NAVAL AVIATION NEWS

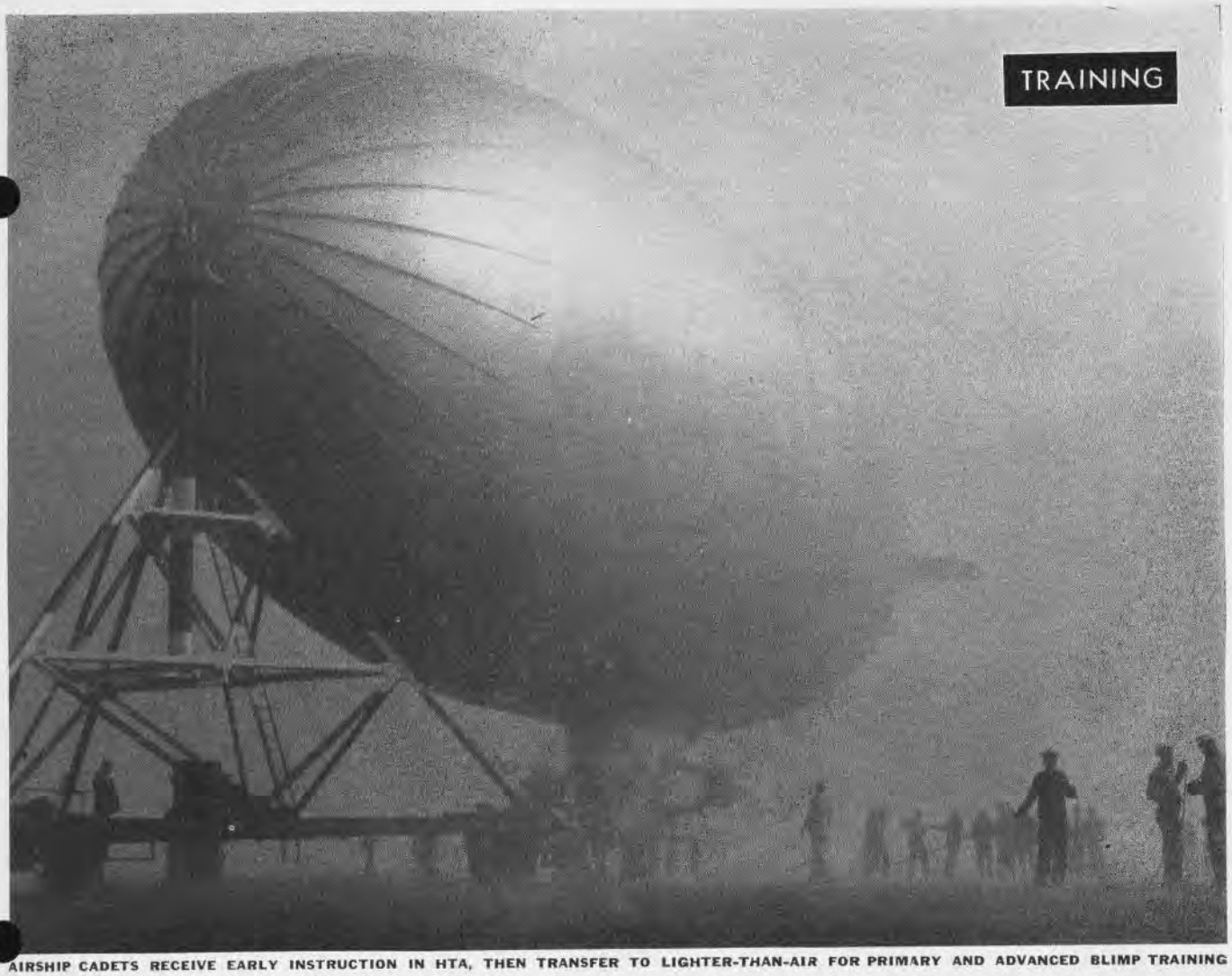
Saylor

Royal Air Force
Lighter Than Air
Grampaw-Pettibone

Sept. 15, 1943

RESTRICTED

Tactical value of Photo Interpretation is exemplified by this picture of one of a number of Jap ships dispersed by bombers off Bougainville. From this view PI analyzed and emerged with conclusions: 1. Ship previously had not been encountered, 2. It probably is of *Teratsuki* destroyer class. Allied fleets immediately were put on the alert.



AIRSHIP CADETS RECEIVE EARLY INSTRUCTION IN HTA, THEN TRANSFER TO LIGHTER-THAN-AIR FOR PRIMARY AND ADVANCED BLIMP TRAINING

LTA

Vitalized Lighter-Than-Air Service Shares the Task of Clearing Sea Lanes of Underwater Menace

SINCE its establishment shortly after World War I, the United States Naval Air Station at Lakehurst has been the Navy's main lighter-than-air training and operating base. The Lakehurst station grew up around the huge hangar which was built to house assembly of the *U. S. S. Shenandoah* when the Navy launched its rigid airship program.

During the last war the United States and other allied nations used non-rigid airships in coastal patrol and anti-submarine work. The British were especially successful in the use of non-rigids to spot submarines. After World War I the Admiralty credited its blimps with actual destruction of a considerable number of enemy subs.

Bases Extended Along East Coast

In the United States, a series of airship bases extended along the Atlantic coast from New England to Key West, and non-rigids were also in operation in the Canal Zone. Training programs were in operation at a number of these bases, as well as at Wingfoot Lake, Akron, where many World War I non-rigids were built.

With completion of the Lakehurst station after the war, all naval lighter-than-air activity centered there until Moffett Field came into being at Sunnyvale, Calif. It was established as an operating base for the *U. S. S. Macon*, one of the two large rigid airships contracted for by the Navy. Following loss of the two rigid ships, Moffett Field was turned over to the Army and Lakehurst became again the

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Navy's only lighter-than-air base. During this period between the two wars, small classes of regular Navy and reserve officers received instruction in free ballooning and rigid airships at Lakehurst. Training in non-rigids dropped almost to zero.

As the national emergency loomed prior to the attack on Pearl Harbor, airship training at Lakehurst was expanded to some extent. Plans were underway for airship coverage of coastal areas as it became evident that the submarine would again be a menace to American shipping.

In the interim, only limited development and training had been carried on, and these by a relatively small group of officers who believed in the ability of the airship to perform an important duty for the Navy. The first K-type non-rigid patrol airship—only naval patrol type non-rigid designed and built since World War I—was one of the results of the development work. A few K ships were under construction, but only a handful of blimps, including two obsolete non-rigids obtained from the Army, and several smaller types, were in operation.

Cadets in Training at Lakehurst

On December 7, 1941, sixty-three aviation cadets were in training at Lakehurst. Four training ships were used. Cadets trained from eight to nine months before they were commissioned as ensigns and designated naval aviators (airship).

Contracts eventually were let for a great number of the patrol type non-rigids and the need for pilots and crews necessitated streamlining and rapid expansion of the training program. Course of instruction for cadets was shortened to six months, then later to four months as the pre-flight school system came into existence. Cadets arriving from pre-flight had already received Navy indoctrination and started immediately on their flight training.

To turn out pilots and crews more quickly, a second training school was established at Moffett Field, which had been taken back from the Army. In general, cadets from preflight schools at Chapel Hill, Athens, and Iowa City received their training at Lakehurst while those from St. Mary's were sent to Moffett Field. At both Lakehurst and Moffett Field, cadets received ground-school and flight training. Ground schools gave instruction in aerodynamics, aerostatics, airmanship, balloons and gases, communications, design and maintenance, ground handling, mooring and docking, navigation, ordnance, parachutes, photography, power plants, and strategy, tactics and mission. The general scheme was to alternate a day of flight training with a day of ground school.

Cadets Serve in Ground Crew

For the first week or so after their arrival at Lakehurst or Moffett Field, cadets served as ground crew members, helping to land ships they were later to fly. This experience was invaluable, as it gave first-hand knowledge of the practical technique required by the crew in dealing with fast landings, light landings, heavy landings.

Now, first airship flights are given in small L-type training ships nearly identical to the type used commercially for passenger flights and advertising before the war. These ships have a capacity of 123,000 cubic feet of helium and are 150 feet long. Besides an instructor and enlisted mechanic, the training ships carry from three to six cadets depending upon stages of training. Training flights last from three to five hours, each cadet having a turn at the controls. Cadet's training is almost entirely in the L-type ships until he has soloed and begun to build up solo time.

Free balloon instruction is one of the most interesting phases of pilot training. An airship with both engines dead can be flown exactly in the same manner as a free balloon. Training balloons are generally of the 35,000-cubic-foot size, filled with hydrogen—used because it is easily and inexpensively manufactured and must be released at the end of the balloon flight when final landing is made. Helium, with which the airships are inflated, is noninflammable and nonexplosive but costs more because it has to be extracted from natural gas in the Texas oil fields and shipped in special cars.

Balloons Have Their Own Technique

An instructor and five or six students make each balloon flight, with students gaining full experience in operation. As it has no motive power, the balloon is a child of the wind and goes in whichever direction the wind takes it. Ballooning is essentially a problem of finding air currents going in to the desired direction, then staying in the currents through vertical control by releasing ballast, causing the balloon to rise, or valving gas which causes it to descend. When the final landing is made, a rip cord is pulled, opening a panel in the top of the balloon which allows all of the gas to escape. The balloon is then rolled up, packed in the balloon basket and placed on a truck that takes it back to the base.

After completing primary instruction in free balloons and L-type non-rigids, students are given advanced training in K-type patrol ships, generally receiving several weeks of actual operation work with squadrons. K-type ships have a capacity of 416,000 cubic feet of helium and are 250 feet long. They are provided with more powerful engines, have far greater range and are armed with machine guns and depth bombs as well as special anti-submarine devices. While it is possible for one pilot to fly a K-type ship with pedals for steering and an elevator wheel for altitude control, common practice is to have one man on the elevator wheel and one on the rudder wheel. Ordinary complement on a patrol mission consists of three officers and seven enlisted men.

When they have successfully completed all flight courses, cadets are commissioned as ensigns and designated naval aviators (airship), after which they are assigned to operating squadrons or to training schools as flight instructors.

In May 1943, the Naval Airship Training Command was established at Lakehurst, N. J. The Command, headed by a rear admiral, has cognizance over all lighter-than-air training as well as development and experimental programs. Figures on the growth of airship training—number of cadets, training ships, flight hours—

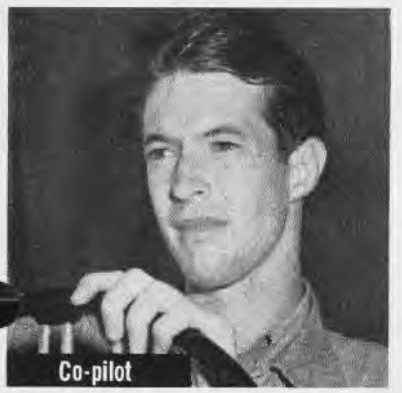
Naval Aviation News

Readers will note the change in name from BuAer to Naval Aviation News. *This change coincides with the transfer of certain aviation divisions from the Bureau of Aeronautics to the Vice Chief of Naval Operations, under the cognizance of the Deputy Chief of Naval Operations (Air).*

Contents of the magazine will remain substantially unchanged by this action. Naval Aviation News *will continue to cover news of interest to all naval aviation activities. Contributions of material will receive the same consideration for publication in* Naval Aviation News.

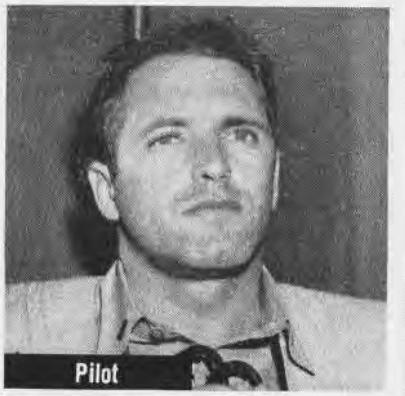
A TYPICAL LTA CREW

The men in a typical LTA crew have been selected from all walks of American life. They are young, intrepid, energetic. Navy trained, they operate as a closely knit unit. The blimp they man has become a definite threat to the enemy's submarine operations at sea.



RICHARD WIDDICOMBE, NAP 1/C, of Suffern, N. Y., is 24. Formerly an upholsterer, he enlisted in 1937, trained at Newport and served aboard the *Chester*. He went through LTA school, Lakehurst.

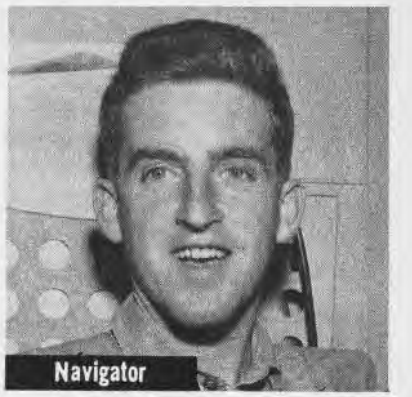
RUFUS J. BARNES, BM 2/C, machinist of Roanoke Rapids, N. C., is 23. He served on the *Houston, Ramapo, and Hammann*. Before attending LTA School, he did shore duty in Hawaii.



LT. (JG) JOSEPH BARTOLF, of Lakewood, N. J., is 28 and a graduate of Columbia University. He took preflight at Floyd Bennett and served at NAS Atlanta. Later he transferred to LTA training.

JOSEPH GARINO, AMM 2/C, press operator from Benld, Ill., is 21. He joined in 1942, received boot training at Great Lakes. He attended machinist mate's school at Navy Pier, and LTA, Lakehurst.

JOSEPH PETERS, ARM 2/C, of New York City, is 25. A truck helper, he joined in 1941 and received boot training at Newport, after which he attended radio school, Jacksonville; LTA, Lakehurst.



ENS. HAROLD JONES, tool designer from Huntington, Ind., is 22. He joined the Navy in 1942, completed preflight at Bendix Field and LTA training at Moffett Field, was assigned to Lakehurst.

HENRY C. IVIN, AMM 3/C, former machinist of Bloomfield, N. J., 20. He enlisted in 1942 and trained at Norfolk. He attended aviation machinist's mate school, Jacksonville, and LTA at Cape May.

FRANK BACHO, ARM 3/C, a coal miner of Filbert, W. Va., is 21. After getting his basic training at Pensacola, he remained to attend radio school. He later attended LTA school.

cannot be given for obvious reasons, but the expansion has been sizable.

New Command Expands Training

In August 1943, a new system of training was inaugurated by the Airship Training Command. Henceforth, primary training is conducted at Moffett Field and advanced training taken at Lakehurst. Primary still is given in small L-type ships, but an advanced training squadron has been formed to take over instruction in patrol type ships. "Synthetic" and other training devices are liberally employed. The training period has been lengthened from four to six months. consisting of three months primary and three months advanced training.

Enlisted training takes place at Lakehurst and Moffett Field. The men receive a four-month course of basic training in all phases of lighter-than-air with emphasis on their specialty, such as: machinist's mates, ordnancemen, metalsmiths, radiomen and other classifications. Finished with their course, the men receive the designation of "Qual LTA," and then are transferred to squadrons or other operational duties.

Expansion of scope and activities of lighter-than-air has necessitated considerable spreading out, and commissioning of new bases has been the logical development. The following stations have been put into operation as LTA bases: South Weymouth, Weeksville, Glynco, Richmond, Houma, Hitchcock, Santa Ana, Sunnyvale, and Tillamook. In addition, bases are in operation outside the continental limits of the United States.

Development of Lighter-Than-Air

Lighter-than-air craft activities in the Navy began in April 1915, when the Navy Department contracted for one non-rigid airship with the Connecticut Aircraft Company, New Haven, Conn., a concern which had secured the services of a German engineer, a German mechanic, and an Austrian pilot, supposedly experts.

This first dirigible, designed and built under the supervision of this imported talent, was a great disappointment, for when it was completed two years later it was so overweight that it barely could lift itself off the ground. Its envelope leaked and the power plant functioned badly. It did fly, however, and since the firm had built the ship in good faith, and at a cost greatly in excess of the contract price it was accepted and designated the D-1. After a few short flights it was put back in the shed, deflated and eventually broken up.

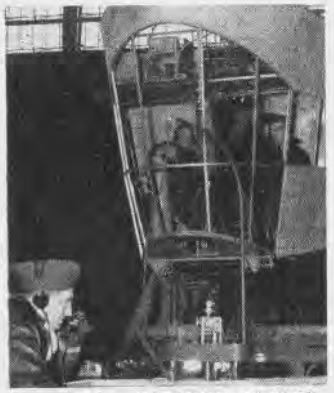
In December 1916, a coast patrol airship of 12 hours' endurance was designed and designated type B. This design was approved by the Secretary of the Navy on January 27, 1917. It was intended to build only one airship of this design as an experiment, but, as relations with Germany became acute, the Secretary ordered the construction of 16.

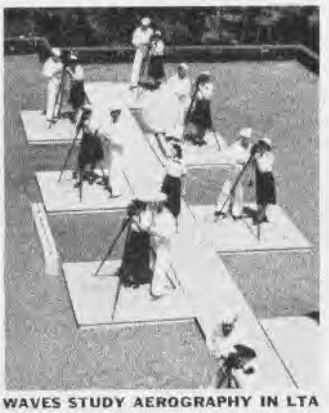
Order Creates Difficult Problems

This order was a thunderbolt, as delivery in any reasonable time was out of the question with existing facilities. No firms had knowledge or experience, and no time could be allowed them for experiment and research. There also was no time to build one experimental airship to prove the design, for all 16 were wanted at once.

