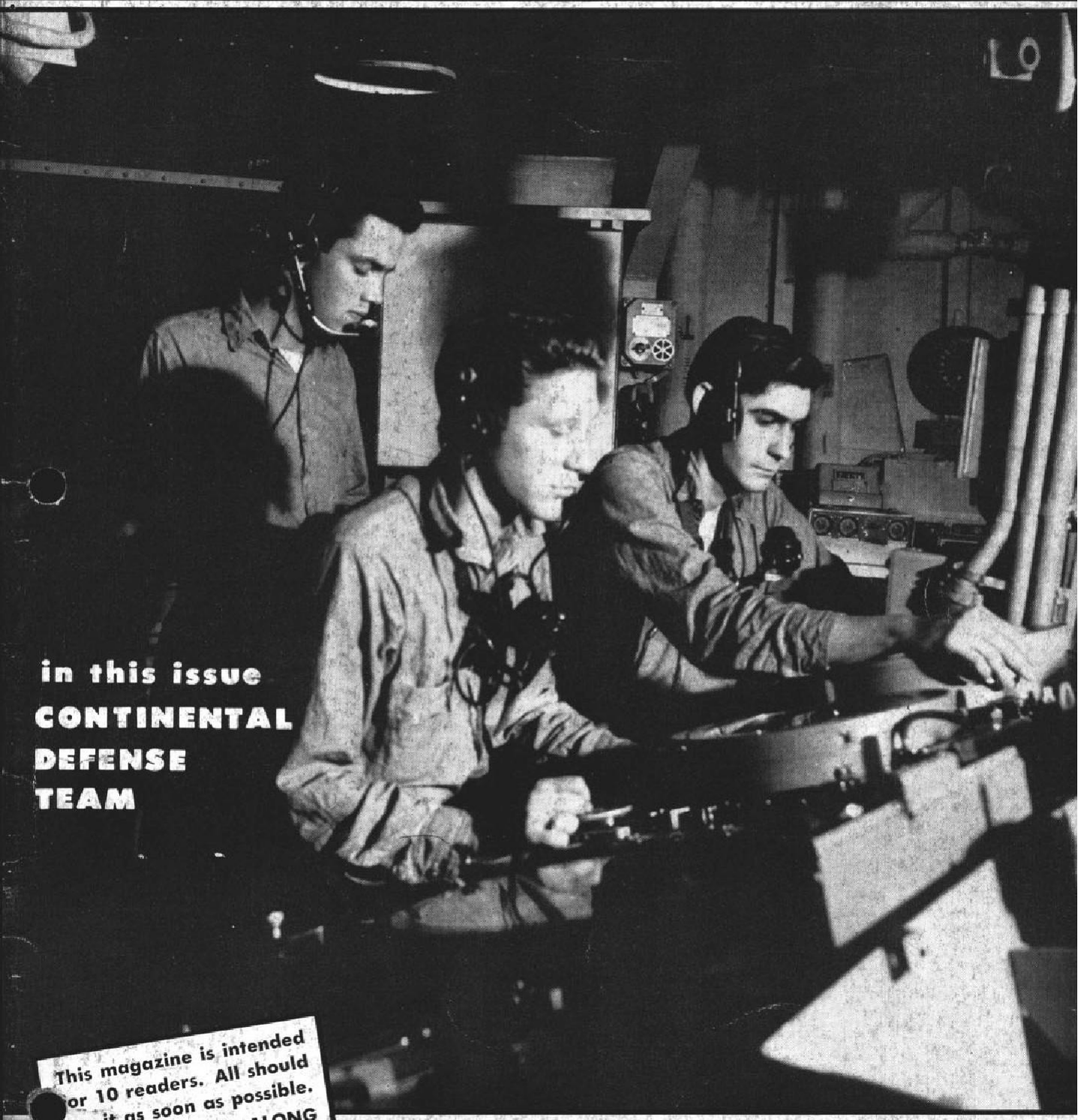
ALL HANDS

THE BUREAU OF NAVAL PERSONNEL INFORMATION BULLETIN

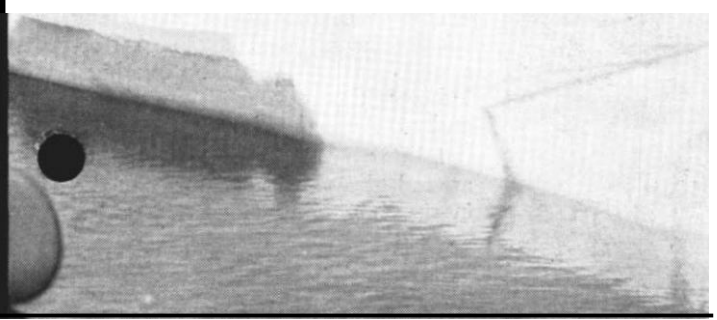


in this issue

CONTINENTAL DEFENSE TEAM

This magazine is intended for 10 readers. All should see it as soon as possible. PASS THIS COPY ALONG

SEPTEMBER 1956



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SEPTEMBER 1956 NavPers-O NUMBER *475*

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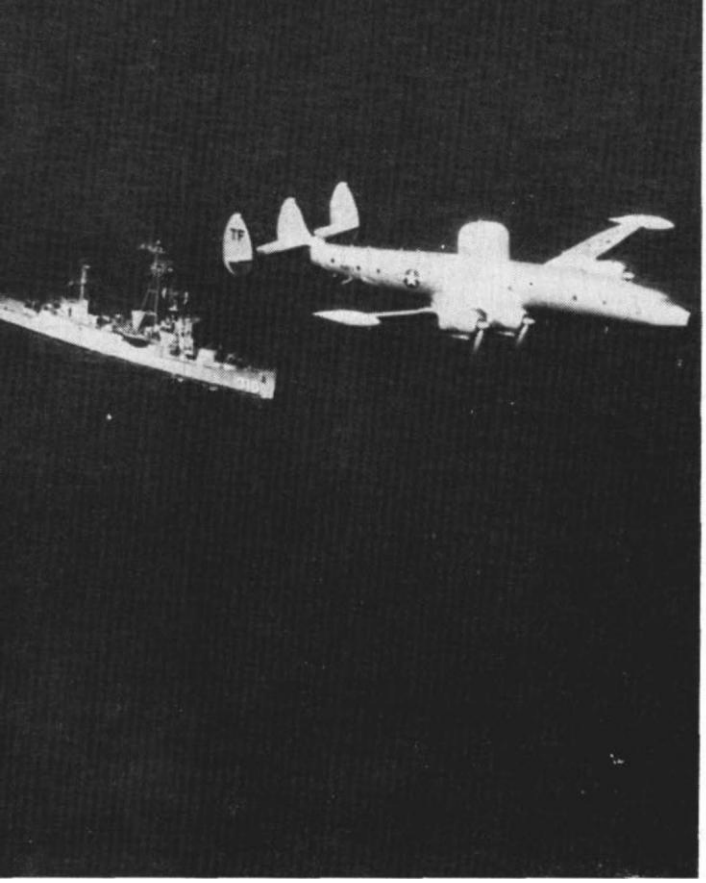
• **FRONT COVER: ALERT FOR DANGER, crew members of** USS **Harveson (DER** 3161 **keep close watch on their early warning radar gear. DER1 patrol** Atlantic **and Pacific as part of the nation's Continental Air Defense team.**

• **AT LEFT: PENETRATION of the Polar regions-both** Arctic **and Antarctic-on such pro(ects as Operation Deepfreeze and** DEW line-in **exploration, research and re-supplying-Is a big (ob of the Navy today.**

• **CREDITS: All photographs published** In **All HANDS are offl-cial Department of Defense photos unless otherwise designated.**



INTER-SERVICE **TEAMWORK** of CONAD protects nation. *Left,* Navy patrols sea. *Rt,* AF pilots scramble to intercept.

CONAD: An Inter-Service Team

"T'VIG, this is Victor 2. Bogey l, course 360, speed 400, angels 5. Bearing 060, range 90. Time 1950, Zulu."

A message like this one, passed from an airborne combat information center far out over the ocean to a Stateside air defense control center, may be the means of saving your life or the lives of your family.

Such transmissions are common occurrences aboard certain avy planes nowadays-but so far the "bogeys" have been friendly planes, quickly identified from Hight plans filed with CO AD, the nation's Continental Air Defense Command. These aerial watchdogs are WV-2 *Super Constellations,* outfitted with a mass of radar gear and assigned the monotonous-but highly important-job of extending our nation's defenses against sneak attack.

These Hying radar installations are just one of the Navy's many contributions to a system which unites sailors, soldiers, airmen and civilians into an airtight defensive organization along orth America's air frontiers.

This system of defense against surprise attack is the responsibility of the nation's youngest military organization, and it is an outstanding example of joint Army-Navy-Air Force and coordinated civilian effort.

CONAD's mission can be simply stated: "Defend the United States against air attack." Carrying out that mission, however, is a vastly complicated business. In brief, here's what each of the four main forces contribute to that mission:

• The Navy supplies and mans the radar picket escort vessels, ocean station radar ships and many of the WV-2 "Flying CICs" which form the seaward perimeter of the defense system. The avy's Bureau of Yards and Docks is supervi ing construction of radar "islands" off the Atlantic coast, and avymen and Navy ships break the orthern ice *Boes* to supply the "Dew Line"-the Distant Early Warning Line of radar installations along the Arctic Circle. Navy fighter-interceptor planes are assigned to CO AD for duty and others can be made available on short notice.

• The Army' primary contribution to CO AD is the manning of antiaircraft installations and Nike missile batteries around our major cities and "critical" target areas.

• Civilian participation in the nation's defense system is represented by the Ground Observer Corps, made up of volunteers who scan the *skies* for low-flying aircraft and check to be certain that they are friendly.

• The Air Force, with its complete facilities for air warfare, supplies the basic organization for the Continental Air Defense system.

Before taking a look at the various elements which operate under CO - AD, it might be wise to examine briefly the command structure of the "unified" organization.

Heading this new military force is Air Force General Earle E. Partridge who ha operational control over all forces assigned to CO AD and is responsible directly to the Joint Chiefs of Staff. CO **AD** headquarters, at Ent Air Force Base, Colo., includes the chief of the Army's antiaircraft command, Lieutenant General Stanley Mickelson, and Rear Admiral Hugh H. Goodwin, who heads all avy and Marine

ALERT SENDS Army *Nike* men into action. *Right:* Civilians in Ground Observer Corps form important part of defense.

Geared for Continental Defense

forces allotted to the air defense organization.

Then, the continent is divided into three defense regions, each with a joint air defense force under an Air Force commander who has the same operational control over the combined forces in his command that the chief officer of CONAD has over the whole. In turn, the three regions are divided into sixteen..air divisions, each exercising control over all air defense units within its area.

These divisions either perform or supervise all measures necessary for adequate air defense--operation of radars and fighters, allocation of forces, implementation of security control plans and activation of warning networks. A control center in each division plots all interceptions and reports of hostile aircraft.

In carrying out its assigned mission, CO AD divides its operations into four distinct phases: 1) *detection,* 2) *identification,* 3) *interception* and 4) *destruction.*

Detection of all aircraft approaching the orth American continent is of primary importance in accomplishing CO AD's objective. Volunteers in the Ground Observer Corps organization join with the artificial "eyes" of a huge radar network in performing this vital first function of CO AD. Long before the sky scanners of the Observer Corps go into action, however, radar will have spotted the intruders.

