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OFFICE OF THE CHIEF OF NAVAL OPERATIONS
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PUBLICATIONS NOTE

Unless otherwise indicated, all Service Changes, Technical Notes, Technical Orders, Bureau Changes and other technical data mentioned in this Bulletin can be obtained by addressing requests to:

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Navy Wings Over Burning Omura—A pair of US Navy carrier-based Helldivers (above) wing their way over burning hangars and other air installations at Omura during the Navy's strike at Kyushu in the Japanese home islands on March 18. Smoke pours from hangars and other buildings (below) along the water front at Omura, as a result of this attack.

AIR COMBAT NOTES

Prepared by Air Intelligence Group, Office of Naval Intelligence

JAPAN'S BOMB WITH A BRAIN*

Japan's newest and most potent weapon is a bomb with a human brain.

The bomb takes the form of a small rocket-propelled glider aircraft designed to be carried aloft and released by a parent bomber. The nose of this glider houses the business end of the weapon—a 2,645-lb. war head loaded with 1,135 lbs. of trinitroanisol.

The human brain is supplied by a "Divine Wind" pilot who crouches behind this deadly nose, goes on oxygen as his parent-bomber carries him and his death-craft as high as 27,000 feet and then, when the glider is released, guides it, at least in theory, into the side of an enemy warship far below. Three rockets in the after fuselage section enable the pilot to increase the glider's range or to build up speed for a terrific final impact.

That this new weapon, which lends itself easily to mass production, appears to be a threat of no minor nature to Allied shipping can be seen from the fact that its maximum range approximates 55 miles and its maximum speed of impact verges on 618 miles per hour.

Several of these suicide weapons were captured on Okinawa. Two of them have been subjected to a comprehensive study at the Technical Air Intelligence Center at Anacostia. The rocket-propelled suicide aircraft bomb has been given the code name BAKA (Japanese for "Fool").

Description—BAKA is a low-wing monoplane with a narrow round fuselage and a long prominent nose. Stubby wings have a moderate sweep-back, sharper taper on the trailing edge; tips are squared and the entire wing has moderate diehedral. A flat rectangular tail plane is mounted at the top of the fuselage and terminates in twin square fins and rudders. A high bubble-type canopy is located well aft near the trailing edge of the wing.

Dimensions

Wing Span	16′ 5″
Length	19′ 10″
Span, tail plane	7′ 1″
Wing area	64.7 sq. ft.
Aileron area, both ailerons	3.2 sq. ft.
Wing loading	Approx. 70.6 lbs/sq. ft. (assessing 800 lbs. for 3 rocket units)
Max. height	
Fuselage, nose section	2′ 6½″
Fuselage, including bubble canopy	3′ 10¼″
Fuselage, tail section	2′ 3¾″

The entire suicide craft is sturdily constructed, the fuselage of aluminum alloy and the wings of fabric-covered stressed skin plywood. A bubble-type plexi-glass cockpit canopy is built in, and the rearward sliding hood is fitted with four release hatches to jettison the canopy, although the apparent intent is for the pilot to remain in BAKA. Behind the pilot, on the bottom of the fuselage, twin rail-type supports are fitted to mount two of the rocket units. A third unit can be supported by two lugs attached to the upper fuselage central longeron. A thin bulkhead with three asbestos-lined holes is installed behind the pilot's seat and the entire fuselage aft of this point is occupied by the rocket units.

The war head resembles that of a torpedo but is made specifically for this installation. It consists of the body, base plate, explosive filling, a cushion plate and five fuzes. Its total weight is 2,645 lbs.; its length 68⅜″ and its diameter 23⅝″. The weight of explosive is 1,135 lbs. of trinitro-anisol which has about the same power and sensitivity as TNT or picric. The explosive is poured into the body in a liquid form and solidifies as it cools. The body is filled completely.

The body is made in one piece machined from a forging. Wall thickness varies from 13/16 inches

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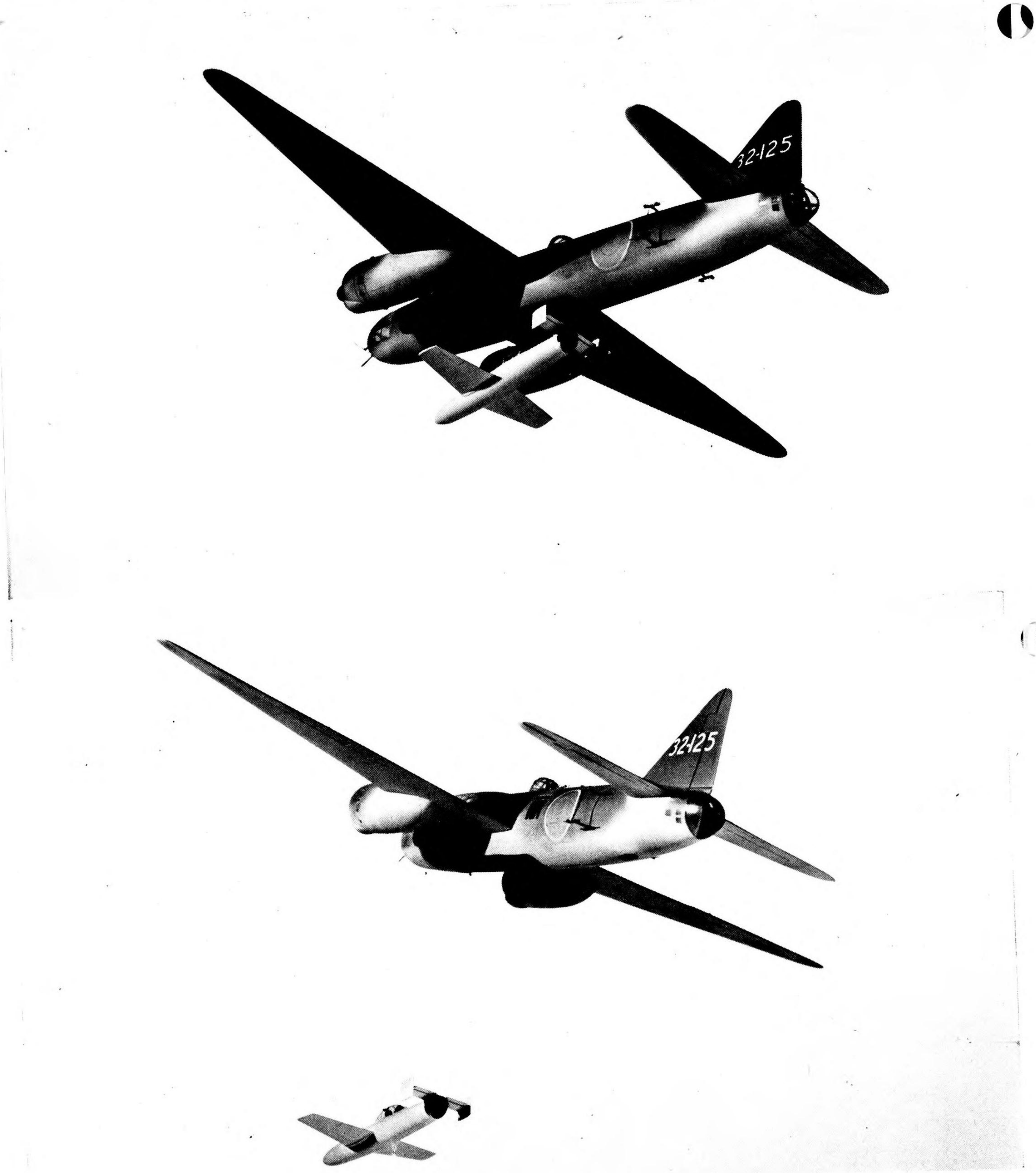
* Subject material for this article has been furnished Air Intelligence Group, ONI, by TAIC.



Release of BAKA from BETTY—Photographs of models show (above) BAKA being released by parent-aircraft BETTY, the method of suspension insuring that the flying suicide bomb will assume a nose-down attitude. Photograph below shows BAKA, now under control of the suicide pilot, starting its long glide to positive death and possible glory.

Captured BAKA—Here a BAKA is pictured in a clearing on Okinawa showing general construction and appearance. Note a metal eye in front of cockpit for attaching to parent-plane.

to 2½ inches. The first 5 7/16 inches of the nose is solid. A hole in the nose is made with the standard nose fuze threads and a set screw is provided to lock the fuze in place after assembly. An aluminum plate, 1⅜ inches thick, is placed in the front end of the body. This is believed to act as a cushion and prevent the detonation of the explosive on the initial shock of impact.

The fuzes are made in two units like the majority of the Japanese Navy bomb fuzes. The "pistol" contains the arming and striking mechanisms and the explosive components are fitted in the gaine. Presumably a delay of 0.1 to 0.15 of a second would be used for shipping attacks.

Four additional fuzes, made of brass, are fitted into the base plate. This large number is probably to insure detonation because all four function simultaneously. One pair functions on straight impact only and the other two are "all-ways" fuzes which operate regardless of the direction of impact. These base fuzes are armed manually by the pilot.

Controls—The control surfaces of BAKA are operated by a standard joy stick (mounting a switch for firing the rockets) and a foot rudder bar. Provision is made to lock all controls while it is being carried by its parent-aircraft; stick forces can be varied in flight. Cables are used for rudder control, and a combination of cables and push-pull tubes for the ailerons and elevators.

Instruments—A small shock-mounted instrument panel forward of the pilot's seat includes on the models examined intercommunication switch and lights; rocket ignition selector switch; altimeter; compass and deviation card; air-speed indicator (0-600 knots); turn and bank indicator; fore and aft indicator (inclinometer); card holder, and circuit test switch.

Above the instrument panel and offset slightly to the left is a pull handle for arming the war head base fuzes; below the panel and to the right is a small electric horn installed as part of an intercommunication system.

Communication between the BAKA pilot and the parent-aircraft is possible only before it is launched. After launching, the electrical circuits are broken and no further communication is possible. The system comprises a horn by which the BAKA pilot may audibly receive code messages and a push button for sending code in a similar manner to the parent-aircraft. A light is provided so that the BAKA pilot may visually observe his message. The horn is not included in this part of the circuit.

Armor—The pilot's seat is of the bucket type with a plywood back. Above it and to the rear, a single conical piece of armor plate, 1' 2½" high by 1' 6¾" wide at the base by 5/16" thick, is fitted to protect the head and shoulders. Two additional

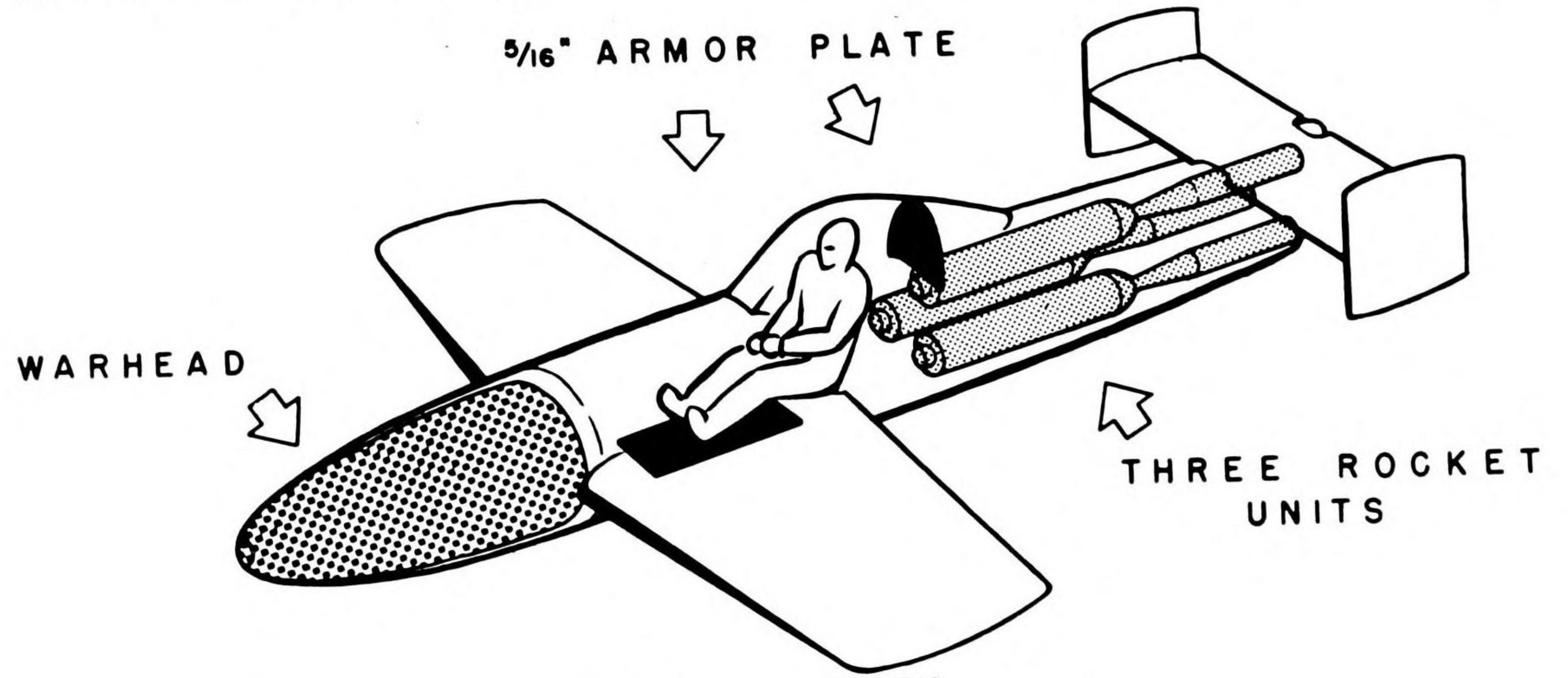


Diagram of BAKA.

pieces of armor plate are installed in the bottom of the cockpit, extending from a position even with the front end of the pilot's seat to the bulkhead just forward of the rudder bar. The forward piece measures 15⅞" long by 12 3/16" wide by 5/16" thick and the after piece 9 15/16" long by 12 3/16" wide by 5/16" thick. There is a 5" x 3.5" (approximately) opening in the after piece for movement of the control stick.

Weights of the armor pieces are as follows:

Head and shoulder	21 lbs.
Bottom fuselage—forward	18.5 lbs.
Bottom fuselage—aft	11 lbs.

Portable Oxygen Bottle—Although a preliminary TAIC examination has not yet revealed a connection between BAKA and the oxygen system of the parent plane, a portable walk-around oxygen bottle which can be strapped to the suicide pilot has been located. The bottle bears the following information:

Weight . . . 1.83 kg. (4 lbs.)
Volume . . . 1.02 liters (72.2 cu. in.)
Pressure . . 150 atmospheres (2,130 lbs./sq. in.)
Estimated Endurance—

Altitude	Duration
19,680 ft.	28.2 minutes
26,240 ft.	25.4 minutes

Possible Launchers of BAKA—The following aircraft are believed to be suitable for launching BAKA or could be made satisfactory without major modifications:

BETTY 22	Satisfactory. May need extended tail wheel.
LIZ 11	Satisfactory without modification.
PEGGY 1	Satisfactory. May need extended tail wheel.
HELEN 2	Possible. Would need longer tail wheel assembly or cut in bomb bay for horizontal stabilizer.
SALLY 2	Possible. Would need extended back bomb bay and longer tail wheel assembly.
TAIZAN	Expected successor to BETTY and could undoubtedly be used. May be in limited production.
RITA 11	Possibly more than one BAKA.

Method of Launching BAKA—Suspension is by a single bomb-type lug close behind the center of gravity thus insuring that a nose-down attitude is assumed on release. The lug is arranged at right angles to the air flow and two half frames are utilized to transmit stress to the fuselage, war head and wings. Ten sway brace points in the wings are indicated for holding BAKA rigid and parallel to the airflow.

Parent-Aircraft—A separate structure is probably fitted in the bomb bay, distributing the load from the single suspension point to the bomb carrying strong points. The sway braces may fall clear when the bomb is released.

In view of the high stalling speed of BAKA and the considerable reduction of the parent-aircraft's speed due to the increased drag, it is possible that BAKA provides little lift even at maximum speed. In this event, BAKA will drop clear when released in normal level flight until its own speed has built up sufficiently. It is not under power when dropped because of the type of suspension and the risk of blast damage to the parent-aircraft.

Performance—A thorough analysis has been made by TAIC of the aerodynamic characteristics of BAKA and a series of performance charts and graphs prepared to show performance under different conditions of dive angle, release altitude and use of rockets at either beginning or end of the dive. Both documentary evidence and captured equipment prove the three main fuselage rocket propulsion units to be Type 4, Mk. 1 Model 20, each of which, according to a reliable document, has approximately 800 kgs. or 1,760 lbs. thrust for a duration of 8 seconds.

In assessing the performance of BAKA, it has been assumed that this thrust of 800 kgs. is correct. It also must be borne in mind that BAKA is primarily a glider and, only secondarily, a powered plane. The rockets greatly increase its speed for a short time but cause only a slight range increase over its maximum glide range.

The theoretical maximum horizontal range of BAKA when released at 27,000 feet is 55 miles. Fifty-two of these miles would be traveled at a glide speed of 229 mph and at a glide angle of 5 degrees 35 minutes. During the remaining three miles, the use of rockets would accelerate the speed to 535 mph in level flight with a corresponding increase in speed as the diving angle is increased. At a 50 degree or greater diving angle, maximum speed would be 618 mph. Whether rockets were used at the beginning or end of the run, or whether they were used to climb, would not appreciably affect the maximum range.

In attacking ships protected by heavy deck armor, it is presumed the rockets would be used at the end of the run in a torpedo approach in order to score a close-to-the-water-line hit. If launched from a distance, however, BAKA would be vulnerable to attack by fighters before reaching a position to effectively complete its own attack. Lacking maneuverability, BAKA could take but little evasive action in its unpowered glide and its only method of escape would be to fire one or more of its rockets. In this event, and also in the case of BAKA using its rockets at the start of its glide, the increased velocity secured from the rocket would dissipate before BAKA could reach its target and its final terminal velocity would be substantially decreased.

The practical service ceiling of BETTY 22, or any of the other possible parent aircraft, is estimated at 17,000-20,000 feet when carrying BAKA, although the theoretical service ceiling of BETTY 22 with BAKA is 27,100 feet. Maximum speed of parent-aircraft in this condition is reduced approximately 15-20 mph.

Since the simple and economical construction of BAKA should permit mass production, the only limiting factor would appear to be the number of parent aircraft available. For this reason, the destruction of the parent-aircraft would appear to be of extreme importance inasmuch as special fuselage modifications are undoubtedly necessary and a drastic cut in the available supply of BAKA carriers would render BAKA inoperative.

IN AGAIN, OUT AGAIN

A PBM-3D, on a 600-mile sector search out of Lingayen Gulf, was on its return leg when a large convoy or task force was picked up on the radar scope at a distance of approximately 30 miles. The pilot flew directly to the target at an extremely low altitude in order to avoid detection. As he neared the target he dropped down to 50 feet altitude, and before wholly realizing it, he found himself in the midst of a 24-ship enemy convoy. He proceeded directly down the center of the formation at 50 feet altitude, and, upon sighting visually the largest bulk of ship, he turned hard to port, recognized the target as an aircraft carrier, pulled back on the yoke to clear the flight deck and dropped his bombs short enough so that he believes the first two entered the side of the ship and the third one overshot. He then passed directly aft the superstructure through the smoke and continued on course to "get the hell out of there."

No AA fire was encountered, and the pilot believes this was because of the complete surprise with which the attack was carried out. He also felt that he may have been mistaken for a friendly plane because his course was directly out from Amoy, an enemy-held harbor.

Actually, the ships had not been alerted until after the bomb drops, because as the plane barely scraped over the carrier's flight deck, having had to pull up to clear it, the crew of the plane insists that they heard the air-raid warning signal, even above the roar of the engines.

The first pilot, the bow gunner, and the tail gunner, as well as the pilot, all got a good look at the target ship, and believe that it belonged to the Hayataka Class.

TECHNIQUE OF STRAFING LOCOMOTIVES

Steam locomotives are predominantly in use in North China, Korea and Japan, although a number of Diesel and electric locomotives are also in use, especially in the Japanese homeland. Destruction of locomotives in North China may effect either a general traffic reduction over all lines in China, Manchuria and Korea or localized traffic reductions in areas chosen by the enemy. The factor of damaged locomotives has been negligible up to the present if intelligence on the number damaged and the estimates of repair time are accurate. With the stepping up of air attacks on all these areas, however, a high percentage rate of destruction is to be expected. Because of the importance of the subject, an article from the MASAF Weekly Intelligence Summary, 8 January 1945, is published below.

At Mediterranean Allied Strategic Air Force headquarters, a study has been made of locomotive design in order to select a more effective axis of attack for strafing attacks by fighter aircraft. Scarcity of information covering locomotive design has limited the study, but it is hoped that the information compiled will prove beneficial.

Locomotive Design—The three types of locomotives are steam, electric, and Diesel electric.

a. The steam engine consists of three parts; namely, (1) the fire box, (2) the shell, (3) the smoke box. The high pressure boiler is located in the lower portion of the shell. The shell extends laterally from the front of the locomotive to the cab and vertically from approximately the center of the locomotive to the top.

b. The electric locomotive depends entirely upon a power plant and sub-stations for its electricity. The current is transferred along a trolley wire located above the railroad and is conducted through a pantograph extending above the locomotive to the main motor in the center of the locomotive.

c. The Diesel electric locomotive obtains its electricity from a generator located in the locomotive. The generator is operated by a Diesel engine and in turn supplies current to the main motor. Both the generator and the main motor are usually located in the center of the locomotive.

Vulnerability—The most vulnerable part of each of the three types of locomotives is as follows:

a. Steam—High pressure boiler.

b. Electric—Main motor.

c. Diesel Electric—Generator and main motor.

Ammunition—The .50 caliber API (Armor Piercing Incendiary) and AP (Armor Piercing) is the most effective ammunition for strafing locomotives. It is capable of penetrating three-quarter-inch homogeneous armor plate at 600 yards range. Information received from the Fighter Command indicates that the thickness of armor plate on locomotives does not exceed five-eights of an inch.