After many conferences with all possible manufacturers, arrangements finally were made for the production of these airships by a group of firms, pooling their knowledge and skill. Contracts were placed on March 14, 1917, for nine airships to the Goodyear Company, five to the Goodrich Company, two to the Connecticut Aircraft Company, and 14 cars and engines (for the Goodyear and Goodrich ships) to the Curtiss Aeroplane Co.

The Goodyear Company also undertook to provide a flying field with


CADETS USE SYNTHETIC TRAINER


WAVES STUDY AEROGRAPHY IN LTA

BALLOONING AIDS LTA TRAINING


PARACHUTE RIGGERS TEST CHUT

shed and hydrogen plant to conduct tests and trials and to train naval airship personnel. Delivery of the B-type airships was accomplished between July 1917, and June 1918, during which time the Goodyear Company trained the first naval airship detachment at Akron. These airships were successful in accomplishing their mission and proved to be equal to the foreign airships of that date. The B airships trained 170 pilots and flew 13,600 patrol hours without a fatality.

In the spring of 1918 a larger and faster type of nonrigid airship to carry heavy depth charges was designed for antisubmarine activities overseas. Designated type C, this design provided high speed to cope with head winds, increased endurance to permit convoying, and a duplicate power plant to lessen the chance of complete break-down at sea. The design proved to be highly successful and a speed of 60 miles per hour was realized. Contracts were placed with Goodrich and Goodyear for 30 C-type airships to be built in accordance with the Bureau's design, the cars for all 30 to be made by the Curtiss Company. The first C-type airship, the C–1, was completed in September 1918 and on its maiden flight flew a nonstop distance of 400 miles. At the time of the Armistice, only 10 C-type airships had been completed and the contracts for the other 20 were canceled.

C-Type Ship Not Favored by Pilots

The C–type airship, although entirely successful, was not favored by pilots because of certain features of design. An attempt to meet these criticisms was made in the D class. This class had the C-type envelope with a 6-foot parallel strip added to the middle body. The cars of the D class were fitted with two Union engines mounted at the stern on outriggers.

By the middle of 1919 the Goodyear Company had acquired a competent design staff which had built one or two airships to its own designs. Among these was a single-engined pusher with envelope slightly larger than the B ship. This seemed a worth-while variation on the B class and was acquired to determine the value of the type. This was the E class. A somewhat similar ship, having a car of slightly different design was also developed by Goodyear and designated the F class. The principal differences between these two ships were in the details of the car and in the fact that the engine of the E–1 was fitted with reduction gearing to the propeller.

The Bureau designed a large nonrigid called the G class during 1919, but no ships of this type were constructed as the project was abandoned in favor of rigids. This G-class ship was to have carried a 3-inch gun of the long recoil type together with a substantial bomb load and was to have an endurance of 50 hours at 45 miles per hour or 25 hours at 60 m. p. h.

Nicknamed Animated Kite Balloon

A project which was the other extreme from the G design and sometimes referred to as an animated kite balloon was proposed in 1920. It called for a very small airship, capable of being towed like a kite balloon, and yet able to maneuver on its own when the towing cable was slipped.

A contract for a ship of this type, known as the H class, was placed with the Goodyear Company in June 1920. The trials of this ship were held in June and July, 1921. It was found to have most of the features desired, but required some improvement in the design of the engine bearers. The volume of the envelope was 43,000 cubic feet and a single Lawrence 60-horsepower air-cooled engine was used. A second ship of this type with the defects of the H–1 corrected was built for the Army and was entirely successful in its trials.

The next nonrigid to be built was the J–1. The design of this type was prepared jointly by the Bureau of Aeronautics and the Goodyear Company. An effort was made to incorporate in it all the good points of the preceding ships and to remedy all the defects which had appeared. Trials of the J–1 were held in the fall of 1922 and were very successful.

Closed Car Featured in K–1 Ships

The K–1, completed in 1931, introduced the closed car, internal suspension, and wheel landing gear. Another novelty, which has not been repeated, was the use of fuel gas to replace a considerable proportion of the gasoline. Later nonrigids of the K class are enlarged editions of the K–1 without the fuel gas feature.

Two additional classes of nonrigids are operated for training purposes: the L class, which is considerably smaller than the K class, and the G class, somewhat larger than the L ships. The G ships were operated formerly by the Goodyear Company and were taken over by the Navy.

Nonrigid blimps form the principal class of airships in use today. They have performed valuable services in antisubmarine warfare. Blimps escort convoys and work closely in conjunction with surface craft and airplanes. When a submarine is sighted, the airship immediately endeavors to attack with depth bombs. If it is unable to reach the spot in time to make an attack with reasonable chances of success, it drops buoys, flares, or bronze slicks to mark the position. Then listening devices are employed to track down the submarine. Its ability to cruise slowly and to remain in the vicinity for a long period is of the greatest assistance in organizing search operations. Convoys escorted by blimps have had few losses and those were caused more by convoy straggling than any other factor.

The blimp has rendered excellent service in searching for and assisting survivors of destroyed vessels or of marine or aircraft disasters. Its low speed and ability to hover permit quick spotting of lifeboats and rafts, particularly under conditions of poor visibility. Once located, rubber boats, food, and water can be dropped and an accurate position can be transmitted to rescue craft.

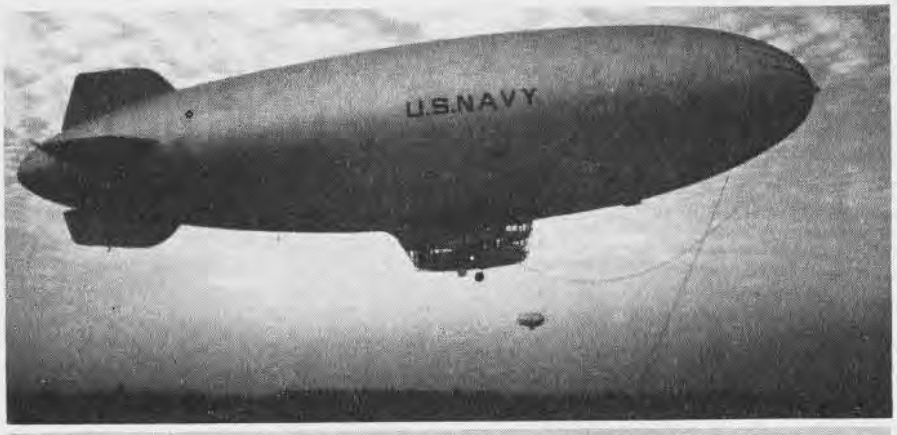
Use of barrage balloons is steadily on the increase. The balloons support a network of strong wires, capable of bringing down or severely damaging low-flying aircraft or dive bombers.

LTA ON PATROL

0410 Crew takes food aboard as patrol day begins

0415 Big blimp majestically is walked out of hangar

0420 Ground crew gets ship ready for day's flight



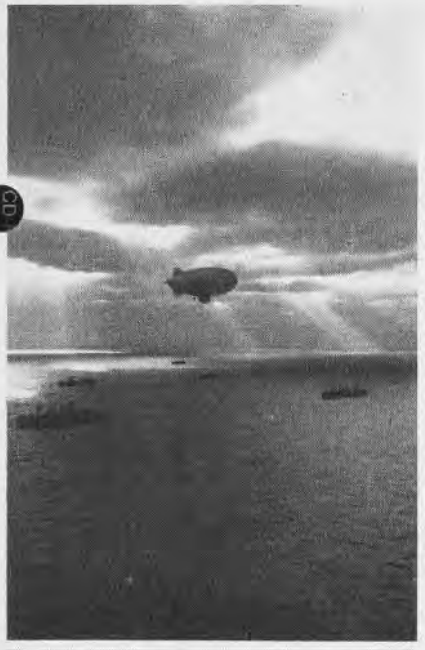
0430 Crew members take positions as K ship gets up and away for a long day of convoy duty and antisubmarine patrol

0450 As ship nears coastline crew dons life jackets

0500 Navigator checks course to meet outgoing convoy

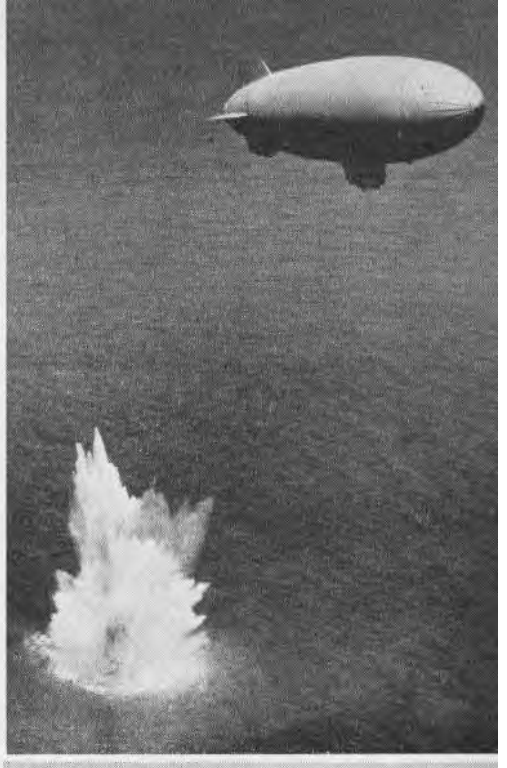
0525 Lookout scans horizon as rendezvous is kept

1830 Distress message causes blimp to alter course

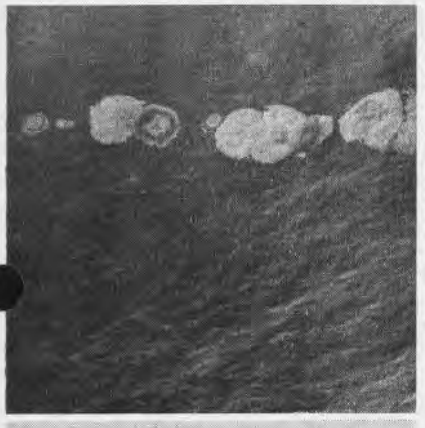


1835 Airship leaves convoy to aid stricken vessel

1900 Ship's survivors give information on attack



1915 Blimp tracks down sub and drops depth bomb



1930 Slick indicates damage done to Nazi submarine

1933 Radioman reports attack to blimp's shore base

2000 Two crew members take time out for hot drink

2005 Convoy duty completed— ship works back to base

2200 Patrol day draws to close as ship is moored

GRAMPAW PETTIBONE

Pre-cautions

The pilot of an SNJ–4 lost control of his aircraft on take-off and hit a truck which was authorized to be on the field. Fortunately, none of the men on the truck was injured because they had been warned to be on the alert for just such an emergency. They all jumped and ran to safety.

The following remark is quoted from the pilot's statement: "I would not be alive today had I not securely fastened my shoulder harness before take-off."

Check Your Altimeter

Two serious accidents have recently occurred during night landing approaches which may have been due to wrong altimeter settings. In one case it is known that a drop in barometric pressure had resulted in the altimeter reading being 200 feet higher than the actual altitude.

The patrol wing in which this latter accident occurred has added the following requirement to the landing check-off list: "Check Altimeter Setting with Control Tower."

▶ *BUREAU COMMENT.*—This requirement is recommended to all squadrons concerned, where radio altimeters are not installed.

Although this is now standard doctrine, it is felt that pilots may often neglect to make this check because they erroneously believe their altimeter readings to be correct. This error will be obviated and possible accidents avoided if pilots are required to check altimeter settings with the control tower when returning from flights during periods of reduced visibility, whenever conditions of radio silence permit.

Don't Lose Your Balance

In reporting a recent fatal crash of a PV–1 airplane following take-off, the trouble board commentary stated: "The pilot used 20% flap for take-off which is recommended for short-run take-off. The total weight was 28,379 lbs. with c. g. at 35% of mean aerodynamic chord."

The pilot was unable to overcome the tail heaviness, the plane stalled, and struck the ground during completion of recovery.

▶ *BUREAU COMMENT.*—Attention is invited to the Erection and Maintenance handbook as well as the Pilot's Notes for the PV–1 which state that the aft c. g. limit is 33.1% M. A. C. for safe operation. Had full consideration been given to proper airplane balance before take-off, and had the limits as set forth in technical data been respected, this crash probably would have been averted.

Any PV–1 loading condition which results in an aft c. g. location above 33.1% cannot be considered safe even with 0% flaps for take-off. While it is possible to use as much as 20% flaps for short-run take-offs, it should be realized that the resultant relatively slow take-off speeds will lower the safe aft c.g.% M. A. C. value.

Attention Avenger Pilots

There have been several cases of pilots retracting the landing gear on TBF and TBM airplanes while on the ground. These accidents usually occur as the result of pilots attempting to raise the landing flaps, but instead raising the landing gear lever by mistake. This is still all right if the airplane is resting firmly on its wheels, but the locking feature of the landing gear becomes inoperative whenever the left wheel is nearly extended. This may occur on the ground as the result of a bounce, or in a short turn. These accidents must, therefore, have occurred when the left wheel was extended, indicating that many similar accidents were prevented only because the left wheel was not extended when an attempt was made to raise the landing gear lever. The landing gear will not retract unless the control lever is raised. Moral: *Know your cockpit!*

Pettibone Harps on Training

Maybe you think I've been hipped on the subject of cockpit drill and knowing your airplane. Listen to this remark of a squadron commander who has been out there: "A pilot is no damn good in combat as long as he has to think about handling his plane."

Propeller Precaution

While in flight, the propeller of an SB2C–1 failed in automatic. The pilot switched to manual, set r. p. m. for 2,150, and commenced a dive from

10,000 feet. During the dive, the engine overspeeded, causing complete engine failure.

▶*BUREAU COMMENT*—If an electric propeller is set in manual at any speed in level flight, it will allow engine r. p. m. to increase as flight speed is increased. In this instance, the manual control was set for 2,150 r. p. m. in level flight. During the subsequent dive, the r. p. m. exceeded the 3,100 r. p. m. limit of this engine, with consequent failure. To make certain that the engine does not overspeed, dives may be made in *full manual high pitch*. This will insure against governor or circuit failures which may occur during dives made with propeller in automatic. For actual combatant operations, however, diving in automatic is the only practical arrangement.

Technical Order 16–41 should be thoroughly understood by all pilots flying aircraft equipped with constant speed propellers.

Grampaw Pettibone on Glide Bombing

To call a pilot a "glide bomber" used to be a term of derision. Recent events have changed all that; glide bombing has more than proved itself and the title now carries a mark of special respect.

The difference between glide bombing and dive bombing is indicated by

the titles; it is mainly a difference in the angle of dive, with greater speed and acceleration necessarily employed in dive bombing. This difference, however, is not always made by pilots engaged in these two methods of attack. This is unimportant where dive bombers are used in glide bombing, but it may become serious when aircraft which were *not* designed for dive bombing are used for this purpose. A particular case in point is the TBF–TBM model airplane. It is basically a torpedo plane and has sufficient strength to withstand the stresses of glide bombing, but *not dive bombing.*

The considerable number of structural failures which have occurred during bombing runs with this airplane indicate that some pilots are trying to make a dive bomber out of it. They are deliberately exceeding the speed and acceleration restrictions, laid down in Technical Order #37–43, and often with fatal results. Those are the maximum limits; they cannot be exceeded with impunity!

The Bureau has recently directed the installation of visual accelerometers in these airplanes. They should be used in training to acquaint pilots with the actual acceleration (g) experienced in pull-outs. Before students are permitted to make runs on a target, their training should consist of a gradual transition from shallow angle glides up to glides of about 40–45 degrees, with pull-outs studied in reference to the accelerometer. This training should continue until the pilot has assured himself of his ability to make his runs without exceeding the speed limit and to recover without exceeding the acceleration limit.

The limitation of 40–45 degrees is recommended because, with wheels down, bomb bay doors open and using minimum power to keep the engine cleared, this glide can be maintained under all load conditions without exceeding the restricted speed. If a greater glide angle is used, or if other of the above provisions are changed, special attention must be given to beginning the pull-out before exceeding the speed limit. In this connection, pilots are cautioned that speed continues to increase during the first part of the pull-out.

Accident reports indicate that several wing failures have been caused by the excessive use of ailerons. The application of ailerons results in unsymmetrical loadings and greatly increases the possibility of failure. A weaving approach is often necessary, as is some turning during the glide, but severe "corkscrewing" should be avoided when approaching speed limitations. The allowed limit of aileron control, as given in T. O. #37–43, is the force required for full aileron deflection at 200 knots. Learn what that force is and don't exceed it!

Technical Order #84–42, particularly paragraphs 11 and 12 concerning pilot technique in dives and pull-outs and in gusty air, and Technical Order #37–43 should be studied and thoroughly understood before making any bombing runs.

Once you have accepted this airplane as a *glide bomber,* it is relatively easy to avoid exceeding the maneuvering restrictions.

THIS IS WHAT HAPPENED WHEN A PILOT IN THE LANDING CIRCLE NEGLECTED TO KEEP THE PLANE AHEAD OF HIM IN SIGHT. (NO ONE WAS SERIOUSLY INJURED.)

