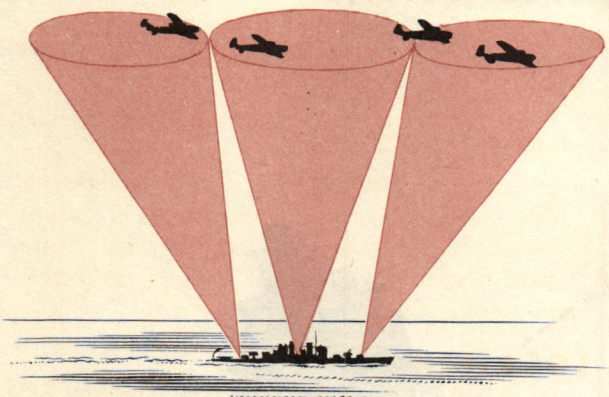
A MANEUVERING TARGET . . .



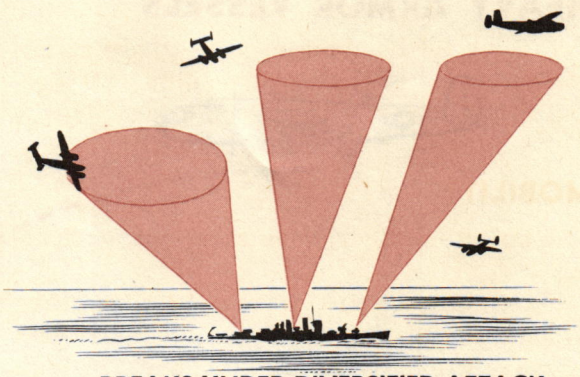
. . . CAN'T OUT-MANEUVER A PATTERN OF BOMBS

One lesson of the present war has been the great vulnerability of even the most formidable warships to air attack. There is no longer any question about whether a battleship will sink if hit by a large enough bomb. The problem now is **how** to hit it.

High level attack allows the vessel too much time for evasive action after the bomb



SOLID DEFENSE . . .



. . . BREAKS UNDER DIVERSIFIED ATTACK

is on its way. A formation of bombers can drop a pattern of bombs that will insure a hit; but except against objectives of major importance, this method is usually too costly to be practical.

Medium altitude attack allows the target less time to maneuver, but this is the most effective range for flak. Most important naval targets bristle with anti-aircraft.

Low level attack is also wide open to defensive fire. It is favored, however, when a single airplane is bombing a single vessel. In this case, two methods of attack may be used: (1) minimum altitude bombing and (2) dropping torpedoes.

Because of the many difficulties encountered in launching an aerial torpedo, the AAF has utilized mainly the first method.

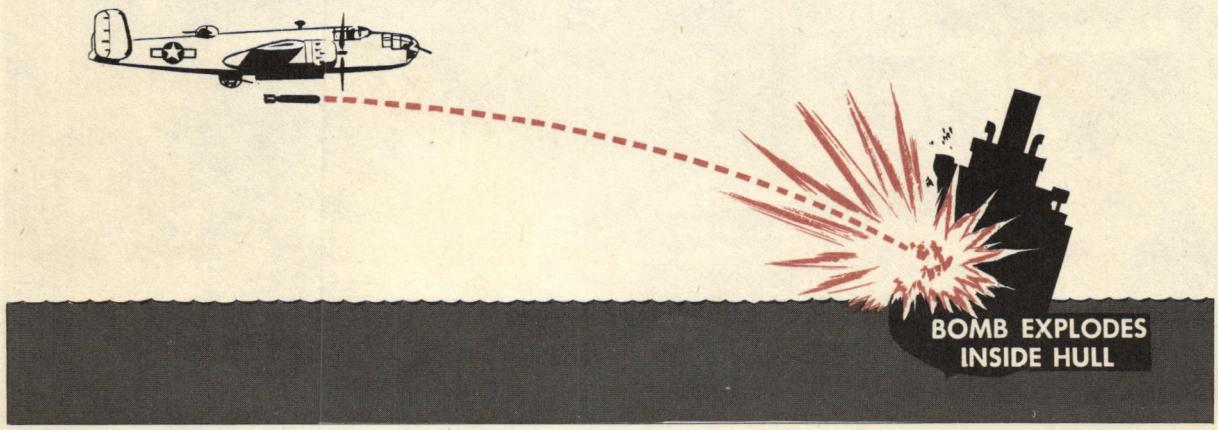
A diversified attack is best when many airplanes are directed against a naval target. Simultaneous high level bombing, dive bombing, and minimum altitude bombing divide defensive fire and greatly reduce its effectiveness.