Perhaps the first warning will come from one of the following "fences" stretching across the northern continent:

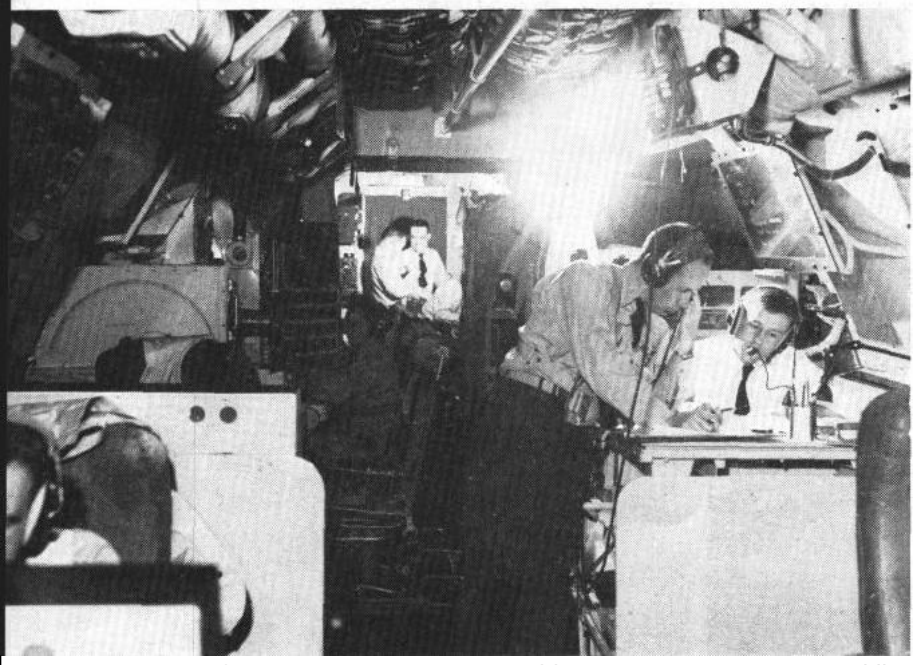
- DEW Line, which is the nickname for the Distant Early Warning Line of automatic, semi-automatic, and manned radar installations in operation or abuilding in the Far orth. This line stretches from Cape Lisburne, Alaska, to Baffin Island, and (like its companion lines) is a joint project of the United States and Canada.
- Mid-Canada Line, also known as the McGill Fence, is a radar installation system stretching from coast to coast along the 55th parallel, just north of the settled territory of Canada. Canadian troops are manning this chain of semi-automatic and automatic radar stations.
- Pine Tree Line is the name applied to the main control and warning radar installation, which roughly parallels the U. S.-Canada border and is jointly operated.

Each of these radar "fences" has a different fw1ction. DEW Line shouts the first warning of approaching aircraft, alerting defense forces and providing the fust information about the unidentified intruder.

The Mid- anada Line furnishes a second set of data on direction, speed and altitude, enabling plotting centers across the continent and at CO AD headquarters to figure out what the enemy is most likely to do.

As the bogey comes within range of Pine Tree, along the U. S.-Canada border, radars are ready to start tracking the enemy craft as they begin converging on their target.

Extending these lines to seaward --covering the northern Hanks of our continent as it were--are the avy's radar escort picket vessels (DER) and ocean station radar vessels (YAGR), in addition to radar-equipped aircraft, lighter-than-air craft and "Texas Towers." The avy's largest role in CONAD is to be found in this seaward exten-



NAVYMEN of WV-2 *Super Constellation,* airborne CIC, *send* message while on Atlantic patrol. Both Novy ond AF keep watch with these planes.

sion of our nation's defenses.

Athwart the broad mid-ocean approaches of the Atlantic and Pacinc are the lines of ships and planes ready to give early warning of possible bogeys. Closer inshore other hips and planes (plus Texas Towers in the Atlantic) provide a second set of references on approaching aircraft.

Perhaps the most unusual of the Navy's contributions to CONAD's chain of "eyes" are the YAGRs-the lumbering Liberty ship merchantmen of World War II which have been adapted to the service of detecting high, fast aircraft *(* see page 25). They share with DERs (see page 20) the mission of maintaining stations along the Atlantic and Pacific coasts, thereby extending the land "contiguous radar," and have been modified accordingly. Their wide, deep holds have become spacious areas for living, recreation and otherspecialequipment requirements.

During their toms on station the DERs maintain constant contact with the nearest shore radar station, while scanning their radarscopes for anything that doesn't appear on preauanged flight plans of all commercial and military aircraft. Flashing a warning which will bring all-weather fighters from the nearest interceptor base is a matter of minutes.

"Flying CICs"-WV-2 *Super Constell.ations* well endowed with radar and other detection devices-,vill soon be on station as another part of the avy's contribution to the nation's continental air defense network. These giant four-engined craft, each outfitted with the latest in airborne radar gear, are capable of picking up enemy aircraft at distances well over 100 miles. When flying "on station" at a height of 10,000 feet, the planes can cover in one sweep a surface area of 45,000 square miles.

These Super Connie CICs are manned by 26 men and have a dual mission in their early warning role: • l) to give an earlier warning of an enemy's sea or air approach than is possible by any other method; and 2) to track any targets and direct defending craft into position to destroy the invader. While performing their early warning duties the planes maintain contact with shoreside air defense control centers, reporting all contacts and the results of IFF signals. Similar planes are being operated by the Air Force.

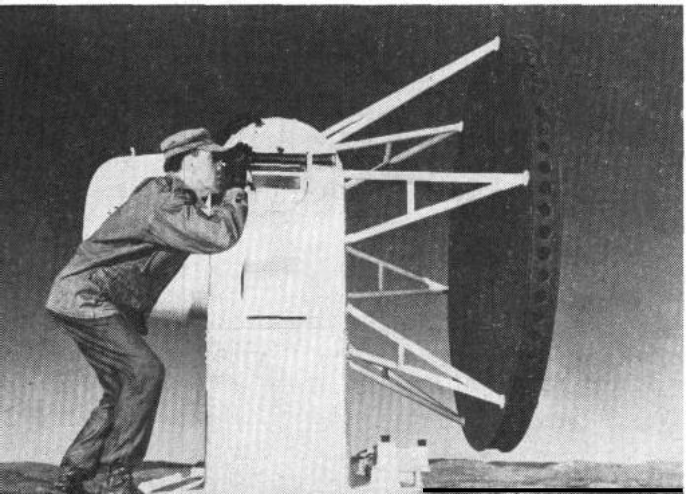
Also part of the seaward extension of the nation's radar defenses are the "Texas Towers" being built for the Air Force under supervision of the Navy's Bureau of Yards and Docks (see page 26). Named for offshore oil rigs along Texas' Gulf coast, these towers provide permanent early radar warning stations approximately 100 miles off the Atlantic coast.

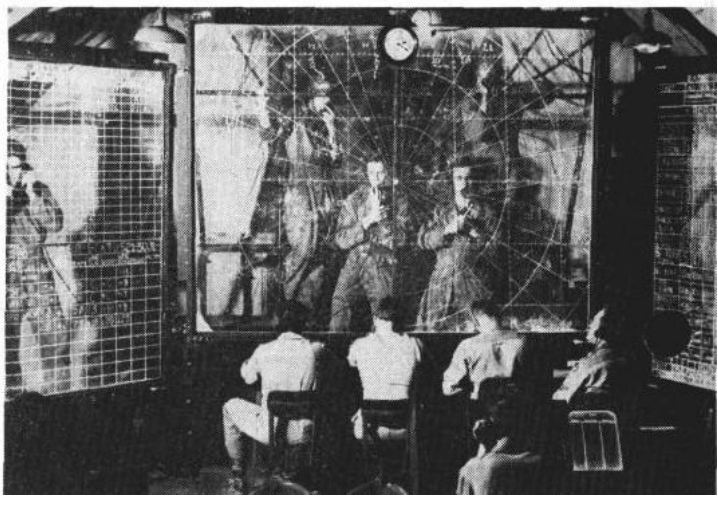
This giant net-the three radar fences and their seaward extensions, plus other radar installations inside the U. S.-gives CONAD good high altitude coverage over a large portion of the northern continent. A 24-hour "skywatch" maintained by volunteers of the Ground Observer Corps affords a widespread system of low-level detection within the U. S. itself.

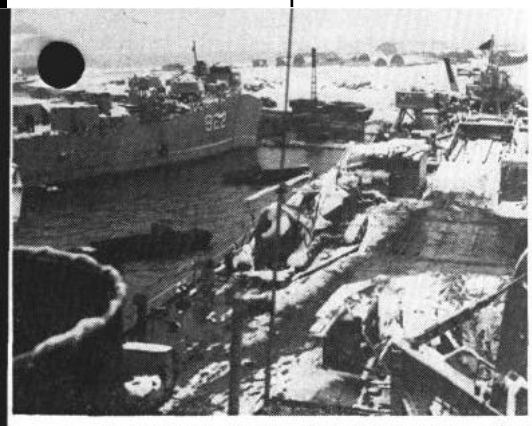
Identification, the second phase of CONAD's operation, is enormously complicated by the number of scheduled flights crossing our coasts and within the continent itself; this situation has been somewhat simplified, however, by placing most flights under a tight system of controls.

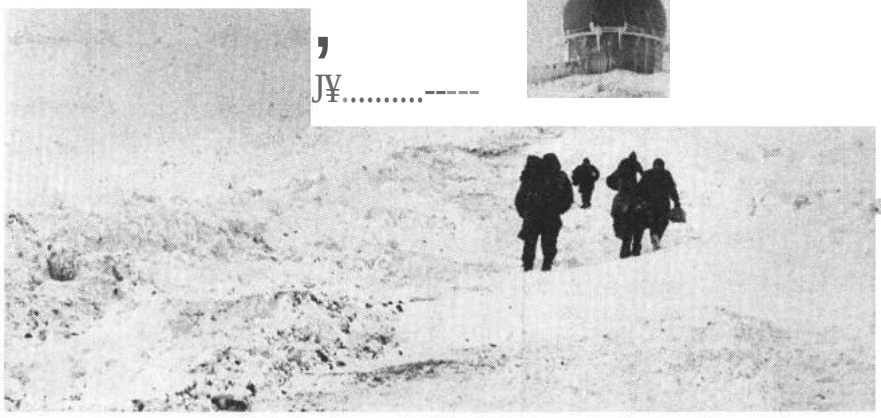
For this ..purpose three types of Air Defense Identification Zones (ADIZ) have been set up; 1) Inter-

ARMY MISSILE MAN checks rodor before *Nike* firing. *Right:* AF ground intercept units like this direct planes to target.









DEW LINE—Navy ships bring in supplies during Arctic storm. *Right:* Members of CONAD team climb to radar station.

national Boundary ADIZ, along the Canada-U. S. border; 2) Coastal ADIZs along both coasts; and 3) Domestic ADIZs, around critical target areas within the United States. Planes which intend to enter or cross any of these areas are required to file Hight plans in advance -plans which can be matched with radar tracks either to identify the plane or to set off a quick scramble by interceptors.

Further protection is provided by improved versions of electronic IFF, the World War II system of Identification Friend or Foe, and a system of fixed "air corridors" along which airlines are required to fly in accordance with prearranged Hight plans.