Navy Fights Well on Land

Inhuman Foe Finally Annihilated

NAS, CLINTON—In a lightning raid, a striking force of officers and men especially trained in Commando tactics wiped out a garrison of enemy jackrabbits and established a bridgehead a mile wide along the north boundary of this station.

The raid, planned to wrest control of the station's Victory garden from the long-eared foe, was considered a local success. The defending jackrabbits were caught flatfooted, apparently unaware of the Commandos' presence until the raid was sprung. Enemy losses were estimated at approximately 100, while the NAS force suffered no casualties.

The raiders included a score of officers armed with shotguns and more than 100 enlisted men, volunteers from Public Works, the master-at-arms force and other departments, who went into the battle armed only with billy-clubs. It is believed that the raid marked the first instance in World War II in which Navy forces have been employed in his type of combat.

The Commanding Officer deployed his raiders in a line of attack approximately a mile wide at the rear of the radio transmitter building. A few jackrabbits on patrol were found before the actual raid was launched, but they were annihilated before they had a chance to warn the main enemy body.

The Commandos went into action at 1519, advancing steadily westward for a distance of two and one-half miles before they gained their objective and retired safely. The surprised enemy filed in confusion from the Victory garden territory and were mowed down by gun and club.

DID YOU KNOW?

Measuring Rods

Army Air Forces Sure Before Counting a Plane Destroyed

If during combat, an enemy pilot is seen to bail out of a single-seater, the plane is a goner, according to a formula for chalking up destroyed enemy aircraft, adopted by the Army Air Forces. Two other tests are: *1.* If the plane is seen descending completely enveloped in flames and 2. If the plane is seen to disintegrate or if complete wing or tail assembly is seen to be shot away from fuselage.

Rules for scoring a *Probable* are just as rigid as those for scoring a *Certain.* A plane counted probably destroyed is one believed sufficiently in flames to preclude the chance of extinguishing them, or one damaged to the extent where believed it must have crashed, but without 100 percent certainty. A plane is counted only damaged when parts are seen to be shot away.

Floating Islands in Ocean

Steel Projects to Facilitate Seadrome Route Across Ocean

Floating, mile-long islands of steel which will tower 70 feet above the ocean and have a draft of 160 feet will cut the cost of trans-Atlantic air travel to virtually the same as overland travel, according to C. Bedell Monro, president of the Pennsylvania-Central Airlines.

This estimate was made recently by Mr. Monro when his company filed application with the Civil Aeronautics Board to establish a "seadrome" route between the United States and Great Britain.

The establishment of this project—floating islands of steel spaced at 800-mile intervals across the Atlantic—will give America vitally needed bases in that ocean and provide the shortest, fastest and most economic airway route between this country and Europe," Mr. Monro said.

The "seadrome" idea was developed by Edward R. Armstrong, Philadelphia construction engineer. It would provide complete airport facilities, as well as hotel accommodations for passengers desiring to vacation at sea. It would be self-propelling at 8 knots. Construction of the seadromes will begin just as soon as steel is available, Mr. Monro said.

▶ ***BUREAU COMMENT*—It is encouraging to see commercial enterprise taking the initial step toward establishing transoceanic commerce affecting post-war aviation. This stimulus is a constructive step toward large pay-loads which is necessary in commercial flying and will enhance competition in the production of transoceanic aircraft.**

The post-war era may bring about certain improved features in aircraft development that would eliminate extensive facilities. Today we can plan, develop, and promote competition.

Note to Draftsmen

Naval Aviation NEWS *frequently receives drawings and blueprints of new tools, devices, and original methods suggested by A&R shops for general use by other activities. These suggestions, reaching* Naval Aviation NEWS *from activities or from the Navy Department Board on Awards, are of sufficient interest to warrant publication.*

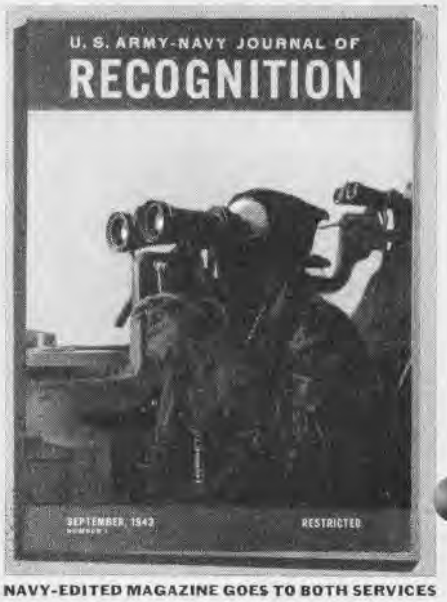
But difficulty is encountered if drawings cannot be reproduced without being retouched or pointed up by an artist. Bureau facilities for this work are overtaxed. Drawing rooms are crowded with work of an extremely urgent nature.

Field activities are urged to take more pains with drawings and blueprints so that they will be, from the editor's viewpoint, in a more "digestible" form. Drawings should be sharp and simple, black on white, legible.

'Recognition,' New Magazine

Navy Edits Navy-Army Monthly

Teaching recognition of ships, planes, tanks, ordnance and other *objets de guerre* undoubtedly will be facilitated by appearance of a new monthly magazine published by the Navy as an outlet for latest information on Navy and Army recognition subjects.



NAVY-EDITED MAGAZINE GOES TO BOTH SERVICES

Bearing the inclusive title *Recognition,* the magazine is well edited, roomy in format, profusely illustrated. Its simple but effective design encourages reading and should provide a constructive force in speeding up grasp of recognition. Wide distribution is accomplished through regular channels.

Transport Planes to Vary

Schedules Will Demand 5 Types

Five types of planes will be needed for scheduled air transport of the future, according to Charles Froesch, chief engineer, Eastern Air Lines, Inc.

These will be: *1.* a plane of small capacity designed to stop every 25 or 30 miles to pick up passengers, mail, and express for transportation between small communities or transfer to main line points; *2.* a larger plane designed to stop every 100 to 200 miles; *3.* a

plane for limited stop service to operate at high speed; *4.* a large plane providing day and night de luxe passenger accommodations designed to operate 1,000 miles or more between stops, and *5.* a "flying box car" for heavy cargo.

Allotment Continues Pay

Dependents Then Don't Suffer

A vital problem of dependents of officers and men in service—often ignored—can be solved easily by registering an allotment.

When a man is reported missing in action (or even from his shore station, say on a ferry hop), he is not declared legally dead for 1 year. The wife, or other dependents, are left entirely without protection—unless there is an allotment.

To arrange for an allotment after the man is reported missing is a difficult process involving sometimes months of waiting. If, however, that allotment already has been declared, it will pay regularly for a year.

Air Divisions Go to OpNav

Aeronautics a Matériel Bureau

Five divisions of the Bureau of Aeronautics have been transferred to the jurisdiction of the Chief of Naval Operations, leaving the Bureau to function as a matériel organization, for which it was organized originally. The divisions are Planning, Personnel, Training, Flight and Air Information.

They will be under the Deputy Chief of Naval Operations (Air), a new position recently filled by Vice Admiral John S. McCain, former chief of the Bureau. The director of Marine Corps aviation and appropriate Marine Corps officers of BuAer are assigned directly to deputy chief.

Special Devices Division will remain in BuAer but will work in close cooperation with the Training Division. The latter will determine utility, number, and distribution of all such devices as are required for aviation training.

SHOW ME THE WAY TO GO HOME

DEAD RECKONING AND CELESTIAL NAVIGATION PROBLEM

Mark left-hand meridian of small area plotting sheet 81° W. Mid-lat 28° N.

You are navigator of a PBM. The plane departs NAS, Banana River, lat. 28°–15′ N, long. 80°–45′ W at 1630 ZT, July 31, 1943, to patrol a course of 120° T for 120 miles. Wind is 26 k from 210° at flight level of 1000 feet, true airspeed (TAS) 124 k.

What is your true heading (TH)? _____

What is your predicted ground speed (PGS)? _____

What is your 1715 DR position? **Lat**_____ **Long**_____

At ZT 17h–10m–44s you obtained an observation of the sun with a bubble octant whose I. C. was (+) 8′ and your watch was 16 seconds slow on Zone Time. The hs was 23°–51′.

At 1712 your radio operator took a relative bearing of 122.5° on station WRX, lat. 27°–00′ N, long. 81°–00′ W.

Solve the sun sight and plot the line of position and radio bearing, advanced to obtain a 1715 fix.

What is the 1715 fix? **Lat**_____ **Long**_____

What is the actual ground speed made good? _____

What is the wind? **From**_____ **Force**_____

What is the estimated time of arrival (ETA) at the end of first leg? _____

At that time you are ordered to change heading to patrol a course 030° T for 180 miles and then return to base.

What is the true heading? _____

What is the predicted ground speed? _____

What is the ETA at the end of the second leg? _____

At 1815 a life raft with survivors is sighted bearing 058° relative, estimated 7 miles distant. You make a contact report.

What is the position of the life raft? **Lat**_____ **Long**_____

Eleven minutes later at 0826 the plane continued on patrol.

What is the course from the end of the second leg to base? _____

What is the distance? _____

What is the true heading? _____

What is the predicted ground speed? _____

At ZT 1900 a fix was obtained in lat. 29°–40′ N, long. 77°–29′ W.

What is the 1945 DR position? **Lat**_____ **Long**_____

At about 1945 you take the following observations:

	Antares		Spica
ZT	19h–40m–44s	ZT	19h–49m–44s
hs	34°–12′	hs	33°–26′

Solve the sights, plot and label the ZT 1945 fix.

What is the position of the fix? **Lat**_____ **Long**_____

What is the actual ground speed? _____

What is the revised ETA? _____

(Answers on page 29)

25 YEARS AGO THIS MONTH

Naval Aviation September 1918

Sept.—Navy submitted two-seater fighter design to Curtiss for use with the K–12 400 h.p. engine. This engine was 175 pounds lighter than the Liberty—and on the average it developed more horsepower. The design was called the "Dunkirk Fighter" owing to the need for a fast fighting seaplane at Dunquerque, France. It was to carry 4 machine guns—and was 20 miles an hour faster than any existing fighting plane. The first machine was destroyed by fire.

Lt. Comdr. Kenneth Whiting in command of Naval Air Station at Killingholme, England. Planes operated against submarines, formed outposts against Zeppelin raids, and convoyed thousands of ships. Plans were made to transport seaplanes on lighters, or floats, towed by destroyers to within easy striking distance of Heligoland, Cuxhaven, Bremerhaven, Emden, and Wilhelmshaven. When the float had reached its station, it was to be given an inclined position by flooding a rear compartment, the seaplane sliding from the deck. Although preliminary trials demonstrated the entire practicability of the plan, it was subsequently abandoned because the cat was let out of the bag by making a test in the vicinity of Heligoland Bight: a Zeppelin took photographs, and the element of surprise—upon which the entire undertaking was based—was lost.

Lighter-than-air personnel abroad urgently requested larger non-rigids capable of carrying a 3-inch gun of the non-recoil type in addition to a substantial bomb load—and with an endurance of 50 hours at 45 m.p.h. They wanted a ship as large as could be constructed on the non-rigid principle. An investigation of this project showed the impracticability of the design.

First non-rigid of the "C" type completed. These ships had a maximum speed of 60 miles per hour and were built to cope with high winds. They were given greater endurance for escorting convoys. Contracts were let to Goodyear for 30 of these ships but the number was reduced to 10 following the Armistice. Ships had two engines—total power, 300 h.p.

Maximum strength of naval aviation school at M. I. T. reached with 1600 students and 115 instructors.

Naval aviation overseas continued to have difficulties in transporting material. There were a shortage of cars, much congestion and completely inadequate railroad facilities. Particularly troublesome was the transportation system between France and Italy. For instance, the French claimed that the Italians would not return freight cars to France, that they kept them for use in Italy. Consequently France would not permit her freight cars to cross the border into Italy. Considerable time was spent in solving the problem.

COMMANDER WHITING

First American DH–4 delivered to Northern Bombing Group from Pauillac. As planes were placed in commission, they were assigned to British squadrons in actual war flights manned by our personnel in an effort to keep them busy until the Navy and Marines had sufficient planes to organize into separate units.

Sept. 21.—In a letter to Commanding Officer of United States Naval Air Forces, Canada (Lt. Comdr. R. E. Byrd), Ensign Walter Hinton outlined necessary steps for trans-Atlantic flight.

Sept. 24.—Letter from Capt. H. I. Cone to Capt. Irwin: "English gradually began to use landplanes for convoy work where humanly possible. Use of dirigibles for escort purposes has proven very good. Our small amount of experience over here would tend to show that dirigibles are invaluable and much less expensive in men, money, and material to accomplish the same amount of escort as seaplanes. Their one disadvantage, lack of weather qualities, is gradually being overcome to a certain extent."

Sept. 30.—All contracts for French seaplanes canceled in view of expected delivery in large quantities of American-built craft.

FIRST "C" TYPE NONRIGID DIRIGIBLES, COMPLETED IN SEPTEMBER 1918, HAD SPEED OF 60 MPH

AN R5 SEAPLANE ON SLIPWAY. PLANES AND DIRIGIBLES SAW CONVOY DUTY IN FIRST WORLD WAR

Navy Airmen Remembered

Four naval aviation fields have been named after deceased naval aviators, according to a recent announcement.

The station at Argentia, Newfoundland, is known as Bristol Field, in honor of the late Vice Admiral Arthur L. Bristol, Jr., who played a large part in its founding and at one time was commanding officer of the *Ranger*.

The field at the auxiliary air station, Milton, Fla., is known as Whiting Field, in honor of the late Capt. Kenneth Whiting, who was naval aviator No. 16 after being taught to pilot a plane by Orville Wright in 1914. He was commander of the first American aeronautical detachment to reach France in the first World War. Later he commanded the *Langley* and the *Saratoga*.

The third field, at Priest Point, Md., was named Webster Field, after the late Capt. Walter W. Webster, former manager of the Naval Aircraft Factory.

The field at the auxiliary air station, Otay Mesa, Calif., was called Brown Field, in honor of the late Melville Stuart Brown, one-time executive officer of the *Lexington*.

Air-Borne Risks Preferred

Substantial reductions in insurance rates for trans-Atlantic travel to the British Isles have been announced by aviation insurance companies in Great Britain and Canada.

Rates recently quoted have been approximately 2 percent for the round trip. The new rate is ¾ percent of the sum insured (up to $100,000 per passenger) for the round trip, including a 2 months' stop-over in Great Britain. All war risks are covered.

Because trans-Atlantic travel by air at present is not always available to everyone, travel by vessel is permitted under the same insurance, one company said, adding "the underwriters prefer the air-borne passenger risk."

Bond Allotment Runs High at Naval Air Stations

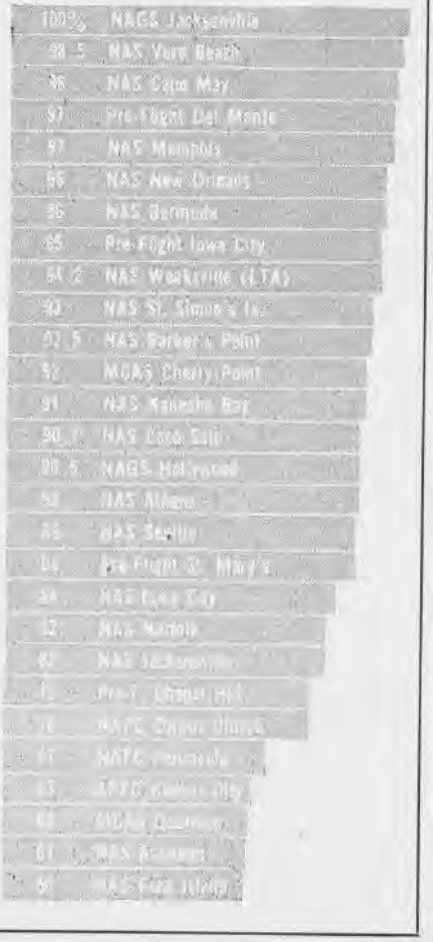
NAS Uniformed Personnel Lead, Copying Civilians' Example

Naval Air Stations, which set the pace in the Navy War Bond campaign for civilian employees, have also taken the lead in the recently inaugurated bond allotment program for uniformed personnel. Although this phase of the Navy bond program is only a few months old, nearly half a million allotments already have been registered by officers and men of the Navy, Marine Corps and Coast Guard.

The allotment program was launched last April, with the air stations taking an early lead. Several stations have already reported more than 90 per cent of their uniformed personnel enrolled through the allotment plan for bond purchases.

July sales set a new monthly record for the Navy bond program, with the total of $27,783,065.25, more than $6,000,000 higher than the previous record, established in April. Of the July total, $4,263,321.25 represented bonds sold to uniformed personnel under the allotment plan.

The chart lists the air stations and allied activities with the percentage of personnel at each station participating.



BEST ANSWERS

VI—Seamanship

Pick the best choice to complete the statements below, then check your answers on page 32.