MINIMUM ALTITUDE ATTACK BOMBING AGAINST LIGHT ARMOR VESSELS

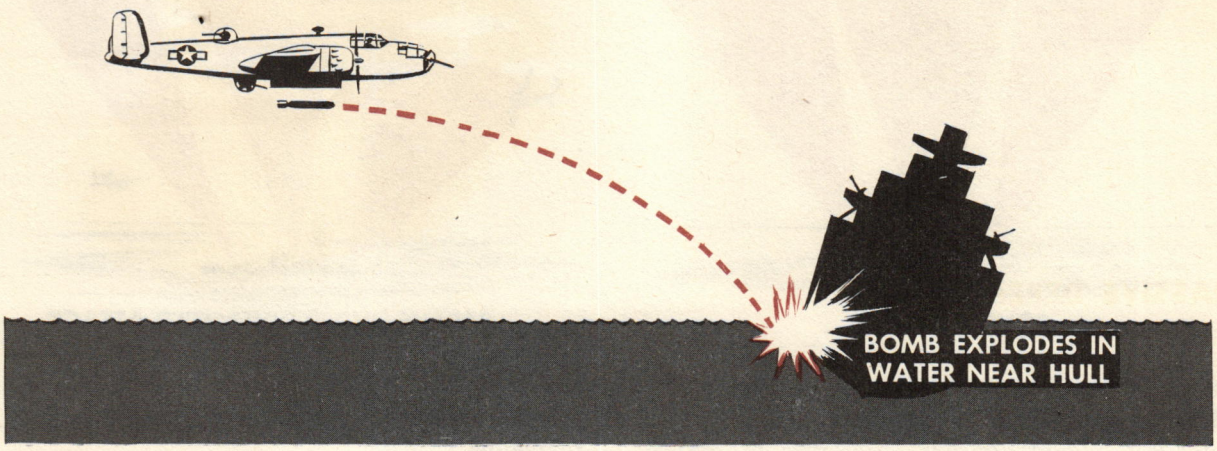
Broadside attacks against merchantmen and destroyers should be made at maximum speed and minimum altitude. A desirable bomb for this purpose is a 500-lb. GP. A 4-sec. delay fuze gives the airplane time enough to escape from the blast and permits the bomb to explode inside the hull.

Aim at the water line. If your bomb falls somewhat short, it will skip across the water and pierce the ship. If it lands somewhat over, it will still hit the ship.

Use maximum forward fire power on your approach. It will reduce the defensive fire directed at your escape.



MINIMUM ALTITUDE ATTACK BOMBING AGAINST HEAVY ARMOR VESSELS



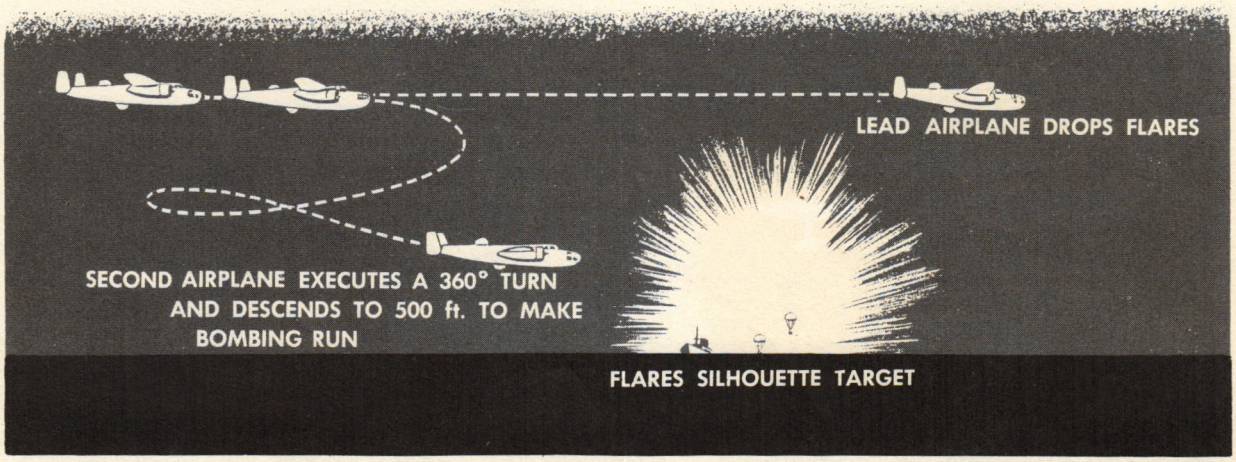
Quartering frontal attacks against light cruisers and larger warships should be made at maximum speed. Altitude in feet should be the same as speed in mph. A desirable bomb for this purpose is the 2,000-lb. GP, with a 4-sec. delay nose and tail fuze.

Aim to hit 50 ft. short of the waterline. Your bomb will sink beside the vessel and explode underwater. The percussion effect thus produced will cause much more damage than a direct hit on the hull of heavily armored vessels.

MINIMUM ALTITUDE ATTACK BOMBING AT NIGHT

Low level bombing attack can be made by two airplanes at night. When the target is sighted, the lead plane makes a straight run for it at medium altitude. The second airplane executes a 360° turn and descends to 500 ft. The maneuver should take about one minute.

When past the target, the lead plane drops flares to silhouette the objective. While the second airplane makes its bombing run, the lead plane circles back to make its bombing run on the target. By the time it is ready to bomb, the second airplane has flown over the target and is ready, if necessary, to light the target for the lead plane.



BOMBING A LAND TARGET

High level, medium altitude, and minimum altitude bombing methods are used against land targets as well as against naval targets. Land targets, however, usually present a much more diversified defense. Target defense is one of the most important considerations when planning a bombardment operation.

Target defense is either active or passive.