Interception of unidentified or hostile aircraft is the duty of fast, all-weather jet fighter-interceptors, capable of intercepting and destroying a target while flying on instruments. When aircraft are spotted, but cannot be readily identified by other means, such planes as the F-86D *"Sabrefet,"* the F-89D *"Scorpion,"* the F-94C *"Starfire"* and the Navy's F3D *Skynight* take to the air for a visual inspection of the interloper. (A Navy fighter squadron of F3Ds, based at San Diego, is on immediate call from GONAD to handle intercepting duties.)

CONAD's combat-ready fighter force is strategically located throughout the country on bases within easy reach of critical target areas and our perimeter defense line. Fighters of other Air Force commands, the Navy and the Reserve Forces are available for emergency use. And during an emergency, the naval representative at CONAD headquarters will be able to call on fighter power at naval air stations or aboard carriers.

Destruction of any hostile aircraft would be carried out by the interceptor-fighter aircraft, or fire from the Army's antiaircraft installations, including the Nike missiles which now defend many of our more important cities and industrial areas. Aerial rockets and refined radar control give the fighter-interceptors a distinct advantage over attacking bombers, while Army's ack-ack command has added the new electronically-controlled *Skysweeper* cannon to its battery of weapons defending heavily populated areas and industrial sites.

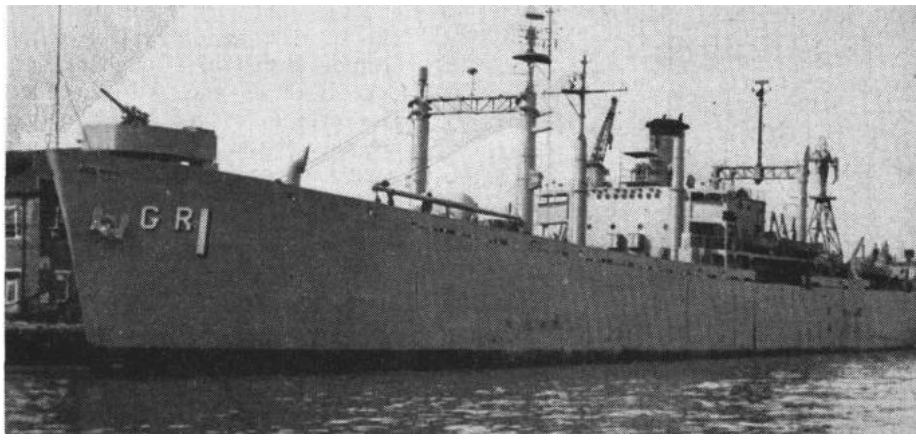
The GONAD organization, as well as its operational concepts and functions, have been built up on the supposition that simultaneous, widely diversified air attacks can be directed against any or all of the major targets within the United States at any given time-and that such attacks are likely to come from the north. Adoption of the motto "Be Prepared" in setting up adequate defenses against such attacks serves the double purpose of acting as a deterrent to attack, and of minimizing the inherent advantage of surprise if such an attack were undertaken.

The final measure of protection is afforded by a system of communication and alerting procedures capable of passing warnings throughout the country in a matter of minutes. When it appears necessary, GONAD can announce a condition of air defense warning to the Federal Defense Administration. A similar but separate system has been set up to notify key military installations.

An additional warning condition, applicable only to the active air defense system, is Air Defense Readiness. Normally initiated as a result of suspicious patterns or actions of incoming unidentified aircraft, it is a means of placing all available air defense forces at maximum immediate operational capability. Another plan, called "SCAT," establishes procedures and instructions for security control of civil and non-tactical military air traffic during an emergency.

This gigantic and complicated web of defense is CONAD. And on the following pages you'll see more of the Navy's role in defense against air attack-Barney Baugh, JOl, USN.

OCEAN LISTENING POSTS-YAGRs converted from **WW** II Liberty ships share with DERs mission of patrolling Atlantic and Pacific on lookout for danger.



ON GUARD-USS Horveson (DER 316), USS *Stricklond* (DER 333) *potrol.*

RADAR PICKETS

"**RADAR** PICKET ESCORT VESSELS, at the present time, are the most important ships in the U. S. Navy."

That's quite a statement, but when quartermaster third class Roy A. Trotter and Jerry Halbrook, ET3, both crew members of *USS Harveson* (DER 316)-the first DE converted for radar picket duties-made the claim, they were not just "sounding-off." Both were speaking from experience and have good reasoning to back them up.

"After all," they say, "what other type of ship in the Navy today is actually performing its regular mission on a round-the-clock basis. Practically all other ships are engaged in peacetime training while we (the DERs) are more or less on a wartime basis, conducting our primary mission at all times."

Such opinions are shared by the majority of those who man the "eyes and ears" not only of the Fleet, but also of the nation. Typical of this attitude is that of a tough old sea-dog-boss of the Atlantic Fleet Destroyer Force and one who does not offer praise lightly. He said, "I have been in the avy for many years but I'm still deeply impressed by the amazing spirit with which our men have taken over one of the most exacting and important of our peacetime jobs."

In making this statement, RADM John C. Daniel, USN, added, "I refer, a of course, to the maintenance of our w, picket radar stations off our coastal waters. It is a real tribute to the officers and petty officers that, in spite of this monotonous, uncomfortable and sometimes dangerous duty, all hands remain tops in spirit and efficiency."

Who can speak with more knowledge or authority about the DERs and this type of duty than ComDesLant himself? He has been around for quite some time and J...'llows them inside and out.

RADM Daniel first became acquainted with radar picket ships the hard way-off the coast of Okinawa near the end of World War II, when lonely little DEs with hastily improvised radar gear attempted to warn the Fleet of approaching Kamikazes and, at the same time, duck the swarms of enemy pilots bent on suicide. He earned a avy Cross for duty as officer in command of a radar picket station unit at that time A and his admiration of the tough W, little featherweights-and those who man them-remains undiminished to this day.

What's so precious about DERs and why should they be selected for this unusual praise from those who man them? Why are they different from other types of destroyer escorts and why do their crews take such pride in duty on board them?

DERs are basically DEs. In fact, they are former escort ships converted for radar picket duties. In addition to the conventional armament for action against hostile surface, undersea and air attacks, they are equipped with a large amount of the latest radar equipment which enables them to detect aircraft at long ranges.

These radar picket escort vessels, serving on lonely stations far out at sea in all kinds of weather, form an essential link in the Continental Air Defense Command system. They extend the nation's early detection seaward, far beyond the reaches of shore-based radar.

At present there are 18 DERs operating with the naval forces of A the Continental Air Defense Com- W, mand. Of these, six are assigned to the Pacific and 12 are in the Atlantic.

ON SEA PATROL

A W'DERs Six of the 12 East-Coast-based of Escort Squadron 16, uss *Joyce* (DER 317), *Harveson* (DER 316), *Fessenden* (DER 142), *Otterstetter* (DER 244), *Kirkpatrick* (DER 318), and *Strickland* (DER 333), have been performing off-coast picket operations since 1952. They are the old timers-the first.

In 1955, Escort Squadron 18 was established as part of the Atlantic Fleet when six more DEs were converted to DERs to help elder brothers maintain station. They are: uss *Chambers* (DER 391), *Pillsbury* (DER 133), *Rhodes* (DER 384), *Calcaterra* (DER 390), *Wagner* (DER 539) and *Vandivier* (DER 540).

Maintaining recently established "DER" stations in the Pacinc are: uss *Falgout* (DER 324), *Lowe* (DER 325), *Koiner* (DER 331), *Savage* (DER 386), *Haverfi,eld* (DER 393) and *Wilhoite* (DER 397).

A W,ently In addition to the 18 DERs currently on station off the East and West Coasts, 12 more are undergoing conversion and will soon add considerable strength to the nation's early warning detection system. Of these, uss *Finch* (DER 328), *Forster* (DER 334), *Roy* 0. *Hale* (DER 336), *Vance* (DER 387), *Lansing* (DER 388), and *Durant* (DER 389) will go to the Pacific; while uss *Camp* (DER 251), *Sellstrom* (DER 255), *Brister* (DER 327), *Kretchmer* (DER 329), *Price* (DER 332) and *Hissem* (DER 400) will scout additional Atlantic stations.

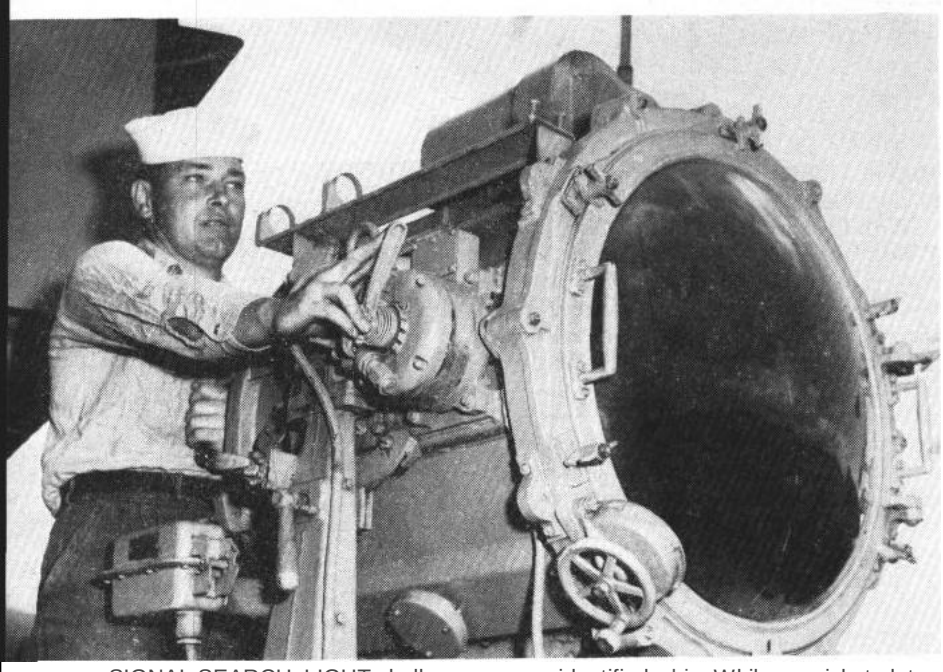
With the exception of *Wagner* and *Vandivier,* all of the DERs now serving in the Atlantic saw duty in World War II as escorts, and many of them have outstanding records. It was *Pillsbury,* for example, who in World War II assisted in the sinking of two German submarines and it was a boarding party from this ship that went aboard U-505 after depth charges brought her to the surface. *Pillsbury* then steamed more than 2500 miles with the German sub in tow. For that action, she received the Presidential Unit Citation.

Kirkpatrick escorted 11 Atlantic convoys during WW II; *Harveson* chalked up 10 convoys; *Chambers* put in two and one-half years of convoy duty during which time she escorted 16 convoys during the North African and European campaigns; *Calcaterra* is also a veteran of 16 transatlantic convoy runs. *Fessenden* was credited with the sinking of an enemy submarine while part of a hunter-killer group with uss *Mi.ssion Bay,* now CVU 59.

It was *Joyce* who served as a rescue ship when uss *Leopold* (DE 319) was torpedoed and sunk in 1944. Twice, while dead in the water picking up the 28 survivors, *Joyce* had to get underway to dodge torpedoes rued at her. It was on her next crossing that *Joyce* became something of a floating hotel as she

DURING CONVERSION from destroyer escorts, DERs received the maximum in modern living at sea. Here, Navymen get ready to enjoy TV in lounge.

RADARMAN plots bogey in CIC and *(below)* DER's course is plotted while USS *Harveson* cruises on station.