Planning the Optimum Axis of Strafing Attack—The following factors must be considered when planning the optimum axis of strafing attack against locomotives for fighter aircraft.

a. Buildings and terrain surrounding locomotives at the time of the attack.

b. Most effective penetration by the bullet is obtained when normal impact (bullet strikes target perpendicular), or as near as possible normal impact, is obtained.

c. At ranges at which fighter pilots start firing, the dispersion of the bullets upon impact will give a good pattern over that area of the entire locomotive, when the center of the locomotive is used as an aiming point.

The Optimum Axis of Strafing Attack—In view of the factors listed above the following recommendations are made on the optimum axis of strafing attack for fighter aircraft against locomotives:

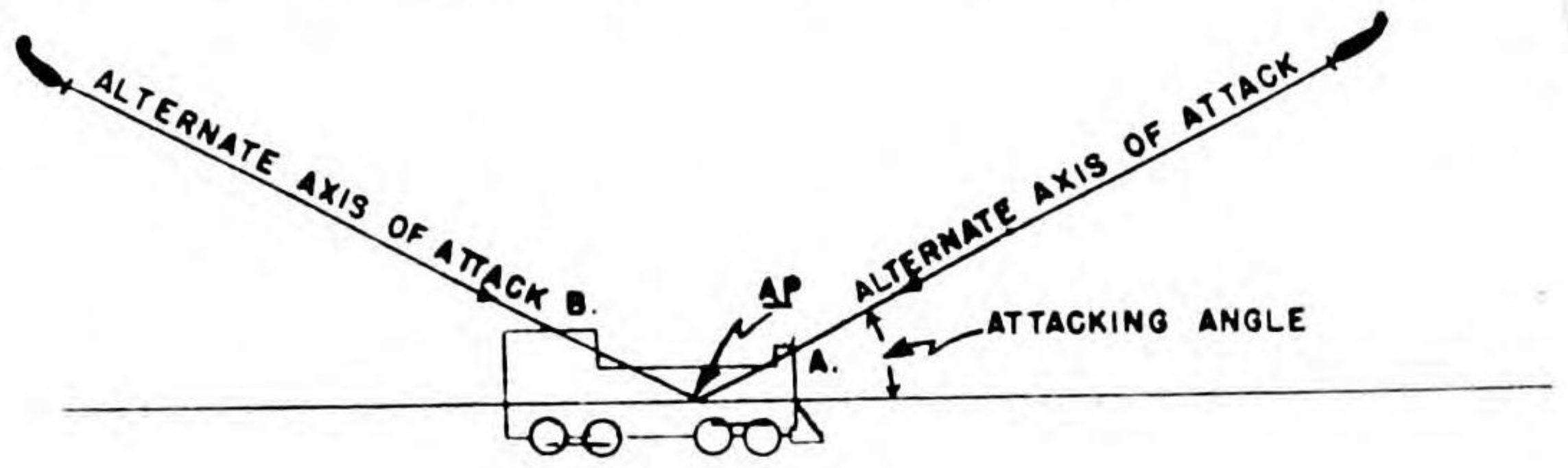
a. Providing direct fire (aiming point can be seen by pilot) is used, an attack should be directed with the center of either side of the locomotive as the aiming point; the vulnerable area at this point is the greatest. (See plan view in diagram).

b. The aircraft attacking angle should be as small as possible, so as to obtain normal impact; this increases the penetrating ability of the bullet. (See elevation view in diagram).

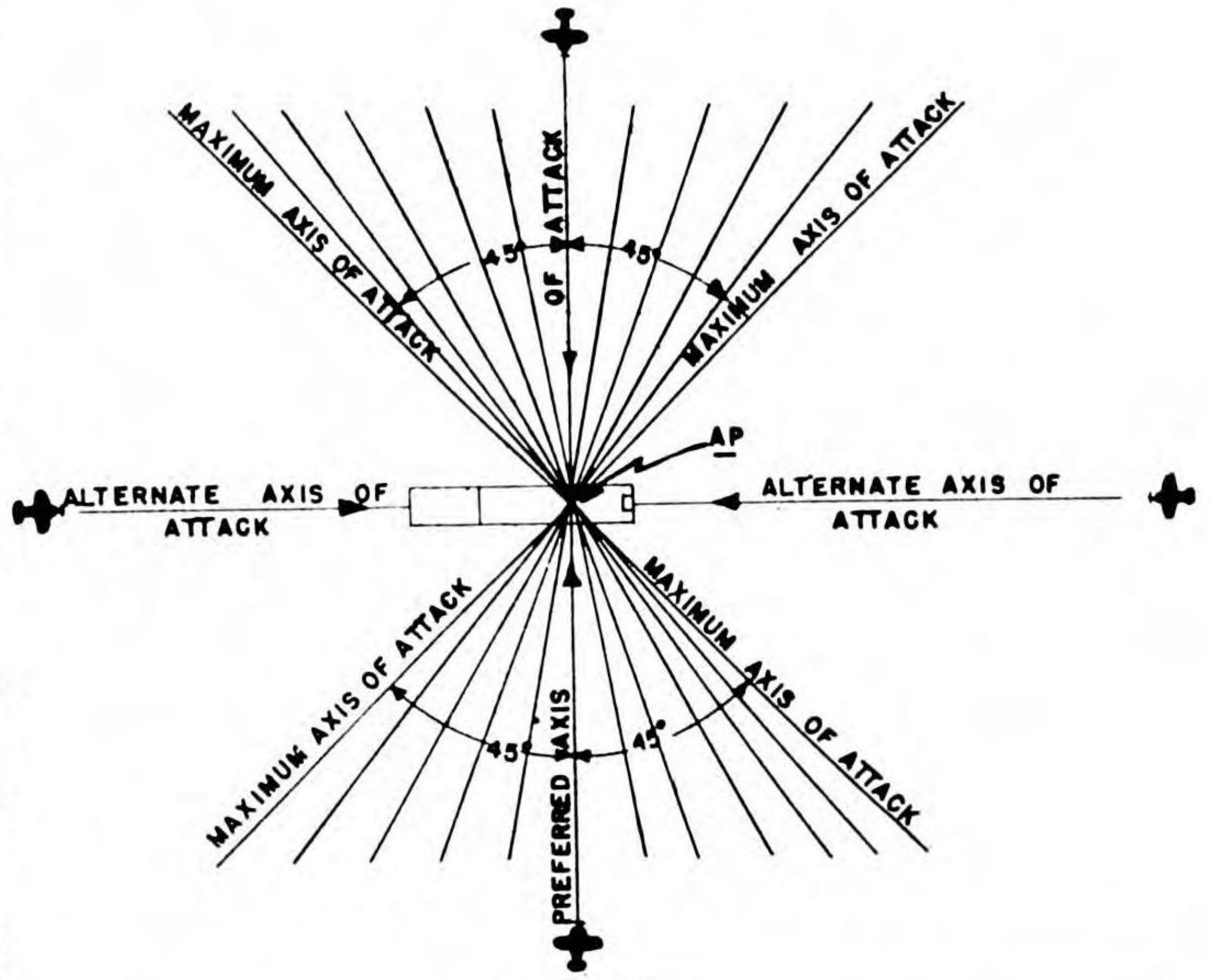
c. An axis of attack directly down the track, either against the direction the locomotive is moving or in the direction which the locomotive is moving, should be employed when it is impossible to use the axis of attack outlined in (a). (See plan view).

1. If the axis of attack is against the direction which the locomotive is moving, use front top of locomotive as the aiming point. (See elevation view in diagram).
2. If the axis of attack is in the direction in which locomotive is moving, use top of cab as the aiming point. (See elevation view)

d. An axis of attack using angles greater than 45 degrees from normal on either side of the locomotive is not recommended, because the striking angle is such as to decrease effective penetration by the bullets. (See plan view in diagram).



ELEVATION VIEW



PLAN VIEW

ONE TRIP—TWO RESCUES

A Dumbo rescue PBY-5 of VP-12, operating under Fleet Air Wing One, was summoned by the fighter director at Green Island on the afternoon of 18 March. Two fighter pilots were reported down, the first located 10 miles northeast of Duke of York Island and the second two miles off Tawin Point, north of Rabaul. The Dumbo took off at 1445 and shortly after take-off received a message that the pilot north of Rabaul had been picked up.

The PBY set a course for Duke of York Island joining a fighter escort. On reaching the area, dye marker was noted in sea and the downed pilot located. Smoke grenades were dropped near him, and the Dumbo landed. The man in the water was missed twice as the PBY taxied up to him but on the third pass he caught the life ring that was thrown and was hauled aboard. He had been in the water three hours and was uninjured.

In the meantime a second message had been received stating that the report of the rescue of the pilot north of Rabaul was in error. The PBY accordingly swung in his direction. The PBY was cautioned by the fighters to watch for heavy AA from Jap batteries along Tawin Point. The fighters were given permission by the PBY to go in and strafe the batteries in an attempt to divert their fire.

The downed pilot was seen clinging to a native outrigger canoe about 2,000 yards off shore. Smoke grenades were dropped and the PBY was headed down wind, letting down from 400 feet to 20 feet for the landing. However, the survivor could not be spotted although the plane was headed directly for the smoke grenade. The plane then climbed to 200 feet, and at that moment, the shore batteries opened up. The PBY circled again and this time the lookout in the after station located the survivor.

All aboard could now hear above the sound of the engines the shells hitting the water nearby. They splashed on both sides of the Dumbo, which continued its approach for the landing. One escort plane called advice to "get the hell out of there" as the fighters could not hold down the batteries' fire and were running out of ammunition.

Concussion of shells hitting on both sides of the plane could be felt and, just prior to landing, two shells hit in front. The Japs were correct as to range but off in deflection. The PBY taxied up to the canoe but the life-ring thrown from the after station fouled up and missed the pilot. Added throttle was applied and a fast turn made to the left while the crew called off, the shells hitting nearby.

The next attempt to reach the survivor met with success. The plane taxied close to the canoe and the downed man caught the life-ring and was hauled aboard. His feet were still hanging out of the after station when the signal was given for take off. He had been in the water for seven hours and was exhausted but uninjured.

Shells meanwhile were hitting all around the plane, the nearest about 150 feet off the port wing. The PBY took off at full throttle, making a quarter circle to avoid heading toward Tawin Point as well as to miss the area where enemy shells had been landing in front of the plane.

Once in the air, flight to base was uneventful. No damage had been done to the plane nor were any of the plane personnel injured.

INSTANCES OF SHIP FAILURE TO RECOGNIZE PLANES

Failure of surface craft to recognize friendly aircraft has caused unnecessary tragedy in battle. In the cases reported below, failure of surface craft to recognize their friends may have been paralleled by failure to identify on the part of approaching aircraft. Constant and unremitting practice in recognition is essential to guarantee safety to friendly craft.

"At 1133 two F4Fs were observed circling over Leyte at low altitude and close range, apparently preparing to make a landing. They were fired upon by LSTs on beach. Our guns were ordered not to fire. However, two bow 40 mm. misinterpreting orders, fired a total of 12 rounds, but ceased fire immediately on orders from the conn. One of these planes was observed to make a 'pancake' landing in the Gulf.

"On the same day at 1811 a TBF could be seen approaching from a bearing 120 true at low altitude, range four miles. This plane was first fired upon by a destroyer anchored about 080 from us, distance two miles. He fired only one round. Plane continued to approach at same bearing and altitude. He was next fired upon by a group of LCIs bearing 095 true. The plane continued at same altitude

Wing-Over: Japanese Style—This dramatic picture shows a JILL disintegrating after it was shot down by a PB4Y near Tourane, Indo-China, 21 February.

toward Leyte. Numerous ships in the Gulf opened fire as he came closer to the beach. Many hits could be clearly seen. The pilot banked to avoid hitting beached LSTs as he crashed into the water. Our guns were ordered not to fire, but one 40 mm. fired five rounds through a misinterpretation of orders. It was evident that many of the ships did not know their aircraft recognition as they opened fire with all guns on friendly planes."

* * *

"At 0752, after the LSTs had formed one eight (18), nine planes appeared at 6,000 feet at 180 relative to the course of this ship. It is believed that the fourth ship astern was the first to open fire on these planes that we recognized as F6Fs. As the planes proceeded up the column of the ships, they were fired on by the ships successively upon hearing and seeing the ships astern fire. No apparent damage was observed to the aircraft as a result of this firing."

* * *

"Enemy planes continued to appear overhead but stayed out of range until 1730. At that time we observed a TBM riding in low from 080. Several ships in the area opened fire, led by an LCI. Then we sighted a Betty bomber cutting away from behind the TBM. Fire followed both of them down as they separated and both were hit heavily, crashing near each other in flames on our port quarter. Firing had continued on the TBM until he hit the water, although his outline was in complete evidence as were the insignia on his wings."

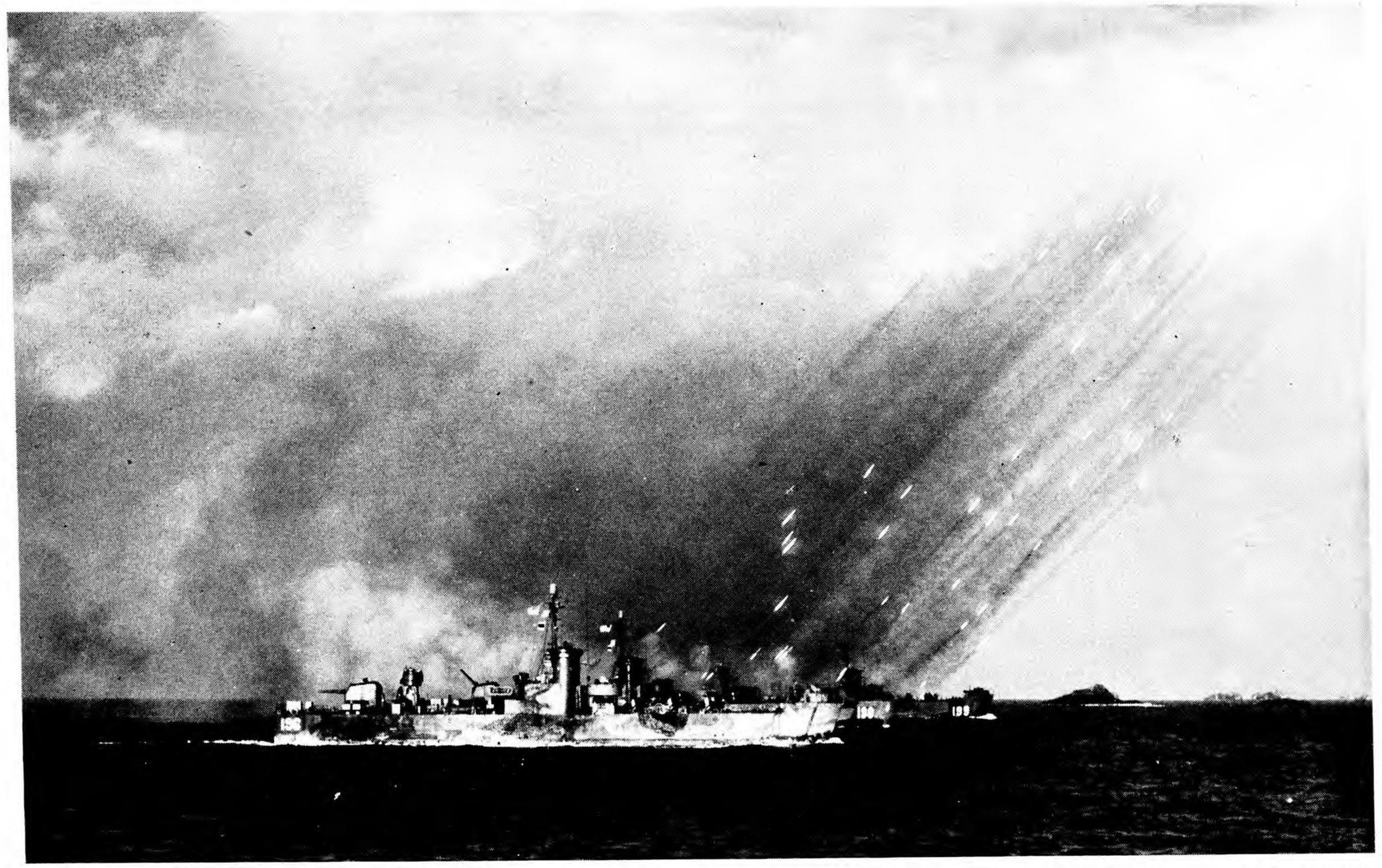
SHIPS' SPEEDS DETERMINED FROM AERIAL PHOTOGRAPHS

Since a moving ship creates a wave pattern, the speed of enemy warships can be calculated with considerable accuracy from measurements of the wave pattern photographically recorded. This method of calculation was developed by the U. S. Naval Photographic Intelligence Center and cooperating groups. In a pamphlet, entitled "Ship Speeds from Aerial Photographs" OpNav 16-VP44, the mathematical methods by which the speed of ships is computed are fully described. Copies may be obtained from the U. S. Naval PIC, Navy Yard, Washington.

INTELLIGENCE NOTES

"Balls of Fire"—On a number of missions over Honshu, B-29s have reported observing "balls of fire," which followed them. The most detailed reports were obtained from the strike mission of 3 April 1945.

The "ball of fire" appeared to be about the size of a basketball. A short streamer or tail was visible at some angles. One crew member believed he saw a wing connected to the ball of fire. Apparently at no time did any of the "balls of fire" approach a B-29 closer than 300 yards, and there were no explosions. But the "ball of fire" succeeded in following the bombers for periods of five to eight minutes. During this time the B-29s adopted evasive action, consisting of turns and changes in altitude and speed, and finally outdistanced the strange weapon.



Blasting Invasion Path at Okinawa—LSMs send up volleys of rockets aimed for the shores of Tokishiki Shima, near Okinawa, five days before invasion. Notice the smoke rising as the rockets are fired.

The action took place at altitudes varying from 6,000 to 12,000 feet. In one instance a B-29 attained 295 mph while losing altitude and quickly outdistanced the "ball of fire." In another instance the strange weapon appeared to fall behind during turns but made up lost distance on the straightaway. Occasionally the weapon would turn inside a B-29 while one instance was noted where it gave up the chase and turned back toward Honshu. Another B-29 took violent evasive action while passing through clouds on three occasions but on emerging from the clouds found the weapon once again on its tail.

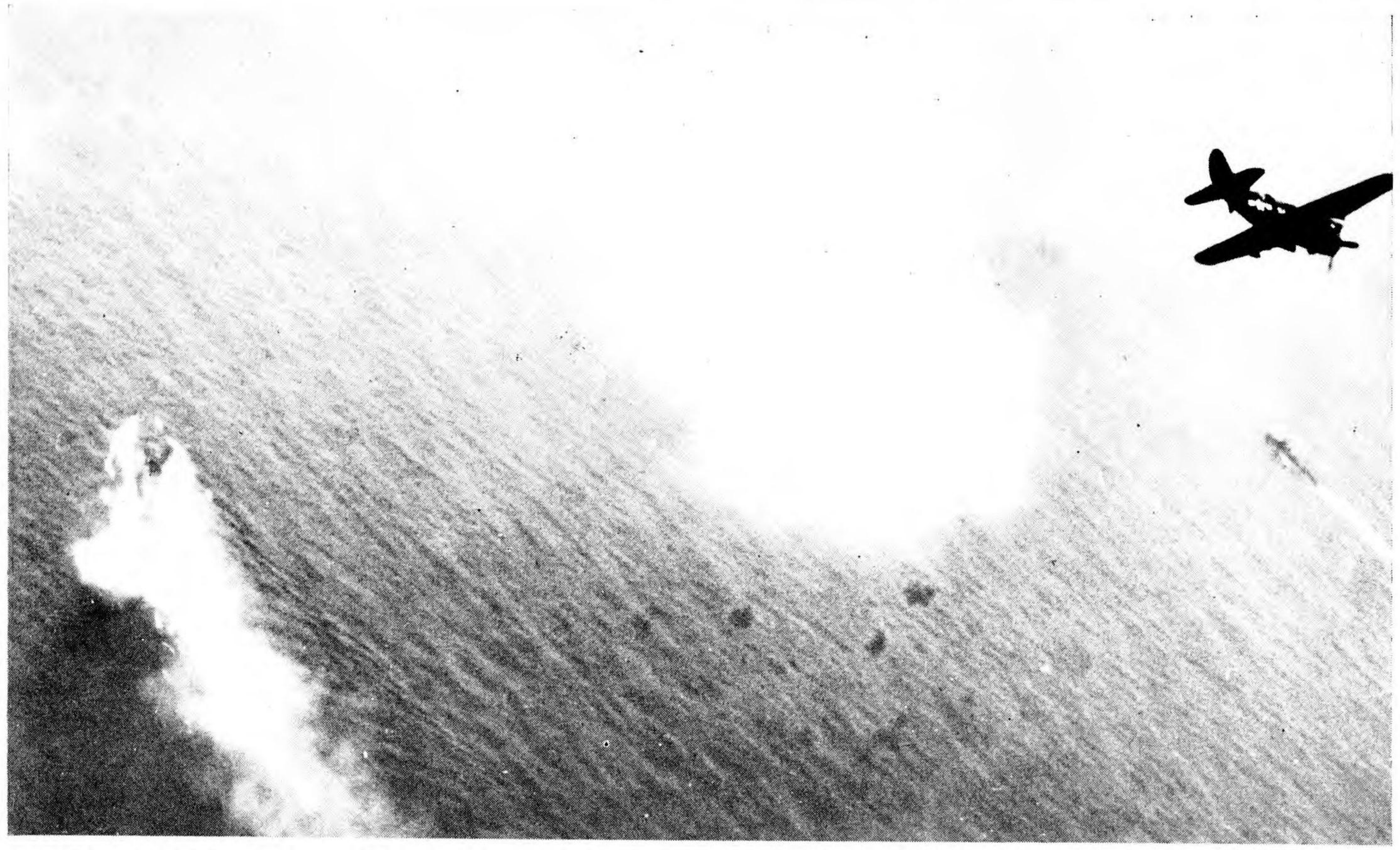
In one case a radar operator picked up indications of an aircraft one mile behind while being followed by a "ball of fire."

Three hypotheses are advanced in explanation: the weapon might be a BAKA, or it might be a radar-controlled, jet-propelled flying bomb launched from another plane or from the ground. However, no control plane has ever been spotted by our crews. Thus a ground-launched weapon seems to be the most reasonable hypothesis.