PASSIVE DEFENSE

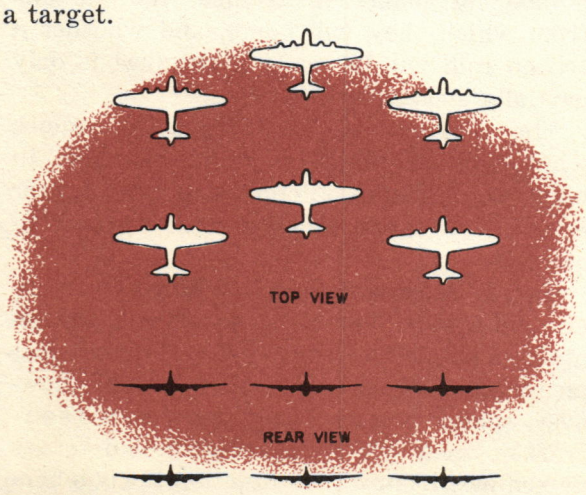
This comprises all equipment and devices used to conceal an objective or to make it difficult to bomb. Balloon barrages, camouflage nets, and dummy targets all belong to passive defense.

ACTIVE DEFENSE

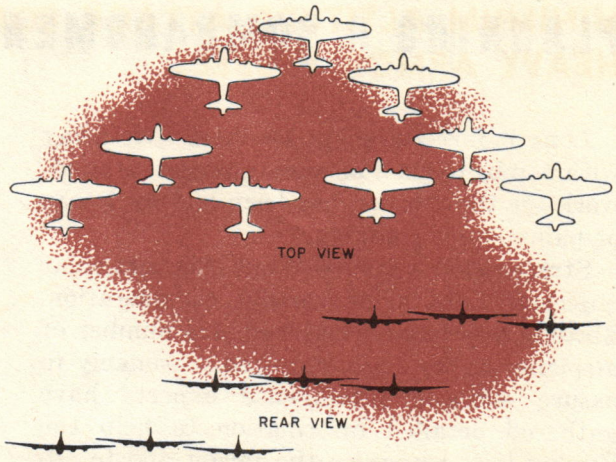
This comprises all weapons and equipment used to shoot down attacking aircraft or turn them back from their objective. Fighter planes, anti-aircraft, radio-detection equipment, and searchlights all belong to active defense.

A tight formation is the best defense against fighter planes. The more concentrated your fire, the less chance a fighter has to get in close enough for a killing burst. The javelin is considered a good anti-fighter formation.

The staggered formation is not so good as the box against fighter opposition, but it is a great deal better against flak. Your planes do not present nearly so concentrated a target.



JAVELIN FORMATION



STAGGERED FORMATION

At bombing altitudes below 300 ft., highly maneuverable bombing aircraft have the best opportunity to escape flak. Bombing accuracy is excellent at this level, and ground crews have trouble getting a "bead" on attacking airplanes.

Bombing accuracy is not nearly so good at bombing altitudes from 300 to 3,000 ft., and this is the most effective range for ground automatic weapons.

Bombing accuracy improves rapidly at bombing altitudes from 3,000 to 7,000 ft., but light anti-aircraft fire is extremely deadly.

Bombing accuracy is highly satisfactory at bombing altitudes from 7,000 to 15,000 ft., and targets of extreme importance must often be attacked from this level. Fighter opposition operates best at these altitudes, however; and they are heavy anti-aircraft's most effective range.

Bombing accuracy remains good at bombing altitudes from 15,000 to 25,000 ft. Fighter opposition is still deadly, but the effectiveness of flak falls off.

Pattern bombing makes up for reduced bombing accuracy at bombing altitudes above 25,000 ft., where anti-aircraft is relatively ineffective and fighter performance tends to favor the bomber.

To score the same number of hits on a given precision target, bombing probabilities show that whereas 3 airplanes can do the job at 5,000 ft., 5 airplanes are necessary at 10,000 ft., 7 airplanes are required at 15,000 ft., 10 airplanes are needed at 20,000 ft., and 15 airplanes must be used at 24,000 ft.

PLANNING A BOMBARDMENT OPERATION

Long before the giant bombers roar away with bombs to blast an enemy target, groundwork for the mission has been laid by weeks of painstaking planning.

Strategists have singled out this particular objective only after careful consideration. Statisticians have dispatched this number of airplanes as the force required reasonably to assure success. Intelligence experts have gathered detailed information to help the bombardiers recognize the target and to advise the pilots about its defense. Meteorologists have forewarned the navigators about weather conditions ahead.

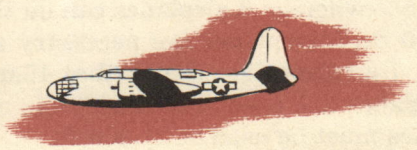
Operations against fixed and transient targets usually require the most elaborate preparations, but a certain amount of planning must precede even attacks against targets of opportunity. The crew of a patrol bomber, for example, is not certain to spot a submarine on any particular mission; but they are **prepared** to attack such a target whenever they find it.

Many considerations affect the kind of operation a given bombardment organization can make. First, there is the matter of available equipment.

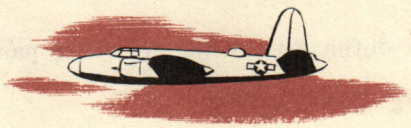
There are four types of bombardment aircraft with which an AAF Bomber Command may be equipped:

1. Fighter Bombers. Any fighter airplane capable of dropping a bomb is so considered. A good example is the A-36, a P-51 with bomb racks.

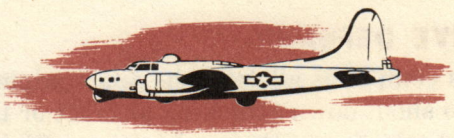
2. Attack and Dive Bombers. The A-20 and the A-24 are prominent members of this class.