SIGNAL SEARCH LIGHT challenges an unidentified ship. While on picket duty DER men keep watchful eye on surface of sea as well as over and under it.

picked up 31 survivors of ss *Pan Pennsylvania,* one of the world's largest tankers, after that ship bad been torpedoed and set aflame. And it was *Joyce* that located the sub by sonar and brought it to the surface by a pattern of depth charges. With the aid of uss *Peterson* (DE 152) and *Gandy* (DE 764), she forced the enemy crew to abandon and scuttle the sub. Twelve of the German crew, including the U-boat's captain, were picked up by *Joyce.*

With their vVW II jobs completed, these escorts were placed in mothballs. They remained in the Reserve Fleet until 1950 when the challenge of air defense required these proud little ships to serve again.

From their peaceful nesting places, the DEs were towed to shipyards where they underwent extensive modification and emerged as floating radar sets. While undergoing conversion, the ships' nerve **centers-A** combat information centers-were,., enlarged to handle the added information to be fed by the new air search, height-finder and surface-search radar.

In addition to the electronic detection devices, more communications equipment had to be installed to handle voice radio and ship-to-shore communications between the shore-based aircraft control warning stations.

Much of this gear was put into what earlier were messing and berthing spaces. This meant, in turn, that the center portion of the main deck had to be enclosed and a superstructure added to provide more and spacious living quarters for the 150 enlisted men and 19 officers.

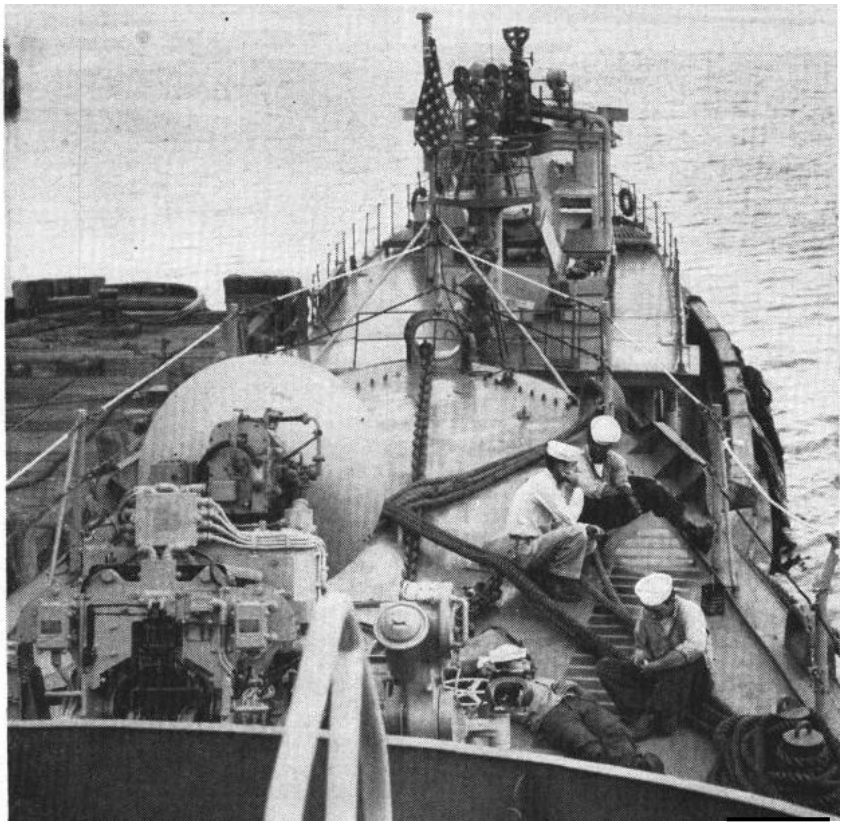
These modifications added more than 400 tons to the escorts' displacement, bringing their weight close to that of a destroyer. Prefabricated aluminum was used in all alterations in an effort to keep the added top-weight to a minimum. Even the tripod mast for the radar antennas and the huge deckhouses were constructed of aluminum. **Mora** than 60 tons of pig iron was plac in the bilges and voids to act as ballast and offset the added topside weight.

Besides the enlarged CIC and installation of electronic and communications equipment, many improvements were made in the habitability of the ships. Even by using soft, multi-colored paints in compartments, laying carpets from bulkhead to bulkhead, adding fluorescent lighting, air conditioning and individual bunk lights, it did not bring living conditions aboard the DERs up to par with other types of ships that have recently been converted. This is because of the original purpose for which they were built and, owing to their added versatility, almost every inch of their 306-foot hulls is utilized.

Even without too many plush accommodations, the majority of DER crew members, like most destroyermen, take considerable pride in their duty and consider it the most desirable and satisfying part of their naval careers.

DERs are small but heavy. They are rough-riding and far from **co.**- fortable. Usually the risks are gre as these ships always remain o station regardless of weather condi-• tions. Work aboard the DERs is

ILLUSION-Bow of *Harveson* is not as long as it seems at first glance. She is moored close to tug while in port for supplies and a breather from patrol duty.



harder than in most ships, yet the **An-action** of duty aboard them defies **Wtalysis.**

The radar picket sailor or destroyerman is summed up thoroughly in a *DesLant Information Bulletin* which says, "You can recognize a destroyerman by his attitude, his training, his appearance, his spirit of service and devotion to duty. You can take a man out of destroyers but you can never take the spirit, the enthusiasm, the seamanship skills, and general all around 'know how' developed in destroyers out of the man."

Without a doubt, duty on board DERs, like most types of destroyers, separates the blue-water sailor from the shore-duty hound. The reaction of men serving in *Harveson,* first of the DERs, is typical.

"I thought I'd been around quite a bit and could take almost anything any ship could dish out," QM3 Trotter said:-!'! had never been seasick in my life, and thought it was a bunch of imagination or malingering. The first time I went out in *Harveson,* I learned better. I was really surprised when I found my-

Alf Wat heading for the rail. Only thing was really hurt was my feelings."

Harveson and other DERs are on station continuously in all types of weather. They steam within prescribed areas on varying courses and speeds depending on prevailing wind and sea conditions. Each ship mans a designated station for eight days before being relieved. In the event of a breakdown while on station, another ship from the squadro,1 takes its place on short notice.

Although assigned to the Atlantic Fleet Destroyer Force, the DERs while on station are under the operational control of the Commander Naval Forces, Continental Air Defense Command.

The surveillance and reporting procedures of the radar pickets are similar to the operation of Air Force Aircraft Control and Warning (AC& W) stations. If a contact is made by the DERs, word is immediately flashed to the nearest shore-based AC&W station.

Once contact is made by the DERs, all aircraft-whether U. S. or foreign, commercial or military-**Aust** identify themselves by pre-**Wranged** plans. If such planes fail to make themselves known, the DERs immediately notify the AC&

COOL JOB-Crew member of *USS Pillsbury* (DER 133) starts to clear ice after storm at sea. Below: DERs also help Navy check on far-out weather conditions.

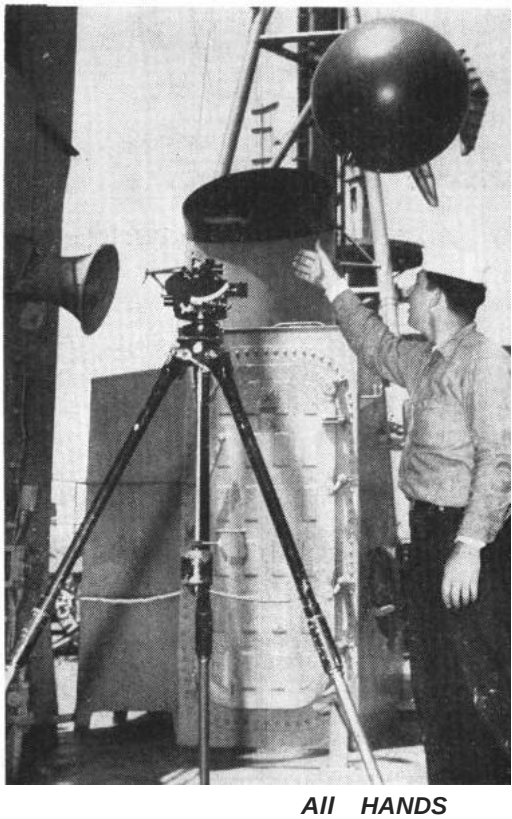
W, which in tw-n send all-weather jet fighter planes scrambling to intercept the unidentified contact.

To date, no hostile planes have been intercepted nor have the fighter pilots had to launch any rockets or do any shooting.

The DERs are capable of controlling-and frequently do control-interceptor planes sent out to investigate unidentified contacts made when on station.

It's the rigid schedule that the DERs must maintain, regardless of weather, that makes duty aboard them "rough." They spend many days en route to designated stations and then eight days on station, before starting the long haul back to port.

The DERs remain in port for at least six days before departing for station again. However, as "rough" as the duty may be, crew members swear by *it.* "Even with duty being harder than most DEs and DDs, I'm still satisfied with it," Halbrook said. "These DERs offer electronics technicians better training than most



USS FESSENDEN (DER 142) cruises Atlantic with her radar antennas alert. Below: keeping close guard below surface too, watch checks unidentified sub.

ships. ETs don't stand watches while at sea, but we're responsible for the continuous operation of the radar. When a piece of gear breaks down, we have to stay with it until it's repaired.

"Duty is tougher in the winter," ET3 Halbrook continued, "but ice doesn't bother reception. Sometimes an antenna freezes up and then it won't rotate. Believe me, it's a feat on a dark night, in the freezing cold, trying to break one loose while clinging to! wildly pitching ice-coated mast.

To ward off the problem of boredom while the DERs are on station, an off-duty recreation program has been organized for the crew. Weather permitting, they have plenty of swim calls, do some fishing and have movies almost every night. If they don't have movies nightly, they always come up with Bingo or some other kind of group entertainmen.

In thepast two years, while ope ating out of Newport, ships of Cort-Ron 16 steamed about a quarter of a million miles while en route to and from, and while on North Atlantic stations.

Not only can the ocean radar pickets find and fix the position of approaching aircraft, but under favorable circumstances, they are also capable of destroying them. They are equipped with three-inch rapid-fire antiaircraft and 20mm machine guns.

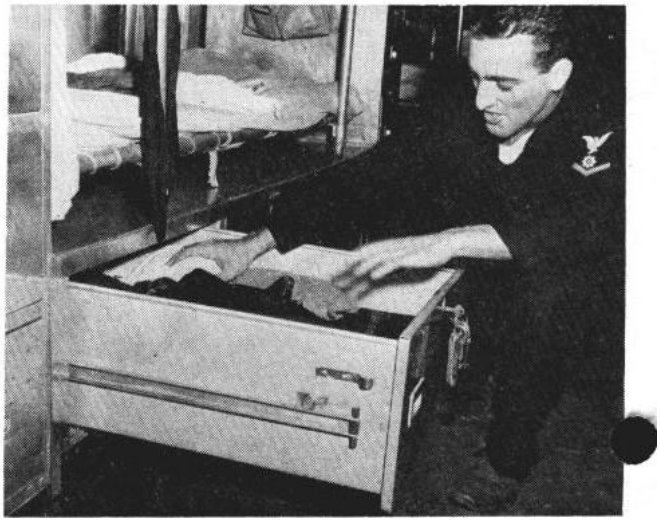
Originally built for convoy and escort work, the DERs still maintain their World War II anti-submarine punch. While on station they also conduct continuous submarine surveillance.