1. When a gyro-compass is operating normally the—

- ☐ *a* spinning axis is parallel to the lines of latitude
- ☐ *b* horizontal axis is parallel to the meridian
- ☐ *c* vertical axis is parallel to the meridian
- ☐ *d* spinning axis is parallel to the meridian
- ☐ *e* horizontal axis points to the zenith

2. The magnetic compasses issued to vessels of the United States Navy are of the—

- ☐ *a* illuminated card type
- ☐ *b* dry type
- ☐ *c* combination type
- ☐ *d* liquid type
- ☐ *e* automatic compensating type

3. The commission pennant is flown at the main truck of a naval vessel to indicate that the vessel is—

- ☐ *a* in commission and in command of a flag officer
- ☐ *b* not yet in commission but is in command of a commissioned officer, not a flag officer
- ☐ *c* in commission and in command of a commissioned officer, not a flag officer
- ☐ *d* in commission and in command of a commissioned officer, who may be a flag officer
- ☐ *e* in commission and in command of a noncommissioned officer

4. Aircraft operating on the water—

- ☐ *a* must keep clear of all ships
- ☐ *b* have right-of-way over all ships
- ☐ *c* are not classed as ships and need not obey the Rules of the Road
- ☐ *d* are not classed as ships but must obey the Rules of the Road
- ☐ *e* are classed as ships and must obey the Rules of the Road

5. The type of talker system that is rapidly superseding the other types is the one that receives its power from the—

- ☐ *a* hand generator
- ☐ *b* talker's voice
- ☐ *c* ship's batteries
- ☐ *d* ship's generators
- ☐ *e* emergency generator

6. Flag hoist signals are normally paralleled by—

- ☐ *a* blinker
- ☐ *b* semaphore
- ☐ *c* wigwag
- ☐ *d* searchlights
- ☐ *e* radio

RAF DEPENDS ON THIS STREAMLINED BEAUTY, THE SWIFT AND DEADLY SPITFIRE, CALLED BY SOME AUTHORITIES THE WORLD'S FINEST FIGHTER

ROYAL AIR FORCE

Might of Britain Has Been Etched in the Sky by Courage and Quick Action of a Capable Air Arm

THE Royal Air Force is a separate service equal in status to the Royal Navy or the Army, its birth dating back to April 1918, when air power was recognized as a definite factor in war. Great Britain had an air force as far back as April 1911, when an Air Battalion was set up in the Royal Engineers. At that time the Italians' use of airplanes in their Tripoli campaign probably convinced the British they too should have military planes.

A year later the Royal Flying Corps, split into military and naval wings, was formed. It absorbed the battalion. In the early days of the RFC, the War Office held the idea that the airplane had no "military significance." Its aviators flew an assortment of Farman biplanes, Bleriot monoplanes and other types, none with engines of more than 80 h.p. rating.

In 1914 the Royal Naval Air Service was created, separate from the RFC. Thus, the British had distinct military and naval air arms during most of the first World War, just as the United States now has.

But in 1918, all aircraft including those on carriers or other plane-carrying fighting ships of the Navy were merged in the Royal Air Force where they remain today. The Fleet Air Arm includes only ship-borne aircra

British Navy Once Considered Peril

An analogy to the formation of RAF as a separate unit can be found in the history of the Royal Navy. Four centuries ago the English Navy was merely a collection of merchant vessels, hired to carry the Army across the seas.

The captains of these ships were not trained in sea warfare and when war came of age on the water, it was found necessary to build and man special fighting ships. This led—in the Sixteenth Century—to the formation of the Navy as a separate service, a move which was revolutionary in its day and subject to attack by some as endangering the Army's efficiency.

When the Armistice was signed in 1918 the RAF found itself with 200 squadrons, 22,647 aircraft, 103 airships, 291,000 officers and men, and 25,000 women—the world's greatest air force. In the years that followed, with disarmament conferences the vogue, RAF dwindled from 27,000 officers to 1,065 and its enlisted men to a fraction of the wartime strength.

Like the RAF, the German *Luftwaffe* today is a unified service under its own commander. Both, however, cooperate closely with army and navy. When either service wants a special job done, it calls on the air force to do it.

RAF Consists of Commands

RAF is organized into a series of commands, each one partly functional and partly geographical in operations. Bomber Command comprises the main force of bomber aircraft, and Fighter Command the main force of fighter planes. Coastal Command has patrol planes and torpedo-carrying bombers that work closely with the Navy.

There are, in addition, the vitally important Maintenance Command, the two training commands—Flying and Technical—Balloon Command, and Transport Command. The first named is one of the largest in the entire Air Force. Its job is to keep RAF planes flying.

BARRAGE BALLOONS KEEP NAZI BOMBERS HIGH

Transport Command includes the former Ferry Command and corresponds to the U. S. Naval Air Transport Service in scope. Balloon Command operates the extensive balloon barrage which protects English cities from low-level attack. All these units are classed as "Home Commands."

RAF also has separate commands which operate in the Mediterranean area, India, and the Middle East. Each of these operates both bomber and fighter planes and other types as well. Mediterranean Command, for instance, is larger today than the entire RAF at the start of the war.

Groups, Squadrons Form Basic Units

The next unit under the command is the group. Most commands are organized in a number of groups disposed geographically. All bomber stations in a particular part of the country, for example, are organized in a group, usually commanded by an air vice marshal. Either a number of stations or wings may comprise the group, with two or three squadrons under the station commander.

The squadron is the basic unit of RAF. It consists usually of about a score of aircraft, according to type. Besides their pilots, they include 200 or more in maintenance and ground staffs.

Closer inquiry into the major home commands reveals that they work closely with army and navy. Coastal Command uses its flying boats to patrol far out into the Atlantic to escort convoys and search out U-boats. Bristol *Beauforts* carry torpedoes to attack enemy convoys.

Blenheims fly the vast ocean lanes to protect British ships, as do Lockheed *Hudsons*. *Catalinas* and Consolidated *Liberators* team up with English-made *Wellingtons* and *Whitleys* to protect from German air and sea attacks the vital lifeline of ships across the Atlantic. Today Coastal Command's battle zone covers more than 5,500,000 square miles.

In defending Allied shipping this Command has flown more than 50,000,000 miles; escorted more than 8,200 convoys; made 760 attacks on enemy vessels and sunk or damaged 300,000 tons. It has attacked more than 300 U-boats, destroyed 75 aircraft attacking convoys and driven off 500 more.

Fighter Command Carries Load

The work of Fighter Command in the now-historic Battle of Britain is easily recalled. Its *Spitfire* and *Hurricane* squadrons, aided by an efficient radio detection system, defeated the *Luftwaffe* in the memorable air war of 1940. Later, in escorting bomber squadrons over Nazi-held Europe and in lone forays, the fighters have knocked hundreds of enemy planes out of the sky. Since the war began more than 5,000 have been destroyed by the command and its allied antiaircraft defense organization.

When Fighter Command's task of protecting England from raiders fell off with decreasing Nazi assaults, it developed a new mission of blasting heavily burdened enemy transportation on land and sea. Swift intruder planes shot up hundreds of locomotives on land and ships in nearby waters.

Bomber Command Hurls Fury on Foe

Bomber Command started its long-range operations against Germany before the 1940 Blitz and today is carrying the brunt of the air war on the continent. Its mighty four-engined *Stirlings, Halifaxes,* and *Lancasters* have sown death and destruction as far as Rostock and Northern Italy. Speedy *Mosquito* bombers have penetrated Berlin in hit-run attacks.

While the two-engined bombers were being supplanted by larger

"Never in the field of human conflict was so much owed by so many to so few."

WINSTON CHURCHILL

Organization of the RAF

BuAer NEWS Chart

bombers, RAF also was increasing its bomb load from two tons to as much as eight tons per plane. Besides bombing European mainland points, Bomber Command also dropped thousands of mines in enemy waters, sinking or damaging 164 ships in a six-month period alone.

Today, with the spotlight on the Mediterranean, the overseas Command in that area takes on increased importance—under it, the Northwest African Air Force, RAF Middle East forces and Malta, that most-bombed spot on earth, now comparatively quiet after more than 3,000 aerial raids.

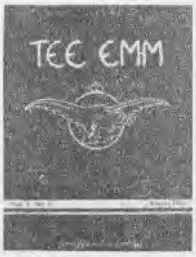
Protects Convoys off Africa

Another Command handles the West Africa operations of RAF—mostly protection for convoys—and the third overseas Command supervises activities in India and Ceylon. As the Allied offensive against Japan gathers momentum in Asia, this command will intensify present raids on Jap-conquered countries which it now is pressing to the limit of its facilities.

Three nonoperational commands complete the organization of Royal Air Force. Flying Training and Technical Training Commands turn out the thousands of pilots, gunners, mechanics and others who fly and repair the planes. The third is Maintenance Command, formed only in August 1938 to take over maintenance units. Its job is to pick up planes at the factory, deliver them to squadrons, repair craft in the field and provide food and anything else required by men and machines of RAF.

These two dopes—Prune and Dilbert—are helping Axis with their antics

As a result of experience learned in North African fighting, Army Cooperation Command was merged into a Tactical Air Force and placed under Fighter Command. This reorganization was aimed to insure greater cooperation between reconnaissance aircraft and light bombers and planes of the main fighter force.



"TEE EMM" DOES JOB OF NAVAIR NEWS

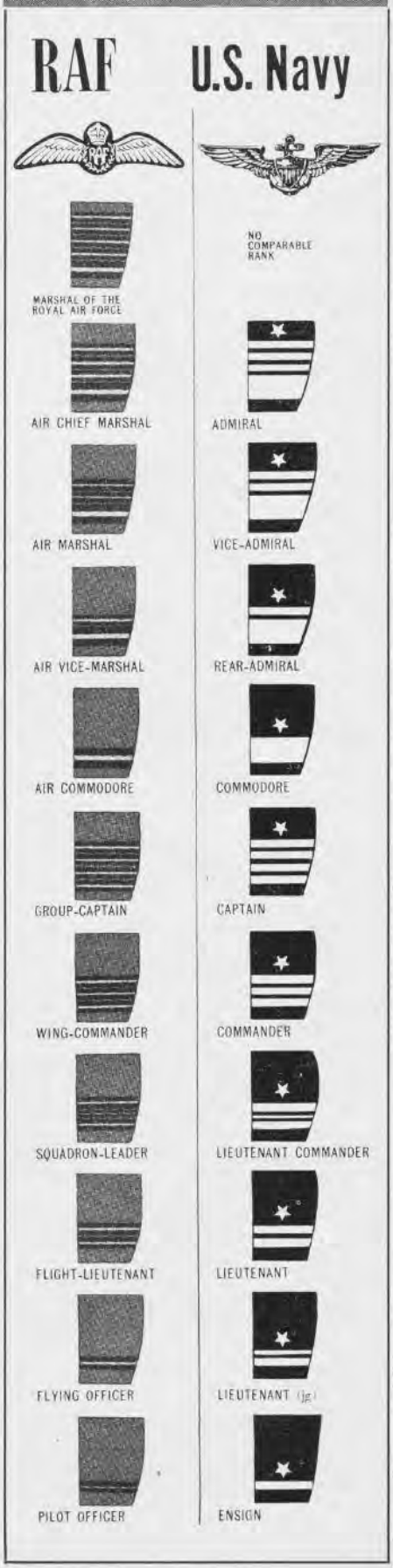
It is expected to increase the striking power of the armies in the field and speed up the flow of information, not only of the enemy's movements but of British troops operating in the field.

RAF SLANG

So that naval aviators will know what is being said when their RAF friends use slang, Naval Aviation News herewith presents some additions to the British airman's vocabulary:

A black——— something badly done
A flannel——— a long winded, plausible story
Beat up——— dummy attack on aerodrome, generally unauthorized
Browned off——— fed up
Brown Job——— any member of the British army
Bind——— anything irksome
Bint——— a girl friend
Char——— tea
Chiefie——— a flight sergeant
The deck——— the ground
In the drink——— down at sea
Erk——— enlisted man, usually a mechanic
Get cracking——— get going
Gong——— a medal
Jankers——— punishment
Kite——— an aeroplane
NAAFI——— canteen (post exchange)
Office——— cockpit
Pulpit——— cockpit
Play pussy——— hide in clouds
Put on a peg——— make a disciplinary charge
Prang——— a crack up
Quick squirt——— short machine gun burst
Shot down in flames——— severe reprimand
Shoot a line——— tell an exaggerated story

COMPARATIVE RANKS OF THE



WAAF

FLIGHT mechanics, bomb plotters, and radio operators of the Women's Auxiliary Air Force are carrying on with the pioneering spirit of the Women's RAF of World War I. They work beside the men of RAF and in many instances have completely taken over their jobs. Manning some of the barrage balloon sites is an example.

On June 28, 1939, WAAF was constituted by Royal Warrant an integral part of RAF. Formerly women who were on duty with RAF belonged to the ATS (Auxiliary Territorial Service) created by the Air Council in August 1938. Now they have their own officers, NCO's, uniforms, and badges—identical with officers and airmen of the RAF.

WAAF has expanded to 78 times its original size. By the end of the second year of the war its strength was passing into the second hundred thousand. Its initial 5 trades have increased to 65. In the signals trades women are wireless and radio operators, and radio mechanics. Technicians are doing skilled and semiskilled jobs as armourers, electricians, and instrument repairers. Among the scientific trades are photographer, meteorologist, and cine-projectionist and tracer. In the medical class are dental clerks, dispensers, masseuses, radiographers, and operating assistants. A clerical group includes general and specialist clerks, bomb plotters, and equipment assistants. Essential too are domestic jobs—cook, tailor, orderly.

ATA AIDS WAR EFFORT BY FERRYING PLANES

So far airwomen have not served as air crews. (Women ferry pilots for RAF are members of the Air Transport Auxiliary Women's Section.) But two categories of WAAF actually fly—flight mechanics who test the engines or equipment in test flights, and nursing orderlies in air ambulances.

During the first winter of the war women in WAAF were tried out on a number of RAF stations. Lack of equipment and accommodations linked with bad weather, made their life hard as England went through its coldest winter in several decades.

As the airwomen proved their ability to do technical jobs required of an air force they were given more and more responsibilities. During the Battle of Britain women staffed plotting rooms where huge maps showed locations of squadrons of British and enemy planes fighting for the lives of those below.

A large portion of WAAF is occupied in cooking and catering for the RAF, manning its telephones and teletypes, staffing its offices and even cleaning its quarters. A number of code and cypher officers have been serving for some time in the Middle East.

After 4 years of action WAAF has found its place in the war picture, working with RAF for victory. Its members have taken over more and more work on the ground, releasing men for flying duty. They had the additional satisfaction of knowing they played an important part in servicing the aircraft these crews were flying.

ROYAL AIR FORCE INSIGNIA

Some RAF Firsts

JUNE 1919—First non-stop flight across Atlantic by Capt. John Alcock and Lieut. Arthur Brown—15 hours, 57 minutes.

JULY 1919—First airship flew across Atlantic—R–34.

JUNE 1921—First air-mail service between Cairo and Bagdad.

SEPTEMBER 1926—R. A. F. lieutenant won Schneider Trophy, flying 281 mph.

SEPTEMBER 1929—R. A. F. again won Schneider Trophy at 328 mph.

APRIL 1931—First air mail carried from Australia to England.

SEPTEMBER 1931—R. A. F. set new world speed record of 408 mph.

JANUARY 1932—First air mail flown from England to South Africa.

APRIL 1933—First plane flown over summit of Mt. Everest.

SEPTEMBER 1936—R. A. F. flier set new altitude record of 49,967 feet.

SEPTEMBER 1938—First long-distance, nonstop flight, Suez Canal to Australia.

SEPTEMBER 1939—First offensive raid of the war on German warships in Schillig Roads.

OCTOBER 1939—First leaflet raid on Berlin.

APRIL 1940—First raid on German bases in Norway, Denmark.