Air-to-Air Bombing Against B-29s—What is believed to have been the first instance of concentrated air-to-air bombing against B-29s was reported by 314th Wing on the Omura mission of 31 March.

Six enemy aircraft were observed to drop phosphorous bombs on the lead formation—the 19th Group. The bombs exploded with a white burst and emitted white streamers of smoke. The enemy aircraft dropping these bombs came out of the sun between 10 and 11 o'clock and were not noticed until just above and ahead of the formation. One burst was in range of the formation, and one B-29 was rocked by the explosion. The remaining bombs burst out of range and caused no damage.

The 29th Group was similarly attacked. Over the target a Tojo was sighted coming in at 12:30 o'clock high and ahead and dropping a phosphorous bomb from about 500 feet above one of the bombers which was flying at 6,000 feet. The bomb burst 800 yards ahead of and level with the aircraft. Another B-29



Just before the End—A Helldiver from a U.S. carrier wheels over the former pride of Japan's Navy, the BB Yamato, (left of center in photo) a short time before the big ship plunged down to Davey Jones' locker. In this photo, the Yamato, although burning and getting near misses, is still underway.

was bombed with a phosphorous bomb by a Zeke from 10 o'clock and 500 feet above. The bomb burst above and ahead of the B-29.

One aircraft was the target of the most serious attack. Five Tojos bombed it alternately from each side, dropping one phosphorous each. Four bombs exploded ahead and 500 feet high and one level and ahead. Another B-29 reported an attack by a Tojo which dropped a bomb 300 yards ahead and 1,000 feet above. The burst occurred level and ahead of the B-29.

Another occasion on which a successful air-to-air bombing was accomplished took place during the Tokyo mission by the 73rd Wing on 7 April. One B-29 was reported hit by a phosphorous bomb and lost as the result of damage sustained, with flak hits as a possible contributing factor. On this mission 20 unsuccessful air-to-air bombings were attempted by the Japs, some from planes flying level and above our formations and some diving on them from higher altitudes.

VICE ADMIRAL FITCH URGES UNREMITTING WAR EFFORT

In his V-E Day message, Vice Admiral Aubrey W. Fitch, Deputy Chief of Naval Operations for Air, urged that no effort be spared in the war against Japan.

"In the exhilaration of one victory let us remember we have another tough foe to fight. When word reached the Pacific that Germany had surrendered, hostilities did not cease. The Japs did not relax their efforts on this day. As I speak, men are fighting and dying. The soldiers inching their way against the Japs on Okinawa are too weary to cheer very loudly.

"This is a moment for thanksgiving, not a time for wild celebration. This is a moment of triumph, but it is also a moment of sadness. We cannot relax when we remember the men who lie on remote battlefields in graves marked by white crosses. We cannot forget that our late Commander-in-Chief is not here to share this moment. But we can and should recall the advice he gave us shortly before he died. 'Let us stick to the plow,' he said, 'until we reach the end of the furrow'."

AEROLOGY

METEOROLOGISTS CONSIDER WAYS TO IMPROVE FORECASTS

With the advent of B-29 bombing operations against the Japanese homeland, the necessity for more accurate and detailed weather forecasts covering Japanese-held areas has become mandatory. A big step in that direction was taken recently when the outstanding military and civilian authorities on meteorology met to consider ways and means of immediately improving such forecasts. Practically all those attending the meeting had had recent combat experience in the operational zones under consideration, the military members as participants in the action and the civilians as observers. Although B-29 operations were the prime consideration, the general problems encountered in carrier-based and land-based naval plane operations were thoroughly investigated with a view to improving all forecasting. Some of the items of major importance are presented below.

Bomber Requirements—More accurate forecasts of visibility, amounts, heights and thickness of cloud layers are required. Three-tenths, or less, sky coverage by clouds is the ideal condition for high level bombing. Where greater cloud coverage exists, it is necessary to resort to radar. Results of radar bombing to date have clearly shown the superiority of visual bombing.

Icing and turbulence materially increase gas consumption. If such activity is not anticipated and adequate provision made, it is entirely probable that too great a bomb load may be carried with the result that the aircraft cannot return to its base. Such costly errors have been made in the past and, until more accurate forecasts can be furnished, will continue to be made. Not only must the forecasts be improved but any sudden and unanticipated changes in the weather must be communicated to the operations office immediately.

Accurate wind forecasts are obviously of vital importance to the successful navigation of aircraft, but the effect of the wind on take-offs and on runs over the target and the importance of ballistic winds to bombing operations are also extremely important.

Rainfall Forecasts—The quantity of rainfall expected has a direct bearing on operations and on maintenance of aircraft at the base. A correct forecast of the amount of rainfall expected enables the maintenance section to perform more effectively by coordinating its activities on the operation fields with the prevailing weather. Provision for correct quantitative rainfall forecasts must therefore be made.

More Reports Needed—The sparsity of synoptic reports and the lack of adequate communication facilities are two factors largely responsible for faulty forecasts. An increase in reports and improvement of communications are required to improve forecasting. In this connection the tremendous importance of reconnaissance planes carrying qualified weather observers was stressed. By way of illustration, many cases were cited where this method had resulted in a considerable improvement in the accuracy of forecasts issued. An added point of great importance is the need for the forecasters to make occasional flights, over the target or in the operating area where possible, but in any event to gain some familiarity with weather as the pilot sees it.

Local Peculiarities—A more technical note was introduced by the discussion of the Asiatic High and the Aleutian Low from the standpoint of dynamic meteorology. Among the points set forth were the relative permanency of the pressure systems in the Pacific during the winter season and the effect of the variations of the pressure trough to the east of the Asiatic High on the weather to be expected in the area. The action of the Equatorial Front with relation to its changes in location and intensity, and the effect of trailing cold fronts, or quasi-stationary fronts, on air operations are also problems to be solved.

The relative effect of the Northeast and Southwest Monsoons on the Philippine area, and the effect of the low pressure areas of Northern Luzon are of considerable importance. The "steering" effect of the upper air circulation on typhoons must be considered with a view to predicting more accurately the path which a typhoon will follow.

The CBI Theater—Weather forecasting in the China-Burma-India theater calls for the development of a forecasting technique for China, the improvement of fog forecasts at bases in Assam and a further study of the effects of surges in the monsoon over India. The strong effect of the intertropical front on summer weather in Burma is a major factor requiring attention.

Long Range Forecasting—All services, military and civilian, are cooperating to the utmost in attempting to arrive at the proper technique to be used in the preparation of the extended forecast. Further development of upper air analysis, and consideration of the general circulation over the entire northern hemisphere are considered to be essential steps toward this goal. At present, forecasters are trying various methods, such as the use of mean 5-day maps of pressure distribution, the effect of the index of zonal flow on the general circulation, the "typing" of weather maps and the use of analogues.

Conclusion—To summarize, action is most needed and is in progress to achieve the following:

1. Improvement in forecasting technique.
2. More synoptic reports to be made available in the Pacific and in the Far East.
3. Improvement in communication facilities.
4. Improvement of the accuracy of forecasts of cloud coverages and the height and thickness of the various cloud layers.
5. Increased use of weather reconnaissance planes with trained observers aboard.
6. The familiarization of forecasters with weather "in the air" by frequent participation in actual flights.
7. Investigation of cyclonic structure and rainfall patterns.
8. Adoption of a uniform system of representing the "Intertropical Front", the "Equatorial Front", etc.
9. Education of pilots to understand that fronts as they know them in temperate regions do not exist in the tropics.
10. Increased use of isallobaric analysis wherever possible.

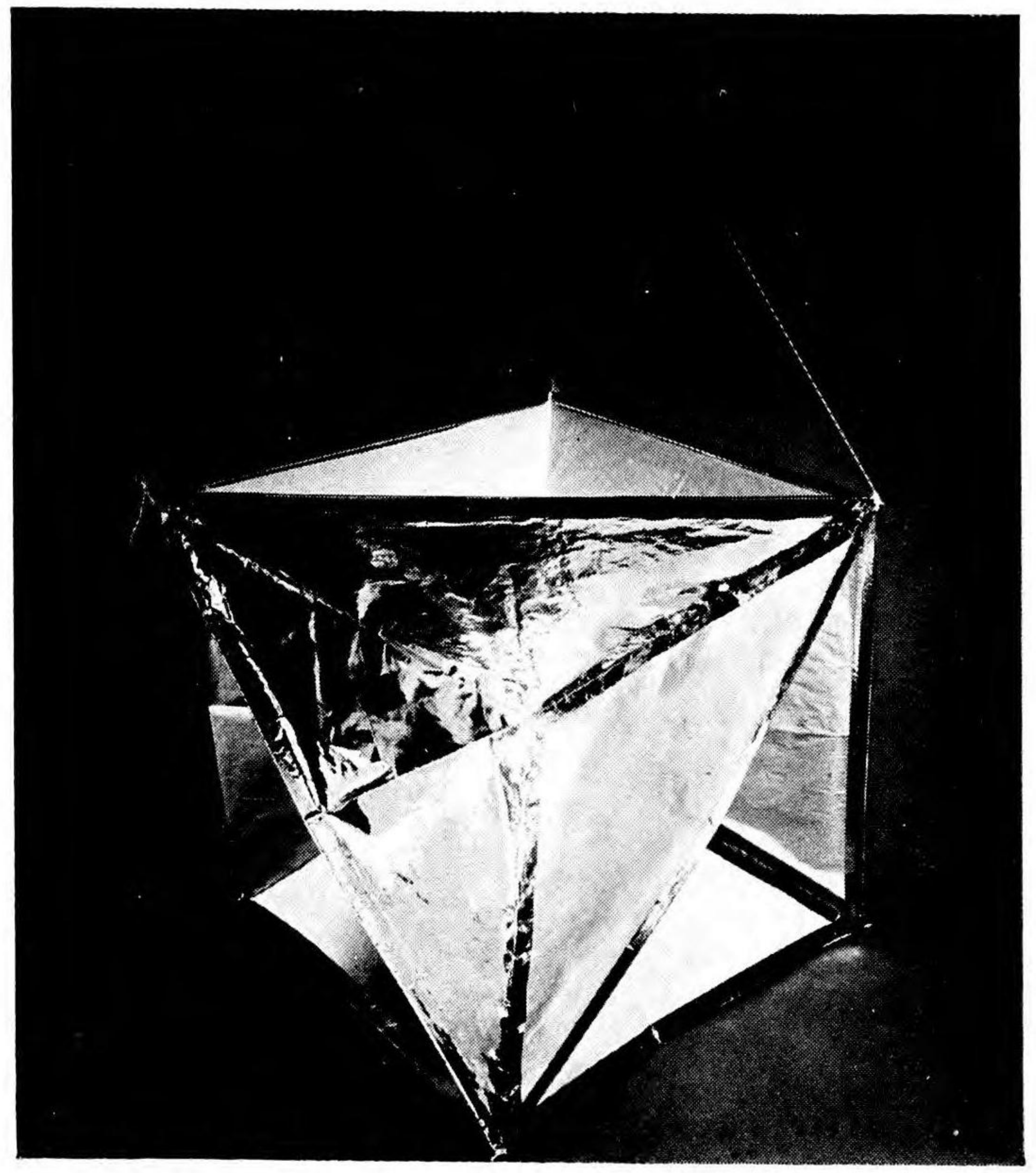
RAWIN—DETERMINATION OF UPPER WINDS BY RADAR

Modern forecasting techniques are utilizing an ever-increasing amount of upper air data, not only temperature, pressure and humidity aloft, but wind direction and velocity as well. Ordinary visual theodolite methods to determine wind velocity and direction aloft are inadequate to supply this information under all conditions of cloud, visibility and heavy weather. Actual experience on a CV in the Pacific over a period of a year showed that 75% of the wind soundings were limited to an altitude of 4,000 feet or less.

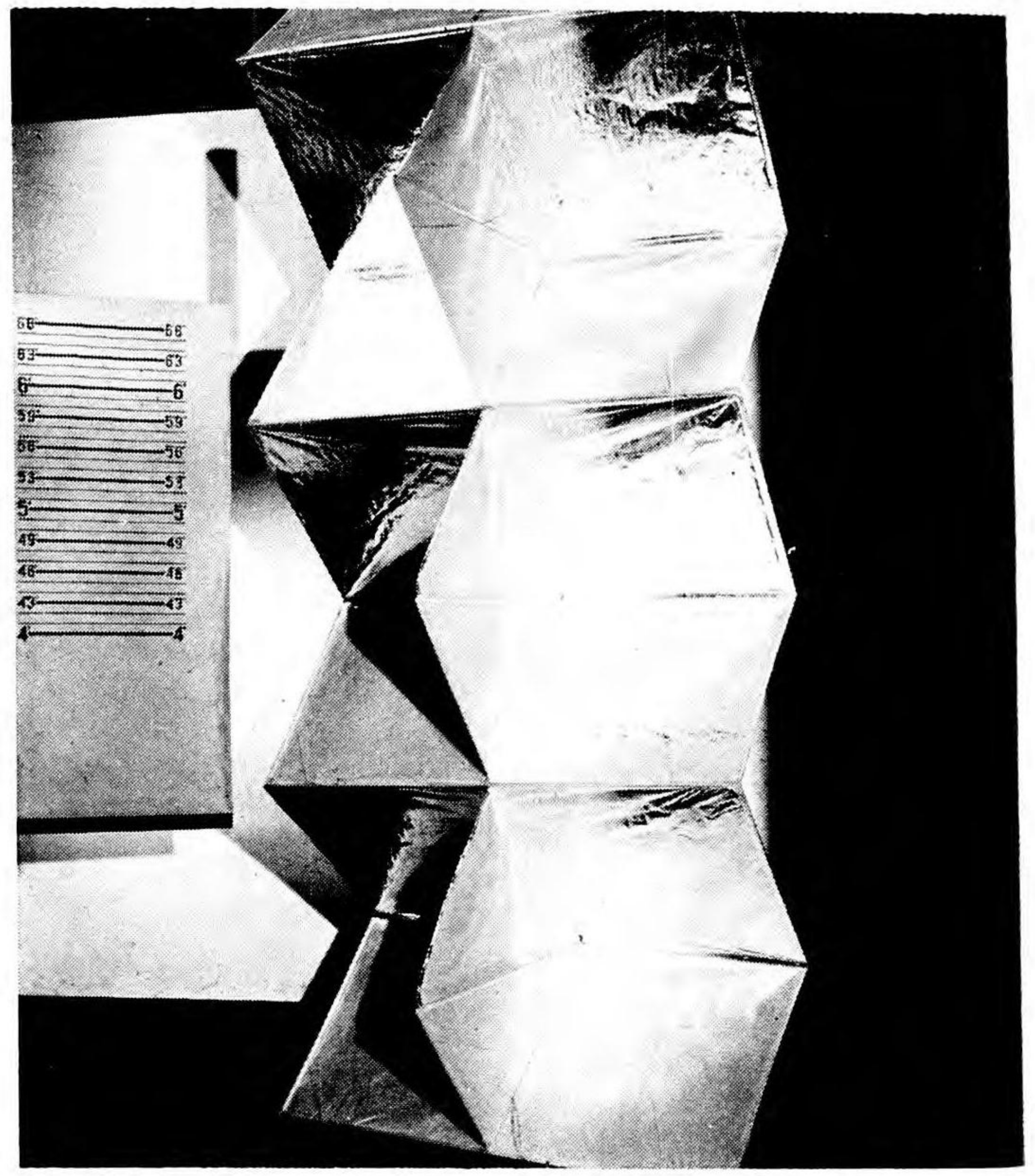
Rawin techniques provide the answer to obtaining wind soundings under such conditions. Rawin, an abbreviation derived from the words *radar* and *wind*, is a method of obtaining wind direction and velocity aloft by the application of radar. Either the search or fire control radar can be used. Search types SM and modified SA and the Mk. IV fire control radar have been used by ships for this purpose. Equally adaptable is the Mk. 12, SP, SK, and the SC. Upper air wind equipment and methods were reviewed in the March 1945 issue of this bulletin. Pictures of this equipment appear on opposite page.

Some of the units conducting rawin soundings and employing this equipment are the *USS Franklin, USS Enterprise, USS Intrepid, USS Hornet, USS Shangri-La, NAS Midway, NAS Alameda, NAS Eniwetok, NAS Johnston Island, NAS Attu, NAF Amchitka*, and the Naval Proving Grounds at Dahlgren, Virginia. On board the *USS Enterprise*, rawins are taken daily. This sounding, together with a temperature analysis of the upper air based on the rawin data, is transmitted to all carriers in the task group. Reports on rawin equipment used and techniques employed by other units are requested in order that existing equipment and methods may be improved and evaluated. This information should be forwarded to the Chief of Naval Operations on the Monthly Aerological Summary form supplied to all aerological units.

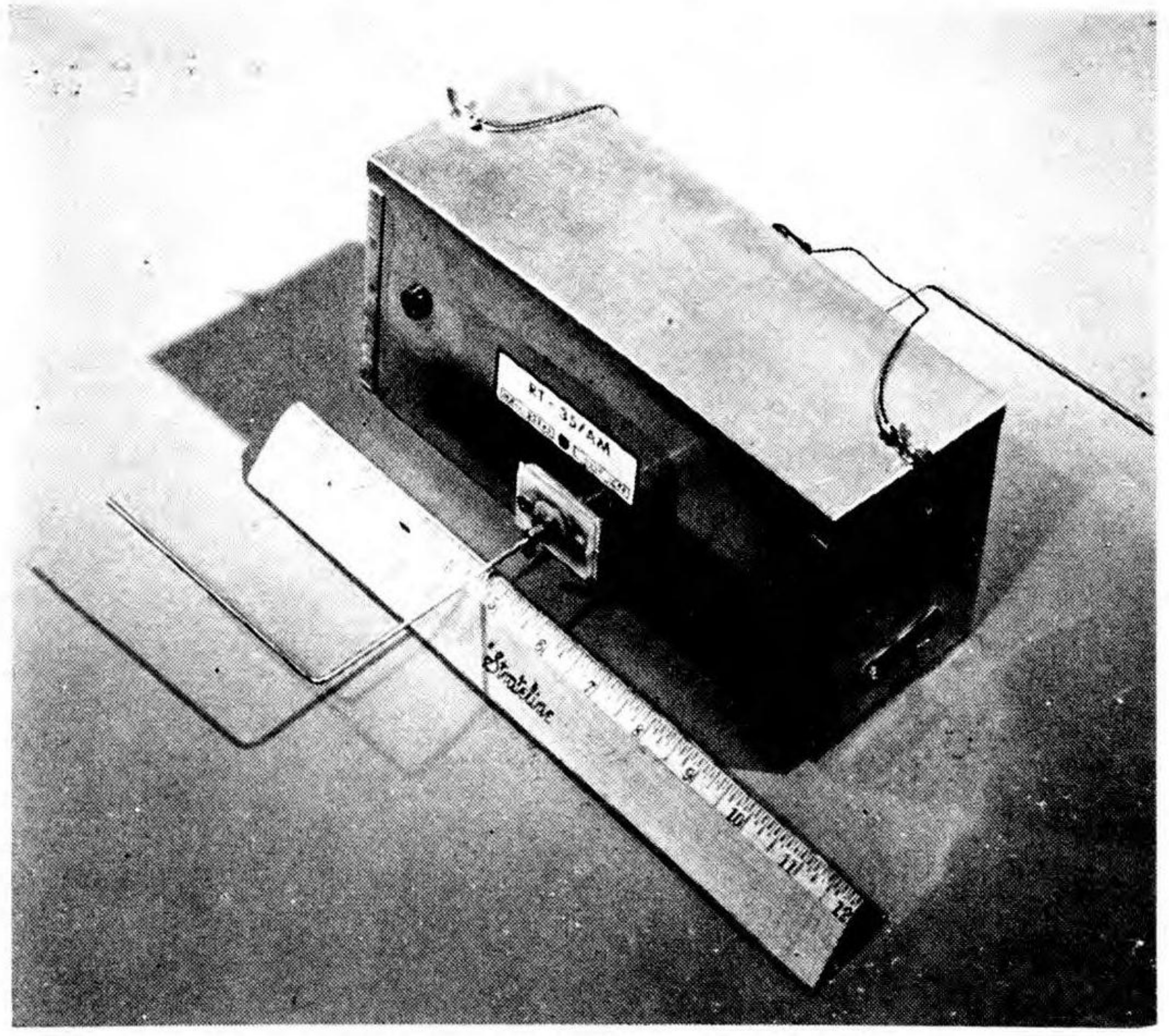
Skill Required—The handling of this apparatus requires the same skill and care as are necessary in making pilot balloon and radiosonde soundings. If a fire control radar is used with the reflectors, the amount of free lift used need not be critically measured and can be varied according to whether a slow or rapid ascent is desired. Reason for this is that the fire control radar will give accurate slant range



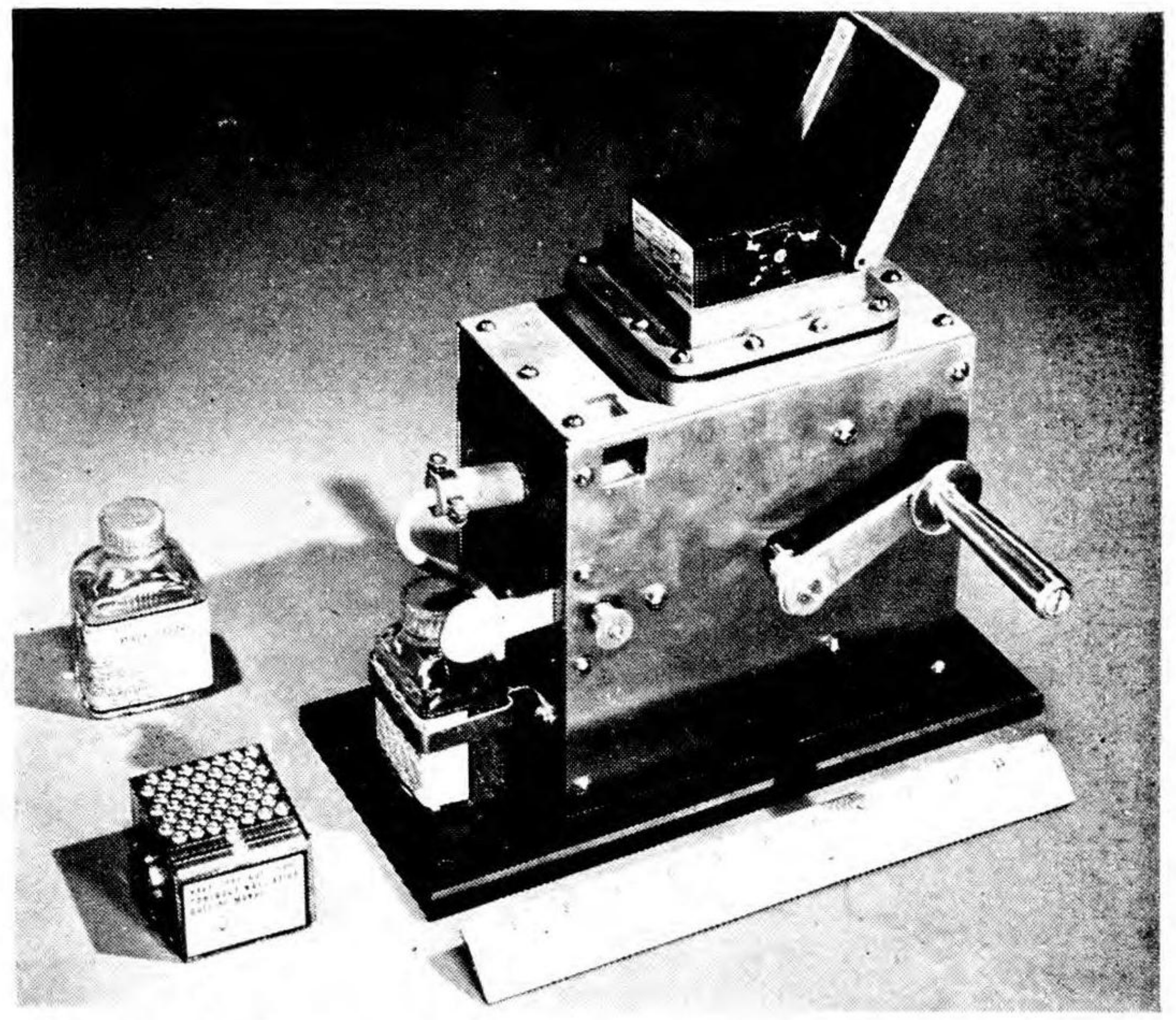
ML-309/AM Rawin Radar Reflector—This small reflector is 30 inches square and weighs 10 ounces. When attached to a 100-gram balloon inflated to give a free lift of 1,000 grams, the reflector rises at 695 feet per minute; with a 350-gram balloon inflated to give a free lift of 1,500 grams, it rises at 1,027 feet per minute. This reflector will give ranges from 10,000 to 18,000 yards when used with the Mk. 4 radar.