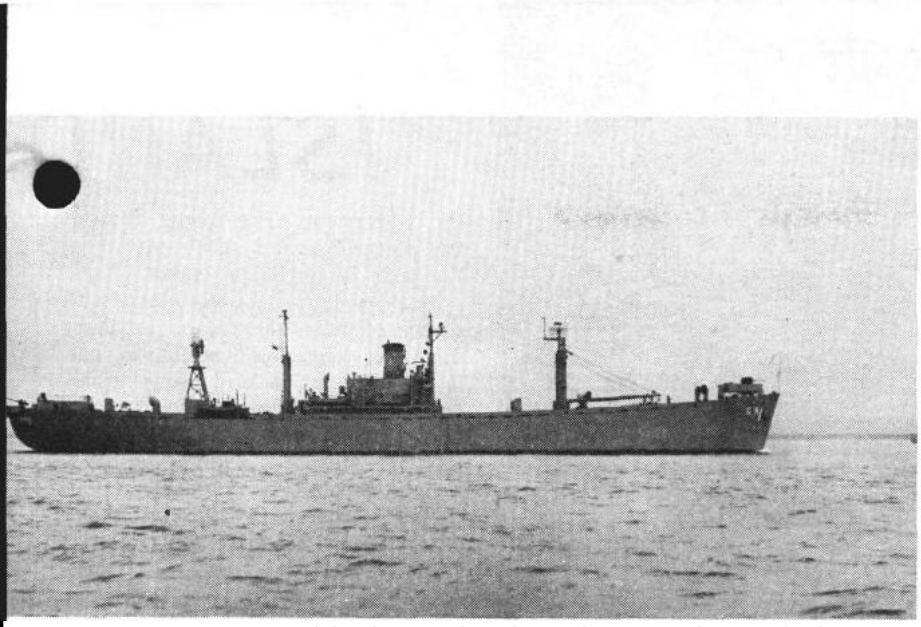
As a result, they can give advance warning of or even destroy an enemy submarine attempting to approach our shores to land advance reconnaissance parties, launch missiles or torpedo ships or lay mines in our harbors or shipping lanes.

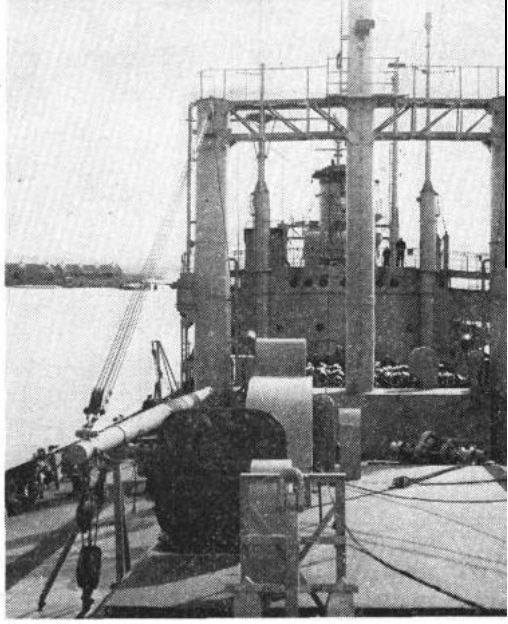
Aerial screening and submarine detection are just a part of the many tasks the versatile DERs perform. They also give periodic reports **A** weather conditions at sea, act - rescue vessels by going to the assistance of small craft and merchant ships in distress, or act as control ships for planes or other vessels engaged in search and rescue missions.

Their ability to move from place to place, to operate in all weather, and perform many duties makes the radar picket escort vessel invaluable, as well as a hard-to-destroy unit of our naval air defense forces.

BERTHING SPACE on DER is large, considering size of ship and its extra equipment. New style lockers keep gear.







ON THE ALERT-USS *Picket* (YAGR 7) and USS *Interceptor(YAGR* 8), shown at commissioning, are part of picket team.

YAGRs Stand Ocean *Sentry Duty*

pEIUIAPS THE MOST UNUSUAL of the recent additions to today's "Navy of Tomorrow" are the YAGRs-Ocean Radar Station Ships.

They are the clumsy, awkward-but vital-ex-Liberty ships of World War II which underwent conversion and provided an economical answer an urgent need-a mobile means extending our Continental Air Defense System seaward.

A
W

Last year, when the Navy was required to bolster its contributions to GONAD, the mass-produced merchantmen were taken out of mothballs and converted for off-shore screening and advance warning duties.

The first of these were uss *Guard,. ian* (YAGR 1), *Lookout* (YAGR 2), *Skywatcher* (YAGR 3) and *Searcher* (YAGR 4), which now comprise YAGR Squadron 21, based at Newport, R. I.

At present there are eight YAGRs in service. The latest are: uss *Scanner* (YAGR 5), *Locator* (YAGR 6), *Picket* (YAGR 7) and *Intercept* (YAGR 8) operating out of San Francisco.

Like the DERs, the YAGRs while on station, are under the operational control of the Commander Naval Forces, Continental Air Defense Command. When not on station the YAGRs are under the administrative command of either the Eastern or Western Sea Frontier Commander.

e DERs are under ComCruDes-or ComDesLant while not on tion.)

Although having the same basic mission, the YAGRs differ considerably from the DERs. During conversion, the Liberty ships were converted solely for radar picket duties and are no longer capable of being utilized as merchantmen.

"Conversion," in the case of the DERs, meant primarily the addition of communications and electronics detection devices, enlarging the Combat Information Centers and redesigning compartments necessary for the job of extending the nation's early warning system beyond the reaches of shore-based radar. With these modifications and added equipment the DERs took on a new role, but did not lose their capabilities of performing the diversified duties for which they were originally built.

The WW 11 Liberty ships were selected for conversion to ocean radar station ships because there was no immediate need for their use as cargo carriers. Their wide and deep 10,000-ton-capacity cargo holds were ideal for installing large amounts of electronics detection equipment and building spacious living compartments.

During conversion, former storage spaces became enlarged CICs, air and surface radar masts replaced cargo booms, overhead lighting gave way to indirect fluorescent fixtures, air conditioning and additional communications equipment were added.

Habitability was the keynote of the conversion of the ex-merchantmen in order to give officers and crews of the YAGRs modem living conditions and features of shore-based facilities during long periods of patrolling on lonely stations.

Messing compartments, with four-man tables and colorful inlaid linoleum, have taken on the appearance of modem restaurants. Officers and CPOs have individual staterooms, while POls share four-man compartments. Other crew members have double-deck "chief-type" aluminum bunks, individual bunk lights and roomy lockers.

Two former cargo holds are now utilized for handball, archery, volley ball, table tennis, weightlifting and even a golf driving range. Hobby shops include woodworking equipment and a photographic darkroom.

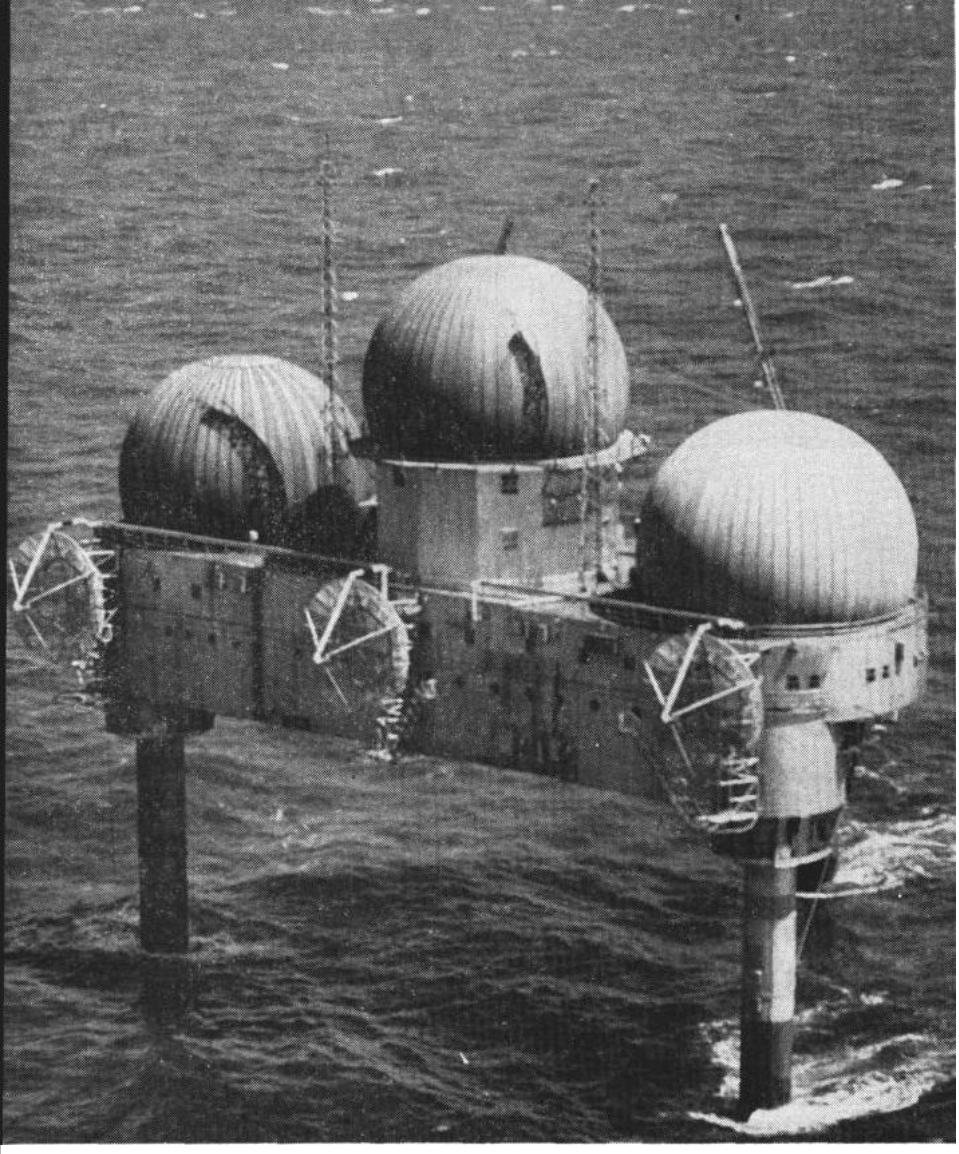
The ocean radar station ships even have permanent motion picture theaters which are also used for divine services and assembly halls.

To insure greater st.ability and to help keep sensitive electronics equipment on an even keel, 6000 gallons of water have been sealed in the double bottoms.

With the new distilling systems now in use, the inconvenient rationing of water--common to most ships at sea-is unheard of aboard the YAGRs. Their enlarged distilling systems are adequate to assure enough fresh water so that usual conservation steps are not required.

The YAGR men like their duty. The crews of ocean radar station ships boast that, while performing tough and vital senb·y duty on the high seas, they have the best living and recreational facilities in the Fleet.

-H. George Baker, J0l, USN.



ALONE IN THE WIDE sea off Georges Bank the first Texas Tower constructed under Navy supervision stands guard. Ball-like domes house radar antennas.

HUGE, TARANTULA-LIKE platforms far out in the Atlantic Ocean will soon join the vast early-warning radar net that is protecting this country against possible sneak attack.

The first of these platforms, called Texas Towers, was put into operation last year. This monstrous man-made island stands on three legs, or stilts, sunk deep into the Continental Shelf some 150 *miles* southeast of Boston.