3. Medium Bombers. The B-25 and the B-26 are considered medium bombers. They are usually used on tactical missions, although the B-25's most spectacular job was a strategic one: the Tokyo raid.



4. Heavy and Very Heavy Bombers. These include the B-17, B-24, B-29, and B-32. Their missions are usually strategic.



Weather plays an important part in any bombardment operation. Cloudy skies and long stretches of overcast are advantageous on the approach and return phases of a mission, where concealment is desired. But they are detrimental to the actual assault if high altitude bombing is to be employed.

Target considerations are the third factor which must be taken into account when planning a bombardment operation.

The importance of the target determines what risks shall be taken to destroy it, the number of planes dispatched, the altitude from which they will bomb, and whether a second raid will be made if the first is only partially successful.

The distance to the target determines what type of airplanes must be used. In many cases, distance determines what fighter escort, if any, can be given to the attacking aircraft.

Target defense determines how the bombers will attack. One bombing plane after another in single file is the best method against an undefended objective. It is suicide, however, against a target bristling with anti-aircraft defenses. The location of these defenses determines from which direction the bombers will attack.

OBJECTIVE FOLDERS

All material pertaining to a given bombing objective is compiled in a file called an **objective folder.** Objective folders are the encyclopedias of target information. In combat, you will use them constantly.

During peacetime the Chief of Staff of the AAF is responsible for preparing objective folders on fixed targets in all possible theaters of operations. In time of war, transient targets develop. Objective folders on these must be prepared according to instructions by the commander of the attacking forces. Actual preparation of objective folders is done by Air Intelligence Officers.

Objective folders are filed alphabetically according to (1) country, (2) state or province, (3) city or town.

The first section is a **General Description** of the objective. Here you find the geographical coordinates and the surveyed elevation. Information is also given about population, climate, importance, railway and highway connections, availability of labor, building materials and construction machinery, and all other data you would expect to find in the "biography" of a town.

The next 16 sections pertain to specific targets in the area as follows:

1. Electric power plants.
2. Aircraft factories.
3. Refineries and oil storage facilities.
4. Steelmills.
5. Coal yards.
6. Airports and air bases.
7. Munitions factories.
8. Railway systems.
9. Highways.
10. Canals.
11. Harbor facilities, docks and warehouses.
12. Naval bases.
13. Military stores.
14. Water supply system.
15. Harbor defenses.
16. Other vital targets.

Each section contains a detailed **target and weapon analysis** for every target mentioned. Aerial photographs, aiming points, and types of bombs required for complete destruction are specified.

Every objective folder contains a general map of the area encompassing a 15-mile radius around the objective. The scale is usually about 1 inch to the mile, enabling easy recognition of landmarks.

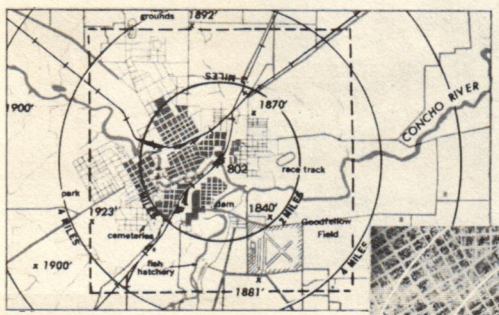
An objective overlay shows the limits of the objective itself and emphasizes important landmarks and features of the terrain.

An anti-aircraft overlay locates known batteries and permits careful planning of the initial point and bombing run.

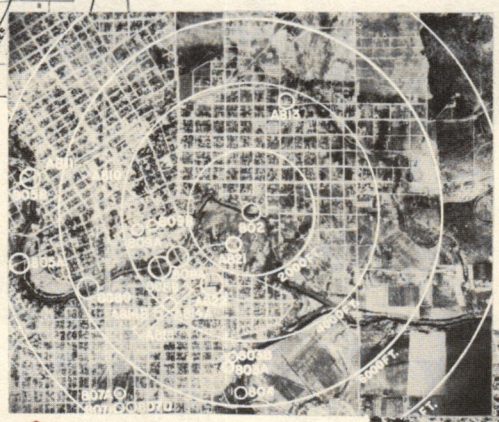
In addition, every objective folder contains an aerial mosaic of the objective, showing vital landmarks and targets as you will see them from high altitudes. A scale of 1 inch to 20,000 is considered adequate for such a photograph.

A target overlay is also included. Vital targets are indicated by a system of numbers or letters.

Objective folders also contain drawings, picture post cards, and amateur photographs of local landmarks.



MAP



AERIAL MOSAIC

AIMING POINT PHOTO

SECTION 6

Duties of Staff Bombing and Navigation Officers

As you study this ever-changing business called bombing, no doubt you wonder how the combat bombardier keeps abreast of new trade secrets, techniques, and equipment.

You may wonder also who sees that full use is made of a bombardier's ability without asking him to do the impossible. What official of a combat group, for example, has the duty of keeping you abreast of the times?

The answer to these questions and more is the staff bombing officer. He is a trained bombardier himself, very often the most experienced and skillful in his organization.

Each squadron, group, and wing has such an officer.

The squadron bombing officer may be a member of a regular combat crew. In addition to his regular duties, he must relay latest bombing information to other bombardiers in his squadron and must train them however necessary.

Group and wing bombing officers are staff members and have seats at operations conferences. Often such officers have been retired from active combat duty.

While the job of staff bombing officer is pretty much what the man himself makes it, certain duties and regulations regarding that office have been prescribed.