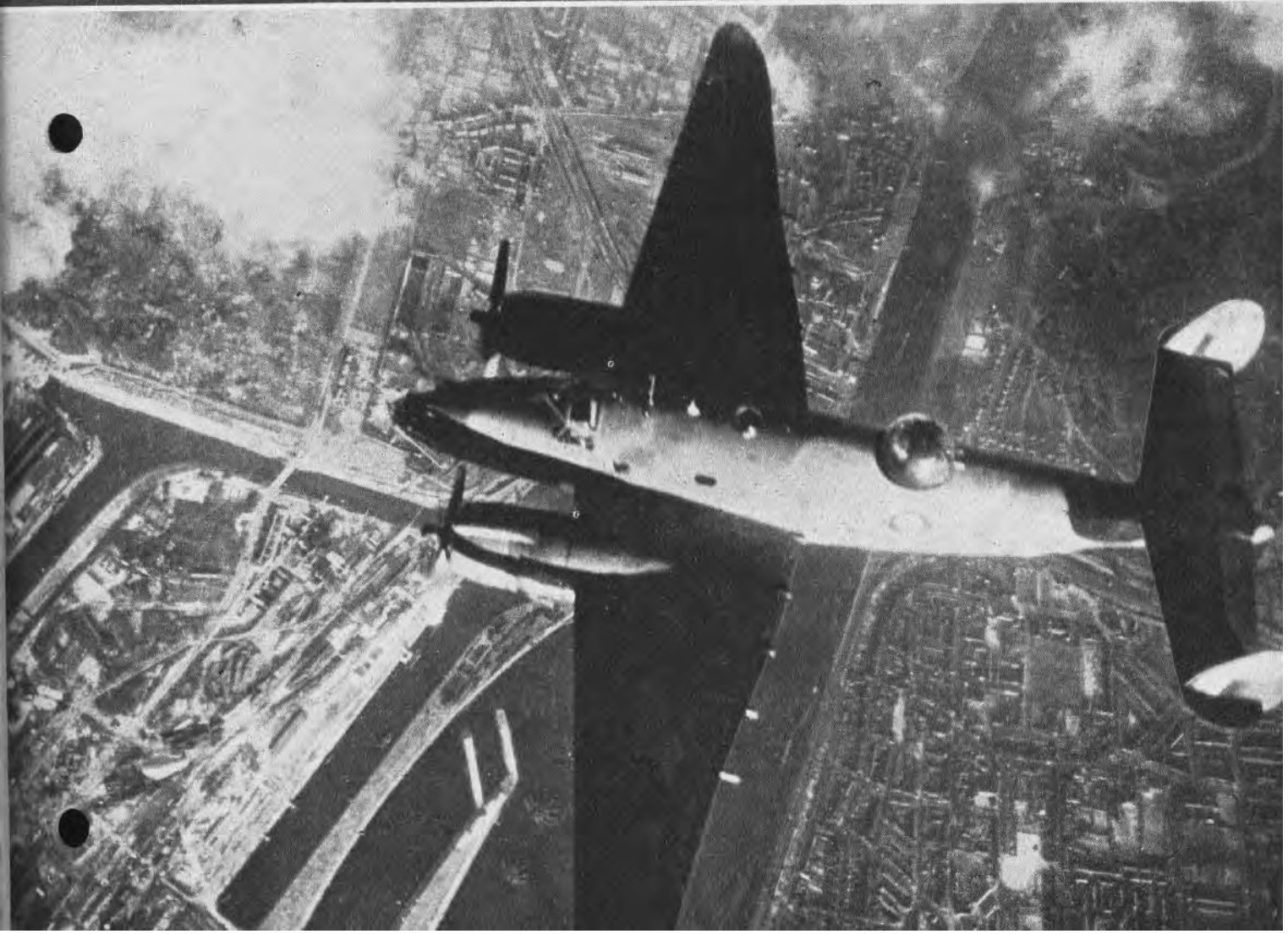
JUNE 1940—First R. A. F. long-range raid on Turin, Genoa, and Milan.

MAY 1942—First 1,000-plane raid on Germany.

NOVEMBER 1942—First 8,000-pound bombs dropped on Turin.

The RAF believes in firepower. Here the 8 guns of a Hurricane fighter loose a burst of 1600 rounds, with one in four a tracer drilling a pattern in the night

Ventura aircraft of RAF bombing command, escorted by fighters, carries out daylight attack on Ijmuiden, Holland, steel factory, doing widespread plant damage



THE BATTLE TURNS

ENGLAND GERMANY

WHEN the German *Luftwaffe* dropped the first bombs on English soil near Canterbury in May 1940, little did it know how inexorably it would reap vengeance a thousand-fold.

Reaching a climax in August and September and on through the fall, the black-crossed aerial armadas hammered Great Britain with everything they had to knock it out of the war. They failed and as the *Luftwaffe* tapered off because of terrific losses, RAF, retaliating, has poured streams of bombers over German-held Europe for the past two and a half years.

The Battle of Britain became the Battle of Germany and the tempo was stepped up. Already British bomb loads more than double what the *Luftwaffe* dropped on England. In two years Hamburg has been raided 115 times, Bremen 110 and the huge city of Cologne hit on 144 sorties. These numbers have multiplied with RAF over Germany almost nightly.

In the height of the blitz on England, the *Luftwaffe* sent over as many as 800 planes a day in its attempt to cripple RAF and British war industry and public morale. By May 1942, the Ruhr was getting that back with interest as 1,000-plane raids, all heavy bombers, dropped more than 1,500 tons of bombs a night. Dortmund took 2,000 tons in one hour. Since the war began Cologne has absorbed more than 500,000 incendiaries and the central part of city is reported to be 80 percent in ruins.

Getting Along on a Shoestring

Britain started the war with a shortage of heavy bombers and depended on two-engined bombers such as the *Wellington* and *Whitley* to carry the brunt of raids on Europe. Later it switched to huge *Stirlings, Lancasters* and *Halifaxes* and quadrupled bombloads carried by the night marauders.

Two-ton bombs soon were augmented by four-ton bombs that

Fast RAF Mosquito bombers drop devastating cargo on the Philips Radio works at Eindhoven, Holland, which had been turning out electrical equipment to help Nazis fight allied nations

A thousand-fold the RAF is repaying Germany and her satellite nations for scenes like the one below showing vast devastation strewn near St. Paul's cathedral in heart of London

plastered the industrial Ruhr. Mines were dropped in a daring raid to blow huge holes in the Moehne and Eder dams and flood lower Rhineland areas.

RAF plane losses run as heavy as 45 or 50 bombers a night as its planes encounter the best fighters the *Luftwaffe* can muster, plus radar-controlled antiaircraft. But that number is far below what the Germans lost in the height of the Battle of Britain.

RAF's *Spitfires* and *Hurricanes* had their best day on September 15, 1940, when they shot down 185 German bombers and fighters. They lost only 25 planes and 11 pilots in exacting that toll. A recapitulation of English and German plane losses shows 2,375 German planes were destroyed in daylight between August 8 and October 31, 1940, at a cost of 375 RAF pilots killed and 358 wounded.

Up to June 1 this year a total of 13,287 German and Italian planes have been destroyed since the start of the war by RAF and by antiaircraft fire. An additional 785 were downed by naval or merchant ships or the fleet air arm, making a total of 14,072 since the war started. This figure has been increased by the toll of the Sicilian campaign where *Luftwaffe* losses far exceed those of the superior Allied forces.

Long-range bombing is the order of the day today as British planes fly round-trip from England to northern Italy or from North Africa to Italy. Berlin has been hit by more than 75 raids, a late one dropping 2,000 tons of bombs, in addition to many nuisance raids by two-engined *Mosquito* bombers designed to spread the *Luftwaffe's* defenses.

In the three and a half years of aerial war ending July 1, 1943, the Germans have dropped 70,000 tons of bombs on England in a swiftly decreasing ratio while RAF has smashed the Ruhr and other German areas with 154,500 tons. The trend is best explained by the fact that England has absorbed only 1,000 tons of bombs this year to 76,000 tons rained on Germany.

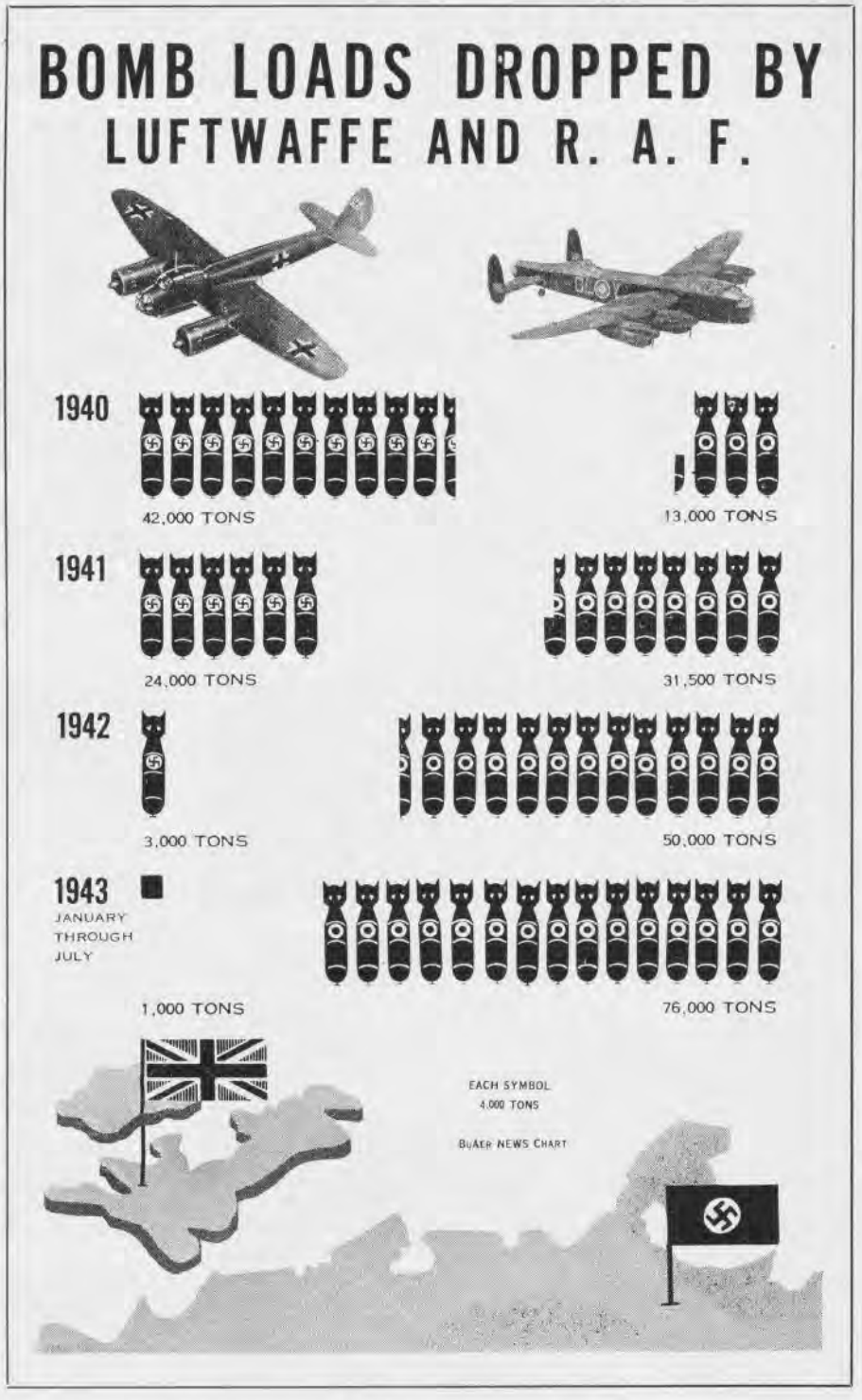
As the blitz wore on and German losses still were heavy, the *Luftwaffe* had to abandon daylight raiding and send its planes over by night. It was in this last phase of the Battle of Britain that most of the civilian losses were incurred.

During the 84 days of attack, 1,700 persons, mostly civilians, were killed in the daytime and 3,360 wounded, while 12,581 were killed at night and 16,965 wounded. No authentic figures are available on casualties in Germany since the English began paying back the Rhineland for the blitz, but they probably are many times as heavy.

The Germans had sunk five ships and damaged five more in coastal convoys during the blitz. They had damaged airdromes; they scored hits on a number of factories and damaged docks and various famous buildings, including Buckingham Palace. They destroyed many thousands of houses.

But they failed to do the most important thing—knock out RAF. By the winter of 1940 RAF was stronger than it was at the start of the Battle of Britain and the *Luftwaffe* had lost 2,375 planes in three months.

In later months U. S. Army Air Forces have supplemented RAF by raiding Germany in the daytime while *Stirlings* and *Halifaxes* were on the night run to the Rhine. In their first year of operations USAAF dropped 16,609 tons of bombs in 82 missions.



RAF LEADERS SHAPE GREAT BRITAIN'S

Leaders of Royal Air Force, some of whom are shown on these pages, were chosen for their experience in military aviation plus a capacity to handle responsibility that might broaden out today, tomorrow, the next day . . . depending on the vicissitudes of war. Frequent organization changes, characteristic of Royal Air Force, point to Britain's awareness that, in the lightning warfare of the clouds, keeping ahead means keeping adapted.

SIR ARCHIBALD SINCLAIR

Bt., K. T., C. M. G., M. P.

The Rt. Hon. Sir Archibald Sinclair, Secretary of State for Air and President of the Air Council, speaks for Royal Air Force in Parliament. Fifty-three years of age, he has been Secretary of State for Air since May 1940. In 1910 he entered the Army, becoming a major in the Second Life Guards. From 1919 to 1921 he was Personal Military Secretary to the Secretary of State for War, and in 1921–22, Private Secretary to the Secretary of State for the Colonies. He has been Chief Liberal Whip, Secretary for Scotland, and Leader of the Liberals in Commons where he had a brilliant political record.

SIR CHARLES F. A. PORTAL

G.C.B., D.S.O. & Bar, M. C.

Air Chief Marshal Sir Charles F. A. Portal, Chief of the Air Staff, as an observer in the Ro[illegible] Flying Corps in 191[illegible] encountered the German ace Immelmann during a flight, took a pot-shot at him with a Winchester automatic rifle, and caused minor damage to his aircraft. Born in 1893, he served as a despatch rider with the Royal Engineers in 1914. He became an instructor at the Imperial Defense College in 1935, and in March 1940 commanded Bomber Command before becoming Chief of British Air Staff in October.

SIR CHRISTOPHER LLOYD COURTNEY

K. C. B., C. B. E., D. S. O.

Air Chief Marshal Sir Christopher Lloyd Courtney, Air Member of the Air Council for Supply and Organisation since January 1940, has served as Deputy Director of Operations and Intelligence at the Air Ministry and as Director of Training. Fifty-three years old, he has been commissioned in all three fighti[illegible] services. He joined [illegible] Royal Naval Air Service in 1912 and received the D.S.O. in 1917 for services as wing commander in Dunkirk. His RAF service includes periods of duty in India and Iraq.

SIR ARTHUR W. TEDDER

K. C. B.

Air Chief Marshal Sir Arthur W. Tedder was appointed Air Officer Commanding in Chief of the Allied Air Forces in the Mediterranean Area upon the formation of the Air Command in that area in March 1943. Fifty-three years old, he entered the Dorset Regiment in 1913, and in June 1916 he entered the Royal Flying Corps. He was granted a permanent commission as squadron leader in RAF in 1919. In May 1941 he was named Air Officer Commanding in Chief for the Middle East area

DESTINY IN THE AIR

SIR SHOLTO DOUGLAS
K.C.B., M.C., D.F.C.

Air Chief Marshal Sir Sholto Douglas, Air Officer Commanding in Chief of the Middle East Command, was serving as Deputy Chief of the Air Staff until November 1940 when he became A. O. C. in C., Fighter Command. Now 50 years of age, he was an observer officer in the RFC in January 1914. One of his squadrons, No. 84, shot down 201 German planes and drove another 149 out of control. Following the war, he graduated from the RAF Staff College and from the Imperial Defence College.

SIR ARTHUR T. HARRIS
K.C.B., O.B.E., A.F.C.

Air Marshal Arthur T. Harris, Air Officer Commanding in Chief, Bomber Command, since February 1942, previously served for a period as head of RAF Delegation in Washington. He commanded the first night-flying experimental detachment in the last war for the defense of London against Zeppelins, later directing RAF in Palestine and Transjordan. Born in 1892, he joined the First Rhodesia Regiment in 1914, transferring to the Royal Flying Corps in 1915. In 1939 he was named Air Officer Commanding Bomber Group 5.

SIR WILLIAM L. WELSH
K.C.B., D.S.C., A.F.C.

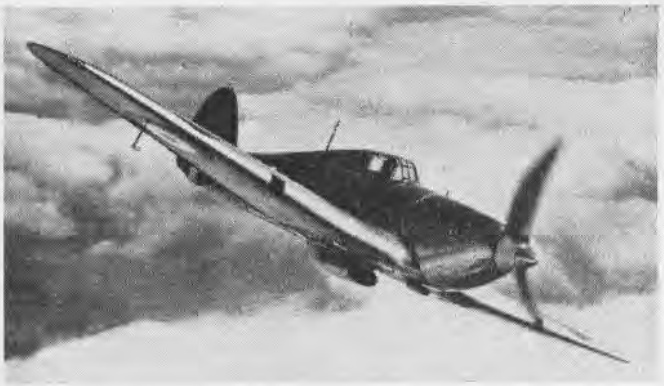
Air Marshal Sir William L. Welsh, head of the Royal Air Force Delegation in Washington, was the Air Officer commanding RAF forces during the landing in North Africa. Among recently held posts are: Air Member for Supply & Organisation at the Air Ministry, Air Officer Commanding RAF Flying Training, and Air Officer commanding Technical Training. He entered the RAF through the Royal Naval Air Service, in which he served from 1910 to 1918, and served as a pilot operating with units aboard aircraft carriers of the Royal Navy.

KING GEORGE VI
Marshal of Royal Air Force

GREAT BRITAIN has in King George VI, Commander in Chief of the Royal Air Force, the only monarch in her history who also is a qualified air pilot. The King saw service in the first World War in both the Royal Navy and the Royal Air Force, although he did not win his wings until after that war was over. He served aboard the H. M. S. *Collingwood* in the Battle of Jutland, being second in command of the battleship's fore turret. During the battle he was on top of the turret for a time until a shell narrowly missed him and he was ordered below by a superior officer. This engagement made him the first English prince to take part in a naval battle since 1780. Later in the war he served aboard the H. M. S. *Malaya* until illness forced him to retire. In 1917 he joined RAF and went to France as an adjutant. Because the King and the Government disapproved, he was not permitted to learn piloting until 1919. King George's experiences in the Navy and Air Force during the last war have proved valuable to him in the present conflict.