The radar platforms represent a joint effort by the different branches of the service and civilian engineering firms. The platforms were designed and constructed under the direction of the Navy's Bureau of Yards and Docks. Air Force personnel will man the towers and provide helicopter service while MSTS will provide the surface b"ansportation to and from the towers. The first of these radar islands is called "U.S. Air Force Station, Georges Bank, Texas Tower No. 2."

In addition to the towers in the Atlantic, plans are currently underway to construct another type of offshore island for use by the Navy. These platforms, to be constructed in the Gulf of Mexico, differ from the Texas Tower platforms in design, size and purpose. The Navy's offshore islands will house personnel who will study temperature and pressure variations in the sea, salinity factors, thermal gradients and periods and length of ocean waves.

The larger of the two types will be erected in 100 feet of water approximatxely 12 miles off the coast, with the platform 40 feet above the waterline. The smaller type will be located in 60 feet of water about two-and-one-half miles off the coast, also with a platform 40 feet above the water line. The lower deck of the platform will in each case clear the crest of hurricane waves.

Both types will be equipped with diesel electric generators, auxiliary machinery, heating, ventilation, galleys, refrigeration and crews' quarters. Helicopter landing decks, radar and communication facilities will also be provided. The larger platform will have sleeping accommodations for 30 persons while the smaller one "vill accommodate four.

The Bureau of Yards and Docks has already let the contract for the construction of these two Gulf Coast platforms for the Navy. Of more immediate interest to the Navyman are the Texas Towers now under actual construction and their installation in the Atlantic Ocean.

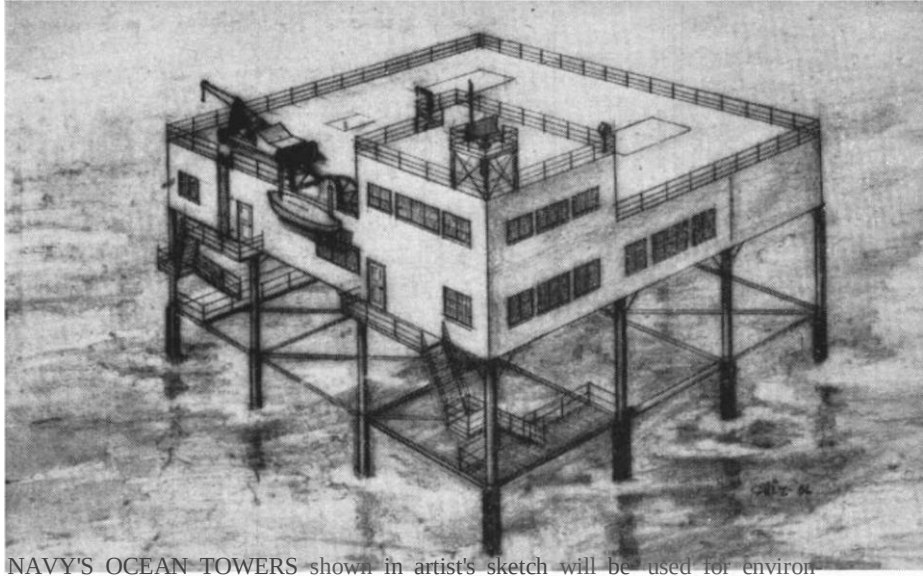
The Texas Tower southeast of Boston, first of these offshore radar stations, will become part of this nation's Continental Air Defense Command. A sb"ing of platforms will be built on the Continental Shelf between Virginia and Newfoundland and will close an important gap in the nation's radar defenses.

The towers, which have an **area** of some 20,000 square feet, are an adaptation of the so-called Texas towers on which numerous successful oil well rigs have been built in the Gulf of Mexico.

The typical tower platform is a 6000-ton triangular structure, approximately 200 feet long on each side, with a height of 20 feet, allowing for two decks. The upper deck is for living quarters, galley, mess hall and recreational facilities. The lower deck is for power plant, boiler rooms, fuel and water tanks and storage space.

Covering a part of the main deck is a deck house 60 feet wide and 200 feet long containing offices and operational facilities. Also rising from the roof of this deck house are two radio antenna masts and three ball-shaped radar domes about the size of a two-story greenhouse with planetarium-like roofs. Under these domes are the radar detection antennas. Two 80-foot boom derricks are located on the mam deck.

The part of the main deck outside the deck house is kept clear of obstructions and is used as a **hf.A** port. Under the platform there i- revolving bridge to allow access to



NAVY'S OCEAN TOWERS shown in artist's sketch will be used for environmental studies. These stations will be located off Florida in Gulf of Mexico.

each of the three supporting caissons.

Each radar tower will be self-sustaining, generating its own electric power and supporting a crew of 50 to 70 men.

After all the work that could be done at the shipyard was completed, the tower was made watertight and towed to its permanent location. With its 12 temporary tubular caissons and the three permanent caissons riding high in the air, the platform resembled a floating factory.

Once at the site, the temporary caissons were dropped to the ocean floor through the open wells of temporary brackets on the platform. Then a complicated pneumatic system took over to raise the platform high above the level of the water.

The raising process is much like that of a boy "shinnying" up a tree. A rig attached to each of the caissons contains a set of two rubber tubes, similar to gigantic automobile tire inner tubes. The tubes perform the role of the arms and legs in shinnying up the caisson.

One tube is deflated while the other is inflated so that it tightly grasps the caisson. The pneumatic system jacks the tube a fraction of an inch, pushing down on the caisson and lifting the platform. The deflated tube is then inflated to lock the platform in place, and the cycle is repeated.

The raising process is so accurate that movement of the platform can be controlled to one thirty-second of an inch.

The platform is supported at the beginning by the 12 temporary caissons, each six feet in diameter. Once the three permanent caissons, each 10 feet in diameter, are imbedded 48 feet into the ocean floor and the platform welded on, the temporary caissons are removed. The flrst of the Texas Tower platforms stands 81 feet above the level of the water.

At present, the U.S. Navy and Air Force keep a radar eye out on the Atlantic with picket ships and complex radar aboard huge air transports. Although the towers will not replace the aircraft and surface ships for long-range radar work, they should replace the expensive airborne op rations nearer the East Coast.

There are no usable offshore shoals on the West Coast and therefore no offshore radar platform construction is planned.

The Atlantic towers are a part of a gigantic warning radar web, including hundreds of ground warning stations, run by the Continental Air Defense Command. There are two general types of ground warning stations-semi-fixed and small automatic. While the semi-flxed stations take up 40 acres, the small automatic stations require only half an acre. The automatic stations pass on to the larger stations what radar observations they pick up.

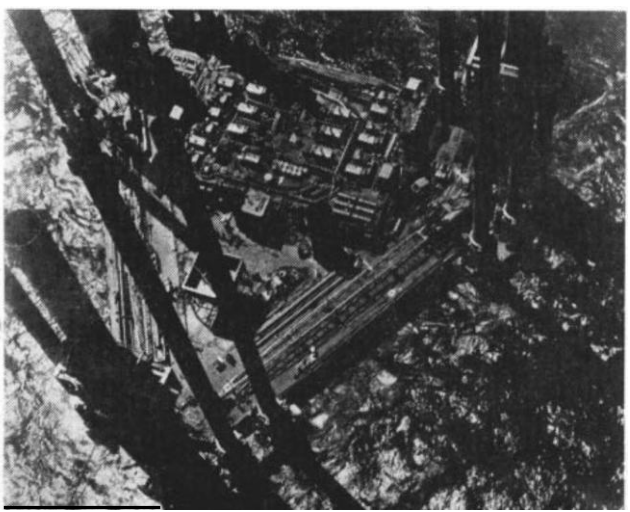
These stations, as well as the Texas Towers, will relay information concerning the direction, speed and altitude of approaching aircraft to the Air Defense Command for interception action.

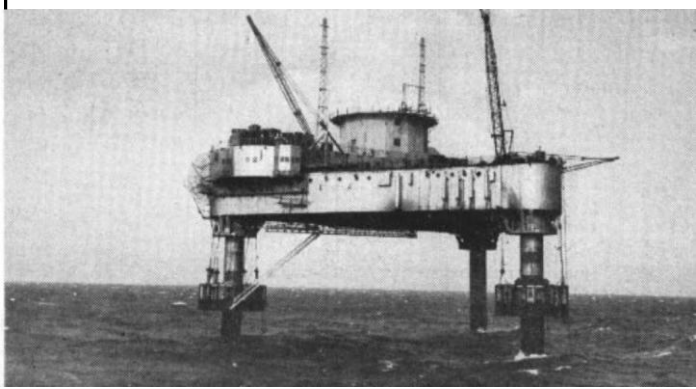
In addition, these stations will pass on their information to ike units throughout the country and will also keep them informed as to the location of friendly interceptors.

Built under BuDocks' supervision, these offshore platforms, which would have been considered absurdly fantastic a few decades ago, present another victory by man over the untiring sea. It is believed that the Texa Towers are the largest structures ever built so high above the sea, so far from land, and under such hazardous conditions.

-Rudy C. Garcia, JOC, USN.

PLATFORM is made ready to inch up temporary caissons. *Right:* Nearly completed, it rests on permanent legs.





The Story of Radar - And How it'

FROM THE jet age juvenile to the man in the moon, everybody's heard of radar.

Most Navymen think of it as strictly a World War II invention, but actually the reflection of radio waves from solid objects, which is the basic principle behind radar, was proven as far back as 1886 by Heinrich Hertz, the discoverer of radio waves. In 1904 a German engineer was even granted patents in several countries on a proposed **way** to use this principle aboard ship as a navigational aid and obstacle detector.