It is not unlikely that someday you may find yourself a staff bombing officer. Therefore, you should be familiar with the duties as outlined by the official AAF memorandum. Also quoted below are duties of staff navigation officers, with whom you will have considerable dealings in combat.

AAF MEMORANDUM)
NO. 35-13)

35-13
4 Pages
Page 1

WAR DEPARTMENT
HEADQUARTERS ARMY AIR FORCES
WASHINGTON, NOVEMBER 23, 1942

PERSONNEL, MILITARY
Duties of Staff Bombing Officers

(The following outline of duties of staff bombing officers is published for the information and guidance of all concerned.)

1. Squadron Bombing Officers. Squadron bombing officers will:
   a. Maintain liaison with:
      (1) Squadron operations officer.
      (2) Squadron staff officers in order to effect as much mutual aid as possible.
      (3) Group bombing officer.
   b. Insure that squadron bombing training is coordinated with the squadron operations officer and other agencies concerned and assist in planning tactical and training operations.
   c. Insure that each bombardier within the squadron is thoroughly familiar with the armament and accessories in the aircraft, and coordinate with the squadron armament and gunnery officer to insure that each bombardier is fulfilling the duties of armament officer of the individual airplane to which he is assigned.
   d. Insure that all instruments which relate to bombing are properly calibrated at regular intervals, and at such other times as it is deemed necessary.
   e. Insure that all bombardiers accomplish Form 12C properly and analyze all Forms 12C with a view to reducing the individual and squadron circular errors.
   f. Insure that all bombardiers receive satisfactory instruction on crew coordination.
   b. Insure that the bombardier crew members receive satisfactory instruction in handling, fusing, and loading live bombs.
   h. Be responsible to the squadron operations officer that the bombardiers within the squadron meet the minimum requirements of training directives from higher headquarters.
   i. Be responsible for the records and charts concerning bombardier training and keep the squadron operations officer informed at regular intervals of the training status of bombardiers within the squadron.
   j. Coordinate with squadron staff officers in providing bombardiers with the necessary training in specialties other than their own to complete their combat training.
   k. Coordinate with squadron operations officer to insure that bombing-pilots receive satisfactory instruction on the correct method of flying a bombing mission.
   l. Coordinate with squadron engineering officer in making necessary "Unsatisfactory Reports" on bombing equipment.
   m. "Check ride" each bombardier within the squadron at least once during the operational training period and check any individual more often if necessary.
   n. Report to the squadron operations officer all bombardiers not suitable for combat operations.
   o. Report all cases of poor pilot-bombardier coordination and take action to correct such condition.

p. Become thoroughly familiar with the technical aspects of the assigned aircraft which relate to bombing.

q. Be constantly on the alert for improvements in equipment, training methods, techniques, and procedure; and submit pertinent recommendations to the squadron operations officer.

2. Group Bombing Officers. Group bombing officers will:

a. Coordinate group bombing training with the group operations officer and other agencies and assist in planning group tactical and training operations.

b. Coordinate with the group staff officers to disseminate to squadron bombing officers information pertinent to bombing and bombing equipment.

c. Maintain proper liaison between the group operations officer and the squadron bombing officers.

d. Be thoroughly familiar with the duties of the squadron bombing officers and supervise and coordinate their activities.

e. Be thoroughly familiar with those technical aspects of the assigned aircraft which relate to bombing.

f. Be responsible for records and charts concerning bombardier training, and inform the group operations officer at regular intervals of the bombing-training status of each squadron within the group.

g. Make reports to higher headquarters on the functioning of bombing equipment and the degree to which bombing requirements are met on specific types of airplanes, after such equipment has been thoroughly tested by experienced bombardiers of various squadrons.

h. Be constantly on the alert for improvements in equipment, training methods, techniques, and procedure, and submit pertinent recommendations to the group operations officer.

3. Wing Bombing Officer. Wing bombing officers will:

a. collaborate with the wing operations officer in issuing training directives and planning operations.

b. Maintain liaison with the group bombing officers of the wing, advise them when necessary, and insure that they exercise the proper supervision in coordinating bombing training with other training operations.

c. Familiarize himself with all new developments in bombing equipment and technique and with all those technical aspects of various types of heavy aircraft which are related to bombing.

d. Disseminate information on new developments in bombing instruments and technique to lower echelons.

e. Consolidate the reports of group bombing officers on the functioning of equipment and the degree to which requirements of bombing are met on the various type airplanes; make recommendations and forward them to higher echelons.

f. Consolidate the analyses of bombing performance as made by the group bombing officers and disseminate information on conclusions reached to all agencies concerned.

4. Air Force Bombing Officers. Air force bombing officers will:

a. Maintain close liaison with the air force operations officer, collaborating with him in the issuance of directives establishing minimum requirements and training standards for bombardiers.

b. Maintain liaison with the various wing bombing officers.

c. Disseminate information on new developments of bombing instruments and technique to lower echelons.

d. Consolidate all reports and analyses submitted by wing bombing officers; make recommendations when necessary and forward them to the proper agencies.

By command of Lieutenant General ARNOLD.
GEORGE E. STRATEMEYER
Major General, United States Army
Chief of the Air Staff

3-4583, AF

OFFICIAL:
FRED C. MILNER
Colonel, AGD
Air Adjutant General
DISTRIBUTION:
"A"

WAR DEPARTMENT
HEADQUARTERS ARMY AIR FORCES
WASHINGTON, NOVEMBER 23, 1942

AAF MEMORANDUM)
NO. 35-12)
PERSONNEL, MILITARY

Duties of Staff Navigation Officers

(The following outline of duties of staff navigation officers is published for the information and guidance of all concerned.)