BRITISH PLANES STOPPED HITLER

NEVER before or since has an aviation fighting force acquired so much experience in so short a time as did Royal Air Force in the Battle of Britain. RAF began its defense with what then proved to be the world's two best fighters, the *Spitfire* and the *Hurricane.* Hitler's hordes of *Messerschmitts, Dorniers,* and *Junkers,* greatly outnumbering British squadrons, fell short of their objective. The reason lay in Germany's faith in Quantity, Britain's in Quality. Today, bettered by improvements developed from combat, British planes are leading an offensive many times more furious than the one they pushed back.



HURRICANE

In the Battle of Britain, *Hurricanes* shot down more aircraft than all other types put together. This low-wing single-seater fighter has a single in-line Rolls-Royce Merlin engine, attains a speed of 335 mph at 22,000 ft. Early models were used largely for interception at high altitudes. Service ceiling is 36,000 ft. This plane is one of RAF's most versatile fighters, also being used for low-level bombing, night-fighting and dive bombing. It carries 12 machine guns or four 20 mm. cannons. Wing span is 40 feet, length over 31 feet. Latest version is the "tank-buster" or "tin-opener", which has been fitted with 2 x 40 mm. guns.

WELLINGTON

Capable of carrying a bomb load of more than 4,000 lbs., this medium bomber is very popular and is being produced in large numbers. It weighs over 14 tons fully loaded, has a range of 3,200 miles. It is a twin-engined mid-wing monoplane of fabric-covered geodetic construction (framework of metal basket-weave type) which makes it hard to shoot down. Huge holes shot in the wings and fuselage have not prevented it from returning to home base. Maximum speed is about 244 mph; service ceiling is 18,000 ft. It has a span of over 86 ft. and length of 61 ft. Three gun stations, using power turrets, mount two to four guns each.

MOSQUITO

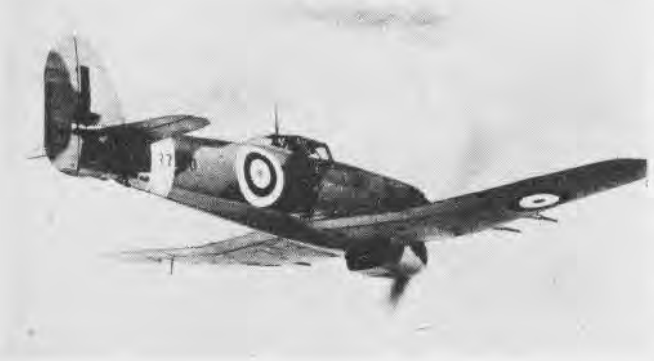
Claimed to be the fastest bomber in the world, the *Mosquito* can outdistance many interceptors, flying at a speed of more than 400 mph. It was used to bomb Berlin in the first daylight raid on the capital, after making its first operational flight in late 1942. This high mid-wing plane is constructed for the most part of plywood, which allows for widely dispersed manufacture. It carries a crew of two, has a span of 54 feet and length of almost 41 feet. It is powered by two liquid-cooled Rolls-Royce engines of unspecified h. p.; its armament is four 20 mm. cannon and four .303 cal. machine guns. Carries 4 x 500-lb. bombs.

BEAUFIGHTER

The twin-engined *Beaufighter* is a fast two-seater plane developed from the *Beaufort* bomber to answer the need for a heavily armed long-range fighter. It has a high service ceiling: 29,700 feet, and a maximum speed of over 330 mph. A mid-wing monoplane, it mounts six machine guns in the wings and four cannon, grouped in the nose. It is used principally as a night fighter but also performs as a day fighter, strafer, "tank buster" and with Coastal Command. Range is 1,500 miles, span is almost 58 feet, and length 41 feet. The undercarriage as well as the tail wheel of this plane is fully retractable for improved streamlining.

SPITFIRE

The *Spitfire,* now eight years old, is one of the finest fighters in the world. Its service ceiling is 37,700 ft., but the latest types have been credited with bringing down Ju–86P pressure cabin aircraft from nearly 50,000 ft. It has a top speed of 400 mph, using an in-line Rolls-Royce Merlin engine; a wing span of nearly 37 ft., and length of over 30 ft. Fast rate of climb, superior maneuverability, four .303 cal. machine guns and two 20 mm. cannon make the *Spitfire* a formidable opponent.



TYPHOON

The *Typhoon,* a new fighter, was specially designed to be built around one of the most powerful engines. It has a speed of more than 400 mph. It is powered by a Napier Sabre sleeve-valve engine of 24 cylinders, and carries either twelve .303 Browning machine guns or four 20 mm. Hispano guns in the wings. The *Typhoon,* designed for high-altitude fighting, is a low-wing single-seater monoplane with a large radiator intake under the nose. Span is 41 ft. 7 in. and length is 31 ft. 11 in. It is used as an Intruder and also as a Fighter Bomber, carrying 2 x 250-lb. bombs. It resembles the *Hurricane* in certain respects.

HALIFAX

Designed for speed in production, the *Halifax* is a heavy long-range bomber that has been used extensively over Germany and the Middle East. Not so fast as the *Lancaster,* it still makes nearly 300 mph. Pilots have rechristened it the "Halibag." Fuselage is of monococque construction; flight, navigation, and bomb control sections are forward of the engines, carry complete armor protection. Bomb load is 5½ tons, span is 99 feet, and length over 71 ft. Trailing edge flaps extend from fuselage to ailerons, permit take-off from ordinary airfields with heavy bomb load. The *Halifax* carries usual air crew of seven.

STIRLING

The *Stirling* carries one of the heaviest bomb loads of any bomber in operation, more than 8 tons. This mammoth monoplane went into operation in early 1941, the first British plane of this type to go into service. It has a maximum speed of approximately 300 mph. It is powered by air-cooled radial Bristol Hercules engines or Wright cyclones. Three power-operated gun turrets, armor-protected, use a total of eight Browning .303 cal. machine guns. Span is 99 feet, and length is over 87 ft. The *Stirling* has seen action in the heavy "Hamburg" raids over Germany and Italy, and is used in day and night raids.

LANCASTER

Called the mightiest of Britain's heavy bombers, the *Lancaster* is a 30-ton long range aircraft, with an outside range of nearly 3,000 miles. It has bombed Berlin, Cologne, the Ruhr, and Hamburg in devastating raids. Bomb load is 8 tons approximately. The *Lancaster* is a midwing monoplane of conventional design, said to be one of the easiest planes to build. It is being produced in large numbers. The four engines may be either radial or liquid-cooled in-line type. Maximum speed is approximately 300 mph. Span is 102 ft., length 69½ ft. Armament consists of 10 x .303 machine guns mounted in four power turrets.

MARINE CORPS AVIATION

Rattlesnakes Are a Hazard

But Jeeps Prove Best Remedy

MCAS, MOJAVE, CALIF.—Guards at the air station here are having trouble with rattlesnakes which thrive in the desert area. As many as four a day have been killed by men walking post around the station, making it advisable for sentries to wear leggings at all times for protection. Antivenom kits have been ordered from the medical department for use of men who have been bitten. So far the best way to kill the snakes without risking life and limb is to run over them with a jeep, the Station says.

New Landing Technique

Checks Swerving, Marines Find

MCAB, EL TORO.—Pilots of a Marine fighter squadron at this station have adopted a new technique of landing F4U–1's to counteract the swerving tendency evidenced immediately after landing.

The pilots use power, 30 degrees of flaps and keep the tail low rather than try to make three-point landings. By making moderate S–turns while taxiing, the blind spot on the nose of the plane is eliminated.

▶ ***BUREAU COMMENT***—**The raised cabin version of the airplane has now been started in the production line and delivery of these planes to service units will begin in the near future. It is believed that the improved vision resulting from this modification will facilitate landing and taxiing of the airplanes.**

Knee-Deep in Error

MCAS, MOJAVE.—Twelve Wildcats took off here on their first overwater hop, but after finishing their various tracking courses over the Pacific only 11 returned to base.

Finally, just before a squadron of TBF's took off to hunt for him, the missing pilot landed with 15 gallons of gas in his tank after a four-hour flight. The pilot's story was that before the flight he wrote the various headings on the knee of his flying suit.

The heading of the third leg was 057°. During the flight the zero got blurred and he read it as 257°. After 45 minutes he realized his mistake. Then he took a heading of 110° for 10 minutes while he plotted his position.

He flew a heading of 80° until he thought he was on the third leg, whereupon he headed for the coastal airfield. (Plotting-board amateurs who diagram the above positions may well wonder how the pilot ever got back to home plate, and whether he thought that 110° was the back azimuth for 257°.)

Moral: Check positions in advance and write heading in large figures on the plotting boards. If the Moslems, no matter where they are, know the direction of Mecca when they want to pray, pilots should at least know the general direction of Point 0 before it becomes too late to pray. This pilot was trained at Corpus Christi, and after flying over the Gulf of Mexico fell into the habit of turning west to raise a landfall. A little common sense often helps; it's a good thing to remember on *which side of what continent* you are stationed.

Chute Kit Bag Utilized

Drops Supplies to Pilots

MCAS, CHERRY POINT.—An ordinary parachute kit bag, or chafing bag as it often is called, serves as an emergency cargo container to hold supplies for pilots forced down in swamps.

A quick attachable chest type parachute is snapped to the two handles of the bag. Into the bag is dumped supplies such as water, food, blankets, flares, and dry flight clothing.

A 10-foot line serves as a static line, and the bag and chute are dropped to the stranded pilot. Actual use has shown that this bag will withstand a load of at least 100 pounds.

Sarong's the Style Today

Original Uniforms for Marines

The sarong is the official uniform worn by the First Samoan Battalion of the U. S. Marine Corps Reserves. It consists of a khaki lava-lava, a skirt, reaching below the knees with scarlet stripes around the bottom. Chevrons denoting rank are worn an inch from the bottom of the lava-lava.

LEATHERNECK AND LAMOUR VERSIONS DIFFER

Samoan Marine Corps Reservists are Polynesian natives enrolled as reservists for the duration and trained by Leathernecks stationed on the island. The uniform is patterned after regalia worn by the famous Fita Fita guard, which has patrolled the area and has guarded the territory's prison for more than two score years.

The Samoan Marines wear their sarongs with a khaki turban, an undershirt and a scarlet sash. Shoes and socks are not required. Despite the fact that very few members of the native reserve speak English, they rarely misunderstand an order or request.

Loose Hose Causes Fire

Flaming Engine Drops Through

MCAS, KEARNEY MESA.—A loose hose connection was blamed for a fire which destroyed the port engine of an R4D–1, just after the pilot had taken off on his solo flight.

There was a sudden loss of power and the pilot turned back to the field to make a downwind landing. During the turn he saw the engine was afire. It dropped off the plane as it rolled to a stop.

All other planes immediately were grounded and thoroughly checked. Other loose connections were found and a new checking procedure inaugurated as a result.

TECHNICALLY SPEAKING

The Square Search Computer

Pilot Precomputes True Headings

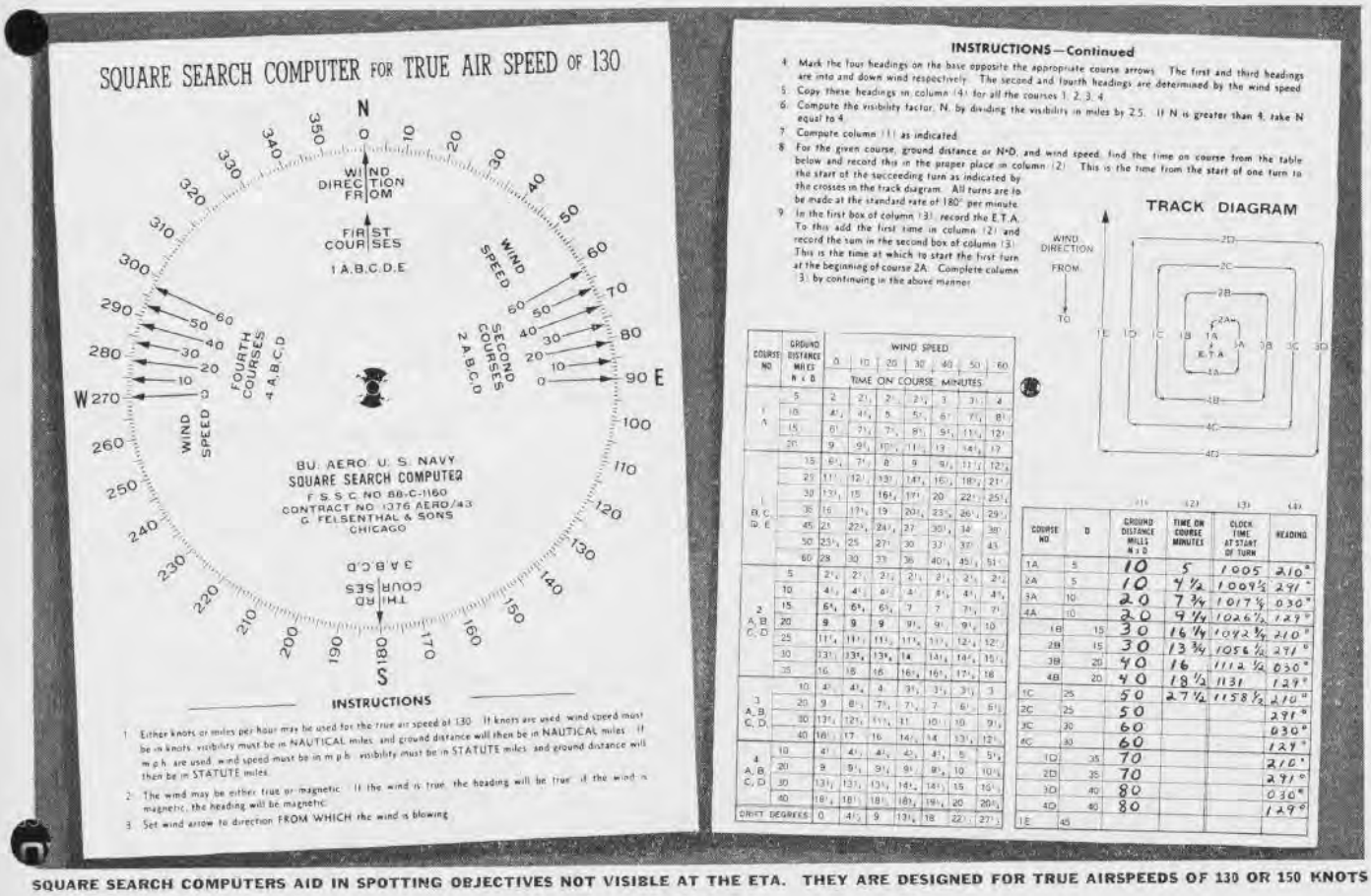
The Square Search Computer has been developed to aid pilots in locating an objective when this objective is not visible at a given point (the E. T. A.). Each computer is designed for a true airspeed, 130 knots, FSSC #88–C–1160 or 150 knots, FSSC #88–C–1165. With this computer, the pilot may precompute his true headings and clock time of turns on each leg of a square search flight path for any given conditions of visibility and wind.

Face of the computer contains a compass rose and a rotatable disk with the true headings indicated. At a true airspeed of 130 knots if wind is 20 knots from 220 degrees, first course will be 220°, second course will be 301°, third 40°, fourth 139°. These, compensated for variation and deviation, may be written in the last column of the chart on the reverse side of the computer. Visibility factor is computed by dividing by 2.5. Resulting nearest whole number is multiplied by distance given on chart, and column 1 is filled in. From precomputed chart included on back of computer, time on each course is taken and written in column 2.

Sample Problem Filled in on Chart

The sample problem which has been filled in on the blank chart assumes a wind of 20 knots from 220°, and a visibility of five miles. Variation is 10° East, deviation has been ignored for the sake of simplicity. Five was divided by 2.5, giving a visibility factor of 2. Each value D was then multiplied by two to give values in chart column (1). Time on course, column (2), was obtained by finding precomputed values under wind speed 20 knots, opposite the appropriate course numbers and ground distance figures. Clock time at E. T. A. was assumed as 1000, giving all times in column (3). All that's left to do is fly the headings in column (4) by times indicated in column (3).

Square search computers are made of white vinylite which may be erased and used many times. The 130 knot square search computer, FSSC #88–C–1160, has been distributed previously and may be obtained from stock at the following Naval Air Stations: Corpus Christi, Jacksonville, Pensacola, Quonset Point, San Diego, and Pearl Harbor. The 150 knot computers, FSSC #88–C–1165, were available for delivery in August. They may be drawn from stock at the following stations in addition to those mentioned above: Alameda, Norfolk, Seattle, San Juan, Trinidad, Miami, Cherry Point, Atlanta, and the Naval Aircraft Factory at Philadelphia.



SQUARE SEARCH COMPUTERS AID IN SPOTTING OBJECTIVES NOT VISIBLE AT THE ETA. THEY ARE DESIGNED FOR TRUE AIRSPEEDS OF 130 OR 150 KNOTS

Boresight Template Designs

Inaccuracies in Method Cited

Two designs of boresighting templates for VF-type aircraft have recently been submitted to the Bureau. These templates were designed for boresighting airplanes where sufficient space was not available for utilizing target screen and boresight bracket method as described in Bureau of Aeronautics Technical Note 64–42.