ML-306/AM Rawin Radar Reflector—This large type of reflector weighs 35 ounces. When attached to a 350-gram balloon inflated to give a free lift of 1,500 grams, it will rise at the rate of 580 feet per minute. Because of its greater area, it will give ranges of 20,000 to 40,000 yards when used with Mk. 4 or similar fire control radar. When used with a search-type radar, either reflector will give increased ranges.



RT-35/AM Rawin Pulse-Repeater—This pulse-repeater, similar in operation to the IFF transpondor, weighs 2 lbs. 11 ounces, batteries inc'uded. Used with Mk. 4 radar, it gives a range of from 50,000 to 100,000 yards.



Vacuum Pump—The RT-35/AM unit uses two batteries which are shipped dry and must be activated, by means of the electrolyte supplied with each battery and the hand operated pump. The pump is standard equipment for aerological offices.

and elevation angles. The SM and SP radar will also give this same data, but elevation angles cannot be measured on the SA, SK and SC, hence the assumed ascension rate must be used to determine the altitude of the target. The actual radar observation and recording of rawin data requires the cooperation of CIC, and officers and men of the Gunnery Department. Type radar to be used and observation times must be worked out and a schedule agreed upon. Director crews, radar operators and aerographer's mates must all function as a smooth team.

Sound power phone communication between the aerological office and the radar operator enables the operator to call out the readings at one-minute intervals to the aerographer's mate who records and plots the data. With this system, the aerographer's mates can coach the radar operator on picking up the target as soon as it is released by giving approximate relative bearings to the operator. As all radars have a certain minimum range, the operator will be unable to pick up the target immediately upon releasing the balloon. Also with the SA, SK and SC radar, the target must be within the vertical angle of the radar antenna pattern before it can be picked up. These minimum ranges and vertical angles are:

SM—1,000 yards—any vertical angle
SP—1,000 yards—any vertical angle
SA—1,200 yards—52°
SK—1,200 yards—20°
SC—1,200 yards—60°
Mk. 4— 400 yards—any vertical angle
Mk. 12— 400 yards—any vertical angle

The elapsed time between the instant the balloon is released and the instant it is picked up by the radar, will vary with the ascension rate of the balloon, type radar, strength of wind and whether the ship is going upwind or downwind. With the SM, SP, and Mk. 4, this elapsed time will be equal to the time it takes the balloon to traverse the minimum range of the radar. With the SA, SK and SC, no soundings will be possible if the target rises with an elevation angle greater than 52°, 20°, 60° respectively. This would be the case when the wind is light or the ship is going downwind. If necessary, missing data for the first 2 to 4 minutes can be obtained visually by the gun director or theodolite and this method abandoned as soon as the target is picked up by the radar.

Other Advantages—Besides overcoming weather handicaps, the rawin has other advantages over the visual-theodolite method. At times it has been impossible to set up the theodolite, because of respotting, gassing and rearming of aircraft. Using rawins, no flight deck space is needed except what is required for the launching of the balloon. Thus there are fewer motions and operations involved in taking a rawin. To speed up the calculations a special rawin calculator is being developed.

Benefits and advantages of taking rawins are not confined to Aerology. On occasion, radar technicians have checked the performance of their sets by simultaneous fire control, search type and visual (theodolite) observation. The known altitude of the target at each minute and its slow closing and opening speeds make it very useful for this purpose.

WEATHER AND THE LANDINGS ON IWO JIMA

On 19 February 1945 the amphibious landings on Iwo Jima, supported by carrier and land-based planes, signified the beginning of what was to prove one of the most difficult and costly amphibious operations of the Pacific War. Regardless of cost or difficulty, however, it was essential that this stepping stone to Tokyo be made available for our use in the operations against Japan. It placed our forces some 600 miles closer to their targets and made possible the use of fighter support in B-29 raids on Japan. As was to be proved later, it also provided an emergency landing field for B-29s returning from strikes.

In effecting the landings on the steep beaches in the face of heavy enemy fire, it was vital that close air support provide all possible aid to the ground forces. Weather again became an important factor to consider, particularly so in this case, because of the proximity of Iwo Jima to the Formosa-Japan area in which low pressure systems develop with great frequency during the winter months. The movement of these "lows" toward the east northeast across the Bonins, as illustrated by Plate I, results in extremely variable weather and in rapid changes in flying conditions. This variability in weather is well illustrated by the following statement received from a CVE: "The weather was characterized by rapid changes in wind direction, cloud cover and precipitation, as low and high pressure systems moved through the area."

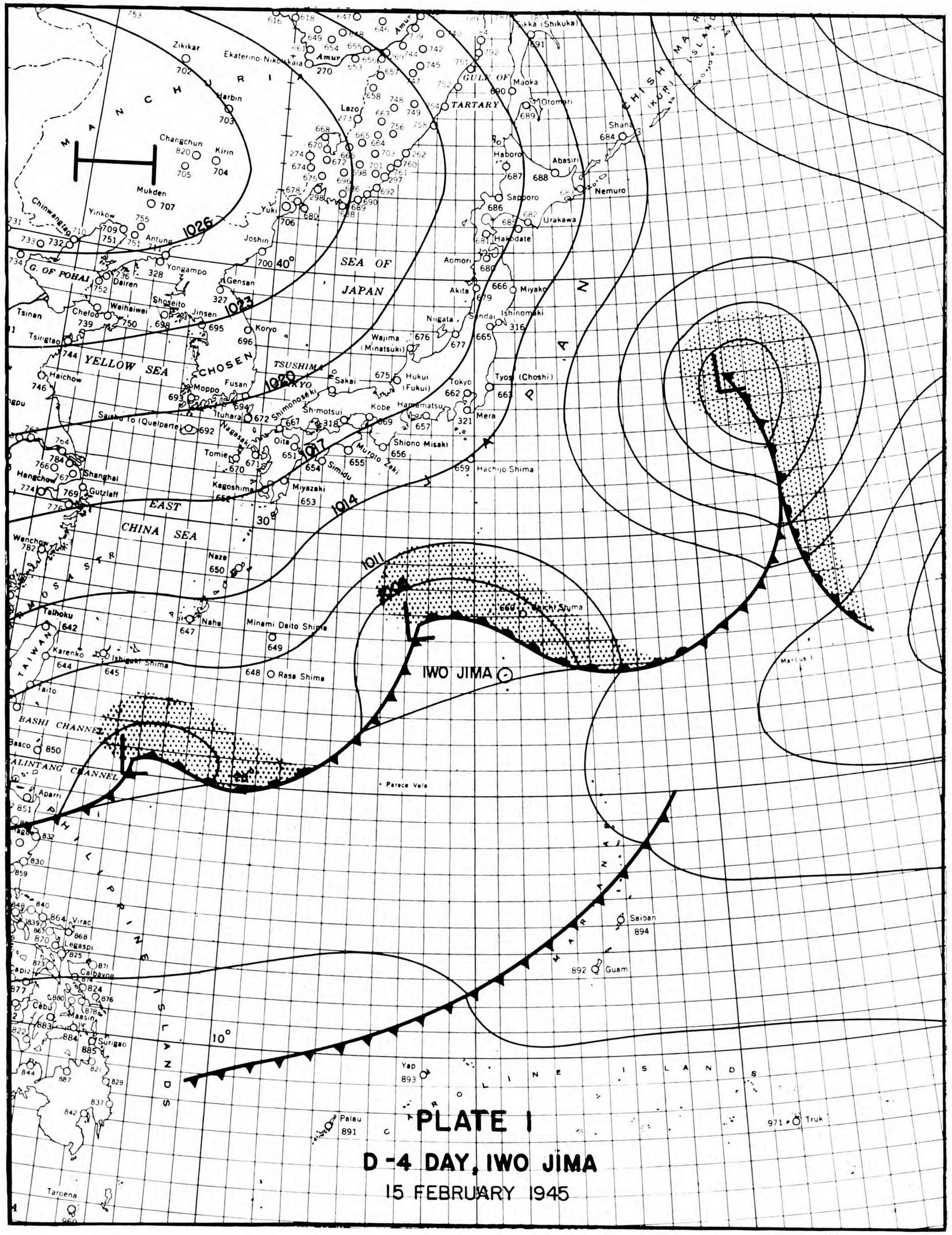


PLATE I
D-4 DAY, IWO JIMA
15 FEBRUARY 1945

The weather for air operations three days prior to, and three days subsequent to, Dog Day was very poor. By D-3-Day the wave development, shown as 200 miles west of Iwo Jima on D-4-Day (Plate I), had passed just to the north of the island. At about 0900 on 16 February the cold front extending south from the center of the wave passed the disposition and caused a wind shift from southwest 12 knots to northwest 10 knots. Behind the front (to the west) intermittent light rain and low clouds failed to materially affect our operations. By 1400 conditions had become excellent for air strikes and for spotting in connection with bombardment by heavy units of the fleet, with only a few scattered clouds and light winds.

Action reports from the various units involved in the operation indicate that the most valuable aids to forecasting were submarine weather reports. Such reports, particularly from the enemy-controlled areas, were said to be of invaluable assistance in determining the correct weather situation. Search plane "in-flight reports" also proved of great assistance in arriving at the correct weather analysis. This is another instance in which the availability of both submarine and in-flight weather reports has a direct bearing on the accuracy of forecasts issued for operations in the Pacific area. An observation, even though relatively isolated by distance from other reports in the general area, will often prove the determining factor in issuing a dependable weather forecast for flight operations.

In this connection it is vitally important that every item, even the smallest, of current weather information be supplied to the Aerological Officer at the very earliest possible moment for proper evaluation. In addition to the submarine and in-flight reports, other pertinent ones are those supplied by pilots enroute to or from, or after returning aboard ship from, the target area. The reports received from picket destroyers also proved exceedingly valuable to forecasters during the Iwo Jima invasion. During a later phase of the operation it was possible, with the aid of these last-mentioned reports, to locate accurately the position of a cold front approaching Iwo Jima. Since no other reports were available in that particular region, the exact location of the front would otherwise have been impossible.

The Iwo Jima operation furnishes a good example of the mutual reliance of Aerology and Operations upon each other. Operational planning and execution of air strikes and support operations rely upon weather forecasts to a large extent. The Aerological Officer must in turn rely upon the weather observations supplied by Operations, especially in the Pacific where large areas are covered by few, if any, reports.

NOBLESSE OBLIGE

Tokyo broadcast, May 4, 1945 commentary by Goro Nakano, former New York correspondent for the Asahi Simbun: "The enemy believes she is the strongest and greatest in the world. Now Germany is defeated. However, Japan is still resisting against the exploitation of this hateful U.S.A. This, indeed, is very noble of Japan."

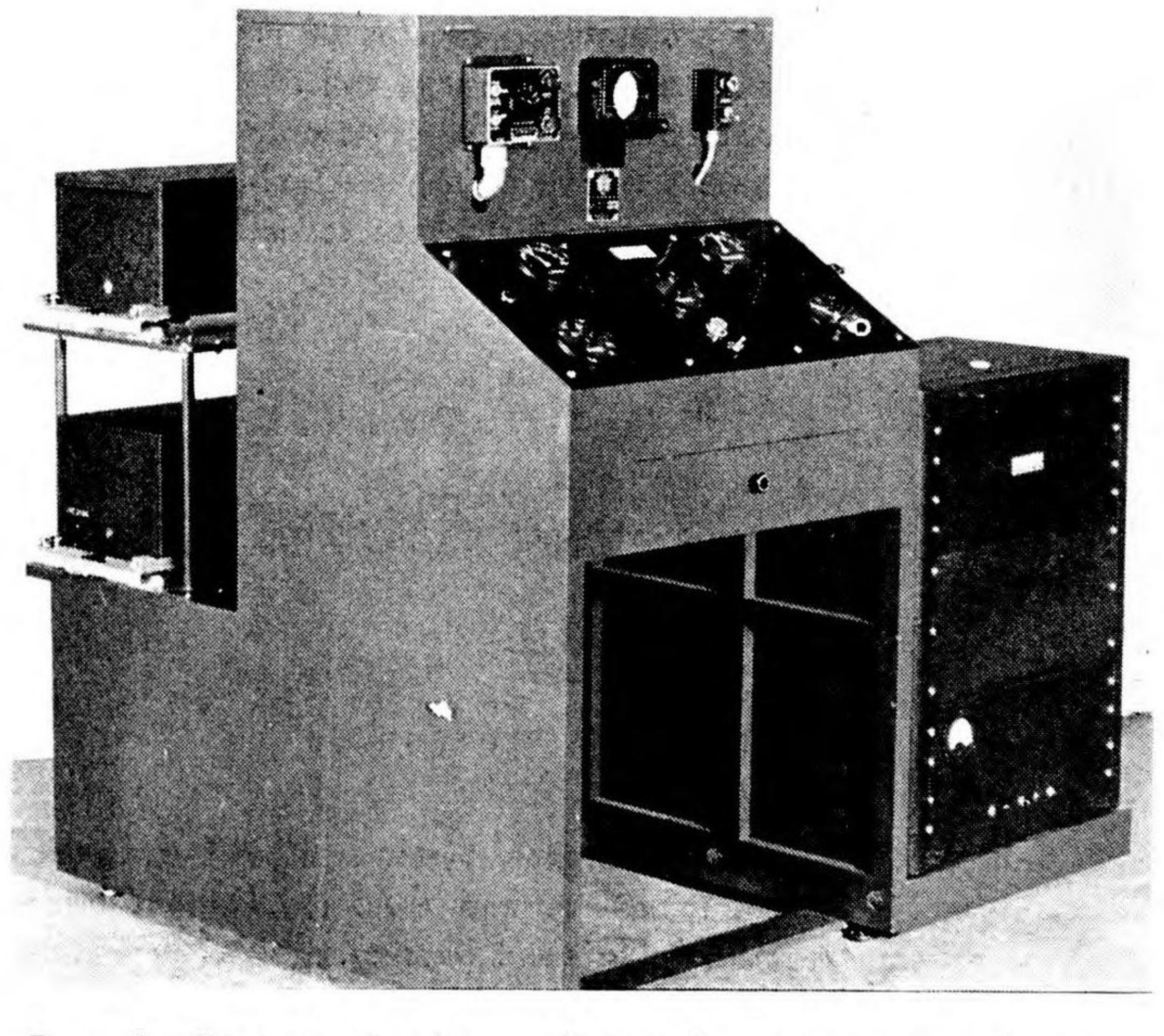
radar presentation produced on an AN/APS-6 Radar Indicator as used in an F6F plane. Indication of the fighter plane's altitude and bank occurs simultaneously with the target presentation.

The synthetic signals are set in by the instructor or student on a control panel. Calibrated dials give the following indications:

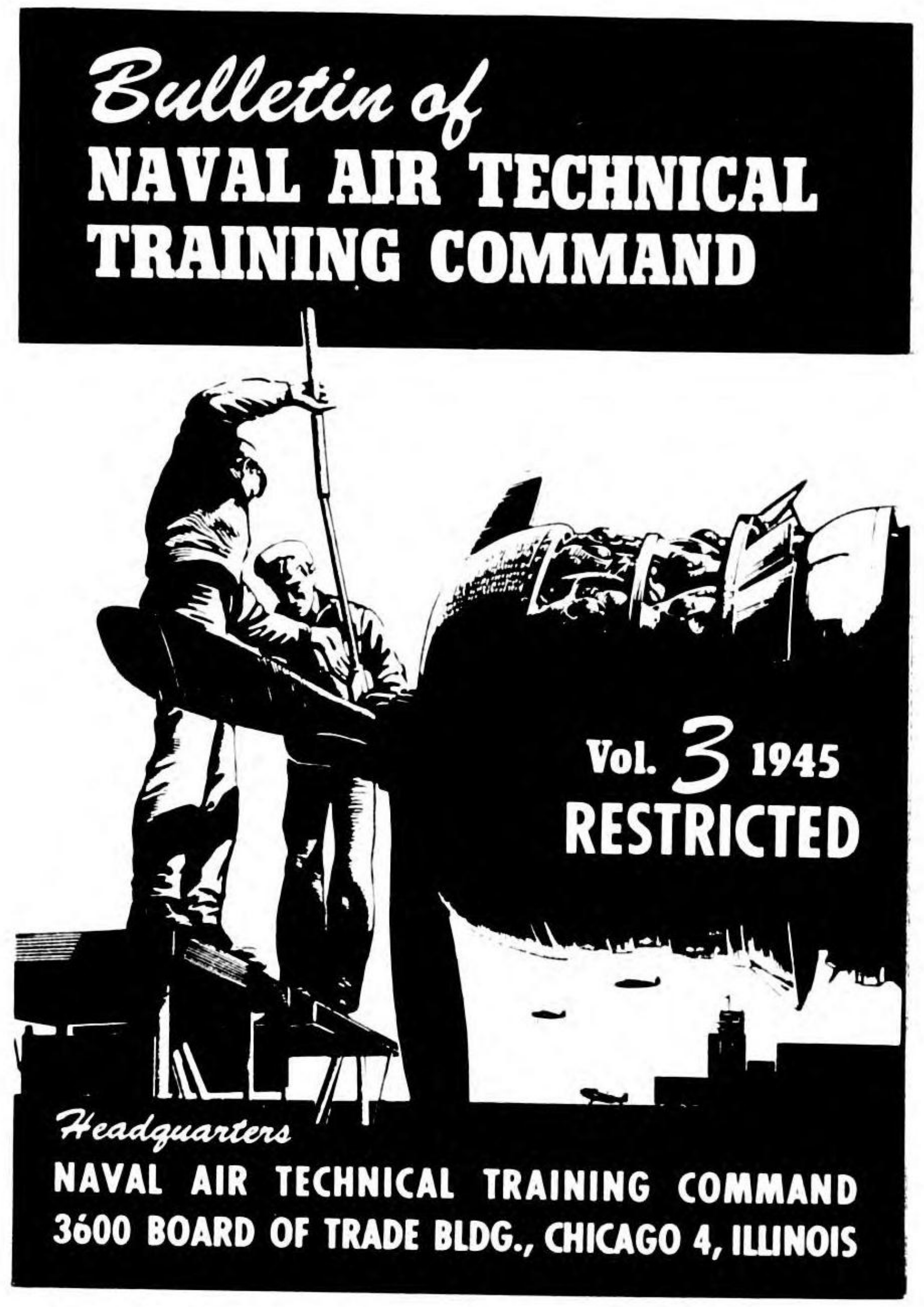
1. Target azimuth.
2. Target range.
3. Target elevation.
4. Own aircraft's altitude.
5. Own aircraft's bank.

The AN/APS-6 Radar Bench Demonstrator is used for classroom familiarization, scope interpretation, demonstration of approach problems and demonstration of interception problems. Students learn the operation of all controls and adjustments. Maintenance instruction may be given on this device since the equipment is arranged on a bench, so that all components are readily accessible.

Allocation of these devices has been made to units engaged in training night fighter pilots. Requests for further information should be directed to Chief of the Bureau of Aeronautics, via DCNO (Air).



Bench Demonstrator—Used for classroom instruction, this demonstrator known as Device 15-A-7, simulates the radar presentation produced on an AN/APS-6 radar indicator in an F6F plane. The device also teaches pilots the operation of all controls and adjustments on the AN/APS-6.



Bulletin of
NAVAL AIR TECHNICAL TRAINING COMMAND

Vol. 3 1945
RESTRICTED

Headquarters
NAVAL AIR TECHNICAL TRAINING COMMAND
3600 BOARD OF TRADE BLDG., CHICAGO 4, ILLINOIS

Training Bulletin—The quarterly Bulletin of Naval Air Technical Training Command carries a description of courses available to personnel. Full details are given except on courses where equipment is Confidential. These confidential courses are described on the next two pages of this bulletin.