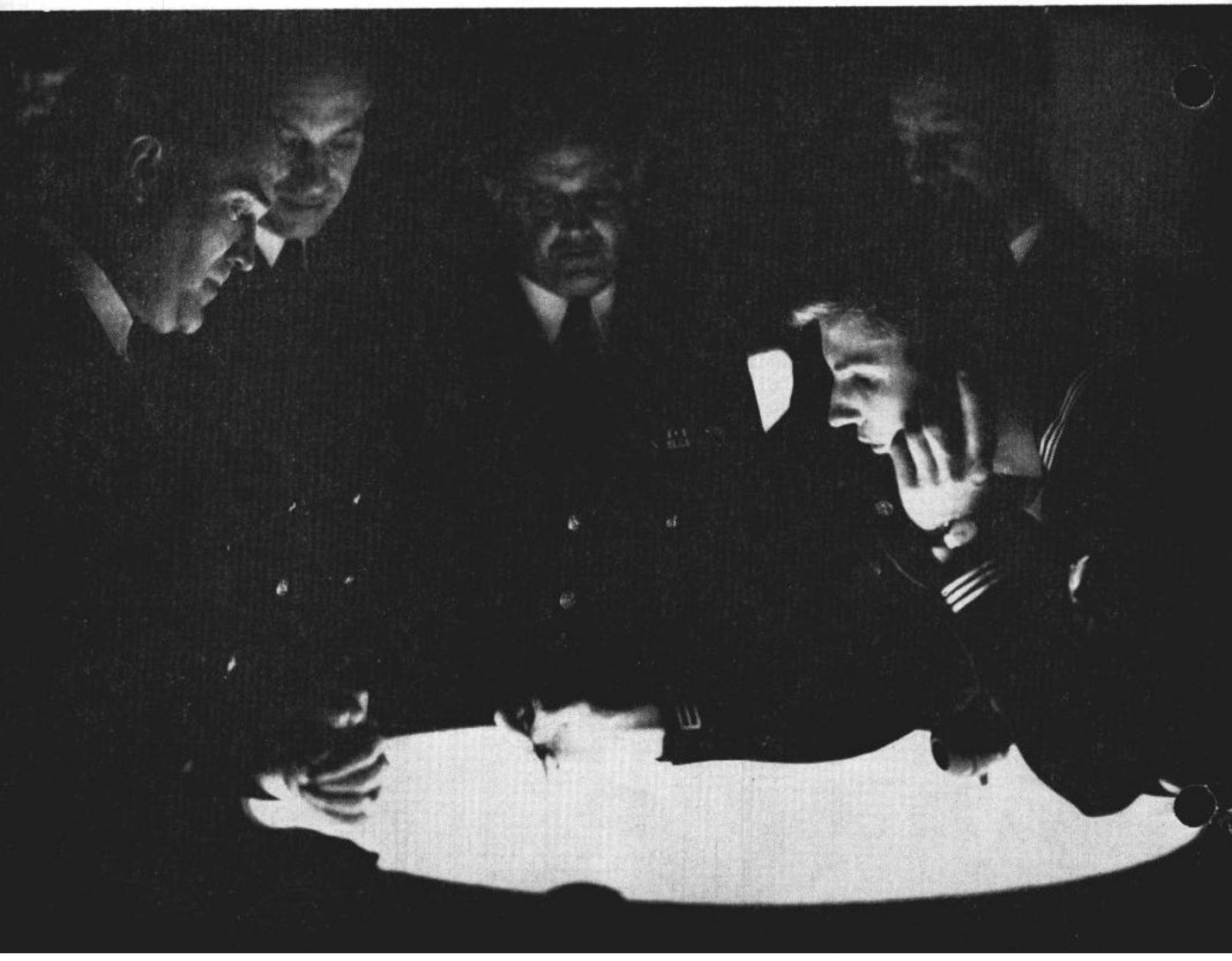
Since then this wonder-working electronic eye has come a long, long way. In fact, its waves have been bounced off the moon. And they can also be bounced off fast-moving automobiles-that's how the traffic-ticket-by-radar was born.

The Navy doesn't have much to do with highway radar, but it can point with considerable pride to the important part it has played in radar's development. Three Navy scientists, Dr. Albert Hoyt Taylor and Mr. Leo C. Young, of the Naval Aircraft Radio Laboratory, and Dr. R. M. Page, of the Naval Research Laboratory, were among the foremost early pioneers of radar as we know it today.

In 1922, while testing plane-to-ground communications in the short-wave bands at Hains Point, Washington, D. C., Taylor and Young noticed that ships moving in the Potomac River distorted the pattern of radio waves, causing a "phase shift" or fluctuating signal. Until then it had not been known that radio waves could be reflected from small, moving objects, as well as from mountains and other large masses. Dr. Page was one of the leading figures in the research which followed this discovery, and many of the early radar patent applications were filed in his name.

By 1932 the Navy scientists were able to detect planes 50 miles from their transmitter, and by March of the following year NRL had made enough progress to outline in detail the theoretical military applications of radar. Congress helped keep the ball rolling in 1935, when the Lab got an appropriation of $100,000 specifically for radio detection work. (The name, radar, comes from RAdio Detection And Ranging.)

In June 1936 ADM Harold C. Bowen, USN, then Chief of the Bureau of Engineering, directed that plans be made for the installation of a complete set of radar equipment aboard ship. As a result, the old four-stacker, uss *Leary* (DD 158), had the distinction of carrying the first seagoing radar, which was tested successfully in 1937. On 17 February of the same year the then



joined the U.S. Navy

Assistant Secretary of the Navy, Charles Edison, and Fleet Admiral William D. Leahy, USN, then Chief of Naval Operations, witnessed a demonstration of aircraft detection by the first radar set developed in the United States.

A more practical set was installed in uss *New York* (BB 34) in 1938. Its success on maneuvers in early '39 proved radar was here to stay, and orders were put out for commercial production. By the time America entered World War II much of the Fleet had been equipped with this invaluable gear.

Meanwhile, scientists of other countries had also been working on radar of one type or another. In l 940, at a conference between British scientists and representatives of the Navy Department and Naval Research Lab, members of the British mission disclosed that their development of radar had stemmed from articles on the work Taylor and Young had done between 1926 and 1930.

During the war radar made tremendous progress behind its curtain of super-secrecy. In 1940-41 it helped win the Battle of Britain by enabling the RAF to intercept German bombers no matter when they made their attacks or where they crossed the English Channel. In 1942 it enabled the defenders of Midway to turn back the Japanese fleet.

In 1943 it guided a Navy plane to the first successful ground-<:<>n-trolled interception of an enemy aircraft in the Pacific theater.

Besides spotting enemy ships and planes, it was found that radar could be used in navigation, fire control, bombing, Ground Controlled Approach, meteorology and countless other operations.

The Office of War Information summed up the importance of radar when it said (before the atomic bomb was dropped):

"Radar has, more than any single development since the airplane, changed the face of warfare; for one of the greatest weapons in any war is rise, and surprise is usually c- eved by concealment in the last utes or hours before an attack. The concealment formerly afforded by darkness or fog or cloud or artificial smoke or the glare of the sun simply does not exist in the world of radar."

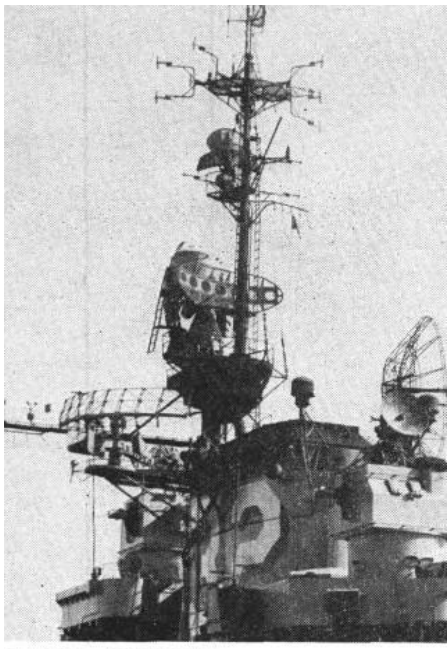
Few people realize that during the war more money was spent on radar research than on the development of the A-bomlr---three billion dollars on radar and two billion on atomic energy. Since the war, radar's versatility has proved it was well worth the cost.

The principle of radar is the same as that of an echo, except that instead of sound, radar works with radio waves. For many years echoes were used to estimate such things as the distance across a canyon or the range of an iceberg from a ship.

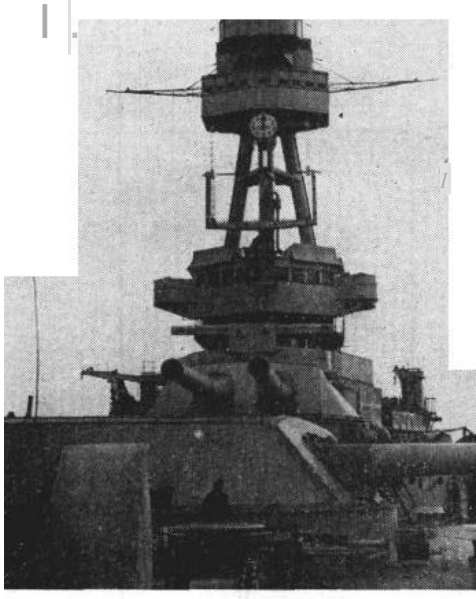
How? Well, let's say your ship is near an iceberg. When a blast is sounded on the whistle you time the interval between the blast and the return of the echo from the 'berg. Suppose it takes six seconds for the sound waves to make the round trip from ship to 'berg to ship. Since sound waves travel 1100 feet a second, the sound has gone 6600 feet in those six seconds. Divide the 6600 in half and you come up with the distance to the iceberg-3300 feet.

Of course, radio waves, moving at the speed of light (186,000 miles a second), travel much faster. But the principle is still the same--the measurement of distance by the time it takes for reflected waves to return to their source.

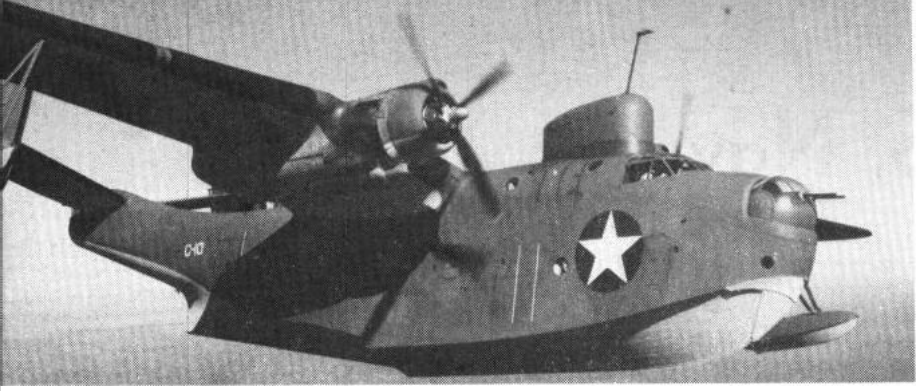
BasicaJly, a radar set consists of three essential parts; a transmitter



ANTENNA· STUDDED superstructure compared with early *models* (below) illustrates how radar had advanced.



EARLY BIRDS-USS *New York* (88 34) tested *radar* in 1939 (note rectangular antenna between bridge and foretop). *Below:* First *radar* as it was on *Leary.*



WORLD WAR II brought great advances. r>lanes like PBM *Mariner* took Navy radar into the air during the war to search out and destroy the enemy.

to send out pulses of high-frequency energy, a receiver to detect the minute portion of energy which is reflected and a device to measure the time interval between pulse and echo and portray this information to the operator.

The radar pulse begins in an oscillator, which produces extremely high frequency radio waves, ranging from less than one million to 10,000 million cycles per second. These microwaves are conducted to the antenna by coaxial cables or hollow, metal pipes called wave guides. On their way to the antenna the waves pass through a device called the duplexer, which automatically switches the antenna from the transmitter to the receiver during the time radar echoes are returning. Thus, the same line and antenna can be used for either sending or receiving.

Since microwaves behave in the same way as light waves, a radar antenna (especially the parabolic one used in fire control) is a lot like the headlight of a car. As the light waves from the headlight are concentrated in a beam by the reflector, so the radar waves are concentrated into a beam or "lobe" by the antenna.

If you'll look around your ship, you'll notice antennas shaped like dishes, bedsprings and barrel-staves. Each of these shapes produces a lobe pattern for a particular job. The size of the antennas varies according to frequency. Low frequency radar uses a large antenna and high frequencies require small antennas.

The "dish" or parabolic antenna is used with high frequency fire control radars because it creates a sharp, narrow beam for pinpointing targets. The "barrel-stave," which is actually a dish antenna with the top and bottom pieces cut off, focuses the waves in a beam shaped like a vertical fan. This type is most commonly associated with surface search radars. The "bedspring" antenna, used with low frequency radars, produces a broader fan which is the most effective shape for the detection of planes at long range.

A radar pulse lasts for only a very few microseconds, after which the

RDs Have a Pip ol a Job Operating Navy's Electronic Eyes

RADAR PLAYS an important part in the duties of many ratings in this electronic, nucleonic Navy, but the rating generally thought of first in connection with it is, of course, radarman.