In one case boresight template is mounted on engine reduction gear housing, and in the other on the brush box housing of the engine. While the template method of boresighting is satisfactory for use under the above conditions, there are inherent inaccuracies in this method and it should not be used where it is possible to use the target screen and boresight bracket method. Inaccuracies referred to are due to the following:

1. Wing guns are not accurately jigged in fixed positions with reference to engine.
2. Condition of flexible mountings of engine may cause sizeable deviations.
3. Any slight error in aligning a gun with target is magnified many-fold at longer ranges due to short distance between gun and target.

Where boresight templates are used, the design could be improved by addition of a vertical member extending downward on which a horizontal reference line could be positioned. By sighting along the ends of the boresight brackets, this line (and consequently horizontal arms of template) could be adjusted so as to be in a true horizontal position with reference to airplane, thus canceling error due to flexible engine mounting. In order to allow for the above adjustment, holes through which template is bolted to the engine should be slotted to permit necessary range of adjustment.

(Succeeds list dated June 15, 1943)

LATEST NUMBERS OF ENGINE BULLETINS AND CHANGES

August 10, 1943

Engine	Bulletin	Change	Date
Pratt & Whitney			
R–985	175		7–10–43
R–985	176		7–20–43
R–1340	193		Being issued
R–1340	194		7–20–43
R–1535	217		7–20–43
R–1690	200		Being issued
R–1690	201		7–20–43
R–1830	309		Supp. 7–7–43
R–1830	320		5–15–43
R–1830	321		Being issued
R–1830	322		7–16–43
R–1830	323		Being issued
R–1830	324		Being issued
R–1830	325		7–21–43
R–1830	326		7–20–43
R–1830	327		Being issued
R–1830	328		7–20–43
R–2800	69		6–29–43
R–2800	70		6–29–43
R–2800	71		7–2–43
R–2800	72		7–7–43
R–2800	73		7–7–43
R–2800	74		7–7–43
R–2800	75		7–17–43
R–2800	76		Being issued
R–2800	77		7–15–43
R–2800	78		7–20–43

Engine	Bulletin	Change	Date
Wright			
R–1820	314		Revised June 43 Mailed 7–6–43
R–1820	332		Being issued
R–1820	333		7–12–43
R–2600	69		Revised June 43 Mailed 7–2–43
R–2600	76		Supp. 7–2–43
R–2600	94		7–1–43
R–2600	95		Being issued
R–2600	96		7–21–43

General Engine Bulletin	Date
1	6–24–43
2	6–30–43
3	6–30–43
4	Being issued
5	7–13–43

It will be noted from the above list that no engine changes have been sent out since the last issue. Instructions which would on the basis of past practice be issued as engine changes are now being issued as bulletins with the intent of simplifying the identification of instruction and information material issued by the Bureau concerning engine operation and maintenance. It will further be noted under the date column that the latest supplements, revisions, or reissues are now shown. Supplements obviously must not replace basic bulletins in service files but should be attached to them. However, revisions do replace the previous issues and to avoid inadvertent reference to superseded instructions all such issues should be destroyed. Occasionally reissues are sent out. Reissues also replace the previous publications but differ from revisions in that only minor corrections are made.

CALLING ALL SQUADRON COMMANDERS

Does Each of Your Pilots Know

FUEL SYSTEM of your planes?

Windshield Glare Cured

Device Shades Sun's Rays

NAS, LIVERMORE, CALIF.—Sun shining on the fuselage between the windshield and forward edge of cockpit of an N2T–1 and an N2S casts a reflection on the windshield which interferes with the pilot's vision. Both the yellow surface of the N2T–1 and the aluminum color of the N2S reflect the sunlight.

To correct this, M & E devised half-moon shaped pieces of cotton cloth, dyed locker green and roughed up with sandpaper, and affixed them with dope to the shiny surface. This was found to dispel the glare. The device is used in both front and rear cockpits of the N2T–1 but is necessary in only the rear cockpit of the N2S, the forward cockpit being shaded by the upper wing.

How to Remove Fabric Dope

Lambert Field Advises Six Steps

NAS, LAMBERT FIELD.—The A & R Shop here has developed a time-saving and effective method for removing old dope from aircraft fabric. Six steps are involved:

1. Mix cellulose acetate dope half and half with thinner. (Dope used must be of the acetate type because of its rapid dissolving action upon all types of dope.)
2. Get enough cheesecloth to cover completely that section from which the old dope is to be removed.
3. Using the doped mixture described in paragraph 1, give the surface to be removed

a good coat and while it is still wet apply the piece of cheesecloth over the top of the section just doped.

4. Dope the top of the cheesecloth, using the same mixture of dope and thinner and allow to dry at least 10 minutes or until the surface feels dry to touch.

5. After the surface is dry, apply pure acetate thinner liberally to the underside of the surface containing the cheesecloth. This should be done with a brush (same type used to apply dope) and should be brushed thoroughly into the fabric.

6. While the underside is still wet, pick up one corner of the cheesecloth and pull it evenly across the surface that has the thinner under it. The dope will come off on the cheesecloth leaving the fabric clean and clear of any old dope. If small patches refuse to peel off with the cheesecloth, it is probably due to not enough thinner on the underside of the fabric or because it was allowed to dry out too much before pulling off the cheesecloth.

Best results are obtained when only acetate dope and thinner are used in this operation.

[Dev. by E. J. Rolston, AMM3c]

ANSWERS TO DEAD RECKONING AND CELESTIAL NAVIGATION PROBLEM

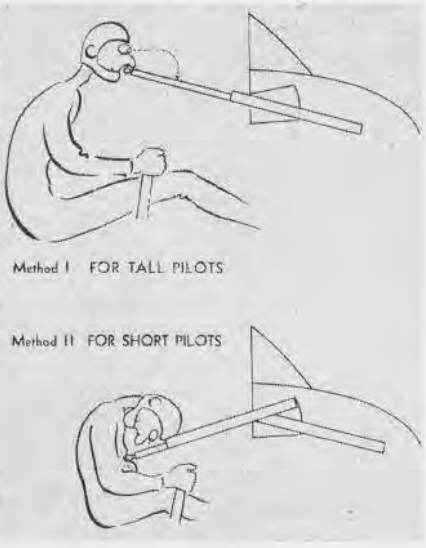
(See page 11)

True heading	132°
Predicted ground speed	121½ k
1715 DR position	Lat. 27°–29′ N
	Long. 79°–16′ W
1715 fix	Lat. 27°–25′ N
	Long. 79°–06′ W
Actual ground speed made good	135 k
Wind	From 238°
	Force 30 k
ETA at end of first leg	1723
True heading	023°
Predicted ground speed	150 k
ETA at end of second leg	1835
Position of life raft	Lat. 29°–08′ N
	Long. 77°–27′ W
Course from end of second leg to base	244°
Distance	215
True heading	243°
Predicted ground speed	94 k
1945 DR position	Lat. 29°–09′ N
	Long. 78°–42′ W
Position of the 1945 fix	Lat. 28°–59′ N
	Long. 79°–04′ W
Actual ground speed	124 k
Revised ETA	2033

NOTE: Tolerances of two or three miles or two or three degrees from the answers are considered correct.

The word "torpedo" was coined by Robert Fulton from the "torpedo electricus" which is the scientific Latin name for crampfish which mortally wounds its victims by shock.

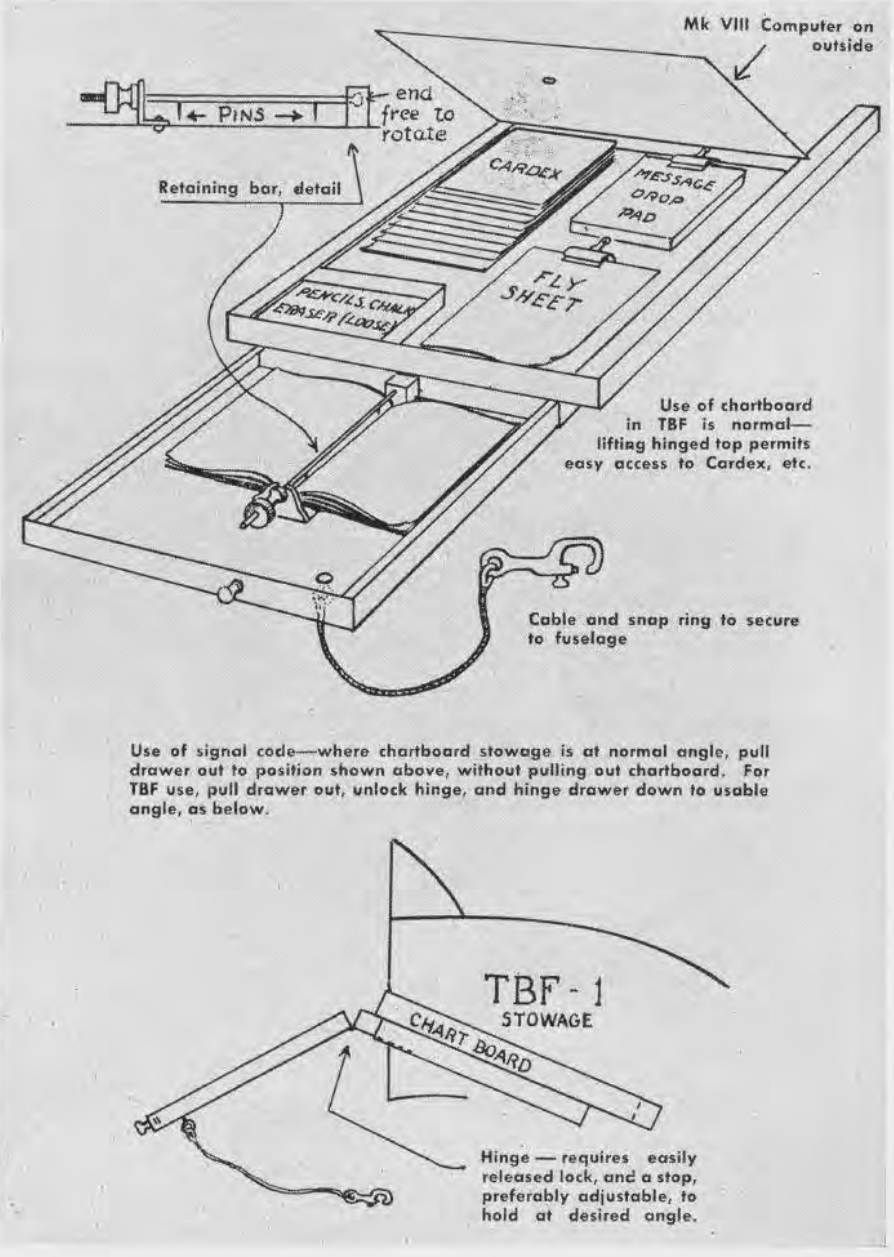
CHARTBOARD INSTALLATION IN TBF-1



Dissatisfaction Noted First Time in Recent RUDM Defining Trouble

A recent RUDM from VT–4 indicated dissatisfaction with the chartboard installation in TBF–1 airplanes. The sketches depict troubles encountered by VT–4 pilots.

▶ ***BUREAU COMMENT***—**This is the first report regarding unsatisfactory chartboard installation in this type of airplane. In general, it is believed that the installation is well adapted for use of all sizes of pilots. Actually, the illustrations appear to enlarge upon the improper way it can be used and neglect to show normal operation of the chartboard and drawer in a horizontal position. Suggestions and comments from other squadrons on the desirability of this installation are invited by the Bureau.**



Wingtip Skids Installed

Ottumwa Has Bureau Authority

NAS, OTTUMWA, IOWA.—The A & R Department at this Station has developed a 6-pound installation of wing-tip skids for protection of wing panels and ailerons against damage when an airplane ground-loops. Wing-tip skids have been installed on a number of airplanes used in routine flight training. A 200-hour flight test has demonstrated prevention of damage to wing panel and aileron on airplanes which ground-looped violently. The wing-tip skid absorbs loads applied in any direction without failure, the strength in torsion and bending being approximately equal.

No damage to the wing structure at the point of attachment has been observed on planes equipped with the newly designed skid. No change in flight characteristics of airplanes equipped with skids has been observed in routine flight and test flights.

Verbal authority to install on airplanes has been obtained from CNAPrimTra. Prints of the assembly and installation will be made available on request.

▶ ***BUREAU COMMENT***—**Bureau approval for this installation has been granted for NAS Ottumwa alone. It is desired that separate approval be requested by each station contemplating its use, as the Bureau wishes to follow closely the service experience in each case. Drawings and data may be obtained directly from NAS, Ottumwa.**

Aircraft Arming Replica

The Aircraft Arming Replica is a full-size wooden copy of the portion of a combat airplane which contains ordnance equipment. It is used, in place of an actual airplane, to train aviation

AOM'S LEARN REARMING JOB IN MODEL PLANE

ordnancemen in rearming and boresighting techniques. Replicas of the following airplanes are available from BuAer's Special Devices Division: F4F–4, F4U–1, SBD–5, SB2C–1 and TBF–1. Other replicas will be available in the near future.

The replica is a wooden structure, covered with a plywood skin. VF replicas have outer wing panels extending to a station immediately outboard of the last piece of ordnance. These wings fold like the wings of the original airplane.

Contours of the wings and fuselage are accurately duplicated. Gun compartments, bomb bays, turret mounts, etc., are also faithfully copied. All operating gear is supplied.

Plane Has Wheels, Tail

The replica has wooden wheels and a spring-mounted movable tail wheel.

Replicas of airplanes having hydraulic gun chargers are equipped with the necessary hydraulic system, actuated by a hand pump.

These replicas may be utilized for training of teams of aviation ordnancemen in rearming and boresighting procedure. Thus necessary training is provided without grounding operational craft.

Use of this device provides for increased arming speed and proficiency on the part of aviation ordnancemen.

Delivery time is from four weeks to four months after approval of the request, depending upon model ordered. Comments and suggestions on this training device are invited by the Special Devices Division of BuAer.

(Succeeds list of July 15, 1943)

NUMBER AND DATE OF ISSUE OF LAST SERVICE AND OBSOLESCENT AIRPLANE BULLETINS AND CHANGES (CONTRACT CHANGES NOT INCLUDED)

August 15, 1943

Airplane	Bulletin	Date	Change	Date
F4F–3	41	6–17–43	132	7–7–43
F4F–3A	34	6–17–43	108	7–7–43
F4F–4	35	6–17–43	91	7–7–43
F4F–7	9	6–17–43	36	7–3–43
F6F–3	8	7–9–43	25	7–22–43
FM–1	15	6–17–43	35	7–7–43
F4U–1	14	6–10–43	61	6–15–43
J2F–3	16	7–10–43	28	5–4–43
J2F–4	11	7–10–43	21	5–4–43
J2F–5	12	7–10–43	14	5–4–43
N2S–1	19	7–21–43	30	3–31–43
N2S–2	13	7–7–43	12	3–31–43
N2S–3	16	7–21–43	22	3–31–43
N2S–4	8	7–21–43	3	3–31–43
OS2N–1	25	7–12–43	27	5–8–43
OS2U–3	50	7–12–43	60	3–25–43
PV–1	7	7–9–43	38	7–16–43
PV–3	4	1–20–43	8	7–9–43
PBM–3	28	6–30–43	81	7–3–43
PBM–3C	24	6–22–43	37	7–5–43
PBM–3R	20	6–30–43	76	7–3–43
PBM–3S	1	6–22–43	4	7–3–43
PBN–1	2	3–26–43	11	7–21–43
PBY–5	36	7–22–43	128	7–10–43
PBY–5A	41	7–22–43	122	7–10–43
PBY–5B	5	7–22–43	26	6–16–43
PB2Y–3	6	5–18–43	78	7–23–43
PB2Y–3R	5	7–2–43	68	7–23–43
PB4Y–1	20	7–16–43	32	7–10–43
R4D–1	11	7–12–43	13	3–11–43
R4D–3	7	7–12–43	10	4–2–43
R5D–1	1	5–26–43	25	7–20–43
R5O–4	3	7–7–43	10	4–24–43
R5O–5	3	7–7–43	5	7–1–43
SBD–3	69	7–13–43	132	7–9–43
SBD–4	21	7–21–43	36	7–9–43
SBD–5	9	7–15–43	15	7–19–43
SB2A–4	2	7–19–43	56	7–8–43
SB2C–1	9	7–19–43	6	5–4–43
SNB–1	7	7–12–43	14	7–3–43
SNJ–3	21	7–20–43	18	5–22–43
SNJ–4	15	7–20–43	15	6–23–43
SO3C–1	23	8–3–43	47	7–7–43
SO3C–2	15	8–3–43	29	6–7–43
SO3C–2C	4	7–23–43	2	1–20–43
TBF–1	61	7–23–43	130	7–22–43

USING SCRAPPED ENEMY PARTS

METRIC SCREW THREADS MUST BE CUT ON FITTINGS

SCRAPPED enemy parts of suitable size and material are sometimes adaptable for use by U. S. forces in the field, but frequently they are of little value unless it is possible to cut metric screw threads on fittings. Sketch and table show how occasional repair jobs may be made in the field.

In preparing lathe for cutting metric screw threads, the compound rest is located so that it travels parallel with lathe ways. Compound rest lead screw is removed and tool rest travel is partly controlled by a lever, tool travel being retarded a fixed amount depending on dimensions of the lever. Three set-ups handle 17 of the 21 standard metric pitches in common use. Lever control is automatic, and thread cutting proceeds in a normal manner even to the use of the thread dial indicator for the US pitch used.