CONFIDENTIAL COURSES GIVEN BY NATECHTRACOM

The following curriculum description of confidential courses offered at activities of NATechTraCom supplements the BULLETIN OF NAVAL AIR TECHNICAL TRAINING COMMAND, Vol. 3, 1945, which has just been published.

Requests to enroll personnel in any training listed here should be directed to the Bureau of Naval Personnel via the Commanding Officer with a copy to the Chief of Naval Air Technical Training. *It is an established policy that men received from an operating unit for special instruction will be returned to that command.* In choosing personnel for training, Commanding Officers are urged to be sure personnel are properly qualified so they can obtain the maximum benefits from instruction. Personnel found deficient in either technical or disciplinary qualifications represent a useless expenditure of time and money and will be returned to their units without being enrolled for instruction.

RADAR OPERATION

NTSch (Aviation Radar Operators)	2 Weeks

NATechTraCen Norman, Okla., and
NATechTraCen Memphis, Tenn.

CURRICULUM

Handling classified material and duties of radar operator. Introduction to radar principles and ASB radar. Cathode ray tubes. Capabilities and limitations of radar.

"L" scan presentation. "Blipology" and scope interpretation. Antenna switching unit.

Operating procedure for ASB. Voice procedure and power supplies.

Operation and destruction system of IFF, and operation of AN/APX-1 and AN/APX-2.

Presentation of "PPI". Operation of AN/APS-2, AN/APS-15. "B" scan presentation and operation on AN/APS-3 and AN/APS-4.

Electronic jamming and countermeasure. Deceptive devices. Navigational uses of radar and ground radar beacons.

Operational and flight notes, and radar flight log.

QUALIFICATIONS

Physically qualified as outlined in BUPers C/L 147-42.
Combat Aircrewman volunteer.
Graduate of ARM, AOM or AMM School.

CONVENING DATES

Every Monday.
Government housing and messing facilities are available.
Trainees report to Commanding Officer.

* * *

SPECIAL PROJECTS FOR AIR

Special Projects School for Air	8 Weeks

Naval Auxiliary Air Station
San Clemente Island
San Diego 46, California

CURRICULUM

For ART rates: Reconnaissance and offensive CM. RIA Operator's Manual APR-1. RIC and RID Operator's Manual. Radar maintenance and fundamentals. CM equipment and A/M nomenclature. Transmission lines. Antennas and antenna polarization. Pulse modulation. Use of Spurious Response Graph APR-1, and its tuning unit and tracking. APA-6 and APR-5 operation, analysis and measurement. Sensitivity measurements of APR-1, and location of described signals.

Special electronic equipment, APR-2, APR-6, APA-24, ARD-3. RBY-1 familiarization and panoramic operation. ARR-5, APA-17, M-2300, ARR-7. Pulse analysis. FM reactance tube circuit, and anti-jamming. 10-AEL radar decoy. MN-2867a Window. Familiarization APT-1 and APQ-2. Monitor receiver and checking frequency control of APQ-2. Operation and familiarization APT-2, AM-14, AM-18/APT, APQ-9, ATA/ARA, GO9A, APQ-9. Mock-up operation. Radar station locating and plotting. Security.

For ARM rates: Reconnaissance and offensive CM. Radar fundamentals. Radio fundamental and frequency concepts. Superheterodyne receivers. Radar weapon of attack MN-1550. Radar jamming MN-955J. ASG and ASD scope interpretation MN-1312, MN-1311. RIB, RIE Operator's Manual. Mock-up operation. Radar station locating and plotting. Undetected approach. Signal interpretation and analysis.

Operator's Manual R6 APR-1. Radex ASB MN 28678. Pulse analyzers. APR-5, APR-7, APR-6 operation. IF Amplifier Sensitivity Measurements APR-1. RBY-1 receiver operation and RBY Panoramic Adaptor operation. Special electronic equipment.

For S(A)T Officers: Enemy radar. Superheterodyne receivers. TN-1, TN-2 tuning units. Countermeasures equipment. A/N nomenclature. Spurious response graphs. ATC/RAX operation. GO-9, ARQ-10 and ART-2 operation and familiarization. Signal interception and analysis.

Radar locating and plotting. PB4Y-2 electrical system. Undetected approach. Tactics and communication procedure. APQ-2, APT-1 mock-up operation. CM test equipment.

QUALIFICATIONS

Graduates of a functional training command school. Only ART, ARM, and S(A)T officers are assigned. All enlisted students must be "qualified gunnery" and cleared for secret material.

CONVENING DATES

Forwarded upon request to Bureau of Naval Personnel.
Government housing and messing facilities are available.
Trainees report to Officer-in-Charge.

SHORT COURSES	2 Weeks

FL-O and FL-M Radar Countermeasures for ARM and ART rates, as related to electronic and other equipment designed especially for the purpose. ARMs preferably graduates of NTSch (Aviation Radioman), NATechTraCen Memphis, Tenn., and of an Operational Training Unit of NAOpTraCom. ARTs preferably graduates of NTSch (Airborne Electronics Maintenance), NATechTraCen Corpus Christi, or from other electronic maintenance schools. All students must be cleared for secret material.

* * *

AIR NAVIGATIONAL RADIO AIDS

NTSch (Air Navigational Radio Aids)	12 Weeks

NATechTraCen Gainesville, Ga.

CURRICULUM

SCS-51 Instrument Low Approach System. BC-751-A Localizer transmitter. Mechanical modulator and cross modulations bridge. Antenna system, patterns, bridge and phasing unit. Course detectors. Indicator box. Localizer control circuit. Glide path transmitter, antenna system and monitor. Power circuits of glide path trailer.

Installation and operational consideration peculiar to SCS-51 system. AN/ARN-4 airborne equipment for use with SCS-51 low approach equipment. Localized receiver, BC-733-D; glide path receiver, AN/ARN-5. Application, theory and components test

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ROCKETS

AIMING ALLOWANCES COMPUTED FOR WIND AND TARGET MOTION

In the firing of aircraft rockets it is essential to hitting accuracy that the correct aiming allowances be made for wind and target motion, since miscalculation of either by 10 knots can result in an error of as much as 15 yards at a range of 1,000 yards. In making aiming allowances three factors must be considered: the rocket's time of flight, wind effects at firing altitude and the foreshortening of ground distances when viewed in the sight.

Rocket Flight Time—A rocket's time of flight for a given slant range determines, in part, the extent to which the impact will be affected by wind or target motion. Rockets are generally divided into two classes: (1) fast rockets, such as the 5-inch "Holy Moses" (HVAR), which covers 1,000 yards in about two seconds and drifts only about 1.1 mils for each knot of beam wind; and (2) slow rockets, such as the 5-inch AR, which covers 1,000 yards in about 2.7 seconds and drifts about 1.5 mils for each knot of beam wind. Briefly, this allowance may be computed as 10 mils allowance for 10 mils beam wind with fast rockets, and 15 mils allowance for 10 mils beam wind with slow rockets.

Wind Effects—The influence of wind at firing altitude on the aircraft causes it to drift. This motion is retained by the rocket when it is fired; however, it varies with the direction of the wind relative to the aircraft's heading, wind force and angle of dive.

A beam wind deflects the rocket the full amount of wind velocity x the rocket's time of flight, regardless of dive angle, thus requiring full wind aiming allowance. A bow/quarter wind exerts only part of its force in changing the course of the rocket. The shallower the dive, the less the rocket is affected and the less aiming allowance is required. The steeper the dive, the greater the effect, therefore aiming allowances approach that for beam wind. A fore/aft wind, at shallow dives, acts only to retard or accelerate the rocket by negligible amounts, requiring little, if any, aiming allowance. As the angle steepens, fore/aft wind exerts more and more force in changing the course of the rocket and the allowance approaches that for the beam wind. The ratio of effect of fore/aft wind to beam wind varies roughly as the sine of the dive angle.

Foreshortening—Since the pilot makes all aiming allowances in his sight, the foreshortening of distances on the ground when viewed in the sight must be taken into account. In a 30° dive, for example, a vertical mil in the sight covers 2 mils on the ground; an oblique mil (045°, 135°, etc.) covers 1.6 mils. Horizontal mils in the sight are not affected by foreshortening. This has been worked out in the following table:

Dive Angle	Mils in Sight	Mils Covered on Ground When Mils in Sight Are: Vertical	Oblique	Horizontal
10°	10	60	40	10
15°	10	40	30	10
20°	10	30	20	10
30°	10	20	16	10
40°	10	16	13	10
50°	10	13	12	10
60°	10	12	11	10
70°	10	11	10	10

Wind allowances are made upwind and target allowances ahead. They require the same numerical allowances, except that they are opposite in application. In the table on page 38 these allowances have been computed in detail and simplified for use.

Wind and Target Motion Combined—Many targets will require allowance for both wind and target motion. If the wind is blowing in the same direction as the target is moving, wind allowance may reduce or cancel the target motion allowance. If the two motions are directly opposite, the two allowances add together. If the wind is oblique to target motion, or vice versa, the final point of aim is the vector resultant of the two allowances; that is, upwind and ahead of the target. Smoke or dust from a moving target generally is blowing opposite to the direction of the final point of aim since it represents a rough vector solution to the combined effect of wind and target motion.

RULE OF THUMB AIMING ALLOWANCES FOR WIND DRIFT AND TARGET MOTION

Note:
1. All mils are mils in sight.
2. Allowances include foreshortening, where a factor.
3. Directions and courses are those apparent in the sight while aiming.
4. Allowances are computed for firing ranges of 1,000 to 1,500 yards but are satisfactory for slant ranges of 500 to 2,000 yards.

SHALLOW ANGLE DIVES

		—Mils Per 10 Knots—		
		Beam	Oblique	Fore or Aft
About 15° Dive	Fast AR	10	4	3
	Slow AR	15	5	4
About 30° Dive	Fast AR	10	6	5
	Slow AR	15	9	8

STEEP ANGLE DIVES

		—Mils Per 10 Knots—		
		Beam	Oblique	Fore or Aft
About 50° Dive	Fast AR	10	9	8
	Slow AR	15	13	12
About 70° Dive	Fast AR	10	10	9
	Slow AR	15	15	14

EFFECTS OF DIVE ANGLE ON RANGE IMPACT ERRORS OF AIRCRAFT WEAPONS

In view of recent official reports which indicate a misunderstanding of the performance of various aircraft weapons, especially those launched in low angle attacks, attention is invited to the following discussion which, it is believed, will provide useful information to operational activities concerned with the maximum effectiveness of their attacks against the enemy.

In general, all of the various factors which may cause impact errors of aircraft weapons, other than guns, are believed to be independent of dive angle and have the following magnitude when measured in angular displacement (mils) normal to the line of flight or trajectory of the weapon. This data is based on training and pertains to CV based aircraft using the Mk. 8 sight with ladder reticle. It should be noted that dive angle has no appreciable effect on deflection impact errors. Skid, however, effects these errors almost the full amount; i.e., 1° skid, almost 1° impact error.

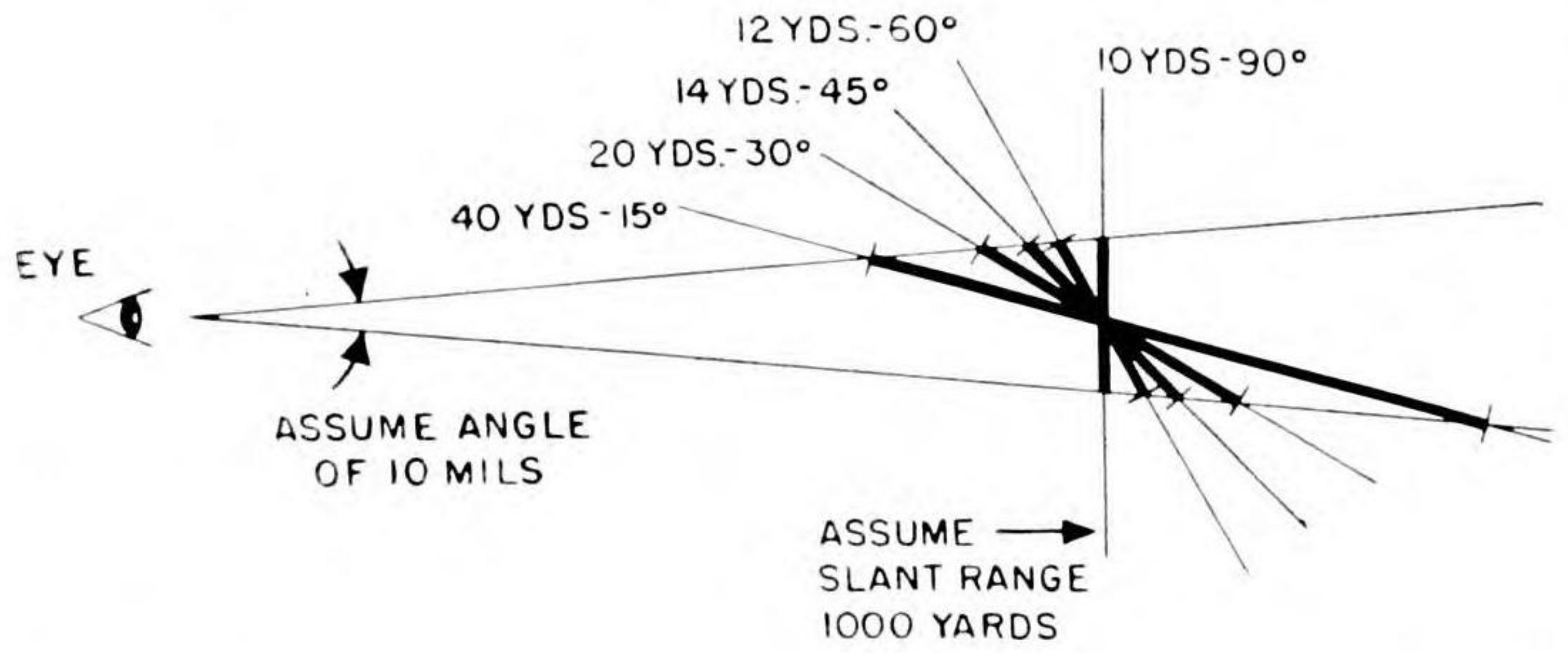
RADIAL ERRORS	AVERAGE ESTIMATE
Aiming Errors	Best— 4 mils Average—10 mils
Ammunition Dispersion	Best— 4 mils Average—6 to 8 mils
Installation and equipment errors	Best— 4 mils Average— 6 mils

These errors may vary in sign—i.e., over or short, right or left, and their total magnitude may therefore vary from 0 to 25 mils. Errors in excess of this amount are usually those caused by improper conditions of release, wild shots, etc. It is to be noted that in the stress of combat, these uncontrolled conditions may be relatively frequent. Other unusual factors such as rough air, bad flight of the aircraft, effects of skidding or gravity, equipment out of adjustment, erratic ammunition, or delayed releases may similarly contribute to inaccuracies in fire. However, their total effect on bombs dropped by well trained, cool, determined pilots will, in general, be small. Training experience has indicated that the average pilot can attain radial impact errors of less than 15 mils in rocket training. Capable pilots can attain average radial errors of less than 10 mils. Data is not available on combat accuracies. It is estimated, however, that these will not exceed under normal conditions 20 mils and should probably average about 15 mils.

The diagram on the opposite page indicates the relationship between mils viewed in the sight (with respect to range) and mils actually subtended on the ground for various angles of dive:

Relation between Relatively Constant Angular Impact Errors and Distance (in Range) on Ground for Various Dive Angles.

Note:
1. Assume angle is 10 mils (10/17 degree).
2. Assume slant range is 1,000 yards.
3. The linear values a mil subtends on the ground in range, varies as the size of the dive angle.
4. Mil is convenient accepted unit of angular measure (for fire control and spotting purposes) and is the angle subtended by one (1) unit of linear measure at a distance of 1,000 units when the 1 unit is normal (90°) to the line of sight.
5. Heavy lines indicate earth for various dive angles.



Note that mils are exactly as seen in the pilot's sight. For relatively flat angles of glide, that is up to about 30°, small mil errors in the sight will have large effects on the ground. For relatively steep angles of attack in excess of about 45°, the mil errors in the sight actually approach those on the ground.

Note that mils are exactly as seen in the pilot's angle and the farther away from the sight or point of origin that the target is located, the greater will be the total distance on the ground subtended by the average mil value of impact errors. To clarify this, note that a pilot, in a 70° dive at 1,000 yards slant range with a 10 mil radial error, will have 50% of his shots within a circle of 10 yards in radius. Increasing this range to 1,500 yards, increases the radius of the circle to 15 yards. Using relatively flat dive angles, such as 30°, can increase these distances up to 20 yards and 30 yards respectively.

Foreshortening—A pilot makes all aiming allowances in his sight, so the foreshortening of distances on the ground when viewed in the sight must be taken into account. In a 30° dive, for example, a vertical mil in the sight covers 2 mils on the ground; an oblique mil (045°, 135°, etc.) covers 1.4 mils. Horizontal mils in the sight are not affected by foreshortening. (See table under "Foreshortening" in preceding article).

Dive Angle—The natural assumption is that steep angles of dive should be those selected for tactical attacks since they also appear to have the advantage of decreased hazard from AA fire. However, the practical considerations of increase in range necessary at high dive angles and the difficulty of controlling the aircraft at the high speeds caused by these high dive angles, make it necessary that some compromise be used. For this reason it has been determined by actual firing tests that VF aircraft attacking at 50° are able to control their planes, aim satisfactorily and achieve at 1,500 yards slant range, an average radial error of 15 mils. This means that they will put 50% of their bombs inside a circle measured normal to flight line about 20 yards in radius. In attacking relatively undefended targets at angles of about 30°, a similar mil error will give similar hitting results except that the 50% circle is about the same radius, since a 1,000-yards slant range can be used without undue hazard to the aircraft on pull out.

All of the above discussions relate to targets with a horizontal aspect. For attacks against targets with vertical dimensions, it is apparent that the attacks should also consider the value of approaching the target so that the major dimension of the target presented will permit the largest possible surface for hitting.

Range estimation is most important when the effective target area is small as it would be in a low angle or flat attack on a horizontal target, in which case errors in estimating range are almost directly related to impact errors. On the other hand, when attacking ships or other vertical targets, the effective target area increases and errors in range estimation are not so critical provided that short firing ranges are used.

It therefore appears that attacks against targets from relatively low angles will not be especially profitable unless the target has some vertical dimension. Since low angle attacks at high speeds generally permit the use of short ranges, it is apparent that impact errors in mils, far in excess of those stated above, may be acceptable and still retain assurance of making a satisfactory percentage of hits. The actual high percentage of hits made in masthead bombing attacks bears this out. From a study of the targets usually attacked by masthead bombing—i.e., ships with a vertical aspect, it can be seen that the ship will present a larger surface to the weapon striking it if the attack is made in a shallow glide. Somewhere in the vicinity of 15° has been found by tests by ComFair West Coast, to be a desirable glide angle. For level low altitude attacks, it is necessary that range be very precisely controlled and that the range of fire be sufficiently short to insure high probability of the target being hit, considering all factors involved.

Comment—Certain remarks made on ammunition dispersion can be viewed more understandingly in the light of a study of the above. Since aircraft rockets generally will have a dispersion between the rockets in a pair, of about 5 mils, it can be seen that horizontal targets attacked at shallow dive angles of about 10 to 15 degrees by pilots with an average radial error of 10 mils, can be missed by distances which appear to be excessive when measured on the ground. For example, at a 10° dive angle, 10 mils in the sight actually subtends 60 mils, on the ground.

OPERATIONAL NOTES ON ROCKET FIRING

The following excerpts on rocket firing were taken from Air Op Memo, No. 72, distributed by ComAirPac and are published here because of their interest to training activities in this country.

Air Group 81, Cape Padaran—Just off Padaran Point (French Indo-China Coast), 45 miles southeast of Camranh Bay, a 9 or 10 ship convoy steaming on a northerly course was discovered. . . . One and possibly two other air groups worked on this convoy; according to the final damage estimate, sinking totalled five cargo vessels, two DEs and three to four patrol craft. The report of VF-81 noted that after the first attacks all planes in the three flights made repeated strafing and rocket runs against all ships in the convoy. It confirmed that as the flight withdrew from the area, five cargo ships were burning steadily while one DE was sunk and other DEs were burning or seriously damaged.

Air Group 11—Planes of Air Goup 11 launched a strike with other air groups against a convoy reported near Quinhon. . . . The fighter escort split up after the VB had made their dives and each fighter division attacked a different ship. A 10,000-ton Ak and a 7,000-ton Ak were reported hit by rockets, following which the ships blossomed out in fires which appeared to be out of control.

Air Group 7—This group likewise participated in both the Padaran Point and Quinhon attacks. . . . Two fighter squadrons headed by Lt. Comdr. . . . were equally adept. One of the escort craft, hit by strafing and rocket fire, caught fire and sank. Another was sunk, and still another was left beached, burning and with depth charges exploding on its fantail.

Air Group 45, Cape St. Jaques—The remaining targets consisted of one DE or DD, a two-stack DD, and an LSM. As soon as the flight leaders of Air Group 4 granted permission for the AG-45 planes to attack, a wide circle to the westward was made by the VT and six VF, and at a point northwest of the three ships, they broke off for their torpedo runs. The six fighters peeled off ahead of the Avengers, and made a strafing and rocket run from north to south, scoring two rocket hits on the mid-section of the DE and three hits amidships on the DD. Two VF dropped 1,000 lb. GP bombs in this run, resulting in near misses. The DE was torpedoed by VT planes and sank, while the DD was beached 150 feet from the shore, burning and smoking.

VC-91—On 16 January FM-2s of this squadron flew their first ground-support operation and had at the same time their first experience of firing rockets while carrying two wing tanks. Under these circumstances the four of them turned in the creditable performance of destroying a medium tank and damaging a heavy artillery piece being towed by it; destroying two trucks and damaging three others; seriously damaging if not burning out completely a Jap barracks; and blowing up an ammunition dump concealed in a building. Three other tanks were hit with the .50 caliber and received undetermined damage.