At sea, the RD works in the Combat Information Center, where reports from lookouts, sonar, radio, :adar, visual signals and intelligence are sifted, evaluated and combined to give the entire ship an up-to-the-minute picture of everything going on in the surrow1ding area. No matter how skilled the CIC officer may be, his evaluation depends in large part on the radarman's speedy and accurate interpretation of what he sees on the scopes. An RD's mistake in the judgment of the size, A number, movement and location of• contacts could mean the loss of his ship.

HUNTING-Radarmen practice searching for pips. Analysis and location of contacts by RDs may some day determine the safety of their ship.

The RD's job calls for a lot more than looking for pips, reading ranges and bearings and keeping his set in good working order. Besides knowing how to operate his own set he also has to know how to foul up the enemy's radar through electronic countermeasures and how to overcome enemy attemps to do the same to him.

Since peering into a scope is a tedious, eye-straining job, radarmen usually work in pairs, with the "onseat" operator being relieved by his partner every half hour. When not "onseat" the RD still has plenty to do. Logs and status boards have to be kept on information coming into the CIC. Navigational data and the location and movement of friendly and enemy ships and planes have to be mapped out on various plotting and maneuvering boards to keep CIC displays current. When not occupied at one of these tasks the RD may be found manning the sound-powered phones, the squawk box, voice.. tubes or ship's service phones **toW'**

transmitter "rests" for several thousand of these infinitesimal measurements of time. This is to keep the next outgoing pulse from drowning out any returning echoes while the receiver is listening for them. It also prevents the transmitter from going up in smoke, since the set would soon bum itself out if it were sending constantly with all its tremendous power.

When the radar waves hit a target they bounce back to the antenna and are "piped" to the receiver. The receiver amplifies the echo and causes it to show up on the radar scope as a "pip." The scope is actually the face of a cathode ray tube, similar to the picture tube in a television set.

Aboard ship the most common scopes are the PPI, RHI and precision scopes. The PPI (Plan Position Indicator) shows a map of the area around the ship, putting into proper relative position all the targets the radar "sees." On it a line of light called the "sweep" swings around the screen like the second hand on a clock, pointing in the same direction as the antenna. The pivot point of the sweep, in the center of the screen, is the ship's location. A pip appears as a spot of light, "painted" in the fluorescent chemical of the screen.

Each time the sweep hits it again the spot becomes a little brighter, until it continues to glow for several seconds after the sweep has passed. Ranges and bearings to the contacts can be determined by the operation of various controls.

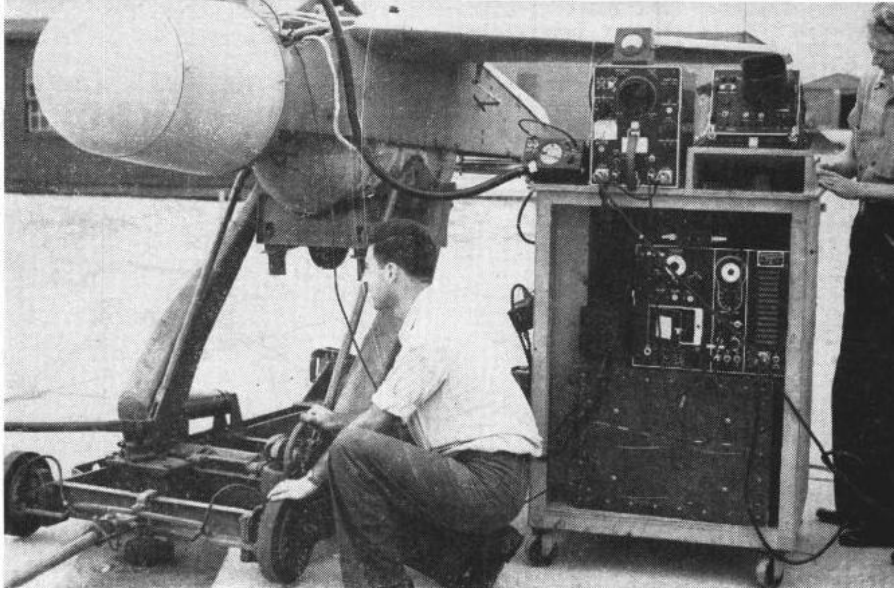
The RHI (Range Height Indicator) presents a picture of a vertical cross section of space. The location of a plane in this cross-section graphically portrays its altitude and distance from the ship.

The various indicators used in fire control gear usually show the operator a pip in relation to a set of cross hairs. By training bis equipment so that the cross hairs fall on the pip he points his director at the target.

Since the echoes picked up on radar scopes are called pips, the art of terpreting them is known, appropriately enough, as pipology. Once be has mastered this complicated, "seat-of-the-pants" art, the experienced radar operator can correctly identify the number and type of targets in a great many cases.

He can also tell whether the contact is on his side or the enemy's, through IFF (Identification Friend or Foe). This system consists of two units, the challenger hooked up to your ship's long-range air search gear, and the transp6ndor, carried by friendly ships and aircraft. In effect, the challenger electronically asks, "Who goes there?" and the b·anspondor answers by returning an echo which shows up as an identifying pattern on the PPL

It's appropriate that radar should ask such a question, for this electronic wonder-worker is like a sentry, "walking" its post night or day, fair weather or foul, peace or war, to protect you, your ship and your country. ***-Gerald Wolff.***



RADAR OPENED up field of guided-missile warfare. Here Navymen check WW II Bat, first fully automatic guided missile, which was radar-guided.

Here's How You Qualify

A ., relay to the rest of the ship the latest CIC information.

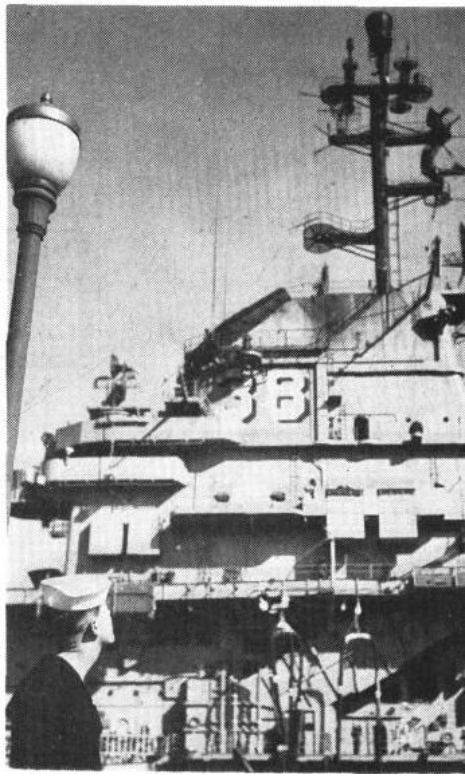
To qualify for the rating an aspiring RD should have average or above average general learning ability and should be able to use numbers in practical problems. He must also have good near vision, normal hearing and a clear speaking voice. A background in physics, mathematics, radio and electricity won't hurt him a bit either. He may get his training in radar through on-the-job experience, training course manuals or service schools.

There are two Class A schools, one Class B school and a number of special courses in which radarmen learn the intricacies of their complicated jobs.

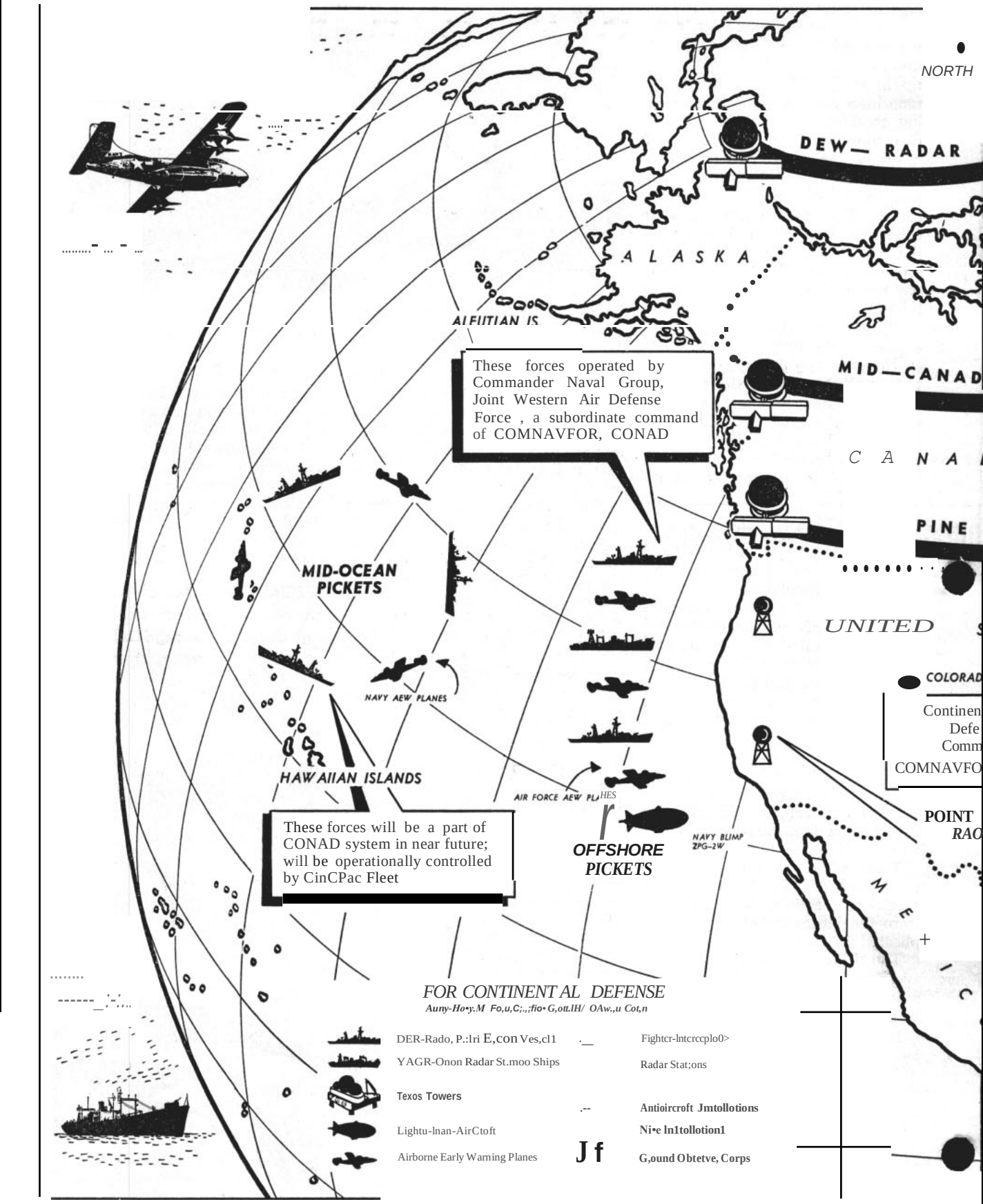
The Class A schools convene every two weeks and the Class B school, every four. For details see NavPers 91769-B.

In a way, the radarman is a modem descendant of the lookouts who manned the crow's nests in ships of long ago. For, although RD didn't join the Navy rating structure until 1942, his job of scanning sea and sky has been part of the Navy from its beginning.

SPECIALIZED **RADAR** antennas used on today's ships form weird pattern high above *USS Shangri La (CVA* 38).



EYES AND EARS ON DUTY I



DEFENSE OF A CONTINENT