1. Squadron Navigation Officers: Squadron navigation officers will:
   a. Maintain liaison with:
      (1) The squadron operations officer in planning tactical and training operations.
      (2) The squadron staff officers in order to effect as much mutual aid as possible.
      (3) The group navigation officer.
   b. Insure that all navigation instruments (airplane and individual equipment) are calibrated at regular intervals and at additional times when it becomes advisable to do so.

c. Coordinate with the engineering officer in making necessary "Unsatisfactory Reports" on navigation equipment.
d. Make every effort to remain informed of new developments in navigation equipment and technique.
e. Become familiar with those technical aspects of the assigned aircraft which relate to navigation.
f. Keep a running analysis of squadron performance to determine the most suitable navigation procedure for use in the area in which operations are conducted.
g. Inspect log sheets of navigators at frequent intervals to insure practice of all methods of navigation and entry of all necessary information for intelligence and weather offices.
h. Supervise training of all navigators assigned to the squadron. In this supervisory capacity, he will:
(1) Determine the proficiencies and abilities of newly assigned navigators and keep the squadron operations officer constantly informed of their training status and capabilities.
(2) Conduct the necessary classes to insure that navigators:
(a) Remain familiar with the theory, procedure, and computations in navigation.
(b) Remain familiar with the methods of correct calibration and use of navigation instruments.
(c) Are familiar with new developments in navigation instruments and technique.
(d) Are familiar with those technical aspects of the assigned aircraft which are related to navigation.
(e) Perform, at frequent intervals, analyses of log sheets of previous flights with a view to correcting errors and improving procedure.
(3) Instruct navigators in the proper methods of crew coordination and represent them in establishing methods of crew coordination to insure that the requirements for successful navigation are met.
(4) Collaborate with the squadron operations officer to insure that navigators are frequently scheduled to participate in flights on which all methods and aids to navigation are used.
(5) Provide a navigator's pre-flight check list on procedure and equipment and require that navigators use it.
(6) Make a periodic check ride with each navigator in the squadron.
i. Coordinate with squadron staff officers in providing navigators with the necessary training specialties other than their own to complete their combat training.
j. Keep a running analysis of squadron navigation performance to determine the most suitable navigation procedure for use in the area in which operations are conducted.

2. Group Navigation Officers. Group navigation officers will:
a. Maintain liaison with:
(1) The group operations officer in planning tactical and training operations.
(2) The group staff officers in order that all possible mutual aid may be effected.

b. Be thoroughly familiar with the duties of squadron navigation officers and supervise and coordinate their activities.
c. Keep the group operations officer constantly informed of the capabilities and performance of squadron navigation officers.
d. Make reports to higher echelons on the functioning of navigation equipment and the degree to which requirements for navigation are met on specific type airplanes, after such equipment and airplanes have been thoroughly tested by experienced navigators of various squadrons.
e. Keep a running analysis of navigation performance with the group to determine those navigation procedures best suited for group operation within the assigned theater.

3. Wing Navigation Officers. Wing navigation officers will:
a. Collaborate with the wing operations officer in issuing training directives and planning operations.
b. Maintain liaison with the group navigation officers of the wing, advise them when necessary, and insure that they exercise the proper supervision in coordinating navigation training with other training operations.
c. Familiarize himself with all new developments in navigation equipment and technique, and with all those technical aspects of various types of heavy aircraft which are related to navigation.
d. Disseminate information on new developments in navigation instruments and technique to lower echelons.
e. Consolidate the reports of group navigation officers on the functioning of equipment and the degree to which requirements for navigation are met on the various type airplanes; make recommendations and forward them to higher echelons.
f. Consolidate the analyses of navigation performance as made by the group navigation officers and disseminate information on conclusions reached to all agencies concerned.

4. Air Force Navigation Officers. Air force navigation officers will:
a. Maintain close liaison with the air force operations officer, collaborating with him in the issuance of directives establishing minimum requirements and training standards for navigators.
b. Maintain liaison with the various wing navigation officers.

c. Disseminate information on new developments of navigation instruments and technique to lower echelons.
d. Consolidate all reports and analyses submitted by wing navigation officers; make recommendations when necessary and forward them to the proper agencies.

By command of Lieutenant General ARNOLD:
GEORGE E. STRATEMEYER
Major General, United States Army
Chief of the Air Staff