Experience with the rockets was reported as follows: One pilot fired four rockets at a half-track at 1,000 feet slant range, but the rockets hit beyond the vehicle. Another made three rocket attacks on a group of parked trucks, firing two from 500 feet altitude, a second pair from the same altitude, and two from 200 feet altitude. This was his first use of rockets. His first pair were short and destroyed a small house alongside the road; his second plowed up the road beyond the trucks; his third pair hit between two trucks and blew them up. Directed to attack a large, two-story barracks with a corrugated steel roof, a third pilot fired two rockets from 500 yards slant range, in a 30° glide, scoring hits just under the eaves which blew off the north wall of the building and caused it to smoke heavily for some time.

The report carried the following comment regarding this initial experience with rockets: "Experience of the VC-91 FM pilots indicates the need for a possible addition to the rocket training schedule, to prepare pilots for aiming rockets correctly at less than optimum launching speeds. Carrying two wing tanks, the FM-2 was able to develop only 200-220 knots from 4,500 feet, the maximum altitude for two pilots because cloud conditions obscured targets from higher altitudes. At that speed the rockets took a sharp drop upon leaving the launchers. The pilots had been trained on the basis of 250-300 knot launching speeds.

"To help eliminate this difficulty it is recommended that new trajectory charts be prepared and special training be given pilots in aiming rockets where wing tanks or other special conditions, such as cloud cover, reduce launching speeds and dive angles."

ROCKET NEWS LETTER SUMMARIZED

A summary of the Airborne Forward Firing Rocket Monthly News Letters, March 15 to April 15, from ComFair West Coast, ComFair Alameda and ComFair Seattle is tabulated here for analysis and to show the accuracy that can be obtained by rocket firing.

COMPARATIVE TABLE OF INITIAL ROCKET TRAINING

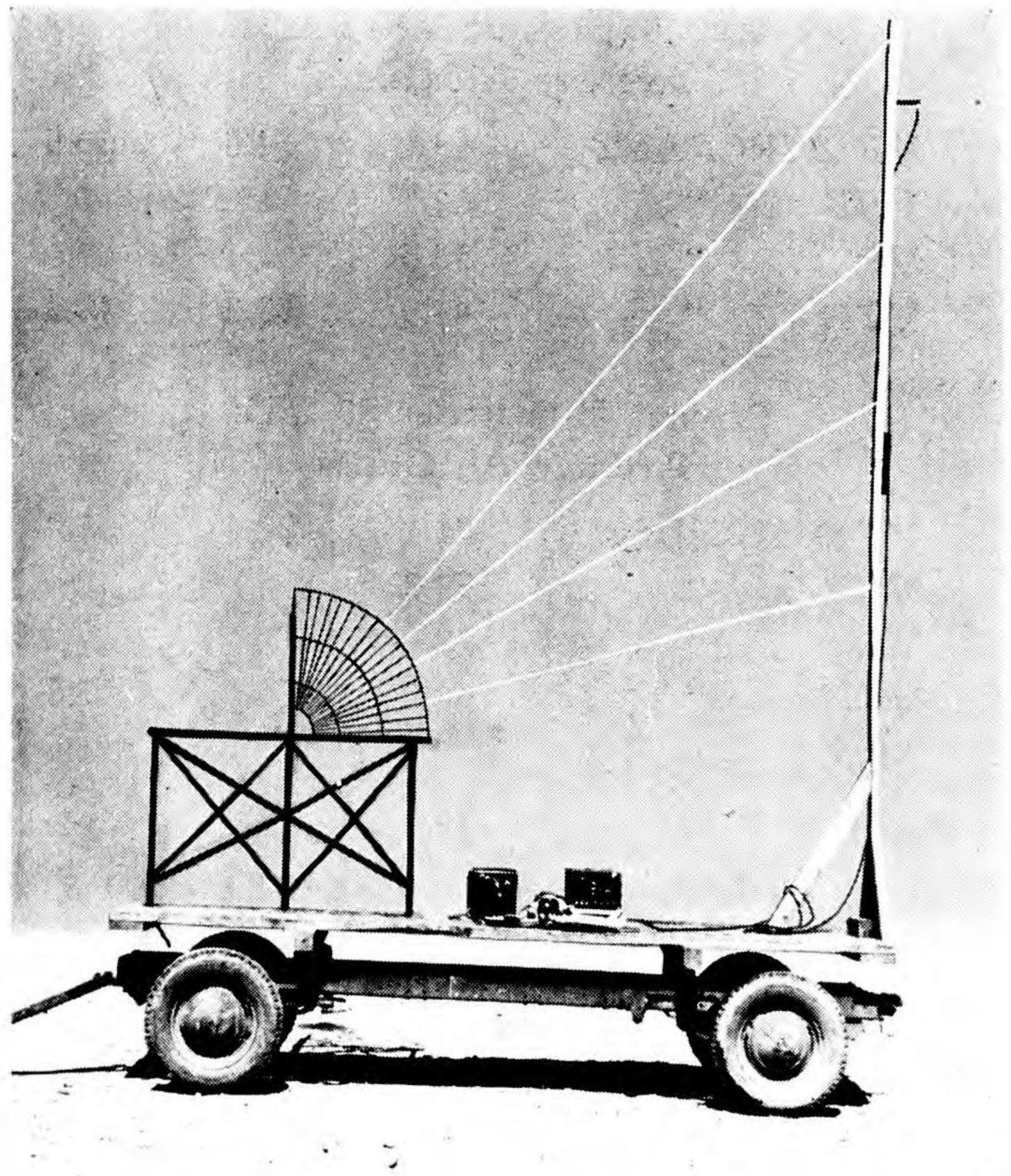
	ComFair West Coast	ComFair Alameda	ComFair Seattle
Total Rockets per Pilot (average)	60	39	50
Total Dry Runs per Pilot (average)	33	15	57
Total Strafing Runs per Pilot (average)	19	6	31
Percent Hits under 10 Mils Average All Glides			
VF AIRCRAFT	37.2	45	33.1
VBF “	40.8		
VB “	30.4		
VTB “	30.3	30.5	21.6
Percent Hits under 15 Mils Average All Glides			
VF AIRCRAFT	58.1	64.6	50.5
VBF “	64.5		
VB “	50.6		
VTB “	49.9	50.8	42.9
Percent Hits under 20 Mils Average All Glides			
VF AIRCRAFT	71.1	78.3	68.2
VBF “	79.3		
VB “	70		
VTB “	64.9	66.5	57.5
Pilots Trained During Month	535	164	141

Note: 1. This tabulation includes the training of pilots of carrier-based aircraft only. All glide angles are included.

2. The number of rockets per pilot shown in this tabulation does not include rockets fired at uncontrolled ranges such as in air support work and at towed water targets.

Comment—The best training records are usually made when pilots have had an adequate high number of dry runs and strafing runs before firing SCARs, followed by sufficient training with SCARs. This is clearly illustrated by the results of the wide-scale rocket training of ComFair West Coast where pilots were thoroughly trained in glide angle and slant range estimation before making any rocket firing runs. The commendable results achieved by ComFair Alameda are somewhat inconsistent with this statement; however, it is possible that the relatively few pilots trained there could have been attached to squadrons of better than average ability.

Training Records—Squadron VT36 was trained at Holtville in a 15° glide angle only and obtained outstanding results. A good illustration of what a squadron can accomplish is revealed by listing the progressive improvement in three-days firing. The percentage of hits within 10 mils improved from 36 4 to 48 9 to 64.5. For hits within the 15 mil radius circle the corresponding percentages were 61.2, 76.8, and 88 respectively. Similarly, the percentage of hits within the 20 mil circle improved from 76.8 to 90 to 97.3. The pilots in this squadron fired about 38 rockets each at the one glide angle and slant range of 800 yards. In view of this performance, it is felt that a maximum of 35 to 40 rounds at 15°



Mobile Harp—When mounted on a truck with the lines extended to permit picking up a plane at greater distances, the "harp" may be used more extensively to maintain pilot proficiency in dive angle and slant range estimation.

and 800 yards is sufficient to insure that each pilot has fully developed his individual rocket firing skill at that angle. Refresher training will aid the retention of this ability.

Replacement pilots of VBF1 and VBF2 turned in a remarkably good performance in initial rocket training at Thermal. Each pilot fired approximately 63 rounds and accomplished the following results: In a 30° glide angle the percentage of hits under 20 mils was 89.4. In a 50° dive angle the percentage of hits under 10 mils was 52.1; under 15 mils, 82.6 and under 20 mils, 96.5.

Mobile Harp—Two of the major factors involved in obtaining accuracy in aircraft rocket firing, glide bombing and strafing are angle of dive and slant range estimation. Frequently pilots would receive their training in these two fundamentals during their initial rocket instruction and then would have no opportunity to refresh that training or use it until several months later when they were in combat. Such a delay causes loss of pilot proficiency. To prevent this, ComFair Seattle has put the harp to greater use. At auxiliary airfields under their command they have inscribed a two foot white circle, 30 ft. in diameter, on the runway. At a predetermined point 3,000 ft. from the circle a harp is set up. Traffic permitting, pilots returning from routine flights and using the runway as their line of approach make dry runs at the target circle. By two-way radio contact the ground crew informs them after each run of their slant range and glide angle. At stations where two runways are available a target circle is inscribed on each and a mobile harp is set up at a predetermined point 3,000 ft. from whichever circle is going to be used.

This beneficial training is in line with CNO's letter on aircraft coordinated pilot training in rocket firing, glide bombing and strafing (Conf. ltr. CNO-Op33D, HHL, Serial 038933, 9 April 1945) which was published in part in the May issue of the Confidential Bulletin.

ROCTUS FORMED FOR FORWARD AREA REFRESHER TRAINING

To maintain proficiency in aircraft rocket firing while pilots are awaiting combat operations, four new units known as ROCTUs (Rocket Training Units) have been formed to conduct rocket refresher training in forward areas. These units are also available for pilot refresher training in glide angle and slant range estimation in order to increase the accuracy of strafing and of glide and dive bombing.

These ROCTU units are attached to CASUs and are made up of personnel experienced in the firing and handling of rockets. Each unit is composed of approximately four officers, including one naval aviator and three S(O) 2s, four AOMs, three ARMs and from 8 to 10 seamen. One unit is capable of conducting training on two rocket ranges.

Of the four units organized and specially trained by the Training Department, ComFair West Coast, three have arrived at the forward area, one to conduct training at Saipan and the other two in the Hawaiian area. It is believed that this means of providing supervised rocket refresher training will help considerably to increase pilot proficiency in combat.

since it will probably contain a large number of sheltered aircraft."

Commander Task Unit 77.4.1 comments: "The most effective support weapon carried by CVE aircraft is the five-inch HE rocket. It was employed by this unit with the nose fuze replaced by a plug, with apparently good results. A high percentage of support targets were "naturals" for HE rockets and many of them required a degree of accuracy unobtainable with glide bombing. In several cases where targets were attacked by VT with bombs with poor results due to a lack of accuracy, the fighters followed through and destroyed the target with rocket fire. This was particularly true in the case of lightly constructed bridges."

SAFETY NOTES FOR LOADING AND FIRING THE TINY TIM

Tests at NOTS Inyokern to determine the feasibility of firing the Tiny Tim (11".75 AR) using the lanyard drop method indicated that this method of launching is simpler, safer and more accurate than the displacement gear method. During these tests the following procedures and safety precautions for loading and firing the Tiny Tim from F4Us and F6Fs were adhered to:

LOADING:

1. No smoking in vicinity of rocket ammunition.
2. Never let rockets of any kind exceed temperature limits stamped thereon.
3. Handle all rocket ammunition with care. Never drop rounds or deform fin areas in any way.
4. Always handle 11".75 AR with approved and adequate handling equipment. Mk. 1 Mod. 0 motor with Mk. 1 or 2 head and standard fin weighs 1,288 pounds.
5. In loading, carefully guard against kinking, bending, or crushing lanyards.
6. Check firing cables for poor insulation or other weaknesses prior to loading.
7. Check out release and firing circuits before loading.
8. Check tension of brake in reel by manually turning reel in both directions, noting increased tension in clockwise direction.
9. Remove safety plug, turn off all switches before proceeding with loading operation.
10. No one should be allowed in cockpit of the airplane during loading operations.
11. Safety plug should be visible to the loading crew.
12. Insert safety release block securely in proper position before removing bomb hoist.
13. Secure firing cable to round nozzle plate before plugging into plane's circuit.
14. Carefully wind lanyard on reel in counterclockwise direction as indicated.
15. Always start lanyard onto reel from indicated position—which should be one-half turn beyond the opening of both micro-switches.
16. If possible, hear the closing and subsequent opening of the micro-switches as the lanyard is wound on the reel.
17. The final position of the pointer on the reel should be between five and six when a standard lanyard (88 inches) is being used.
18. With safety plug in, all switches except firing switch (or button) on, and safety release block in place, insert no-voltage test light in plane's circuit. A satisfactory circuit is indicated if this test light is not blown out. Remove safety plug and turn off all switches when this circuit check has been completed.
19. Safety plug out and in full view of crew and all switches off, insert no-voltage test light to again check against circuit leaks, before plugging round into plane's circuit.

FIRING:

1. Before take-off, check loading of 11".75 AR. Check sway bracing, reel indicator, lanyard and all pigtail plugs.
2. Check station distributor box and, if necessary, pylon or bomb rack releases for desired positions.
3. Replace safety plug in station distributor box only when in air; red guard switch must be "OFF".
4. Red guard switch must not be turned on until clearance ahead and below is carefully checked. It is advisable to do this as a check in the vicinity of base (safety in event of firing circuit mishap), then put switch back to "OFF" position until commencing attack.

ENGINEERING PROGRESS AND DESIGN

EQUIPMENT AND MATERIAL

OXYGEN PRESSURE BREATHING APPARATUS DESIGNED FOR 43,000 FEET

It is the purpose of this article to acquaint appropriate naval activities with the status and nature of existing positive pressure breathing equipment. It is emphasized that this apparatus is intended at present for experimental and test applications and not for service usage. Further, because of the necessity for a genuine appreciation of the potential dangers inherent in flights to altitudes in the vicinity of 40,000 feet and above and to insure a full and complete working knowledge of the equipment, a three-day indoctrination at specified activities is mandatory for persons contemplating such flights.

A type of positive pressure oxygen breathing equipment capable of fulfilling the oxygen requirements of flight personnel up to altitudes of approximately 43,000 feet has been developed by the Bureau of Aeronautics.

The present standard diluter demand oxygen equipment installed in nearly all high altitude naval aircraft is considered adequate for usage at service operational levels up to 40,000 feet. Combat reports to date indicate that this present standard oxygen equipment is fulfilling its intended function. Flights to altitudes as high as 43,000 feet are not routine. However, in order to make possible flight with safety above 40,000 feet, development of suitable positive pressure apparatus has been underway since early in 1942.

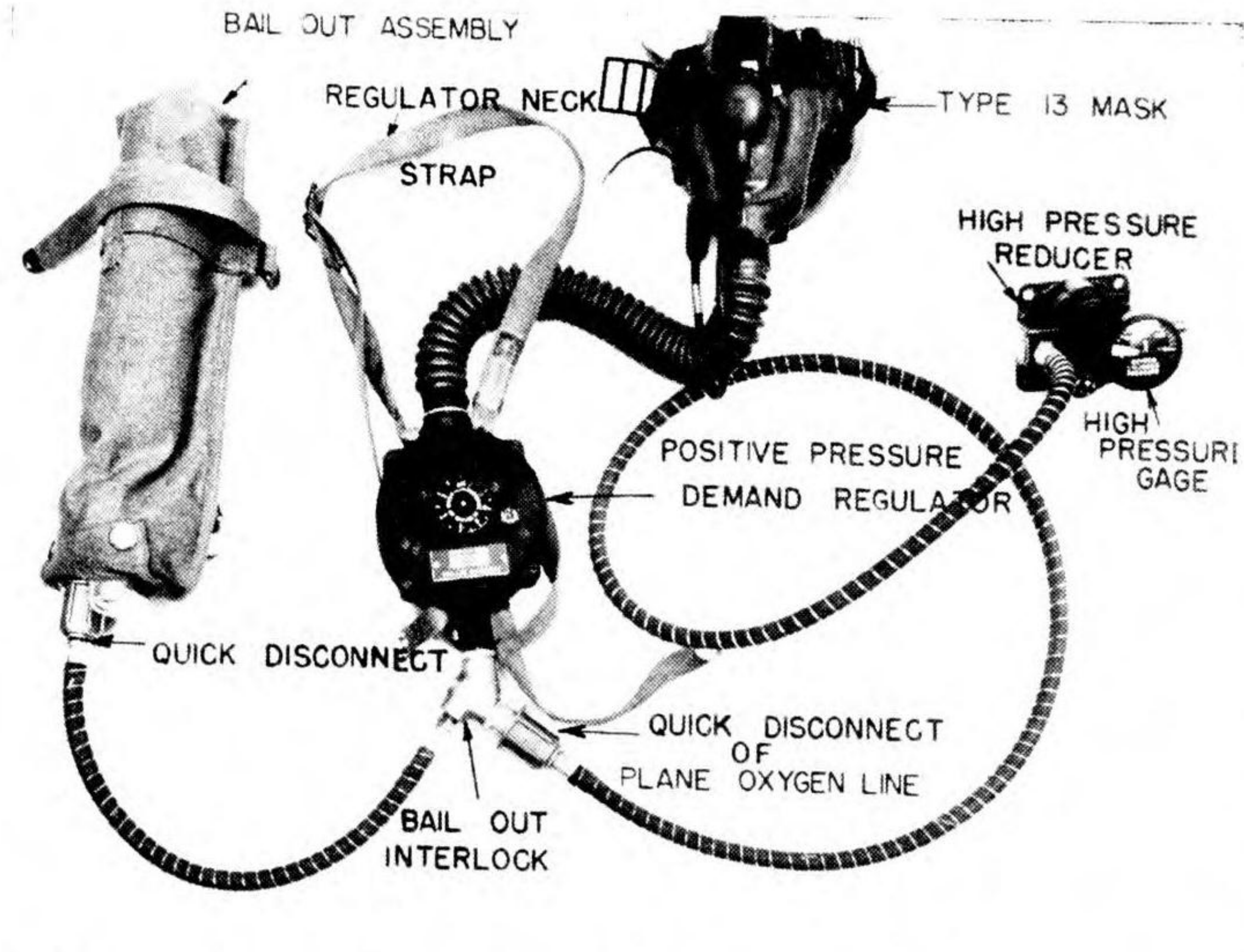


Figure 1—Positive Pressure Demand Oxygen System.

The problem involved in any aircraft oxygen equipment is directly associated with the progressive rarefication of the atmosphere as one ascends to increasingly higher altitudes. But after an altitude of about 40,000 feet is reached, even breathing 100% oxygen gives inadequate blood tension since the total air pressure is too low. From 40,000 on, adequate oxygen tension can be achieved by delivering oxygen to the mask under pressure.

At present, there are certain newer airplanes under development which are expected to have performance characteristics which will enable them to fly above 40,000 feet. In such cases the Type 1 Positive Pressure Demand Oxygen System (Fig. 1) may properly have some application. This equipment is available in limited quantities to naval or other activities where a need for such apparatus exists, and then only subsequent to a special indoctrination course (lectures and simulated flights in a low pressure chamber) to acquaint the selected personnel with an understanding of the factors involved and the proper use of the equipment. The complete Type 1 assembly is individually issued in a convenient hand carrying kit. *The positive pressure system has been approved for experimental and test purposes only.*

Figure 2

A typical installation for airplanes capable of attaining altitudes above 40,000 feet usually incorporates pressure breathing equipment interconnected to the standard diluter demand system, since the positive pressure equipment will likely be required only at intervals. The integration of the two systems may be accomplished by inserting a tee in the standard high pressure supply line and connecting it to a pressure reducer located conveniently to the pilot (Fig. 1). The pressure reducer and the flexible tubing leading therefrom to the pilot are the items permanently installed in the aircraft. The remainder of the pressure breathing equipment is worn on the person of the user. (Fig. 2). These individually worn items are a chest type positive pressure regulator, a positive pressure mask, a bail-out cylinder assembly, a bail-out interlock and the necessary tubing and disconnects. Actually, the assembled pressure breathing system involves two partially separate systems. The one system permits the utilization of the regular aircraft oxygen supply for relatively long endurance flights, while the other system provides a readily available emergency source of oxygen of relatively short endurance for parachute descent from extreme altitudes.

The positive pressure regulator operates on the demand principle, delivering oxygen only during the inhalation phase of the respiratory cycle. A manually adjustable knob on the face of the regulator controls the pressure at which the oxygen is delivered to the mask. The control knob operates over the range of 0-10 inches of water pressure. The recommended pressure settings for various altitudes above 40,000 feet are as follows:

Altitude	Pressure in Inches of Water
40,500	2
41,000	4
41,500	6
42,500	8
43,000	10

If the equipment is properly employed, the oxygen saturation in the blood at any altitude up to 43,000 feet should be at least equivalent to the oxygen saturation of the blood at 10,000 feet breathing air.