The necessary additional parts may be made as simple as desired consistent with required accuracy. As the tool is fed in for successive cuts, ratio and pitch change. This may be compensated for by originally adjusting set-up with the tool in its final cutting position, so that final cut is to desired pitch. This error is small, but light cuts are recommended on long threads as the effect will be cumulative.

In many cases, a piece with the desired thread pitch may be available. This can be chucked and lever and pivot positions adjusted to generate this pitch without reference to special dimensions.

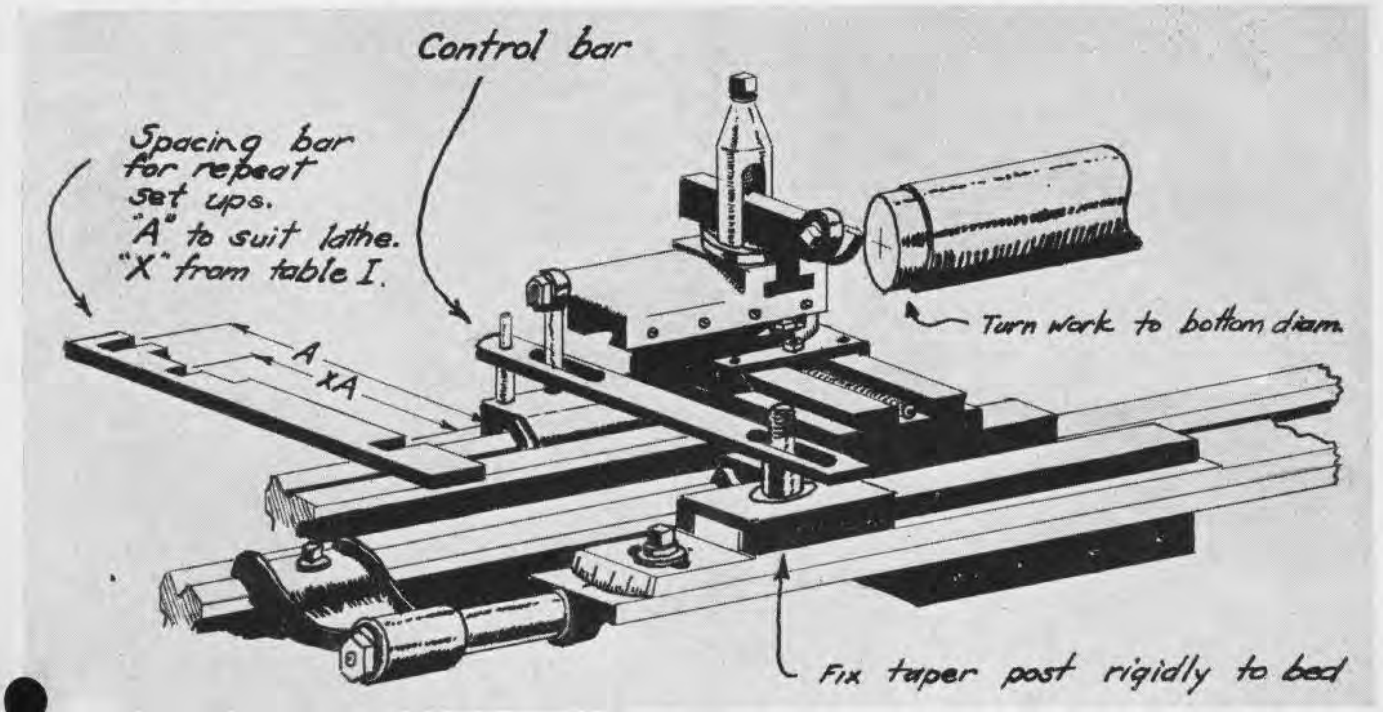
The metric thread is a 60° thread, the same as the US thread. For convenience, depth of a single thread and width of flat are included in the table in decimals of an inch, the depth equaling 0.6495 p and the flat p/8.

TABLE OF THREAD DATA

Nominal Metric Pitch, millimeters	Threads per inch	Suggested US Thread	X	Depth of Single Thread, inches	Width of Flats, inches
.5	50.800	36	.709	.0128	.002
.6	42.333	28	.662	.0154	.003
.7	36.286	26	.716	.0179	.004
.75	33.867	24	.709	.0192	.004
.8	31.750	22	.692	.0205	.004
.9	28.222	20	.709	.023	.004
1.0	25.400	18	.709	.0256	.005
1.25	20.320	14	.690	.032	.006
1.5	16.933	12	.709	.0384	.008
1.75	14.514	12	.827	.0448	.009
2.0	12.700	9	.709	.0512	.010
2.5	10.160	7	.690	.0640	.012
3.0	8.467	6	.709	.0768	.015
3.5	7.257	6	.827	.0895	.017
4.0	6.350	4½	.709	.105	.020
4.5	5.644	4	.709	.115	.022
5.0	5.080	3½	.690	.128	.025
5.5	4.618	3¼	.704	.141	.027
6.0	4.233	3	.709	.154	.030
6.5	3.908	3	.767	.167	.032
7.0	3.629	3	.827	.179	.035

$$X = \frac{\text{US threads used}}{\text{threads per inch desired}}$$

Other ratios may be used if the above do not fit the job.



CAPTURED EQUIPMENT CAN OFTEN BE TURNED AGAINST ENEMY BY RECUTTING THREADS ON FITTINGS. THREE SETTINGS HANDLE MOST COMMON PITCHES

LETTERS

SIRS:

A Marine fighter squadron at this station probably has as distinguished an array of air heroes commanding it as any in the nation. Its commanding officer fought with the "Flying Tigers" in China and its executive officer won the Navy Cross for his fighter tactics at Guadalcanal. The navigation officer holds the Navy Cross for similar exploits. The communications officer won a Distinguished Flying Cross and the flight officer the Air Medal and Purple Heart.

MARINE CORPS AIR STATION
El Toro, Calif.

SIRS:

This activity has been very much interested in comments from other NACSBs regarding plans for the publication of magazines or newspapers designed to cover all activities under the jurisdiction of the respective boards, since a similar project is soon to make its appearance from this Board.

Very shortly *Upcheck*, the excellent publication of the soon-to-be-discontinued FIS, Lockport, Ill., will become the composite voice for NACSB, Chicago, and all activities under our jurisdiction. It will contain news sections on all activities, a department for news and educational features of interest to men on our backlog and considerable material of general interest to and about Naval Aviation.

OFFICER IN CHARGE
Naval Aviation Cadet Selection Board
Chicago, Ill.

SIRS:

In operation since July 26, the new Ship's Time is successful, according to consensus here. In order to allow personnel to sleep during the cool hours of the night, Ship's Time was set two hours behind Pacific War Time. Shortened daylight hours which will interfere with flying will necessitate gradual adjustment to Pacific War Time.

COMMANDING OFFICER
NAS, Pasco, Wash.

SIRS:

It is requested that this office be furnished with one copy of each issue of Naval Aviation NEWS commencing Jan. 1, 1943, up to and including Sept. 15, 1943. It is further requested that this office be placed on the mailing list for all future issues.

EXECUTIVE SECRETARY
Army Air Forces Equipment Board
Orlando, Fla.

SIRS:

In accordance with the newly inaugurated policy of the Bureau of Naval Personnel of offering certain categories of aviation cadets the option of discharge from the Naval Service, this Board has completed the task of mailing well in excess of 800 letters to eligible men who are under our jurisdiction. It is interesting to note that less than one-half of one percent took advantage of this offer.

OFFICER IN CHARGE
Naval Aviation Cadet Selection Board
Washington, D. C.

SIRS:

A committee to review adequacy of personnel complements visited this station recently. The purpose of the visit was to examine the existing station complement with a view to making replacements by Waves, Civil Service personnel, etc., to release men for sea duty. Each department head submitted to the personnel officer a careful analysis of his personnel needs with a statement as to ratings which could be replaced. The visit had a beneficial effect in that we became more completely familiar with the department's personnel policies, and it gave us the opportunity to reexamine our own personnel problems.

COMMANDING OFFICER
NAS, St. Louis, Mo.

SIRS:

If possible, this school would like to receive regularly the publication, Naval Aviation NEWS. It is felt this publication can be used to advantage in connection with the training program of this school. If this request can be complied with, the copies should be mailed to the Director of Ground School, Army Air Forces Navigation School, San Marcos Army Air Field, San Marcos, Texas.

DIRECTOR OF GROUND SCHOOL
Army Air Forces
San Marcos, Texas.

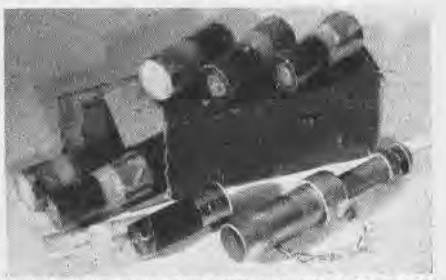
Close the Hatch!

Several activities have reported that on the Model PBM–3, –3R, and –3C airplanes the auxiliary power plant hatch-cover stop-brace bends and breaks due to the slip-stream pressure against the open hatch cover when the engines are being warmed up.

The hatch is not designed to be left open when the engines are being warmed up and should be used only to permit ingress and egress to the auxiliary power-plant compartment. It is recommended, therefore, that operating personnel close the hatch after entering or leaving the compartment.

Pyrotechnic Projector Kits

A sufficient quantity of pyrotechnic projector kits to equip all life rafts now in service has been procured under contract N288s–11320, and is being delivered to all major supply points for inclusion in the life raft equipment container as detailed in TN 6–43 dated February 15, 1943.



SIGNALLING KITS ARE FOR USE ON LIFE RAFTS

The opened kit consists of one projector and six red Very's shells. Each shell is sealed in a waterproof plastic container and the entire kit is protected by a wax dipper cardboard carton. The hand projector will fire the shell approximately 250 feet in the air and no apparent recoil results when the projector is operated. It is considered that this kit will provide an adequate night signalling medium for personnel afloat water.

Activities should requisition the kits from the major supply points as required. Inasmuch as no specifications are available for this item at present, they should be requisitioned as "Contract N288s–11320 Pyrotechnic Projector Kits."

"You And Your Silly Premonitions of Disaster"

BEST ANSWERS
To questions on page 13
1. d 2. d 3. c 4. e 5. b 6. e

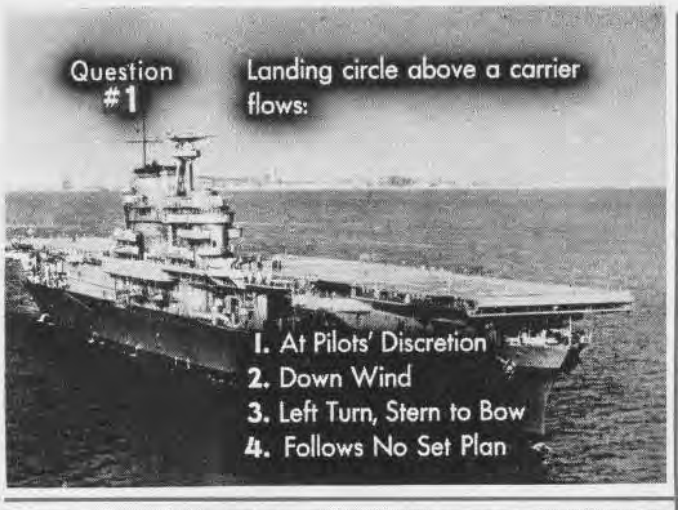
ANSWERS TO PIX QUIZ
on inside back cover
1.3 2.2 3.3 4.4 5.3 6.2

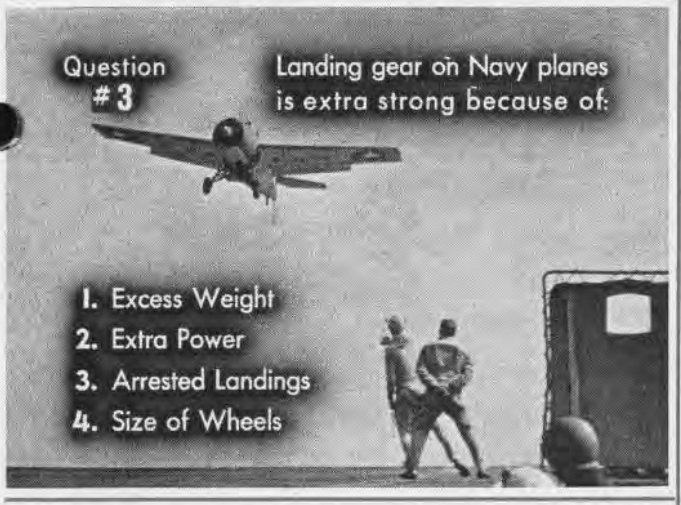
WHAT DO YOU KNOW ABOUT CARRIERS?

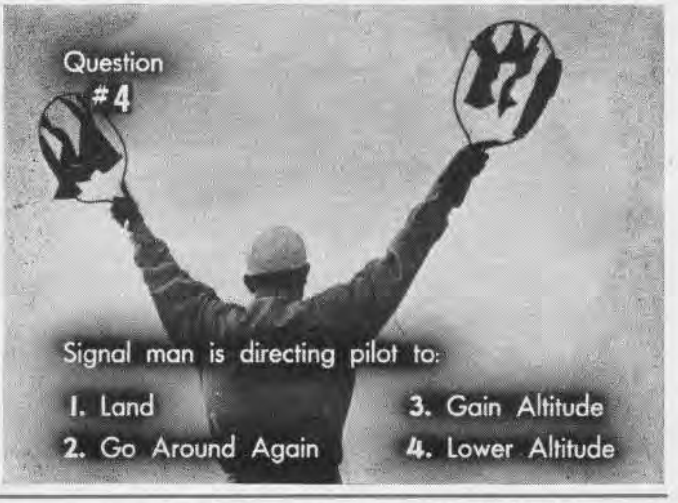
In 1915 a young Nip naval officer named Yamamoto said: "The most important ship of the future will be a ship to carry airplanes." What Yamamoto did not predict, or foresee, was that carriers are destined to play a big part in humbling his nation. **Answers on page 32.**

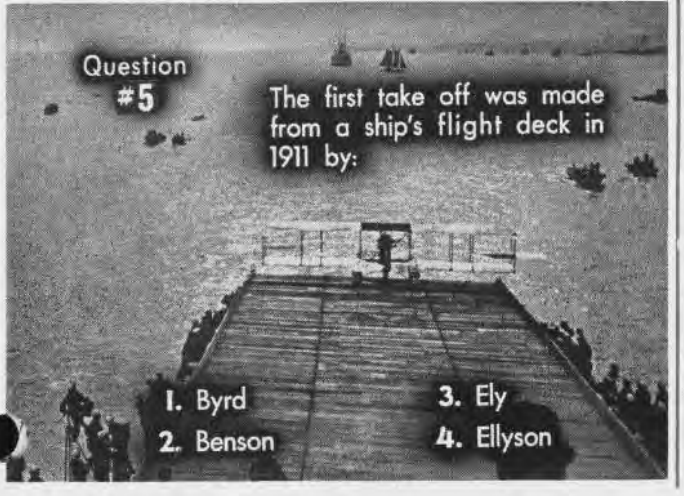
Write your answers here

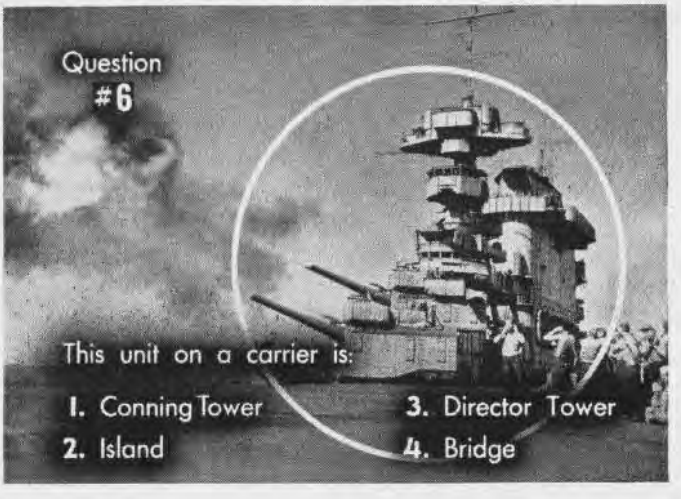
1		4	
2		5	
3		6	











DORNIER "Do 217"

Span—62 feet 5 inches.
Length—56 feet 6 inches.
Service Ceiling—29,000 feet (with normal load, 22,500 feet).
Approximate Speed—325 m. p. h. at 17,000 feet.

DISTINGUISHING FEATURES—Twin-engine, shoulder-wing monoplane. Short tapered wings with round tips. No dihedral. In side view, a long thin fuselage with thick nose. Dorsal turret in rear of cockpit. Twin fins and rudders at outboard of stabilizer.

INTEREST—This aircraft was introduced during the first part of 1942. It is used for level precision bombing and has also been in action as a torpedo bomber against convoys. In addition, this Dornier operates as a dive bomber and for this purpose may carry a novel "umbrella" type jettisonable diving brake in its tail, used to slow its speed. The Do 217's are very formidable airplanes and it takes the most modern of fighters to deal with them. They are the current Dornier bomber, the older Do 17Z being obsolete. Several modifications differing somewhat in detail are also in use.