OFFICIAL:
FRED C. MILNER
Colonel, AGD
Air Adjutant General
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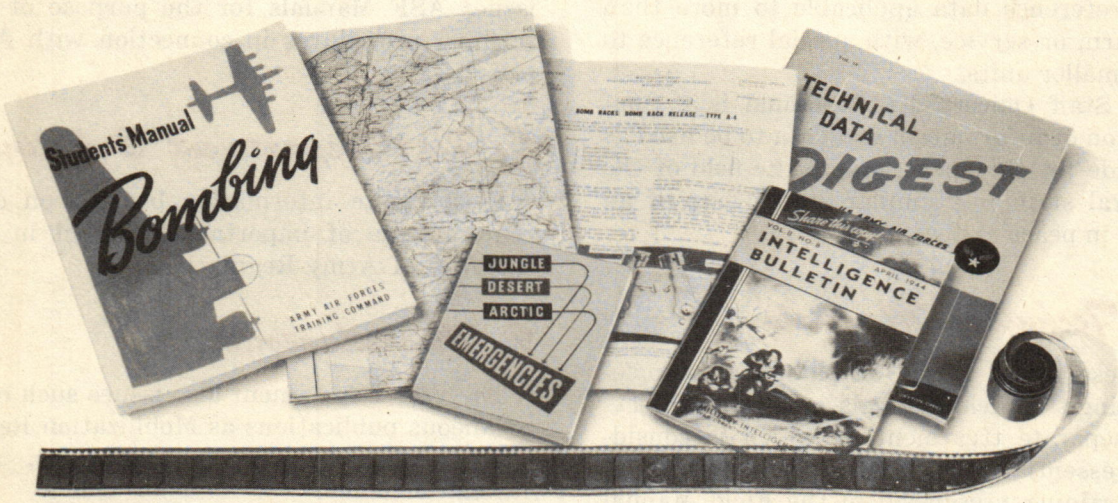
SECTION 7

War Department and AAF Publications



Much Material Available

In the past, Army Air Forces schools have been a prolific source of material of interest to bombardiers. One of the purposes of this series of manuals is to provide standard texts to replace the improvisations which have been necessary at times in the past. There are many other agencies which produce matter dealing with bombardiers and their work. There is no central index of such publications.

Air Forces officers should know the essential official publications of the War Department and the AAF. Most of these are found in libraries, offices, or technical supply rooms of AAF installations.

WAR DEPARTMENT PUBLICATIONS

These are official publications issued under the direction of the Adjutant General's Office.

1. Army Regulations

These are the rules and directives by which the Army operates. They are loose leaf vol-

umes kept up to date by inserting changes in the basic regulations. Army Regulations are filed in adjutants' offices and in many post libraries.

2. Field Manuals

These constitute the primary means for expanding the basic doctrines of Field Service Regulations. They are published in three general divisions as follows:

a. Field Manuals for the several arms and services contain instructions relative to the tactics and technique involved in the employment of such arms and services, together with data needed in the theater of operations.

b. Basic Field Manuals contain training and reference data applicable to more than one arm or service, with special reference to the smaller units.

c. Staff Officers' Field Manual is a compilation of information and data to be used as a guide for the operations in the field of the general staff or a similar staff group of all units in peace and war.

3. Technical Manuals

These are a series of pamphlets supplementing the Field Manuals, covering subjects the separate treatment of which is considered essential to a fuller accomplishment of the training prescribed in the Field Manual series. The scope of this series includes pamphlets describing materiel and containing instructions for the operation, care, and handling thereof; guidebooks for instructors and specialists; material for extension courses; reference books, etc. All current Field and Technical Manuals are indexed in FM 21-6.

4. Training Circulars

Changes or corrections in current FM's and TM's are issued under this title.

5. War Department Circulars

These contain special information needed from time to time to explain Army Regulations, or to provide Army personnel with information on special matters prior to the issuance of Army Regulations. All citations are printed in these circulars. Files of W. D. Circulars are kept by adjutants and by some post libraries.

6. Information Bulletins

This is a limited but important series of books. Their purpose is to provide for quick publication of needed data which have not yet been sufficiently standardized to be issued as Field Manuals.

7. ASF Manuals

As the chief procurement agency of the Army, the Army Service Forces occasionally issues ASF Manuals for the purpose of describing procedures in connection with ASF activities.

8. War Department Bulletins

Disseminate information bearing on current matters of importance but not in the category of Army Regulations.

9. Miscellaneous

The War Department also issues such miscellaneous publications as Mobilization Regulations, tables of Basic Allowances, and others.

AAF PUBLICATIONS

1. AAF Regulations

Similar in nature to the AR's of the War Department, but limited in application to the AAF. They are kept up to date by a loose leaf system, and are filed by adjutants and some post libraries.

2. Technical Orders

These cover the use and maintenance of AAF equipment. Because of the nature of the equipment — for example, the navigational and bombing computers—the Technical Orders frequently become virtual textbooks

on their subjects. Station Technical Inspectors keep a complete file up to date, and the bimonthly Index of Technical Instructions and Information (TO No. 00-1) contains a complete index. Needed copies may readily be obtained through technical supply agencies.

3. AAF Training Standards

These are short pamphlets which analyze the functions of AAF personnel and units (according to AAF regulations), provide instructions for training, and prescribe standards of proficiency. They are issued as needed, and are found in administrative and school offices and libraries.

4. AAF Memoranda

These are official bulletins interpreting existing and new War Department and AAF Regulations.

5. AAF Circulars

These are official bulletins similar in content to War Department Circulars.

INTELLIGENCE PUBLICATION

There are no clear lines of demarcation between the subject matters covered by the various intelligence agencies of our Army and Navy. These agencies cooperate fully in gathering material, and also reproduce each other's work rather freely. Since the Navy, the Army Ground Forces, and the Army Air Forces are all interested in enemy aircraft, enemy artillery, etc., it is natural that interrelationships between their intelligence agencies should exist.

MILITARY INTELLIGENCE SERVICE (G-2) PUBLICATIONS

The following intelligence publications are released by the Military Intelligence Service of the Army:

1. Information Bulletin

Comprehensive description of special subjects such as Japanese warfare and the German rifle company.