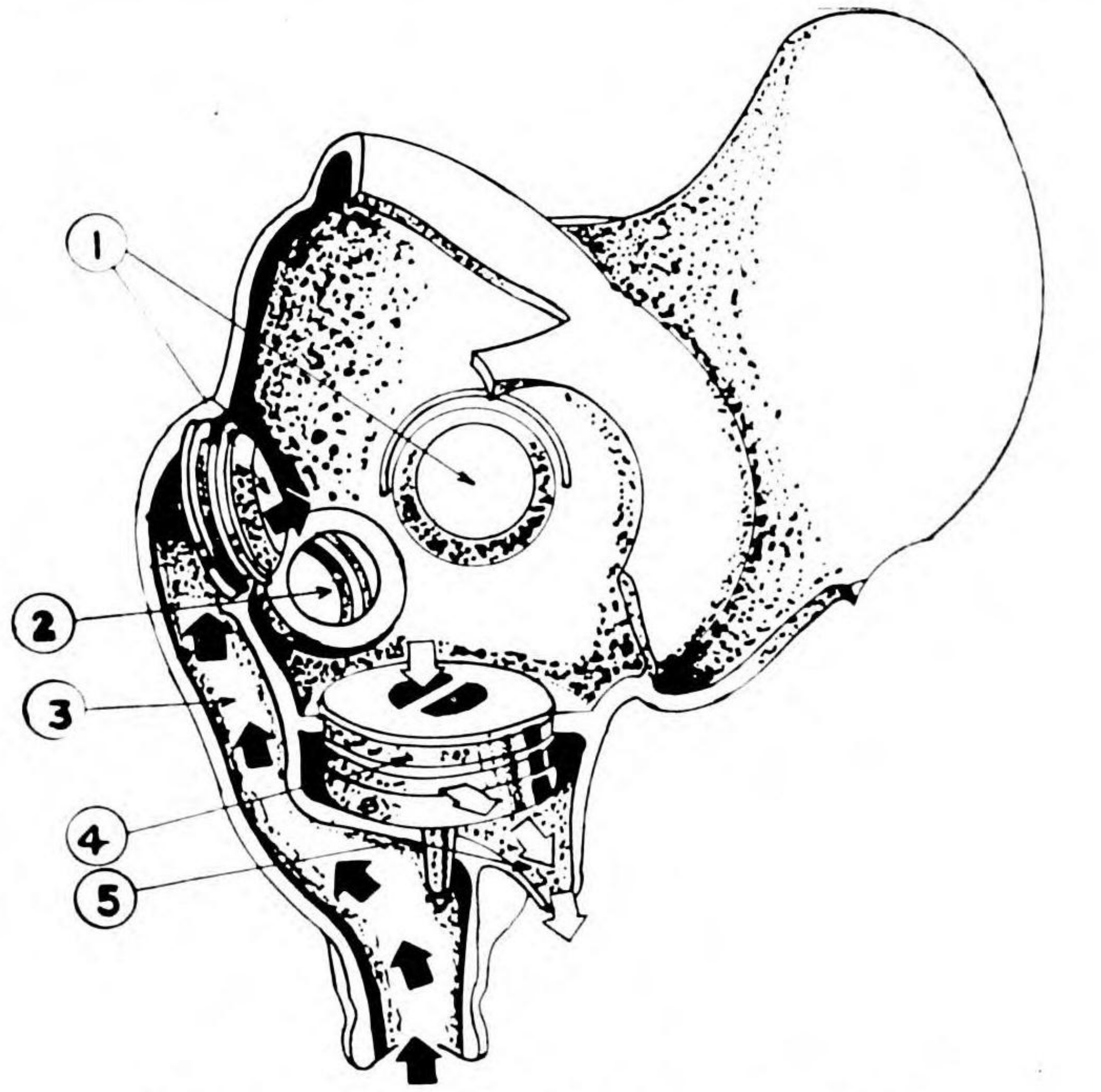


Figure 3—Type 13 Oxygen Mask

1. Inlet valves.
2. Recess for microphone.
3. Inlet port to mask.
4. Exhalation valve.
5. Outlet for exhaled air.

Black arrows—Oxygen.
White arrows—Exhaled air.

The positive pressure mask (Fig. 3) is sturdily built and incorporates a mask microphone and an especially designed compensating exhalation valve (Fig. 4), together with inhalation check valves. This system of valves permits retention by the mask of any pressure delivered by the regulator without necessity for manually adjusting mask valve loading.

The bail-out assembly (Fig. 5) consists of a 30.5 cu. in. nonshatterable high pressure (1800 psi) cylinder, a pressure reducer with a built-in pressure

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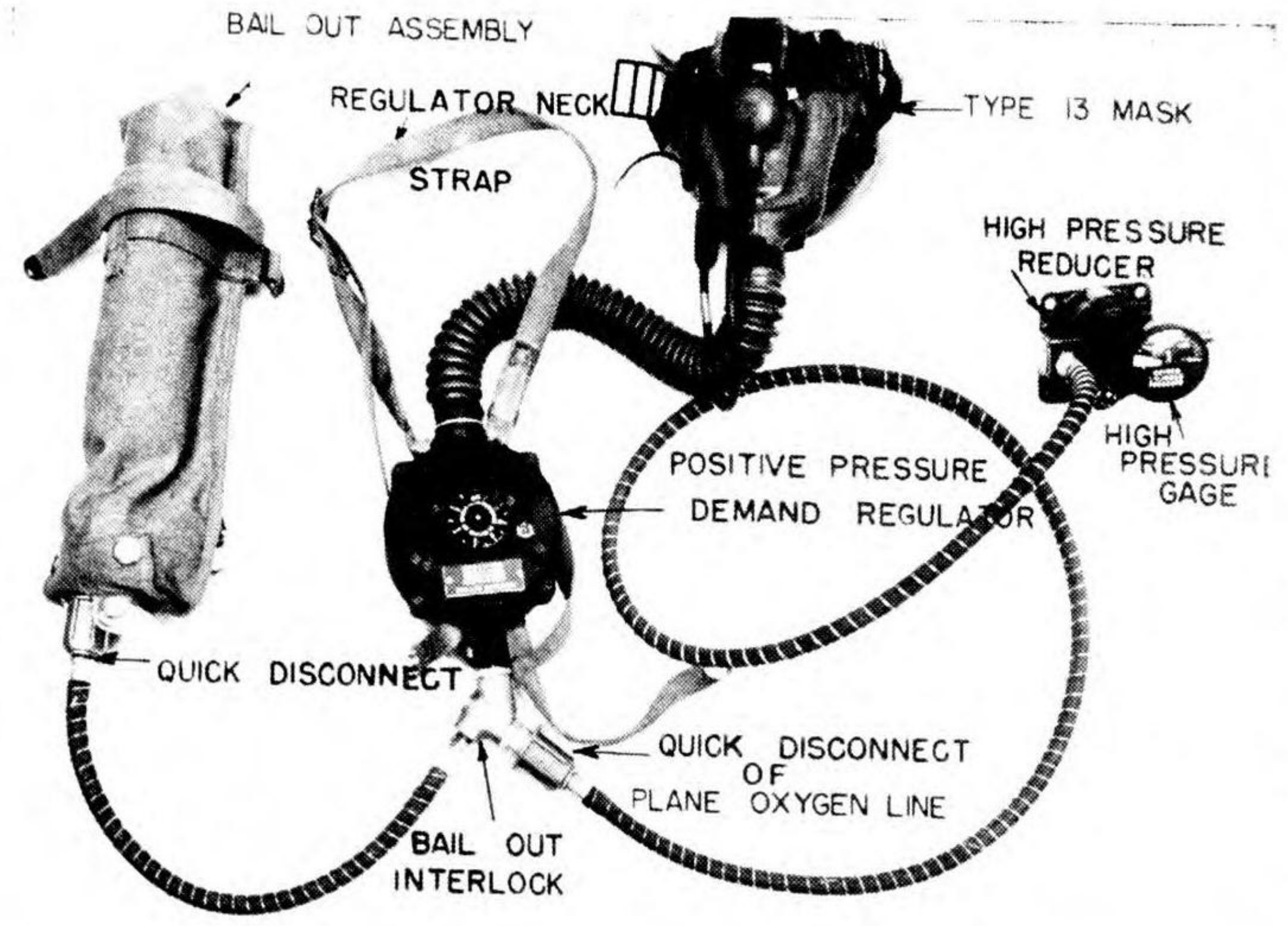

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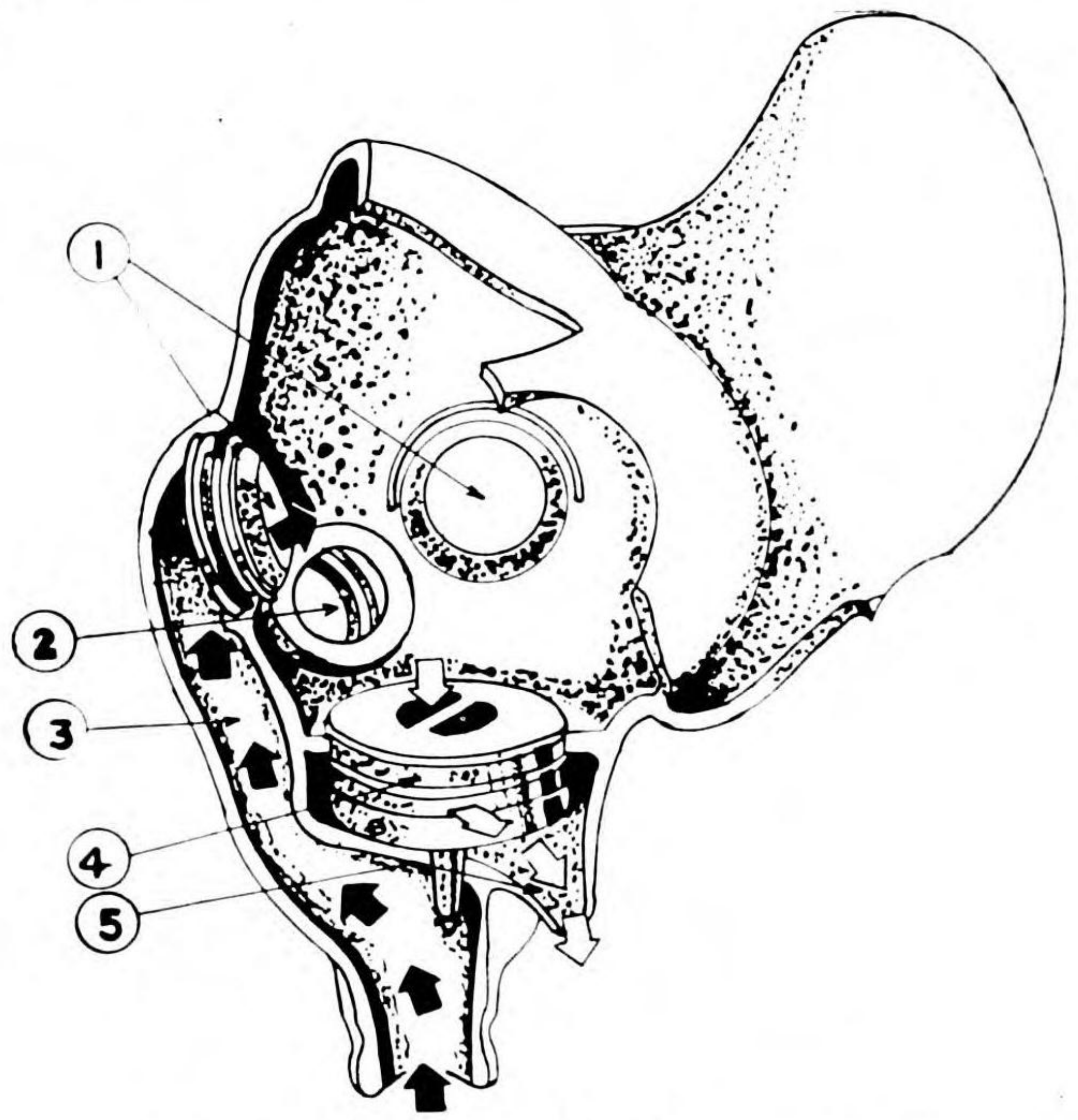

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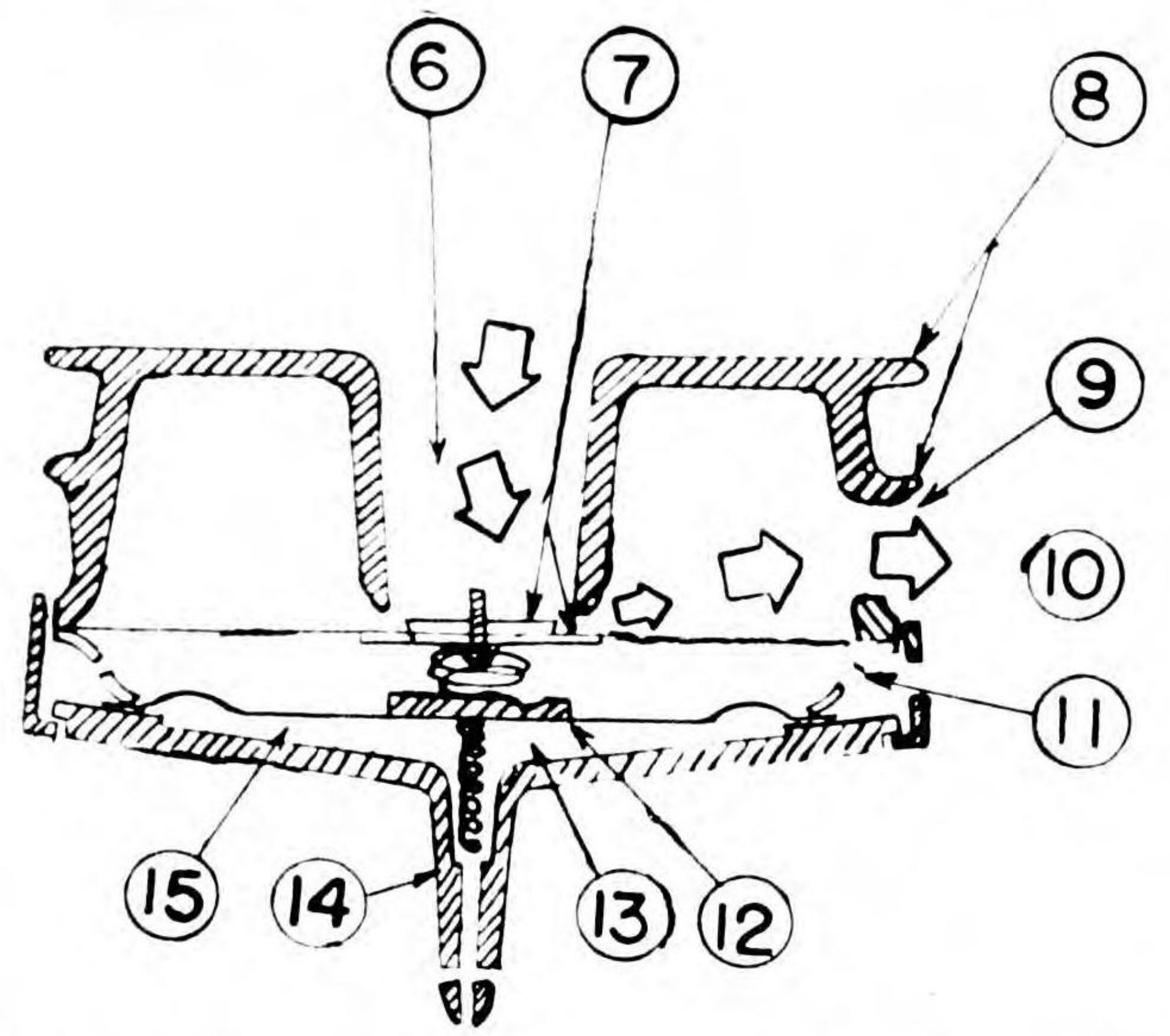

Figure 4—Compensated Exhalation Valve Details.

6. Exhaled air enters exhalation valve here.
7. These plates stiffen the main diaphragm.
8. Projections on valve housing which seat in mask.
9. Exhaled air leaves the valve here.
10. Main diaphragm.
11. This port permits pressure between the two diaphragms to equalize with the outside atmosphere.
12. This cup holds hairspring in place between the two diaphragms.
13. Oxygen supply pressure is exerted in this compensating chamber.
14. This tube sticks down into the mask inlet.
15. This compensating diaphragm responds to oxygen supply pressure by pressing up against the main diaphragm.

gage, oxygen refilling connection, a quick disconnect fitting, and a canvas container for carrying and attaching the unit on the thigh of the user.

To provide an effective means of introducing both the aircraft and the bail-out oxygen supplies into the breathing system, a so-called bail-out interlock (Fig. 1) is attached directly to the base of the pressure breathing regulator. During uneventful flights the aircraft oxygen supply is used and a mechanically actuated check valve prevents inadvertent depletion of the emergency oxygen from the bail-out cylinder. Should the necessity arise, the transition from the aircraft supply to the bail-out supply is readily accomplished by making one quick disconnect break at the bail-out interlock. Loss of oxygen at the disconnect is prevented by check valve action.

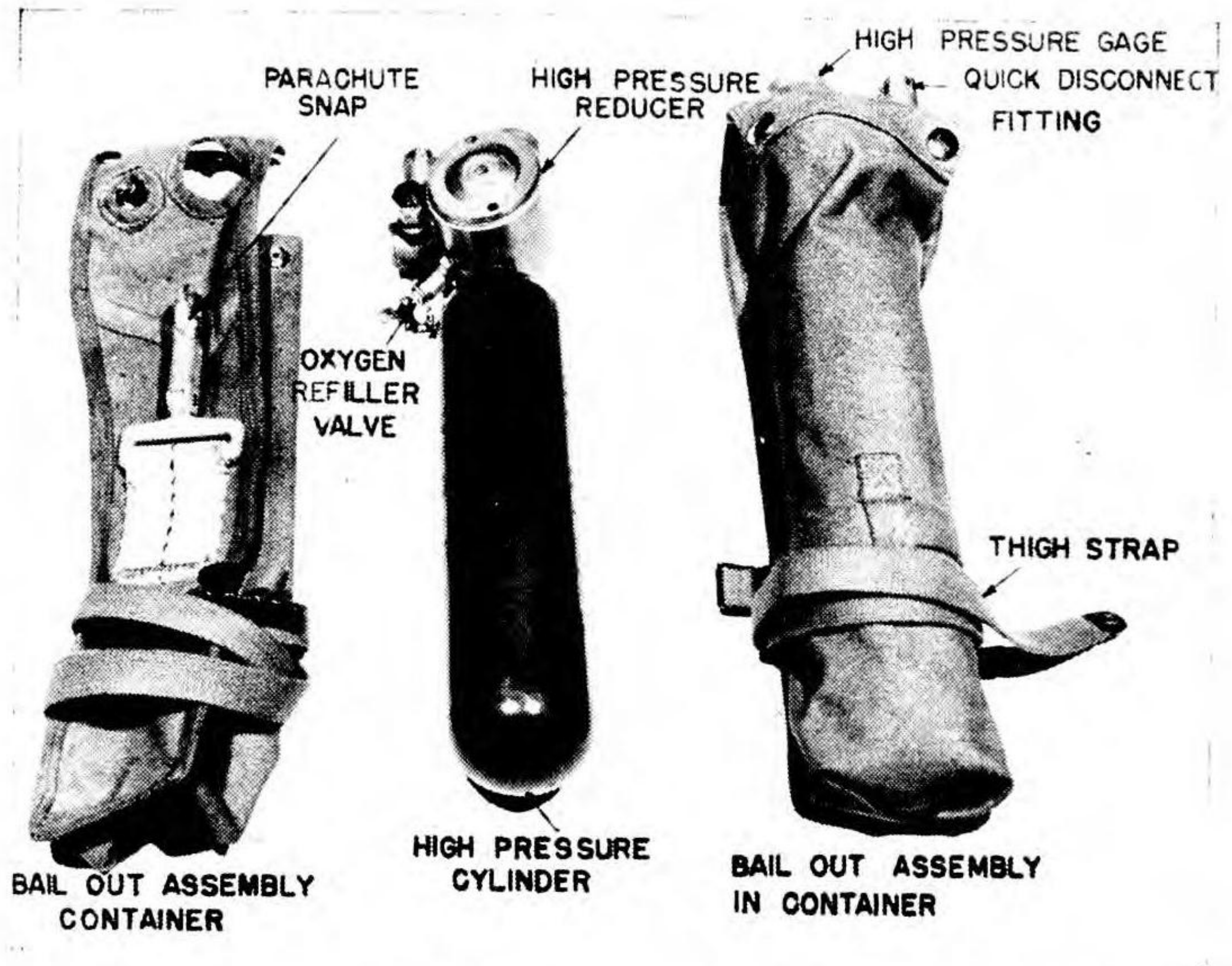

Figure 5—Positive Pressure Bail-Out Assembly

With a full bail-out cylinder (1800 psi), adequate oxygen is supplied at all times during an open parachute descent from 43,000 feet to 10,000 feet. When the bail-out supply becomes exhausted, the mask is removed as no harmful effects will occur as a result of breathing ambient atmosphere for the remainder of the descent.

PARACHUTE WEBBING AND HARDWARE SALVAGED FOR CARGO TIE-DOWNS

Salvaged parachute webbing and hardware can now be utilized as cargo tie-downs. Methods have been developed whereby odd lengths of parachute webbing can be spliced, provided with quick release take-up buckles and attachment hooks, and substituted for tie-down ropes in cargo-carrying aircraft.

Because advanced bases and service activities were faced with a shortage of rope tie-downs, BuAer has developed a method of utilizing material from parachutes with over-age, discolored, or otherwise unacceptable web risers. This tie-down gear consists of an easily assembled quick-release take-up buckle, snap hooks for attachment to cargo tie-down rings and a splice—all of which utilize parachute webbing and hardware. The various types of attachments that can be assembled are illustrated by Figure A. Figure B shows alternate methods of assembling snap hooks or the quick release take-up buckle, if facilities for sewing are not available. An

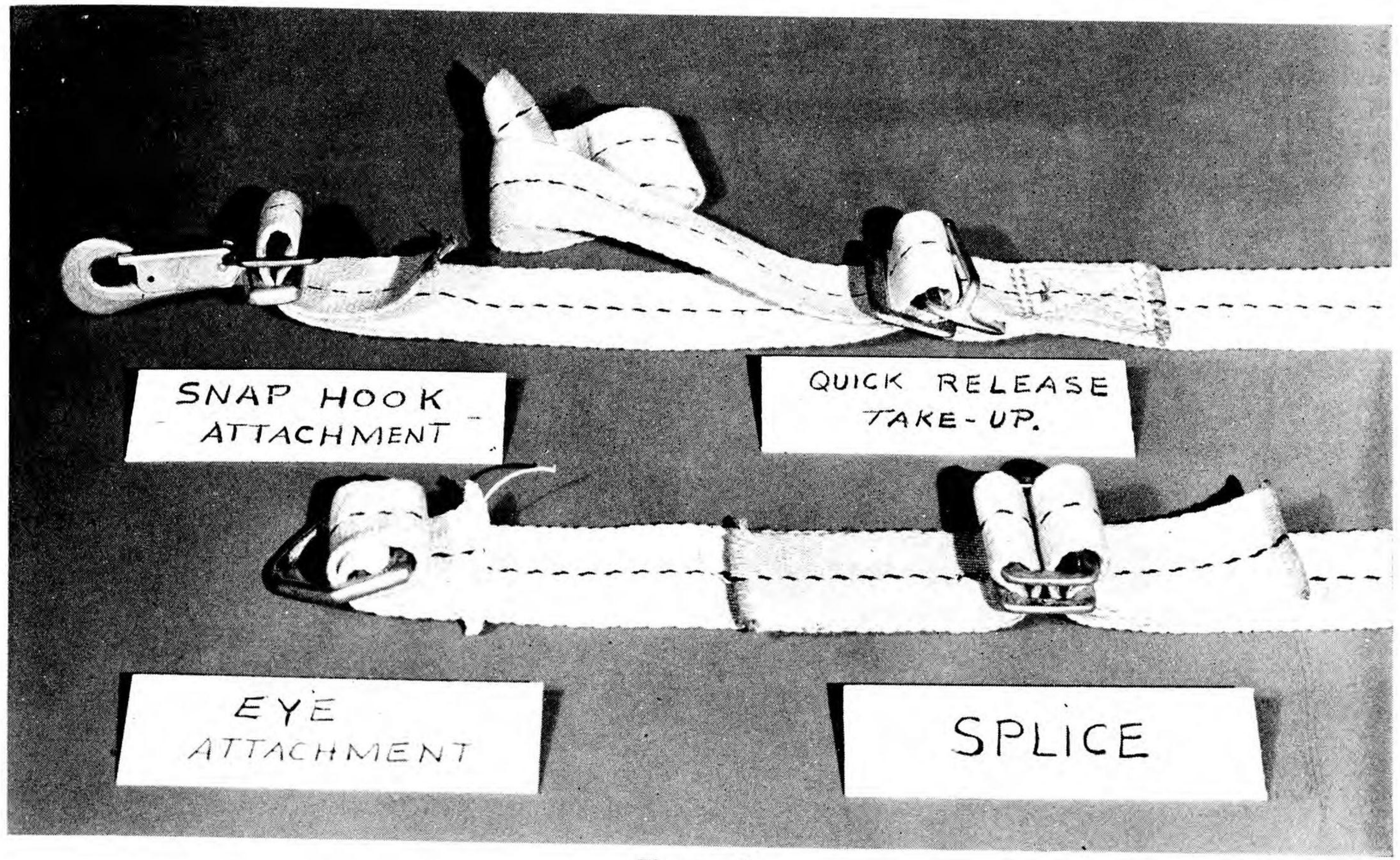

Figure A

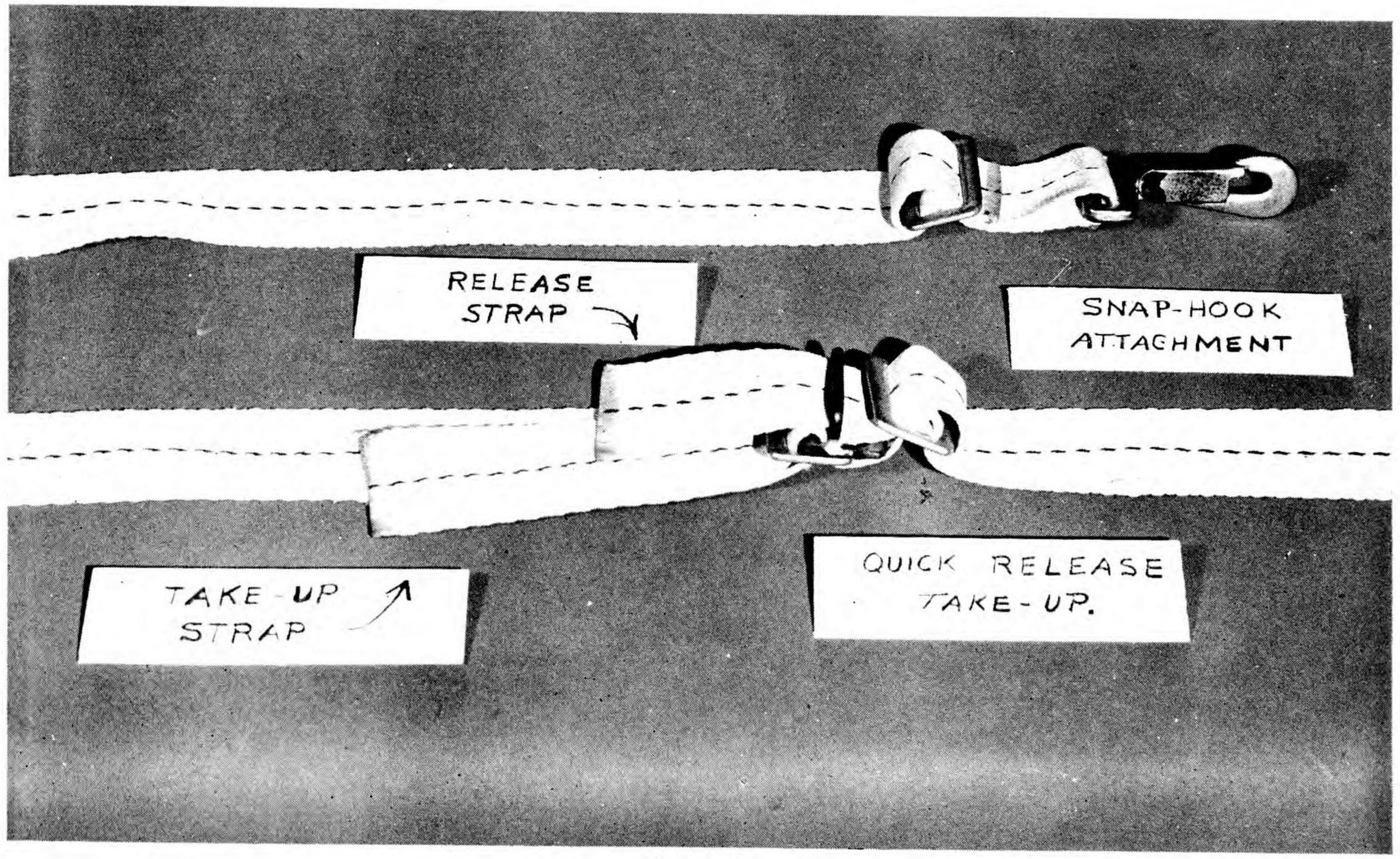

Figure B

assembly consisting of two snap hooks, one 10′ and one 3′ length of webbing complete with quick release take-up buckle weighs 1½ lbs., fits all cargo carrying planes now in naval service and is recommended for use by all service activities where it is desired to replace rope tie-downs in naval aircraft.

Laboratory tests indicate that all the attachments are satisfactory for loads up to 1,200 lbs. and that vibration does not tend to loosen them. Additional tests involving measurement of stretch and slippage when the webbing is wet or dry have been satisfactorily completed. Service tests are now being conducted and final reports will be available in the near future.

Inasmuch as this gear can be quickly assembled at any activity by utilizing salvaged equipment, this device is considered useful to all naval air activities. A technical note giving complete information will therefore be issued when complete test data are available.

NEW TYPE FROZEN FOODS FOR TRANSPORT PASSENGERS

Passengers travelling on trans-Atlantic flights are being served food prepared under a new process which three out of four consider equal to food served on the ground and superior to any formerly served on flights. By the new system, frozen pre-cooked food is carried in the airplane, and, when needed, requires only one small oven to thaw and heat it for use. This system has recently been adopted by NATS Atlantic and installations will soon be made in PB2Y-3Rs operating from the East Coast to San Juan. It is proposed for JRM airplanes now in production.

Advantages of the system are simplicity of operation and equipment, warm nutritious food, no food waste, no galley facilities required and minimum skill, time, and effort required of personnel. Essential equipment includes a specially designed 19″ x 20″ x 14″ oven unit with a capacity for six complete meals. This oven weighs 35 pounds and requires 2,035 watts at 24 volts D.C. An insulated 14″ x 20″ x 35″ balsa wood box, carrying 36 complete dinners, weighs approximately 50 pounds. It will preserve the food in frozen condition up to 60 hours.

With wider use of this system, it is anticipated that ground facilities for supplying the food will be enlarged. In addition, work is now in progress to reduce the wattage now required to operate the oven.

MEASURES TAKEN FOR PILOT COMFORT

The importance of providing adequate comfort for pilots has been the subject of considerable study and research by BuAer. Subsequent to the introduction of naval aircraft with extended operational ranges, attention has been directly focussed on projects dealing with pilot comfort.

In long range patrol or transport type of aircraft where the size of the cockpit permits free movement and when the control of the airplane may be relinquished to a co-pilot, the obvious and most satisfactory method of increasing comfort and relieving fatigue is for the pilot to leave his seat and move around the aircraft. In single-engine combat aircraft, however, the size of the cockpit precludes this method of relieving fatigue and, therefore, the pilot is forced to obtain such relief as is possible by shifting the position of his body in the seat and putting his legs and feet in various positions.

In order to provide an increased measure of comfort for pilots, the following modifications in pilot's flight equipment have already been accomplished:

Parachute Seat Cushion and Back Pad—The bound hair padding provided for these pads has been replaced by a padding of synthetic sponge rubber. Service comments have indicated that the cushion of relatively thin bound hair was not sufficient to eliminate the feel of objects from the pararaft. Further, the effectiveness of the bound hair cushion was materially reduced after a short period of use because of matting which followed the contour of the equipment in the pararaft case. Seat cushions and back pads of synthetic sponge rubber which increase pilot comfort and help reduce fatigue are now being delivered to service activities.

Pararaft Kit, Model PK-1—The pararaft case containing equipment and raft in one compartment has been superseded by the Model PK-1 Pararaft Kit now being delivered to service activities. Numerous comments of pilots who were required to sit on a pararaft case containing water cans, first aid kit and raft repair kit, were taken into account when the new kit was developed. It is so designed that the pilot sits on the folded raft and all equipment is stowed in a compartment beneath the raft. By this arrangement, the rigid items of equipment are not felt.

Pilot Seat and Back Pan—BuAer has recently developed and tested a light metal seat pan and a back pan with a metal insert. The seat pan is shaped to fit the contour of the buttocks of the wearer and is covered with a 1½-inch synthetic rubber pad. The entire assembly is provided with a fabric cover. The back pan is provided with a metal insert to fit the small of the wearer's back and will provide adequate support for this portion of the body. Both the seat pan and back pan have been live jumped and found satisfactory in every respect. In limited service tests they have improved comfort and reduced fatigue, materially. Figure C illustrates the seat pan and back pan attached to a QAS parachute harness. This gear required no modification for incorporation into existing parachute harnesses. Action has been initiated to produce a quantity of these units for issue to pilots of single engine aircraft.

Figure C—Pilot Seat and Back Pan Unit.

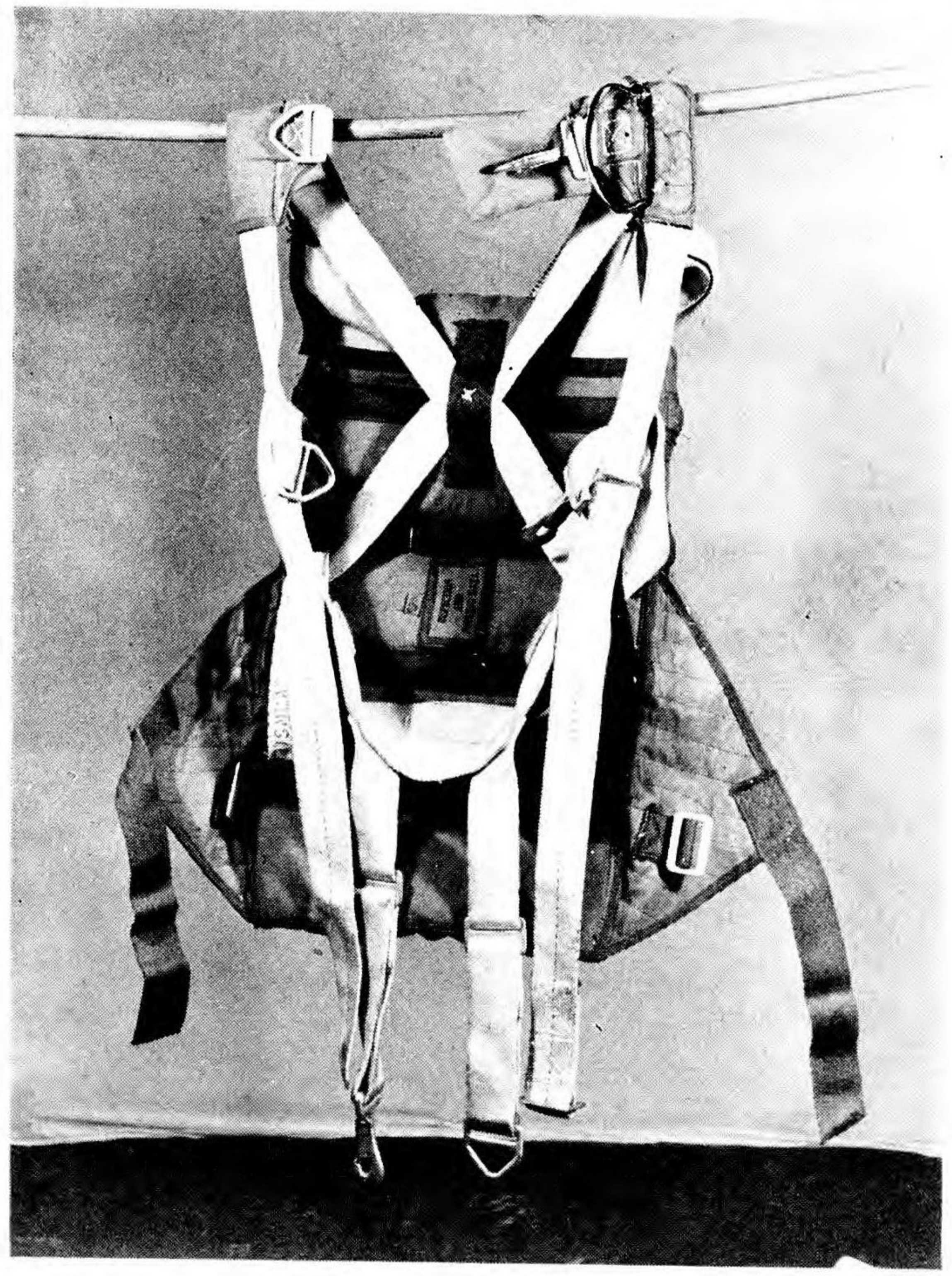

Figure D—Parachute Harness Split Sling.

QAS and QAC Parachute Harness Split Sling—BuAer has initiated action to eliminate the present double thickness parachute harness sling on the QAS and QAC parachutes and to replace it with a split sling similar to that now used on the standard back type parachute harness. (See Figure D). This revision will result in a more comfortable seat inasmuch as the sling webbing will be reduced in thickness and spread over a larger area.

Other projects for improvement of pilot comfort are also under way.

STRUCTURES

Stabilizer Dynamic Tests—The dynamic load tests which led to the reinforcement and redesign of the stabilizers of the Models F6F-3 and F6F-5 airplanes were discussed in the Naval Aviation Confidential Bulletin of December 1943. Subsequent to the incorporation of the reinforcements in service airplanes and the redesign of the production F6F-5 stabilizers, the adequacy of these changes was questioned for the following reasons: When restrictions were exceeded by the original F6F-3 airplane, failures of the stabilizer usually resulted only in the loss of the outer third of the stabilizer, thereby permitting the pilot to retain control of the airplane and execute a satisfactory landing. With the incorporation of the changes briefly described below, it was felt that the point of failure may have been transferred to the inboard stations of the stabilizer or to the fuselage with the possible resultant loss of the entire stabilizer or empennage. The Naval Air Material Center was therefore requested to conduct ground dynamic tests of all the F6F stabilizer configurations being used in service to determine the location and type of failure which would occur in the empennage if restrictions were appreciably exceeded and to determine the probable actual factor of safety existing in the stabilizers. The original stabilizer was fabricated from .051, .040, and .032 skin gages (proceeding from root to tip); the redesigned stabilizer was fabricated from .051, .051, and .040 skin gages and a beam of fifty per cent greater strength; and the boot stabilizer was fabricated from the original stabilizer by adding .051 sheet to a portion of the stabilizer leading edge and by increasing the beam strength thirty per cent.

The tests consisted of applying oscillatory loads, super-imposed on non-oscillatory loads, in a manner to resemble as closely as possible those measured in flight. The time required to produce failure under given loading conditions, together with the magnitude of the applied loads, formed the criteria for the strength of the stabilizers. The magnitude and distribution of the oscillatory and non-oscillatory loads applied to the F6F-3 original production stabilizer simulated approximately the loads measured in flight at 360 knots and 6.5g. This speed-load factor combination was chosen as a basis for the ground tests since failure of both right and left stabilizers had previously occurred at this load condition. Actually it was found necessary to increase these loads somewhat to duplicate the flight failure in a reasonable amount of time.

The results of these tests indicate that the changes in the stabilizers will not transfer the failure to an inboard location; that the redesigned production F6F-5 stabilizers (present production) have greater strength than the original production F6F-5 stabilizers; that the boot stabilizers have considerably greater strength than either of the other two types; and that the strength of all the F6F stabilizers now in service is adequate for all operations required within the permissible speeds and load factors given in current operating restrictions. *The necessity for remaining within the speed-acceleration limitations, however, is emphasized.*

Notwithstanding the conclusions of the foregoing paragraph, BuAer is continuing its investigation of the strength of the F6F-5 airplane with the object of determining whether or not any arbitrary increase in strength of the empennage is necessary.

DIVINE DISAPPOINTMENT

Tokyo—15 March 1945—"While hell is bursting on Iwo-Jima, Manila is on fire and Tokyo itself is being bombed, there is little to note here in Tokyo that will show any rupture in the calm of the Japanese people. War is a confusing phenomenon. One never knows when he is winning or losing and appearances may often be misleading. The situation in Germany at the end of the last year is a good example. So we might pause at this stage of the war to consider, in the light of world events, just who will be the winner in this war. . . . The Sun Goddess Amaterasu, when she founded Japan, declared: 'This country will be immortal.' When we think of these facts our determination to win the war is further strengthened. We cannot disappoint the Sun Goddess Amaterasu. We simply cannot lose this war."

RADIO AND ELECTRICAL

"TARGET DISCRIMINATOR" AIDS IN IDENTIFICATION OF RADAR TARGETS

To help radar operators identify targets more easily at long distances, many naval patrol planes now scanning the sea and sky with AN/APS-3 radar will be equipped with "electronic binoculars"—the TD-4/APS-3 Target Discriminator Unit. The device is a lightweight attachment which can be easily added to the present installation of either AN/APS-3 or the newer AN/APS-3A radar.

Without a target discriminator unit, a radar operator may see an indication on his scope at 60 miles, for instance, but cannot tell whether it is a cloud, an island or a group of ships. If he has the target discriminator, he can "magnify" the portion of the scope containing the indication and may discover that what appeared to be one target is actually several ships in a convoy.

TRAINING FILMS

CONVOY ATTACK STRATEGY

MN-4355 *Coordinated Attack on Enemy Convoys.* 16 mm. sound, B/W, 30 min.

This motion picture shows very clearly by the use of models and animated diagrams the complex principles of executing a coordinated submarine and air-patrol attack on enemy convoys.

First, the tactics employed when the submarine pack attacks without the air-patrol are fully explained and illustrated, including their relative movements, formations, principles of attack, use of communication channels, and the function of the Officers in Tactical Command. Then the attack is shown with the air patrol participating, thus concentrating the attack and making it more effective. The final point brought out is that the success of the attack depends on the complete cooperation of all the units.

Intended for: submarine and air patrol personnel on convoy duty, particularly submarine CO's and division commanders. Assumes considerable technical background.

ROCKET FILM DISTRIBUTED

MN-4382b *Airborne Forward Firing Rockets—Carrier Procedure, Assembling, Testing, Loading Rockets Aboard a Carrier.* 16 mm. sound, B/W, 22 min.

Demonstrates the assembly of rockets, testing of installation, and safety precautions followed by planes landing with unused rockets.

Shows a circuit test and a solenoid test aboard the Hancock. Demonstrates aboard the Manila Bay the assembly of body and fins simultaneously, checking of the pigtail, tightening of the retainer rings, use of the "null voltage" test kit in which the lights show the test to be satisfactory.

Includes a brief discussion of the coordinated use of tank-rocket teams in combat tactics.

Intended for: Aviation ordnance officers and enlisted men, and pilots.

SURPLUS RADEX ASB BOOKLETS

Additional copies of the confidential booklet, "Radex ASB—Jam and Anti-Jam," are still available. These booklets are for use with the film MN-2867b "Radex ASB," for training purposes. The booklet explains what jamming is: tells how to be sure when jamming occurs: describes the principal types of electronic jamming, anti-jamming measures and the four controls: illustrates methods of finding a jammer: gives a compact summary on anti-jamming. Interested activities may obtain copies of the booklet by sending a request to CNO(Op-33-J11). Excess booklets on hand after 1 July 1945 will be destroyed.

DISTRIBUTION CEASES ON CERTAIN FILMS

At the request of Gunnery Training (Op-33-D), no further distribution of the following confidential rocket training films will be made:

MG-4485	*First Test of CIT Rockets on P51-D "Mustang" and Other Scenes*
MG-4563a	*Test of Modified Base Fuze, Mark 157 on 5"AR (3".25 Motor) Part I*
MG-4563b	*Test of Modified Base Fuze, Mark 157 on 5"/HVAR—5" Motor 5" Head —Part II*
MG-4778	*Assembly, Loading and Fuzing of Aircraft Rockets*
MG-4901	*F6F with Streamlined Zero Length Rails*
MG-5246	*SB2C 11".75 AR from Fixed Wing Launchers and Free Drop Lanyard Firing*

Other rocket films, heretofore listed in Naval Aviation Confidential Bulletin, (see especially February 1945 issue) contain much of the operational and technical material of current importance that is shown in the above listed films.

At the present time in the final editing stage is a composite film made up of the most valuable sequences of these and other National Defense Research Council test films covering operational aspects of airborne rocket firing.

In addition, there is now in production a training film covering technical aspects of assembling and loading of all types of airborne forward firing rockets.

Notice will be given of these new films upon completion and distribution.

TITLE INDEX

Material appearing in the Naval Aviation Confidential Bulletin, January through June, 1945, is included. Roman numerals indicate month: January, I, February, II, etc.