2. Special Series

Prepared periodically to provide officers with information received from official and other reliable sources.

No. 3. "German Military Training"
No. 7. "Enemy Air-Borne Forces"

3. Campaign Studies

A periodic publication dealing with foreign armament, training, tactics, and equipment. It discusses the tactics and technical development of the various components of the armed forces of our enemies. It also compares Axis and Allied equipment.

4. Intelligence Bulletins

A monthly publication dealing with various phases of enemy activity, prepared for distribution to lower echelons.

5. Military Reports on the United Nations

Published monthly to provide a means of distributing recent information concerning technical development, tactical doctrines, organized tactical methods, and operations of the United Nations.

AAF INTELLIGENCE PUBLICATIONS

The AAF Intelligence Service releases the following contributions of its own:

1. Information Intelligence Summary

Distribution to squadrons.

2. Command Information Intelligence Series

Distribution to Commands.

3. Special Informational Intelligence Report

Distribution to designated persons.

4. Counter-Intelligence Bulletins

Deal with methods to prevent sabotage in war factories and at air fields, counter-espionage, etc.

5. Special Studies on Bombing

Deal with raids and missions.

MISCELLANEOUS INTELLIGENCE REPORTS

Besides the regular series, there is a large amount of additional material available from the above sources, the Navy, various training commands, and research agencies. These include reports on tactical operations, confidential letters of G-2 or A-2 sections, interviews with aviators and others from combat areas, reports of military attaches, reprints of intelligence reports of our allies, and numerous other items.

OBJECTIVE FOLDERS

These are a very specialized type of Intelligence report, and are classified as confidential or secret.

Objective folders are available for instructional and study purposes through intelligence channels. The list of topics covered is secret, but it is known that folders on both foreign and American localities have been prepared. They are available in some school and post libraries, and may be obtained for legitimate uses through your post intelligence officer.

WHERE TO LOCATE INTELLIGENCE BULLETINS

These bulletins and publications are regularly issued by the intelligence services to established schools and air fields and are sent as a rule to the intelligence officer (S-2). Intelligence bulletins are generally found in war rooms, technical libraries, and in post libraries.

PHOTOGRAPHY, MAPS AND CHARTS

The AAF Aeronautical Chart Division plans, procures, and supplies the maps, charts, and related publications required by the AAF. In doing this, the Aeronautical Chart Division makes use of many photographic and map-making agencies, including Army, Navy, Coast and Geodetic Survey, Intelligence, foreign, and commercial sources. Its maps and charts are available through any of its five regional stores, located in Washington, Atlanta, St. Louis, San Antonio, and Oakland. A "Catalog of Aeronautical Charts and Related Publications" lists all of the Aeronautical Chart Division's own supplies. In addition, a similar catalog of Navy maps and charts is furnished by the Division, and all such Navy Publications are stocked in the five stores.

Publications of the Aeronautical Chart Division may be drawn for Army use by operations officers or higher echelons. Military schools and personnel are commonly supplied through the operations officer of the post. Civilians may purchase those maps and charts which do not have military significance.

Aeronautical charts are classified by the Division as follows (see AAF Reg. No. 95-1):

1. Planning Charts (world coverage).
2. Weather Charts (planning, world coverage).

3. Long Range Air Navigation Charts (world coverage).
4. Plotting Charts (world coverage).
5. Pilotage Charts (world coverage).
6. Approach Charts (industrial and strategic points).
7. Target Charts.
8. Miscellaneous.
   a. Radio Direction Finding Charts.
   b. Radio Facility Charts.
   c. Airport Directories.
   d. Wall Maps, Charts, etc.
   e. Publications of the Directorate of Weather, Weather Research Section.

At the present time all target charts, perspective charts, and aerial photographs of target areas are available only through the office of the Assistant Chief of Air Staff, Intelligence, in Washington, D. C.

TRAINING AIDS

The Training Aids Division of the AAF supervises and coordinates the use of training literature, posters, films, film strips, and mechanical training equipment. It undertakes to index much of the above. However, mimeographed books are not indexed. It also issues a catalog of training devices—its Synthetic Devices Catalog—and will supply the cataloged training aids on request by AAF organizations. The Division also compiles special detailed catalogs covering particular subjects —for example, its catalog of Recognition Training Aids—and can provide the catalog of Navy Synthetic Training Devices, as published by the Navy's Bureau of Aeronautics. Upon request it will undertake to obtain the cataloged items for AAF users. It will compile lists of approved books and pamphlets on any topic connected with AAF training, upon request.

The Training Aids Division thus makes available to other fields and agencies the literature and training devices developed in the various branches of the Air Forces and in the Navy. In case needed literature or training aids are not listed in the catalogs, TAD will undertake to find them.

The Training Aids Division also publishes a periodical called the TAD Bulletin, which reviews and evaluates new training aids of every description.

FILMS AND FILM STRIPS

The War Department lists a considerable number of films and film strips in FM 21-7, and announces new issues frequently in Training Circulars.

The Training Aids Division publishes the Army Air Forces Training Film and Film Strip Catalog, and is able to provide a similar catalog of Navy releases. These catalogs duplicate each other and FM 21-7 only in part.

New films are usually distributed through channels to units which are expected to need them. These are deposited in school, post, or other film libraries. Units not thus supplied may requisition needed films which are listed in the catalogs. If the catalogs do not disclose a film on a desired topic, TAD will undertake to locate one or have it made.

Notes: